[Course Overview](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=964bfbf4-020f-4027-b383-14f21ab8a51e&clip=0&mode=live)

Course Overview

Hello. My name is Deborah Kurata, and I'd [like to welcome you to my course,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=964bfbf4-020f-4027-b383-14f21ab8a51e&clip=0&mode=live&start=8.198888888888888) [Object-Oriented Programming Fundamentals](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=964bfbf4-020f-4027-b383-14f21ab8a51e&clip=0&mode=live&start=10.183) [in C#. This course takes you on a journey](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=964bfbf4-020f-4027-b383-14f21ab8a51e&clip=0&mode=live&start=12.3532) [through the principles, practices, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=964bfbf4-020f-4027-b383-14f21ab8a51e&clip=0&mode=live&start=15.377624999999998) [terminology of object-oriented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=964bfbf4-020f-4027-b383-14f21ab8a51e&clip=0&mode=live&start=17.975) [programming. Along the way, we'll build a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=964bfbf4-020f-4027-b383-14f21ab8a51e&clip=0&mode=live&start=20.273000000000007) [sample application with unit tests so you](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=964bfbf4-020f-4027-b383-14f21ab8a51e&clip=0&mode=live&start=22.631571428571434) [can code along or use it as a reference](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=964bfbf4-020f-4027-b383-14f21ab8a51e&clip=0&mode=live&start=25.454499999999996) [for your own development. Some of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=964bfbf4-020f-4027-b383-14f21ab8a51e&clip=0&mode=live&start=28.952363636363646) [major topics that we cover include](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=964bfbf4-020f-4027-b383-14f21ab8a51e&clip=0&mode=live&start=31.106749999999998) [identifying classes from requirements,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=964bfbf4-020f-4027-b383-14f21ab8a51e&clip=0&mode=live&start=32.7975) [separating responsibilities for focused](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=964bfbf4-020f-4027-b383-14f21ab8a51e&clip=0&mode=live&start=35.657) [classes, defining relationships between](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=964bfbf4-020f-4027-b383-14f21ab8a51e&clip=0&mode=live&start=37.975) [classes, and leveraging reuse through](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=964bfbf4-020f-4027-b383-14f21ab8a51e&clip=0&mode=live&start=40.948) [inheritance, interfaces, and polymorphism.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=964bfbf4-020f-4027-b383-14f21ab8a51e&clip=0&mode=live&start=44.366) [By the end of this course, you'll know](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=964bfbf4-020f-4027-b383-14f21ab8a51e&clip=0&mode=live&start=48.838) more about object-oriented concepts so you [can better leverage the features of C# to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=964bfbf4-020f-4027-b383-14f21ab8a51e&clip=0&mode=live&start=53.319999999999986) [build well-crafted and testable](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=964bfbf4-020f-4027-b383-14f21ab8a51e&clip=0&mode=live&start=56.32800000000001) applications. Before beginning this [course, you should be familiar with basic](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=964bfbf4-020f-4027-b383-14f21ab8a51e&clip=0&mode=live&start=61.18342857142857) [C# syntax and have some experience with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=964bfbf4-020f-4027-b383-14f21ab8a51e&clip=0&mode=live&start=63.47212499999999) [Visual Studio. I hope you'll join me on](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=964bfbf4-020f-4027-b383-14f21ab8a51e&clip=0&mode=live&start=66.6755) [this journey to learn object-oriented programming in C#, at Pluralsight.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=964bfbf4-020f-4027-b383-14f21ab8a51e&clip=0&mode=live&start=69.21199999999996)

Introduction

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So](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=0&mode=live&start=4.838) [the more you know about object-oriented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=0&mode=live&start=8.327285714285715) [programming concepts, the more you can](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=0&mode=live&start=10.291) [leverage the features of C# to build well](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=0&mode=live&start=12.121) [crafted and testable applications. Welcome](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=0&mode=live&start=15.162) [to Object-Oriented Programming](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=0&mode=live&start=18.554750000000002) [Fundamentals in C#, from Pluralsight. My](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=0&mode=live&start=19.85) [name is Deborah Kurata, and this course](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=0&mode=live&start=23.422124999999998) [takes you step by step through the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=0&mode=live&start=25.691) [principles and practices of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=0&mode=live&start=27.724) [object-oriented programming. The course](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=0&mode=live&start=30.36933333333333) [provides you with a firm foundation in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=0&mode=live&start=32.064) [object-oriented programming to help you](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=0&mode=live&start=34.381) [build production quality applications.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=0&mode=live&start=37.281714285714294) [Object-oriented programming is the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=0&mode=live&start=39.3) [foundation of many current application](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=0&mode=live&start=40.716) development approaches. 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Need to build an API or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=0&mode=live&start=79.122) [application programming interface for your](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=0&mode=live&start=81.8138571428571) [application? Yeah, if you are building a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=0&mode=live&start=84.2892) [software product, management wants an API](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=0&mode=live&start=86.15114285714282) [even though they probably don't know what](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=0&mode=live&start=88.56933333333333) [it is. Every cool product now provides an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=0&mode=live&start=90.79550000000003) API, right? 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Let's start our journey](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=0&mode=live&start=138.49566666666666) [into object- oriented programming with a few definitions.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=0&mode=live&start=140.68500000000003)

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Though they are often used](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=7.176799999999998) [interchangeably when speaking about](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=9.647833333333333) [object-oriented programming and when](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=11.19875) [building applications, they are not the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=13.212000000000002) [same thing. A class is code. Here is the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=15.815333333333331) [beginning of a customer class. Notice the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=18.712444444444433) [class keyword. It has properties such as](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=21.87842857142858) [EmailAddress and FirstName. The properties](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=24.522428571428573) [define the data managed by the class. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=26.534000000000002) [class also has functions such as Validate.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=29.579500000000003) [The functions define the actions or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=32.903) [behaviors managed by the class. In](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=34.474) [object-oriented programming, these](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=37.246) [functions are called methods. Together the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=38.727399999999996) [properties and methods of a class define](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=40.97271428571429) [the class members. The basic purpose of a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=43.147200000000005) [class is to provide the definition for a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=45.86055555555555) [particular type of objects. This class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=48.68750000000001) [defines objects of type Customer that can](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=51.389714285714284) [work with customer data and perform](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=54.196999999999996) [customer operations such as validating](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=56.1132) [customer information. An object is an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=59.131) [instance of a class. It is created using](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=62.54099999999998) [the C# new keyword. The syntax creates a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=65.86949999999997) [new instance of the customer class. That](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=68.6825) [instance is an object. This variable](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=71.31771428571429) [references the resulting object, hence, it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=74.2452) [is often called an object variable. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=76.81700000000002) [customer object represents a specific](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=80.10328571428572) [customer. Use the object variable to get](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=82.59471428571429) [or set any of the properties identified in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=84.57766666666664) [the class. The object variable holds the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=87.35785714285714) [state of the object, meaning, it retains](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=89.39800000000002) [the values of its properties and use the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=91.62042857142855) [object variable to call any of the methods](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=94.67742857142858) [identified in the class. In this case, the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=97.26449999999998) [Validate method is called for this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=100.01) [specific customer object. When the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=101.6) [application terminates, the object is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=104.5215) [gone. Any object state is gone unless it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=106.3545) [was stored somewhere such as in a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=109.230625) [database, but the class still exists](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=111.829) [because the class is defined in the code.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=114.181) [A common metaphor for understanding class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=117.927) [verses object is a cookie cutter. A class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=119.931) [defines the properties and actions for all](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=123.04928571428572) [objects created from it like this cookie](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=125.29950000000001) [cutter defines a consistent size and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=127.788375) [shape. Use the cookie cutter to create](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=130.31062500000004) [instances, each of which is an object.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=133.06071428571437) [Each object defines its own values for the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=135.581) [properties just like cookies created from](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=138.004) [the cookie cutter can have different](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=140.46) [decorations. Mmmm, cookies. The main point](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=143.12657142857145) [to get from this metaphor is that the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=145.79599999999996) [class provides the definition of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=148.93528571428578) [object type. It defines the properties and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=151.499) [actions appropriate for the thing, in this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=153.91833333333332) [case, heart-shaped cookie. Once you define](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=156.9642) [a class, you can create any number of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=158.85000000000002) [unique objects from the class. Each object](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=161.07142857142858) [is created as an instance of the class and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=163.90874999999997) [has its own values for the properties. In](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=166.86929999999998) [this example, different decorations. So](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=170.0436) [each cookie has the same object type,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=172.64437500000003) [heart-shaped cookie, but different values.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=175.097) [What about other related terms such as business objects and entity?](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=1&mode=live&start=178.456)

[Terms in Context](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live)

[You may hear something like, we need to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=1.297) [define the business objects. Confusingly,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=3.642) [the term business object normally refers](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=6.2846) [to a class. In most cases, it refers to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=9.047) [classes defined specifically for solving a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=12.641749999999998) [business problem like our customer class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=15.042000000000002) [here. So the customer class could be](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=17.807999999999996) [referred to as a business object. Used in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=19.937000000000005) [this context, a business object is not an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=23.349) [object at all, it is a class. So an object](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=25.452555555555556) [is not a class, but a business object](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=28.824400000000004) [often does refer to a class. Yeah, this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=31.302285714285713) [seems inconsistent to me too. When](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=34.650285714285715) [identifying and designing classes, it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=37.169200000000004) [doesn't really matter what we call them as](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=39.321875) [long as it's clear that once we start](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=41.49744444444444) [coding, we are building classes. Let's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=43.229) [talk about one more term at this point.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=46.86777777777778) [Entity. We just said that a class defines](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=49.426) [the properties and actions appropriate for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=52.285) [the thing, in that case the heart-shaped](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=54.26) [cookie. Calling each of the things we want](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=57.130875) [to create a class for, things is a little](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=59.07662499999999) [imprecise. A common term is to use entity.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=62.83733333333334) [This same term is used in the same context](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=66.01) [and database design to define the things](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=68.102) [that are significant enough to consider.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=71.028) [Same here. Anything from the real world](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=73.698) [that is significant enough to be](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=76.34) [represented as a class in the application](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=77.977) [is referred to as an entity. Note that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=80.42) [this use of the term entity has nothing to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=83.77877777777779) [do with Entity Framework, though Entity](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=86.36833333333334) [Framework also uses the term entity to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=88.98014285714285) [define the significant things. Putting the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=91.99600000000001) [terms together, say we are building a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=95.13085714285715) [customer management system. From the name](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=97.6462) [of the system, we would expect customer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=99.779) [would be an entity. It is important enough](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=101.71100000000003) [to consider as a class. After some](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=104.55222222222224) [analysis, we determine that there should](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=106.964) [indeed be a customer class. And it has](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=109.03228571428572) [first name and last name properties, and a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=111.634375) [Go On An Adventure method. When executing](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=114.415125) [the application, the user may request all](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=117.7945) [customers with a last name that starts](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=120.03887499999999) [with Bag. So the application may create](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=123.27733333333333) [two instances of the customer class; one](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=126.09914285714282) [for Bilbo Baggins and one for Frodo](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=128.83442857142856) [Baggins. These are our two objects created](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=132.44000000000003) [from the class. Bilbo and Frodo are both](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=135.43299999999994) [customer objects. They are instances of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=138.7441428571428) [the customer class. And either one, or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=141.4398571428571) [both, can execute the Go On An Adventure](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=144.48066666666665) [method. Now that we know the difference](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=148.07125) [between an object and a class, let's define object- oriented programming.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=2&mode=live&start=149.90875)

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To](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=16.931) [build an application following object-](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=20.025333333333332) [oriented programming techniques, start by](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=21.597) [identifying the classes from the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=24.079857142857147) [requirements or specification.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=25.992) [Object-oriented programming represents the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=28.418) [entities and concepts of an application as](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=30.555) [a set of classes. Next, analyze the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=33.009) [identified classes and separate](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=36.63366666666666) [responsibilities as needed.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=38.427) [Object-oriented programming focuses on](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=41.144) [logically separating the responsibilities](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=43.13) [of the application into classes. The idea](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=45.36) [is that an application should be](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=48.477250000000005) [decomposed into parts with minimal](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=50.305) [overlap. If each class has a singular](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=53.62333333333332) [purpose, it is easier to write, test, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=56.5027142857143) [later find that class to update or extend](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=58.85222222222224) [it. That makes the code easier to modify](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=61.29685714285714) [and adapt to new requirements and future](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=63.44312500000002) [demands. This is sometimes called the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=66.37842857142856) [principle of separation of concerns. No](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=68.10685714285717) [class is an island. No class stands on its](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=71.8834) [own. Object-oriented programming involves](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=75.02650000000001) [understanding the relationships between](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=77.227) [the classes. These relationships define](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=79.324) [how the objects created from those classes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=82.409) [work together to perform the operations of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=85.042) [the application. One of the key goals of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=87.415) [object-oriented programming is reuse. By](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=90.533) [extracting commonality among a set of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=94.02214285714285) [classes into a separate class, our code is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=95.895) [more reusable. Extensive reuse of existing](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=98.257) [proven classes shortens development time](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=101.865) [and leads to more robust applications.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=104.98) [This course walks you through each of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=108.737) [these tasks. Though shown here as a set of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=111.53233333333331) [steps, object-oriented programming is an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=114.28925000000004) [iterative process. You may identify a few](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=117.23433333333331) [classes, look at separating out some](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=120.10950000000003) [responsibilities, and then find you need](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=121.868) [to identify more classes. You may define](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=123.84799999999998) [some relationships and find you need to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=127.47228571428569) [separate out more responsibilities, and so](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=129.71249999999998) [on. We're covering a lot. Let's look at ways to get the most from this course.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=3&mode=live&start=132.6045)

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This](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=6.527250000000002) [means understanding basic C# syntax,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=9.360000000000001) [variables, conditionals, and control flow.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=12.3456) [If you don't have the requisite knowledge,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=14.5685) [consider viewing one of the C#](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=16.921599999999998) [Fundamentals courses in the Pluralsight](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=19.056142857142852) [library. It is also suggested that you](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=20.824166666666667) [have experience with Visual Studio as we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=24.186285714285713) [will be using it to build our classes and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=26.409799999999997) [our unit tests. If not, consider viewing](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=28.710333333333335) [one of the Introduction to Visual Studio](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=31.137999999999998) [courses in the Pluralsight library. You do](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=33.606125) [not need object-oriented programming](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=36.78614285714286) [experience. We'll cover what you need in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=38.79242857142859) [this course. If you know some C# and are](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=41.43074999999999) [comfortable with Visual Studio, you are](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=43.998874999999984) [ready to go. When building applications,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=46.95087499999999) [there are often lots of steps and places](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=49.432500000000005) [where things can go wrong. That's when a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=51.801375) [good checklist can come in. I'll present](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=54.24662500000001) [checklists at the end of many of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=56.550000000000004) [modules, and we'll use them as a brief](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=58.91255555555554) [review of what was covered in that module.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=60.98944444444444) [Feel free to jump ahead to the checklist](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=63.172000000000004) [if you have problems when coding along](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=65.65342857142858) [with the demos. And consider referencing](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=67.95800000000001) [these checklists as you start implementing](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=70.1366) [your own object- oriented applications.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=72.34814285714286) [Coding along through the demos is another](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=75.976) [great way to get the most from this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=78.319) [course. Though not required, it is often](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=80.86033333333334) [helpful to try out the presented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=82.55274999999997) [techniques. Now let's finish up this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=85.15099999999998) [introductory module with a look at the outline for the remainder of this course.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=4&mode=live&start=87.23600000000002)

[Course Outline](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live)

[This course takes you through the process](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=1.723) [of building object-oriented code in C# by](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=3.193) [stepping through each object-oriented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=6.395) [programming task. Most projects start with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=8.23) [some words. This course begins by walking](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=10.826) [through how to turn those words into a set](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=13.499) [of well-defined classes. Then we'll build](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=15.954) [those classes using C# and write some](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=19.023875000000004) [simple unit tests to test those classes.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=21.653333333333336) [Next, we separate out some of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=24.668) [responsibilities of those classes into](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=26.502) [additional classes and modify the code](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=28.984) [accordingly. Then we look at how to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=32.39114285714286) [establish relationships between the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=34.03471428571427) [classes and change the code to implement](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=35.6042) [those relationships. The relationships](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=39.05457142857143) [define how the objects from those classes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=40.637) [work together to perform the operations of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=43.13128571428571) [the application. The power of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=46.6492) [object-oriented programming lies in its](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=48.8196) [promise of reuse. We look at techniques](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=50.7685) [for leveraging reuse using object-oriented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=53.275000000000006) [programming techniques. We'll modify the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=55.66) [code to build a reusable class, and then,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=57.7525) [of course, reuse it. We'll take reuse a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=60.29357142857142) [step further and build a reusable](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=63.20322222222224) [component as well. Lastly, we look at](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=65.078) [defining and using interfaces. Interfaces](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=68.922) [are an integral part of the .NET Framework](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=70.93871428571428) [and are used in many design patterns. When](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=73.50677777777777) [you've finished this course, you will have](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=76.877) [a firm foundation in the object-oriented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=78.60825) [programming principles and practices. You](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=80.63820000000001) [will have the knowledge to build](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=83.67085714285714) [production quality applications, and you](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=84.798) [will be ready to successfully advance to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=87.66971428571429) [intermediate level C# courses. The more](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=90.096) [you know about object-oriented programming](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=93.08233333333334) [concepts, the more you can leverage the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=94.684) [features of C# to build flexible,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=97.071) [well-crafted, and testable applications. Let's get started.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m1-introduction&clip=5&mode=live&start=99.8838)

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Or maybe just we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=11.702) [need to change the system to track](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=14.716555555555555) [different types of products. Welcome back](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=17.07633333333333) [to Object-Orienting Programming](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=19.646500000000003) [Fundamentals in C#, from Pluralsight. My](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=21.009666666666664) [name is Deborah Kurata, and this module](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=24.37325) [shows you how to extract classes from](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=26.79) [words as a first step in building an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=29.544499999999996) [object- oriented application. This module](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=31.863874999999993) [takes you step by step from business](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=34.68725) [requirements through to an initial set of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=37.21366666666666) [classes that address those business](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=40.12425) [requirements. We first analyze the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=42.19237500000002) [business problem starting with the nouns](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=44.67666666666668) [to identify appropriate classes. Then,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=46.89333333333333) [define an initial set of class members,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=49.598) [that is, the set of properties and methods](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=52.396) [for each of those classes. Along the way,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=54.583) [we identify two of the four pillars, or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=57.52766666666667) [key characteristics, of object-oriented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=60.928000000000004) [programming, abstraction and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=63.75833333333334) [encapsulation. Note that some literature](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=66.841) [includes only three pillars of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=69.32766666666666) [object-oriented programming, skipping](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=71.17524999999999) [abstraction. That's because abstraction is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=73.50866666666667) [more of a concept, the way to think about](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=75.58000000000003) [your classes, and not a programming](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=78.1321428571429) [technique. This will become clear as we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=81.13250000000002) [define our abstractions later in this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=83.29949999999997) [module. Although the example used in this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=86.35939999999998) [course builds a new application, all the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=88.59442857142858) [principles, practices, and techniques we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=91.54700000000001) [cover are equally applicable when](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=93.87399999999998) [implementing new features or making](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=95.8542) [enhancements to existing applications. Now](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=98.74171428571427) [let's get to that imaginary meeting with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=101.98585714285714) [the subject matter experts so we can collect our requirements and get started.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=0&mode=live&start=104.1635)

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Where do you start? The first](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=20.696666666666665) [step to building an object- oriented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=23.757428571428573) [application is to identify the classes. So](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=25.931428571428572) [let's start there. Let's take a look at](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=28.96175) [the specification change request, or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=31.417142857142863) [email, that we were given using it to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=32.78814285714286) [identify the initial set of classes that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=35.5375) [represent the business entities, and then](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=38.02649999999999) [define the appropriate properties and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=40.3765) [methods. You are called into a meeting](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=43.556666666666665) [with one of the department heads and her](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=45.73566666666669) [staff. They will be your subject matter](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=48.19483333333332) [experts for collecting the requirements.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=50.35728571428572) [One of the subject matter experts says,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=53.073) [thank you for meeting with us today. 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The subject](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=65.26400000000001) [matter expert continues. We are calling it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=69.1446) [the Acme Customer Management System. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=71.84099999999998) [new system must manage business,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=74.10650000000001) [residential, government, and educator](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=76.74199999999999) [types of customers. It must manage our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=78.859) [products and accept orders from customers](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=81.68957142857141) [either online or through our call center.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=84.09799999999998) [No problem, you say, or something to that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=87.309) [effect. Okay, this particular business](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=90.22188888888891) [problem is a little overly simplified, but](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=92.09000000000002) [it defines a business component that we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=94.7805714285714) [can build within the timeframe of this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=96.92314285714284) [course, and it is complex enough to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=99.46083333333334) [demonstrate key object-oriented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=101.60200000000003) [programming principles. Let's analyze the requirements we were given.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=1&mode=live&start=103.28166666666667)

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[When extracting classes from words, the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=2&mode=live&start=2.348) [easiest place to start is with the nouns.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=2&mode=live&start=4.7379999999999995) [A noun is a person, place, thing, or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=2&mode=live&start=7.818) [process. Look at each noun defined in the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=2&mode=live&start=10.81444444444445) [requirements and determine whether it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=2&mode=live&start=12.645) [should be represented as a class. Looking](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=2&mode=live&start=14.617) [at the first requirement, manage business,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=2&mode=live&start=17.7702) [residential, government, and educator](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=2&mode=live&start=20.486000000000004) [types of customers, the noun that sticks](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=2&mode=live&start=22.341) [out is customer. From the second](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=2&mode=live&start=25.501285714285714) [requirement, manage our products, the noun](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=2&mode=live&start=27.87825) [is product. The third requirement, accept](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=2&mode=live&start=30.66728571428572) [orders from customers online or through](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=2&mode=live&start=33.17300000000001) [our call center, includes several nouns,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=2&mode=live&start=35.37166666666668) [but the important one for our purposes is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=2&mode=live&start=38.507) [order. In this case, each requirement](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=2&mode=live&start=41.642111111111085) [identified one class. That may not always](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=2&mode=live&start=44.10566666666666) [be the case. Some requirements may](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=2&mode=live&start=46.964000000000006) [identify multiple classes or no classes at](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=2&mode=live&start=49.3014) [all. This step results in our first cut of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=2&mode=live&start=52.734999999999985) [classes. The Customer class manages the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=2&mode=live&start=56.109444444444456) [business, residential, government, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=2&mode=live&start=58.137333333333316) [educator customers. The Product class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=2&mode=live&start=60.38120000000001) [manages our current products. And the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=2&mode=live&start=62.90414285714286) [Order class manages orders received online](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=2&mode=live&start=65.33414285714287) [or from the call center. Next, we identity](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=2&mode=live&start=67.68433333333334) [appropriate properties and methods for each class.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=2&mode=live&start=71.16319999999999)

[Define Appropriate Members](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live)

[The members of a class define the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=2.286) [properties, or data, the class requires](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=3.749) [and the methods, or operations, that an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=6.458428571428572) [object from the class can perform. We](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=9.477142857142855) [again use the requirements as a starting](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=12.439124999999999) [point to define the appropriate members](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=14.316) [for each class. Let's begin with the class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=16.428) [properties. To manage the customers, we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=20.82337500000001) [must minimally track the customer's name,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=22.886714285714294) [last name, first name, email address, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=25.56366666666667) [home and work addresses. To manage](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=28.545714285714283) [products, we should track the product](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=31.258800000000004) [name, description, and current price. And](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=32.92883333333333) [to handle the orders, we must track the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=35.73222222222222) [customer, order date, shipping address,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=37.614) [and the products and quantities ordered.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=40.773) [With the properties defined, here are our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=43.634) [classes so far. Our customer class manages](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=45.591) [the customer properties. The product class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=48.967) [defines the product properties, and the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=51.968500000000006) [order class tracks the order properties.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=54.195714285714295) [Wait, what? This isn't right. Using the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=57.307) [nouns to determine the initial set of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=60.708571428571425) [classes is helpful, but it only provides a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=62.884142857142855) [starting point. Looking at the properties](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=65.93924999999999) [and methods for each class helps clarify](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=67.90000000000002) [the design and often illustrates other](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=70.1617142857143) [potential classes. In this case, we need](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=73.265) [to track the customer, order date, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=75.68275000000003) [shipping address for the order, and then](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=77.75366666666667) [each product and quantity ordered. It](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=80.374875) [wouldn't make sense to require a separate](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=82.85450000000002) [order for each ordered product. It sounds](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=85.32614285714284) [like we need another class, Order Item.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=87.71657142857141) [The order then has a set of order items](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=91.516) [specifying the product and quantity. Now](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=94.316) [that we have the properties, what about](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=97.58683333333333) [the methods? We'll need some basic methods](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=99.67999999999999) [in each of the classes, Validate to ensure](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=102.052125) [valid information is entered, Retrieve to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=105.1686666666667) [retrieve existing data from a data store](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=108.23057142857142) [such as a database, and Save to save](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=110.65833333333333) [entered or changed data back to that data](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=113.74225) [store. The methods define the operation's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=116.08416666666668) [actions and behaviors appropriate for the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=118.526) [class, hence, methods are named using a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=121.3952) [verb. Each object instantiated from the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=124.35100000000001) [class can perform the operations. That's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=126.40699999999997) [it. We have our initial set of classes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=129.219875) [along with their properties and methods.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=131.5142857142857) [There is one more thing to think about at this stage. The fourth dimension, time.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=3&mode=live&start=134.45)

[Consider Time](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live)

[It's easier to think about the list of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=2.279) [classes and their members at one point in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=3.656) [time. But the resulting application will](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=6.8275555555555565) [need to work for several years or more.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=8.483285714285715) [During that time, data will change.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=11.759) [Customers move, product prices are](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=14.206) [updated, and so on. Let's take a moment to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=16.252666666666663) [think about our classes and members over](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=18.859333333333346) [time. Over time, the customer's data may](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=22.088571428571434) [change. Their email address, their](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=24.853285714285708) [addresses, and even their name. It's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=26.608000000000004) [important to think about whether the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=28.79985714285715) [application cares about these changes or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=30.818333333333328) [needs to track historical information.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=32.690571428571424) [Notice how the order has a property of its](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=35.526) [own for the shipping address. This ensures](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=37.643) [that the shipping address is retained over](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=40.38685714285714) [time, regardless of changes made to the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=42.681333333333335) [customer's addresses. If the customer has](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=46.062400000000004) [an updated address, the order retains the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=48.67314285714285) [address the order was originally shipped](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=50.94650000000001) [to for historical reference. Looking at](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=53.23566666666667) [the product, how will its data change over](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=56.058749999999996) [time, and how will that affect the order?](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=58.171) [Can the product price be updated? That](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=60.94875) [would be problematic. Consider this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=63.99875) [scenario; customer Joe places an order for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=66.33) [a new keyboard. His order comes to 49.95.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=69.25900000000001) [The staff then changes the price to 59.95.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=73.222) [Since the order item is simply referencing](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=77.209) [the product, when Joe gets an email of his](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=79.228) [order a few minutes later, the price is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=81.54) [now 59.95. That would make for one unhappy](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=85.0776) [customer. How do we deal with these data](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=88.40057142857147) [changes over time? One option is to track](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=91.04699999999997) [the purchase price in the order item. That](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=93.25012500000003) [ensures that the price given when the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=95.86287499999997) [order is placed is the purchase price](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=98.00033333333334) [regardless of changes to the product data](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=100.11342857142857) [over time. It is always a good idea to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=103.2845) [take a moment and consider how time](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=106.26510000000005) [affects your classes and members, and add](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=108.777) [classes or members as needed to ensure](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=111.39200000000001) [your classes stand the test of time.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=113.86085714285716) [Speaking of time, now is a good time to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=116.74150000000002) [introduce two more terms; abstraction and encapsulation.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=4&mode=live&start=119.34233333333336)

[Abstraction](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live)

[From the list of requirements, we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=2.5) [identified Customer as a class, but what](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=4.490666666666667) [is a customer in the context of our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=7.646888888888889) [application? Joe Smith is a customer. Joe](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=10.09657142857143) [is the CEO of Smith Incorporated. He's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=13.822428571428572) [married, has two children, and a dog. He](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=16.752875) [takes the metro to work every day and goes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=19.50822222222222) [out to lunch on Fridays. For the purpose](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=21.755833333333335) [of this customer management system, the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=24.480142857142855) [majority of this information is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=26.81025) [irrelevant. We can abstract it away and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=29.518375) [focus only on the features of the customer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=31.803333333333338) [appropriate for our application. For our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=34.76999999999998) [case, we only care about a customer's name](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=37.273166666666654) [and contact information. That helps us to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=39.99212499999997) [simplify reality and think of customer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=43.001) [just in terms of a contact. If we were](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=45.35814285714287) [building a system that sent emails about](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=48.567874999999994) [products that Joe might like, then we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=50.42885714285715) [could define a different abstraction for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=52.86766666666667) [our customer that included more personal](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=54.51) [information. Or if we were building a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=57.67533333333333) [personal assistant, we might define an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=59.639571428571415) [abstraction that included Joe's family and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=62.05633333333331) [how he gets to work. The appropriate](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=63.83099999999999) [abstractions depend on the requirements of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=66.90660000000001) [the application. Abstraction is the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=70.32528571428573) [process of defining classes by simplifying](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=72.40800000000002) [reality, ignoring extraneous details, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=75.28449999999998) [focusing on what is important for a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=78.39622222222222) [purpose. It involves abstracting away the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=81.34477777777781) [extraneous details in order to focus on](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=83.90433333333334) [what is relevant for the particular](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=86.01575) [application. Defining appropriate](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=89.30020000000002) [abstractions is considered one of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=90.97550000000001) [pillars, or key characteristics, of object-oriented programming.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=5&mode=live&start=93.22200000000001)

[Encapsulation](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live)

[Another pillar of object-oriented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=1.678) [programming is encapsulation. Unlike](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=3.264) [abstraction, which is a concept, basically](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=6.184166666666666) [a way to think, encapsulation is a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=8.619399999999999) [technique. Encapsulation is a way to hide](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=12.06675) [or encapsulate the data and implementation](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=14.570571428571432) [details within a class, thus hiding](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=17.421) [complexity. This large circle represents a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=21.201857142857143) [class, specifically the customer class.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=23.536166666666663) [The data field's name, email, home](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=26.256) [address, and work address are all hidden](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=28.307999999999993) [within the class. No other code can access](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=31.151333333333326) [these data fields. The code for the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=34.545124999999985) [operations such as the validate, retrieve,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=37.01049999999999) [and save is also hidden within the class.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=39.09542857142857) [No other code can just jump into this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=42.379749999999994) [code. The benefit of hiding this data and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=45.31549999999999) [implementation is that no other code in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=48.47228571428571) [the application needs to know about these](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=50.73524999999999) [details. In C#, the object data is exposed](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=53.067600000000006) [to the application through property](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=55.89014285714285) [getters and setters. The operations are](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=58.42399999999999) [exposed to the application through](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=61.174) [methods. The exposed set of methods and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=63.56433333333334) [property getters and setters define the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=66.09542857142856) [class interface to the rest of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=68.27416666666666) [application. We'll talk more about](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=71.10271428571427) [interfaces later in this course. If the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=72.667) [UI, for example, wants to access the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=75.16485714285717) [property such as the name, it must call](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=77.44750000000002) [the getter or setter. The getter retrieves](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=80.26499999999999) [the value of the private data, optionally](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=82.61142857142858) [manipulates that data, and returns it. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=84.9308) [setter optionally validates the incoming](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=88.565) [value, and if valid, updates the private](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=90.232) [data. We'll see this in action in the next](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=93.3885) [module. Any code that wants to perform an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=96.82688888888892) [operation using the code within the class,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=98.87437500000003) [must call the methods. Encapsulation is a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=100.935) [key underlying principle that makes it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=104.83500000000001) [possible to build large, full-featured](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=107.26057142857144) [systems by breaking complex operations](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=108.8994) [into encapsulated units. These](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=111.758) [encapsulated units are classes.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=114.801) [Encapsulation allows the objects in an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=117.409) [application to work together without each](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=119.39) [object knowing the details of other](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=121.635) [object's implementation. Encapsulation](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=123.772) [hides both the data and implementation](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=126.97983333333333) [within the class. This data hiding has](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=129.62775) [many benefits. It protects the data. No](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=133.23866666666663) [other code can modify the underlying data](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=135.59537500000005) [except through the getters and setters.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=138.03) [This prevents an object's values from](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=140.391) [being corrupted by other objects. We can](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=142.40871428571424) [add code to the getter to perform](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=145.5727777777778) [operations before the data is provided.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=147.098) [For example, we could ensure the user has](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=149.97) [access to the specific data element. We](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=151.901) [can add code to the setter to perform](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=154.7121111111111) [operations before the data is set. For](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=156.513) [example, we could provide validation so](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=159.53428571428572) [that the data is never set to an invalid](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=161.804) [value. Hiding the method implementation](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=165.0899000000001) [details also has benefits. It helps to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=166.91259999999997) [manage the complexity of the application](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=169.53375) [by breaking it down into manageable units.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=171.55400000000003) [It shields the other objects from having](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=174.537) [to know the implementation details. Only](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=176.27562500000008) [the class needs to understand the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=179.27462500000001) [implementation. The code is easier to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=181.84637500000008) [modify and test because the implementation](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=183.64749999999995) [is encapsulated in one place. Because of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=185.99260000000004) [this, the implementation can be changed,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=188.74866666666665) [as needed, without impacting the rest of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=191.275) [the application. The real world works like](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=193.447) [this as well. For example, if you go to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=196.563) [Amazon and order a product, you don't need](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=199.276) [to know anything about where or how your](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=201.719) [product is stored or how your order is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=203.553) [processed. By building classes with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=207.1058888888889) [properties and methods, we encapsulate the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=208.59733333333332) [logic for each entity within one unit of code.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=6&mode=live&start=210.62557142857148)

[Summary](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live)

[In this module, we saw how to use the set](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=2.739) [of words from the requirement](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=4.712) [specification, whatever its form, to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=6.046) [identify the initial set of classes for an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=8.89875) [application. We walked through how to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=11.189714285714285) [analyze the business problem. Start with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=13.648) [the nouns to identify the entities and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=15.958000000000002) [determine which entities should be](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=17.903599999999997) [implemented as classes. Define the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=20.020599999999998) [appropriate members, which are the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=22.032500000000002) [properties and methods of each class.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=23.410285714285713) [Identify each role of a data element as a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=25.128) [property and each required action or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=28.515857142857143) [behavior as a method. And don't forget to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=30.797) [consider the effect of time. For example,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=33.70811111111111) [adding a shipping address to an order may](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=35.80528571428571) [seem like duplicating data, but it allows](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=38.48257142857143) [the customer data to change over time](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=40.658125000000005) [while retaining the order data at a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=42.529250000000005) [specific point in time. Along the way, we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=45.1298) [define two of the four pillars of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=48.31699999999999) [object-oriented programming. Abstraction](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=51.1945) [describes an entity in simple terms,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=52.932) [ignoring the irrelevant details. It](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=55.6304) [reduces complexity by focusing only on](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=58.69728571428571) [what is important for the purpose of this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=60.937) [specific application. And encapsulation,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=63.427) [which allows for hiding the data and the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=66.41366666666666) [implementation within the class. We'll see](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=69.95599999999999) [encapsulation in action in the next](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=72.29557142857142) [module. We've taken the first step in the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=74.72) [journey toward an object-oriented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=77.37224999999998) [application by using the requirements to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=79.1218) [identify the initial set of classes, their](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=81.40633333333335) [properties, and their methods. Before](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=84.24716666666667) [moving on, let's see how to implement what we have so far in C#.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m2-identifying-classes&clip=7&mode=live&start=86.86266666666668)

[Building Entity Classes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=0&mode=live)

[Introduction](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=0&mode=live)

[Now that we've defined a set of classes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=0&mode=live&start=0) [for our basic entities, let's build them.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=0&mode=live&start=4.168) [Welcome back to Object-Oriented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=0&mode=live&start=8.235) [Programming Fundamentals in C#, from](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=0&mode=live&start=10.042200000000001) [Pluralsight. My name is Deborah Kurata,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=0&mode=live&start=13.227600000000002) [and this module demonstrates how to build](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=0&mode=live&start=15.54225) [classes. Recall the classes we identified](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=0&mode=live&start=19.1378) [so far in this course; Customer, Product,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=0&mode=live&start=21.223875) [Order, and Order Item. This module](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=0&mode=live&start=24.854200000000006) [provides step- by-step demonstrations](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=0&mode=live&start=28.15271428571428) [showing you how to create and test one of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=0&mode=live&start=30.06666666666667) [these entity classes. The others are](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=0&mode=live&start=33.87812500000001) [created later in this course using the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=0&mode=live&start=35.90275000000001) [same techniques. But before we can build](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=0&mode=live&start=38.242000000000004) [the classes, we need to lay out the structure of the application.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=0&mode=live&start=40.81000000000001)

[Layering the Application](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live)

[Most applications today are built with a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=2.207) [layered structure. Though not specifically](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=4.174) [an object-oriented programming concept,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=6.686) [layering is key to defining a good](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=8.984) [application structure. That structure is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=11.089) [then defined in Visual Studio using a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=13.864142857142856) [solution for the application and a project](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=16.507714285714286) [for each layer. Most applications are](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=19.688999999999997) [minimally divided into three layers. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=22.389199999999995) [user interface layer is where we create](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=25.326) [the forms, or pages, that are displayed to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=27.581000000000003) [the user. It includes any logic required](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=30.1705) [to control and populate the user interface](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=32.44457142857143) [elements. The business logic layer is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=35.533) [where most of the application logic](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=37.15900000000002) [resides, including the logic to perform](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=39.67150000000001) [the business operations. The design we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=41.78950000000002) [have so far in this course will be](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=44.07171428571428) [implemented in the business logic layer.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=46.481) [And a data access layer that contains the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=49.26) [code to retrieve data from the database or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=51.276) [other data store and save data back to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=53.958) [that data store. If you use Entity](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=56.73311111111113) [Framework, this is where the Entity](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=59.67542857142857) [Framework code resides. Some applications](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=62.23299999999999) [have additional layers, depending on the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=64.3232) [complexity and design of the application.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=66.36114285714285) [Though it's not really a layer, many](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=68.26514285714286) [applications include a common library for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=71.15033333333334) [general purpose code that's useful](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=73.79466666666666) [throughout the application. That can](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=76.3145) [include code for features such as logging](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=78.69000000000001) [or sending an email. Each of the layers](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=80.91640000000001) [and the common library are defined as a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=84.53799999999998) [separate project within a Visual Studio](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=87.281) [solution. When the code in each project is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=90.01733333333333) [built, Visual Studio creates an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=92.76200000000004) [appropriate component. The user interface](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=95.30133333333332) [project might compile to an exe. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=97.25528571428572) [remaining layers are created as class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=99.487) [libraries and compiled to DLLs. Dividing](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=101.97985714285713) [an application into layers makes it easier](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=104.77383333333333) [to work with each layer and easier to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=106.9725) [extend the application. By having the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=109.77619999999999) [business logic separate from the user](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=112.4912857142857) [interface, we could later add a web user](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=114.05375000000001) [interface onto a desktop application](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=116.59733333333332) [without reworking or rewriting any of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=118.6576) [business logic. Now we are ready to start building our application.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=1&mode=live&start=122.80039999999998)

[Building the Business Logic Layer Component](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live)

[The classes we have identified so far in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=2.741) [this course will contain the data and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=4.474) [processing required for the business](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=7.055) [logic. So let's start by building our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=9.901666666666666) [business logic component. I've just opened](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=12.184428571428569) [Visual Studio. I am using Visual Studio](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=15.820714285714283) [2017 Enterprise edition, but you can use](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=19.363142857142865) [any edition of Visual Studio, including](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=21.783374999999996) [the free Express edition. Start by](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=24.50914285714286) [creating a new project. Click Create new](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=27.709666666666664) [project on the start page or File, New,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=30.445375) [Project from the menu. Then, select the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=34.43057142857143) [project template. First, pick the desired](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=38.895999999999994) [language on the left. Everything you see](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=41.34050000000001) [in this course can be done with VB or C#,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=43.278625) [but we'll use C#. On the right, select the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=47.04411111111112) [template. Since we are building the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=51.094666666666654) [project for the business logic, we want](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=52.527625) [the template for our Class Library. We'll](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=54.48171428571429) [stick to the .NET Framework Class Library](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=56.96950000000001) [for our purposes. We are building the Acme](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=59.934) [Customer Management System business layer,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=62.91483333333335) [so we'll name the project ACM, for Acme](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=65.595) [Customer Management, .BL for business](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=69.062) [layer. I'll pick my desired location. And](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=72.66283333333335) [since the solution will hold all of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=75.79522222222222) [projects for this application, we'll name](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=77.613) [it just ACM. Visual Studio then creates](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=81.1898) [the solution and project and displays it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=85.04599999999999) [in Solution Explorer. It also creates a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=88.36271428571426) [default class for us. Looks like we are ready to write some code.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=2&mode=live&start=91.57199999999999)

[Building a Class: Properties](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live)

[In this demo, we build the customer class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=2.811) [and add some of its properties. Now that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=5.686) [we created the business layer project, we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=8.848) [can add the entity classes to that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=10.9845) [project. Let's start with the customer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=13.4815) [class. We could delete Class1 and add our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=15.877333333333334) [customer class from scratch, or we can](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=20.009857142857143) [simply rename Class1. If we rename Class1](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=23.178000000000004) [in Solution Explorer to Customer, it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=26.5435) [provides an option to automatically rename](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=29.024666666666665) [the class in the code file. Let's do that.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=31.23225) [By default, a class is private and not](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=34.864875000000005) [accessible to any other code. The public](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=37.92662500000001) [keyword gives the class public](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=41.275499999999994) [accessibility. That means that the class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=43.73674999999999) [is callable from any other part of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=45.42524999999999) [application. We want other layers to use](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=48.26550000000001) [these entity classes, so we want them to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=50.0565) [have public accessibility. We now have a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=53.72333333333334) [Customer class. Each class we define is a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=56.84233333333332) [type. Just like strings are types and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=60.294714285714285) [integers are types, our classes are types.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=62.59285714285713) [We've identified several properties for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=66.176) [the Customer class, including a name](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=68.25099999999998) [property. We could define a name property](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=71.85183333333336) [here. In most cases, when building a class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=74.34042857142856) [that represents a person, the name is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=76.55825000000002) [divided into two separate properties;](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=78.88214285714282) [FirstName and LastName, and if necessary,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=81.48640000000002) [middle name or initial. This gives us more](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=84.822) [flexibility in working with and displaying](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=87.57357142857146) [the name. Let's define a property for the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=89.9848) [first and last name. Recall from the last](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=92.35725000000001) [module, a class should encapsulate its](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=95.39414285714284) [data. That means that the actual data is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=98.29183333333333) [hidden within the class, and access to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=100.85000000000001) [that data is provided with accessors. In](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=103.46174999999997) [code, the data is hidden by defining a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=107.40322222222221) [private backing field. This field holds](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=109.661) [the data, and it uses a private access](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=112.78133333333332) [modifier to ensure that no code outside of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=115.71885714285713) [this class can access it. The data is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=118.79175000000001) [accessible to other parts of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=121.60224999999998) [application through a C# property. I'll](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=123.32683333333333) [paste the code, and we can talk through](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=126.049875) [it. A property is often defined with a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=127.99057142857143) [public access modifier, meaning any code](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=131.4592) [can use it to get or set the data. If we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=133.74399999999997) [want the property to only be accessed](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=136.6727777777778) [within the current project, meaning our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=138.865) [business logic layer, we can use the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=141.2734) [internal access modifier instead. Internal](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=144.60049999999995) [means that access is limited to code](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=146.9037142857143) [internal to the project in which it is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=149.3939) [defined. Code in any other project such as](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=152.33709999999994) [the user interface layer could not access](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=154.68599999999992) [the property. In this case, we do want](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=157.842) [this property to be public. A property](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=160.30133333333328) [includes a get accessor, or getter, and a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=162.83014285714282) [set accessor, or setter. As its name](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=166.55228571428574) [implies, the get accessor gets the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=170.3476666666667) [property value. In this example, the code](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=173.22157142857145) [returns the value of the backing field. We](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=175.50799999999998) [can add code in the get accessor to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=178.6) [perform any operations prior to returning](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=180.416) [the value such as verifying that the user](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=182.826) [can access this data or reformatting or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=185.853) [converting the data. For example, if this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=188.8) [was returning a price, it could return it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=192.06350000000003) [in the appropriate currency for the user's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=194.37400000000002) [country. Leave off the getter entirely to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=197.25739999999996) [define a write-only property. The set](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=199.67024999999995) [accessor sets the property value. In this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=202.82466666666667) [example, the code simply assigns the value](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=206.14916666666667) [to the backing field. We can add code in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=208.20350000000005) [the set accessor to perform any operations](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=210.81522222222225) [prior to assigning the value such as](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=213.4592857142857) [validating the value before assigning it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=216.096) [or reformatting or converting the data.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=218.75666666666666) [Leave off the setter to define a read-only](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=221.67) [property. We'll see examples of how these](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=224.96600000000004) [properties are called a little later in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=227.20800000000003) [this module. Every time we define a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=229.89275) [property, declare a private variable to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=232.70350000000005) [hold the value. That variable is the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=235.11200000000005) [backing field, and add a C# property with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=238.0696666666667) [get and set accessors. In many cases,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=241.85819999999995) [there is no need for code in the getter or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=244.49800000000002) [setter. When that is the case, we can](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=247.59525000000002) [shortcut the property syntax using](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=249.6341111111111) [something called auto implemented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=251.5515) [properties. Let's define the FirstName](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=254.0225) [using the shortcut syntax. Notice how much](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=256.14166666666665) [shorter that syntax is, but where's the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=259.4913333333332) [backing field. Behind the scenes, the code](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=263.2912499999999) [is still creating a backing field, we just](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=265.69771428571426) [don't have to manage it. We get the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=268.5688571428571) [benefits of encapsulation without the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=271.75100000000003) [extra code. How do you decide when to use](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=274.049) [which? If there is no need for logic](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=277.53037500000005) [within the getter or setter, use an auto](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=278.9833333333335) [implemented property, otherwise, use the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=281.8868571428571) [full property syntax. But there are other ways to create properties.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=3&mode=live&start=285.01057142857144)

[Using Snippets](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live)

[Let's take a moment and talk about](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=2.783) [snippets. Visual Studio provides a set of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=5.253125) [snippets, which are pre-built pieces of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=7.57742857142857) [code. We can use snippets to help us build](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=9.805166666666668) [our classes. Let's add an email address](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=13.733000000000002) [property using a snippet. To use a snippet](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=16.56388888888889) [in Visual Studio, use Edit, IntelliSense,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=19.367571428571424) [Insert Snippet from the menu, or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=22.312499999999996) [right-click Snippet, Insert Snippet.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=26.71542857142857) [Double-click the appropriate category,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=29.908) [then locate the desired snippet. We want a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=32.291) [property snippet, so scroll to prop.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=36.319666666666656) [Notice that the tooltip describes the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=38.969) [snippet and provides its shortcut name.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=40.75) [Consider memorizing the shortcut name for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=44.296) [any snippets you plan to use often. Notice](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=46.51) [there is prop to generate an auto](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=50.02575) [implemented property, propfull to generate](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=52.005) [a full property with its backing field,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=55.361) [and propg to generate a public getter with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=57.776) [a private setter. We want an auto](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=61.09) [implemented property, so double-click to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=63.663) [select the snippet. The highlighted areas](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=66.319) [are called replacements. Replace the value](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=69.201) [and press Tab to move to the next](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=72.11966666666665) [replacement. We want an email address](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=75.22233333333334) [property, so type string, Tab to close the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=77.84700000000002) [list, Tab to move to the next replacement,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=81.32424999999999) [EmailAddress for the property name, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=84.197) [Enter to complete the replacements. This](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=87.27633333333334) [makes it quick to add auto implemented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=90.17175) [properties to a class. Even though the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=92.053) [specification didn't call for it, we know](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=94.92299999999999) [we'll want a unique identifier for each](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=97.10399999999998) [customer, so let's add a customer ID](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=99.70075) [property. In this case, we want to allow](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=102.65071428571424) [getting the ID, but never setting it. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=104.71288888888884) [database will set the ID. Let's use propg,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=107.99633333333334) [Tab, Tab. We'll keep the type as int, Tab,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=111.48600000000002) [and name it CustomerId, Enter. Any caller](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=115.113) [can then get this ID, but only this class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=119.55614285714286) [can set it. Looking again at the Visual C#](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=122.62700000000002) [snippets, there are snippets available for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=126.72285714285714) [many common tasks. Try them out. Let's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=128.722) [skip the postal address fields for now.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=132.9625) [We'll deal with those later, but before we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=134.933) [move on, let's create one more property.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=137.252) [The original specification called for a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=140.972) [name property with LastName, FirstName.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=142.69) [Let's add a FullName property that returns](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=146.262) [the format required by the specification.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=148.396) [We don't need a backing field because it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=151.384) [doesn't require holding any additional](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=153.377) [data. The LastName and FirstName already](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=155.937) [take care of that, and we don't need a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=157.69816666666665) [setter. No other code should change this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=161.0208888888889) [value. Instead, code would change the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=163.32071428571427) [LastName or FirstName properties directly.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=165.16928571428573) [In the getter, we return the FullName in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=167.965) [the appropriate format; LastName,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=170.082) [FirstName. Now that we have our first set](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=173.81799999999998) [of logic in our application, let's write our first unit test.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=4&mode=live&start=175.83489999999995)

[Testing the Class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live)

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A unit test](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=13.3028) [is another piece of code whose sole](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=16.42411111111111) [purpose is to test a particular unit, or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=18.644111111111116) [piece of our code. We normally write unit](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=21.967999999999996) [tests for each property and method in our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=25.090428571428575) [class. These often include tests with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=27.781833333333328) [valid values, tests with invalid values,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=29.56483333333334) [and tests for any corner cases. In this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=32.788) [example, we test the FullName property.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=36.436499999999995) [This is the test with valid values. We](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=39.132) [could also write tests for invalid values](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=42.16) [such as null or empty first or last name.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=44.0518) [There are several common techniques for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=47.578) [organizing the code in a unit test. I use](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=49.061) [the Arrange, Act, Assert structure. In the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=52.78185714285715) [Arrange section, we set up for our test.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=55.9916) [In this example, we create an instance of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=58.842) [the class using the new keyword. We then](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=60.712) [use that instance to set test data in the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=63.976444444444446) [properties. Lastly, we define the expected](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=66.81671428571428) [result of the test. In the Act section, we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=69.2914) [access the property or method we are](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=72.4905) [testing. In the Assert section, we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=75.02500000000002) [determine if our test was successful. We](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=77.03624999999998) [use the .NET Assert class to assert that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=79.55114285714288) [our expected value and our actual value](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=82.57042857142856) [are equal. If they are equal, the test](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=85.58814285714286) [passes, otherwise, it fails. For a more](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=88.32128571428575) [detailed introduction to unit testing in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=91.34042857142859) [Visual Studio, including test naming and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=93.31966666666669) [structure guidelines, see Defensive Coding](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=95.90999999999997) [in C# in the Pluralsight library. Now let's give testing a try.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=5&mode=live&start=98.55214285714287)

[Testing the Class: Valid Values](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live)

[In this demo, we'll write a unit test to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=2.852) [test our code using valid values. In](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=5.113) [Visual Studio, we create our unit tests in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=8.91425) [a separate project. To keep things](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=11.4035) [organized, let's put the unit test in a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=13.685857142857142) [separate folder. Right-click on the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=16.383000000000003) [Solution in Solution Explorer, and select](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=18.200499999999998) [to Add a New Solution Folder. We'll name](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=20.78466666666667) [that folder Tests. Note that this adds a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=24.886000000000003) [folder grouping to our solution, but not](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=27.446374999999993) [in our system directory structure. Then we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=29.66328571428571) [create the test project in that folder,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=33.301249999999996) [right-click on the folder, and select Add,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=35.333800000000004) [New Project. On the left side of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=38.8122) [dialog, select the appropriate language](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=41.226714285714266) [and Test. Then select Unit Test Project. I](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=43.621666666666655) [normally name my test project the same as](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=47.59433333333333) [the component it is testing with the test](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=49.717) [suffix, ACM.BLTest. To create the test in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=52.426) [a new system folder, add /Test to the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=57.66144444444444) [location path. Click OK, and Visual Studio](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=60.70500000000001) [creates a basic UnitTest class and unit](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=63.513124999999995) [TestMethod. Before we can test our class,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=67.526) [we need to reference it from the test](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=69.73599999999998) [project. Under the Unit Test Project,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=72.70633333333333) [right-click on References, and select Add](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=74.96985714285717) [Reference. On the left side, select](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=78.29379999999998) [Projects, and check ACM.BL, our business](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=81.15216666666667) [layer project we are testing. Our test](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=84.29983333333334) [project now has access to the classes in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=87.43674999999999) [our business layer project so I can test](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=89.69774999999998) [them. Now we are ready to write our test.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=92.37955555555554) [Rename the generated test file in Solution](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=95.47542857142858) [Explorer to the name of the class we are](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=98.125) [testing with a test suffix; CustomerTest,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=100.95925) [and select to rename the class as well.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=103.58166666666668) [Once the class is in place, we can add a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=106.80833333333334) [method to the class for each test we wish](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=109.83939999999998) [to perform on that class. As we saw in the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=112.16199999999999) [slides, the first test we want to write is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=114.83550000000001) [one to test the FullName property with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=116.94966666666667) [valid values. Rename the generated](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=119.535) [TestMethod to describe the test,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=121.807) [FullNameTestValid. We'll use the Arrange,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=125.47675000000001) [Act, Assert structure for the test. In the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=127.75866666666668) [Arrange section, we create an instance of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=130.75057142857142) [the customer class. The customer class we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=132.9644) [created is a type, so we declare a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=135.78500000000003) [variable of that type. That defines the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=138.611) [object variable that will reference our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=140.9312857142857) [object. The code is showing an error](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=143.38299999999998) [because we are missing the using](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=145.44466666666673) [statement. Use the quick action to insert](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=147.77800000000002) [the appropriate using. The using statement](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=149.84428571428575) [specifies that code in this file will](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=153.234) [access the BL component. Next, we want a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=155.25) [new instance of the class, so we use the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=158.67277777777778) [new keyword and the name of the class.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=160.77040000000005) [This line of code creates an instance of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=162.91000000000003) [the customer class and assigns it to an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=165.7652857142857) [object variable defined as type Customer.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=168.85266666666664) [Now we use the object variable to set the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=171.236) [FirstName property to a test value and set](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=172.947) [the LastName property to another test](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=176.116) [value. Notice that we are getting a quick](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=178.94800000000006) [action suggestion. Click it, and we see](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=182.44555555555564) [Object initialization can be simplified.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=185.2407142857143) [There is a shortcut syntax for creating an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=187.18299999999996) [instance of an object and assigning](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=189.92128571428572) [property values in one statement. This](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=192.52662499999997) [syntax is called an object initializer.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=195.8642857142857) [Let's use that. Click on the action to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=198.674) [apply it. Lastly, we define the expected](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=200.933) [value. In the Act section, we perform the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=205.21175000000008) [operation we are testing. In this test, we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=208.012) [get the value of the FullName property. In](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=210.99777777777783) [the Assert section, we verify that the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=213.68750000000003) [expected value equals the actual value.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=216.712) [Now we are ready to run the test. Do you](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=219.27033333333335) [think it will pass? You may have already](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=224.05900000000003) [noticed the error that we made when](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=226.74300000000005) [defining a FullName property. Well, let's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=228.79714285714286) [run our test anyway and see how it shows](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=230.9194285714286) [us our error. First, open the Test](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=233.4294285714286) [Explorer, Test, Windows, Test Explorer. It](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=236.4463333333333) [displays the list of tests and the results](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=239.83325000000002) [of those tests. Pin the window so it stays](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=242.08350000000002) [on the screen. We can run the test from](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=245.39366666666675) [Test Explorer, or right-click on the test](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=248.36499999999998) [itself and select Run Tests. Visual Studio](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=250.72428571428568) [first builds the solution, then shows the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=253.85000000000008) [result of the test in the Test Explorer.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=256.89885714285714) [Navigate down to the test to view](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=260.234) [execution details. Hmmm, expected Baggins,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=263.79777777777775) [Bilbo, actual Baggins, Bilbo. Ah, we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=267.84557142857136) [forgot a space. Let's fix that. Going back](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=272.7966) [to the Customer class, we need a space](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=275.84774999999996) [after the comma. Run the test again, and everything is green, it passes.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=6&mode=live&start=279.291125)

[Testing the Class: Invalid Values](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live)

[As much as we'd like our users to always](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=2.135) [put in valid values, the reality is, they](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=4.211) [don't. So our code needs to take](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=7.828777777777775) [precautions and handle invalid scenarios.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=9.754) [In this demo, we'll write a unit test to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=12.53) [ensure our class gracefully handles](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=15.091) [invalid values. Let's add another test for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=18.221000000000004) [our FullName property. This time with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=21.377374999999997) [invalid values. First, let's try leaving](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=23.951) [the FirstName empty. I'll paste the code.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=26.637) [It looks similar to our prior test, but](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=29.094500000000004) [notice we are defining only the LastName](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=31.613500000000002) [here, and expect the FullName to be the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=34.06128571428572) [LastName with no comma. Then let's write](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=37.54300000000001) [another test leaving the LastName empty.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=40.274857142857144) [In this case, we expect to get the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=42.0848) [FirstName with no comma. We have no code](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=45.06888888888888) [for special handling of the comma, so I'm](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=47.35377777777777) [betting these will fail. Again, open the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=50.04657142857142) [Test Explorer, pin it, and select to Run](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=53.12671428571428) [All. Yep, the test for invalid values](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=56.681) [fail. Clicking on the test, we can see](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=60.40314285714285) [that our code adds a comma even if there](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=62.39333333333335) [is no FirstName and if the LastName is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=64.86877777777775) [missing. Going back to the Customer class,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=68.7664285714286) [let's update the FullName code to better](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=70.905) [handle null or empty values. Now if there](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=73.251) [is only a LastName defined, the FullName](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=77.465125) [is the LastName with no commas. If there](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=79.965) [is only a FirstName, the FullName is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=83.23725) [initially null, so we set the fullName to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=85.179) [the FirstName. If there is both a LastName](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=87.92524999999999) [and a FirstName, we start with the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=90.71325) [LastName, add a comma, and a space before](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=92.969) [appending the FirstName. Try the test one](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=96.684) [more time, Run All, they pass. By using](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=101.18000000000002) [unit testing, we can check our code as we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=105.2615) [go while we remember its details even if](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=107.62499999999999) [there is no user interface built yet, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=110.18950000000001) [ensure our code handles both valid and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=113.14375000000001) [invalid values. Our test also gave us some](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=115.746625) [practice using object variables. Before we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=119.3788) [move on, let's talk a bit more about working with objects.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=7&mode=live&start=122.01644444444443)

[Working with Objects](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live)

[Working with objects can seem a bit](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=2.304) [strange at first. Let's review how to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=4.017249999999999) [create a new object. An object is created](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=6.802999999999998) [using the new keyword, followed by the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=9.863500000000002) [type of object to create, and parenthesis.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=12.177625) [This example creates a new instance from](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=14.702333333333334) [the Customer class. Assign the resulting](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=18.1685) [object to an object variable. The type of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=21.002124999999996) [the object variable is the type of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=23.810333333333336) [created object. The object variable then](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=26.1675) [holds a reference to that newly created](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=28.326000000000004) [instance. When defining local object](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=31.4632) [variables, instead of declaring a specific](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=34.12520000000001) [type, use the var keyword. Var defines an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=36.48616666666666) [implicitly-typed variable. An](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=40.656) [implicitly-typed variable is strongly](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=42.663) [typed just as if it were declared with a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=44.739) [specific type. Using var shortens the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=47.437) [syntax and can make the code easier to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=50.244) [read in cases where the type is obvious.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=52.8208888888889) [Here we are obviously creating an object](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=55.568) [of type customer. Once we have an object](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=57.99000000000002) [variable, we use it to access the class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=61.594222222222236) [properties. Here is the Customer class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=64.8536) [similar to how we have it so far. We use](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=66.71275000000001) [the full property syntax for the LastName](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=69.73966666666668) [property and auto implemented properties](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=72.97183333333336) [for the CustomerId, EmailAddress, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=74.896) [FirstName. For the FullName, we defined a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=78.40775000000001) [read-only property by defining a getter](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=81.15257142857143) [with no setter. Assign a value to a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=83.884625) [property with an equal sign just like](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=86.4718888888889) [assigning a value to a variable. Assigning](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=88.68133333333333) [a value to the property executes the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=91.6272857142857) [setter. This example assigns the value of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=94.02171428571428) [the backing field to Baggins. Use the same](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=96.86333333333333) [syntax to set the FirstName. Even though](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=100.410875) [this property uses the auto implemented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=102.93414285714287) [property syntax, assigning to the property](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=105.026) [still executes the setter and sets the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=107.898) [value of the hidden backing field to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=110.06722222222223) [Bilbo. Get the value of the property by](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=113.02449999999999) [simply referencing it, and it executes the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=115.52049999999998) [getter. This example returns the FullName](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=118.54500000000002) [of Baggins, Bilbo. But working with objects can get a bit more complex.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=8&mode=live&start=120.76483333333331)

[Objects Are Reference Types](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live)

[Objects are reference types, meaning that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=2.868) [they hold a reference to their data, not](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=4.93) [the data itself. This is different than](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=7.647399999999999) [value types such as integers that hold](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=10.624) [their data directly. Why does this matter?](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=13.218500000000002) [Well, here's a little quiz. In this first](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=16.231) [case, we declare an integer i1, and set it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=18.99725) [to 42. Then, define a second integer i2,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=22.794999999999998) [and set it equal to i1. Now for the tricky](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=26.555) [part, set i2 equal to 2. What it i1 at](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=30.8954) [this point? To find the answer, let's talk](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=34.843999999999994) [through that again. We declare i1 and set](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=37.76300000000001) [it to 42. Then we declare i2 and set it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=41.33287499999999) [equal to i1, which copies the value of 42.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=45.64060000000001) [Then we change i2 to be 2, so what is i1](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=49.733) [at this point? It's still 42, but now](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=53.582083333333316) [let's look at what happens when we do](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=56.93500000000002) [something similar with reference types.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=58.887374999999984) [Declare a new customer, c1, set c1's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=61.608) [FirstName to Bilbo, then declare a second](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=64.94149999999999) [customer, c2, and set it equal to c1. Then](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=68.17188888888889) [change c2's FirstName to Frodo. What is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=73.0215) [c1.FirstName? Let's talk through that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=78.10866666666666) [again. First, we declare c1. It's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=80.64920000000001) [referencing a new customer. We set the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=83.449) [FirstName for that customer to Bilbo. Then](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=86.23199999999999) [we create a second object variable, c2,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=88.74857142857142) [and reference that same customer. At this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=91.491) [point, since they are reference types,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=95.90057142857142) [both c1 and c2 are referencing the same](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=97.609125) [customer. So if we change c2's FirstName](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=101.40842857142857) [to Frodo, what is c1.FirstName? It is also](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=105.15116666666667) [Frodo because they are both pointing to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=110.025) [the same customer. It is important to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=112.6156) [remember how reference types work as you](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=115.04642857142858) [create and manipulate objects. But what if](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=117.692) [you need a property that is shared with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=120.07166666666667) [all instances of a class? That's the purpose of the static modifier.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=9&mode=live&start=122.08557142857144)

[Static Modifier](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live)

[The static modifier declares a member that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=2.825) [belongs to the class itself instead of to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=5.635) [an object of the class. This is useful for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=8.859) [tracking information shared between all](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=12.242999999999999) [instances of the class. In this example,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=14.381571428571428) [we want a count of the number of object](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=17.15333333333334) [instances created from a class. So each](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=20.351875) [instance of the class needs to increment](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=23.292250000000003) [that shared value. Static members are](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=25.7325) [accessed using the class name and not an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=28.650000000000006) [object variable. Let's try this out. Since](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=32.30533333333333) [we've been working with properties so far,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=35.100714285714275) [let's use the static keyword on a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=37.766) [property. In the customer class, let's add](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=40.111000000000004) [an auto implemented property using a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=42.105750000000015) [snippet. Remember the shortcut; prop, Tab,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=45.17419999999999) [Tab. Let's define it as an int, Tab, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=48.72133333333333) [call it InstanceCount. We want to share](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=53.37627272727274) [this count with all object instances, so](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=55.76788888888888) [we add the static modifier. Using the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=58.00271428571428) [static modifier on a class member denotes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=61.64150000000001) [that the member belongs to the class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=64.17842857142857) [itself rather than to any specific](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=66.38300000000001) [instance. To see how that works, let's go](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=69.76699999999997) [back to our CustomerTest and add a test](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=71.90949999999998) [for our static property. I'll paste the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=74.83600000000001) [code, and we can talk through it. In this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=77.21050000000001) [test, we create three new customers using](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=79.73000000000002) [the new keyword. The object variables c1,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=82.7175) [c2, and c3 all reference different](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=86.15299999999999) [customers each with a unique FirstName. If](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=88.88733333333333) [we access the object variable c1 and drop](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=91.67185714285715) [down IntelliSense, we see that the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=95.80766666666668) [InstanceCount property is not there. To](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=98.49871428571429) [access a static property, we use the class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=101.15242857142859) [name itself. Type Customer., and we now](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=104.99833333333332) [see the InstanceCount property. In this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=107.49471428571428) [test, we increment this property after](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=111.21442857142857) [each object is created to count the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=113.17122222222223) [instances. The resulting value should be](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=116.20377777777782) [3. Open the Test Explorer, pin it, and run](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=119.01033333333332) [this test. It passes. Use the static](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=123.595) [modifier to declare members that belong to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=127.63085714285715) [the class itself and not to an instance of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=129.80166666666665) [that class. We'll see more of the static](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=132.80260000000004) [modifier later in this course. Now let's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=135.40774999999996) [finish off this module with some](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=137.81050000000002) [checklists we can use as we implement classes in C#.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=10&mode=live&start=139.87862500000003)

[Checklists and Summary](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live)

[Checklists are a great way to recheck our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=2.231) [understanding and our code. Most](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=4.316) [applications today are divided into at](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=7.035) [least three layers; user interface for the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=9.191500000000001) [forms and pages displayed to the user,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=11.536285714285711) [business logic for the business](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=13.930571428571431) [operations, and data access for retrieving](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=15.948666666666666) [and storing data. Many applications also](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=18.797600000000003) [have a common library for general purpose](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=21.465999999999998) [code that is useful throughout the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=23.98128571428572) [application. This can include code for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=27.14125) [logging, sending email, and other tasks](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=29.10416666666667) [common across the entities. The classes we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=31.118333333333332) [identified are for the business logic, so](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=34.280857142857144) [we created the business logic component.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=36.647571428571425) [In Visual Studio, we created a solution](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=39.333400000000005) [for the application and a project for the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=42.34414285714287) [business logic component. Just like an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=45.774625) [integer is a type and a string is a type,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=47.7844) [each class defines a type. Give the class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=50.68462499999999) [a good name, reflecting the entity it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=53.6165) [represents. By default, new classes added](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=56.174) [to a project have no access modifier. To](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=58.36212500000001) [access the class from other classes and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=62.234) [projects, set the access modifier to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=64.089) [public. There are several ways to define a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=67.67185714285714) [property. Define a property manually by](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=70.98062499999995) [declaring the backing field with a private](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=73.198) [access modifier, declaring the C# property](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=75.61166666666665) [and adding the getter and setter. Use](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=78.85633333333331) [auto-implemented properties as a shortcut](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=83.3592) [syntax to create and manage the backing](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=85.01885714285714) [field automatically. These are used when](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=87.957) [the property getter and setter don't need](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=90.323) [any logic. And use Visual Studio snippets](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=92.84466666666667) [to make it quick and easy to add](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=95.25287499999999) [properties to any class. Test your classes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=98.6292222222222) [as you go with unit tests. Create a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=101.70666666666668) [separate project for the tests, and then](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=104.53142857142856) [set a reference to the business layer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=106.576) [component. Define tests for valid and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=108.37183333333333) [invalid scenarios. Organize each test](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=111.80733333333333) [using an Arrange, Act, Assert style;](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=114.66485714285713) [Arrange to create an instance of a class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=117.37766666666667) [and set up test data, Act to access the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=120.81033333333332) [property or method being tested, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=123.8315) [Assert to determine the result of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=125.82471428571428) [test. We also covered how to work with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=129.11866666666668) [objects. To create an object from a class,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=132.39325000000005) [use the new keyword. Use the var keyword](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=134.45) [to shorten our declarations. Set and get](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=138.28050000000002) [data using C# properties. We learned that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=141.5021428571429) [objects are reference types and how to use](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=144.65399999999997) [the static modifier to declare a member](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=147.28649999999996) [that belongs to the class instead of an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=149.30337500000002) [object instance. At this point, the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=152.65979999999996) [customer class has a set of properties,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=154.73077777777775) [but what about the methods? We'll add those in the next module.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m3-building-classes&clip=11&mode=live&start=156.73585714285716)

[Building Entity Classes - Methods](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=0&mode=live)

[Introduction](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=0&mode=live)

[For our classes to actually do something,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=0&mode=live&start=0) [we need methods. Methods are the functions](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=0&mode=live&start=5.105) [that perform our business operations.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=0&mode=live&start=8.267) [Welcome back to Object-Oriented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=0&mode=live&start=11.283) [Programming Fundamentals in C#, from](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=0&mode=live&start=13.369399999999997) [Pluralsight. My name is Deborah Kurata,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=0&mode=live&start=16.279799999999998) [and this module continues the process of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=0&mode=live&start=18.776999999999994) [building entity classes by creating](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=0&mode=live&start=21.24366666666667) [methods. In the last module, we built the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=0&mode=live&start=24.94825) [business logic component, created the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=0&mode=live&start=27.753124999999997) [Customer class, and added properties to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=0&mode=live&start=29.830600000000004) [that class. We then built a unit test to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=0&mode=live&start=32.82314285714286) [test the logic for one of the properties,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=0&mode=live&start=35.59359999999999) [but what about the methods we had defined?](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=0&mode=live&start=38.092249999999986) [In this module, we'll create the methods](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=0&mode=live&start=41.387) [in the Customer class, including special](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=0&mode=live&start=43.045124999999985) [methods called constructors. We'll then](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=0&mode=live&start=46.352199999999996) [use what we've learned so far in this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=0&mode=live&start=48.62233333333333) [course to create the Product, Order, and Order Item classes.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=0&mode=live&start=50.38214285714286)

[Building a Class: Methods](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live)

[In this demo, we examine how to create](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=2.398) [methods as we create the methods for the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=4.244) [Customer class. We are back in Visual](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=6.45) [Studio looking at the Customer class. In](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=9.493) [the last module, we created these](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=12.809375) [properties. Let's add the methods after](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=15.379624999999994) [the properties in the code file to keep](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=17.109428571428573) [our class organized. Methods are created](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=19.904666666666667) [using C# function syntax. Let's create a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=22.637142857142862) [function for validate. I'll paste the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=26.197000000000003) [code, and we can talk through it. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=28.23825) [function access modifier is public, so any](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=30.5345) [other code in the application can call it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=33.14000000000001) [such as a user interface. The method](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=36.312333333333335) [returns a true or false value defining](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=39.266) [whether the data is valid. So the return](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=41.61216666666667) [type of the function is a Boolean. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=44.6091) [body of the Validate method validates the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=47.00485714285715) [property values. Let's say that this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=49.207857142857144) [specification identified that the last](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=51.451) [name and email addresses were required, so](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=53.85433333333332) [our object data is not valid unless those](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=56.7975) [two properties have a value. Our Validate](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=59.219) [method code checks that the two properties](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=61.76128571428572) [are not null, empty, or just whitespace.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=64.03533333333333) [The result is a Validate method that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=67.18628571428573) [validates the state of the customer object](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=69.91557142857141) [as part of the specification. We have two](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=72.7935) [more methods defined for the Customer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=75.8785) [class; Retrieve and Save. Here is some](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=77.6896) [step code for a save and for a retrieve.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=82.05749999999999) [This retrieve returns one specific](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=85.578) [customer by ID, but what if we need to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=87.39716666666666) [display a list of customers? If we have a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=90.25059999999999) [small number of customers, we may also](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=93.91349999999998) [want the retrieve method that retrieves](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=95.95387499999998) [all of them, or if we have many customers,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=97.47633333333333) [we may want a retrieve method that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=100.02828571428572) [retrieves all of them for a specific](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=102.4395) [region or all of them with orders that are](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=104.312) [pending. For our purposes, we'll just](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=107.95070000000005) [define a second retrieve with no parameter](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=109.89285714285711) [that returns all of the customers. This](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=112.52050000000001) [retrieve returns a list of customers as a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=115.71442857142857) [generic collection. If you are not](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=118.91250000000001) [familiar with the generic list collection,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=120.73450000000003) [check out the C# Best Practices:](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=122.389) [Collections and Generics course in the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=124.93) [Pluralsight library. We're not going to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=128.0705) [concern ourselves with the remainder of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=129.84642857142853) [the code for the Retrieve and Save methods](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=131.29762499999998) [at this time, but we do have completed](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=133.65000000000003) [code in our Validate method. How do we try it out? Another unit test.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=1&mode=live&start=136.2442857142857)

[Testing the Methods](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live)

[In this demo, we examine how to test class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=1.797) [methods with unit tests. We saw earlier in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=4.56) [this course how to test class properties](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=8.31088888888889) [with unit tests. We follow the same](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=10.547999999999998) [process for our class methods. For each](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=13.600444444444442) [method, we write unit tests for both valid](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=16.03775) [and invalid scenarios. Let's build some](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=18.637) [tests for our Validate method. We'll start](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=21.644874999999995) [with valid values to confirm that the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=24.130285714285716) [Validate method is performing correctly](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=26.13133333333333) [when the customer data is valid. I'll](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=27.653857142857145) [paste the code, and we can walk through](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=30.456375) [it. We are testing a valid scenario, so we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=32.223571428571425) [name the test with a method name and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=34.84666666666666) [valid. We then follow our standard](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=37.401142857142865) [structure; Arrange, Act, Assert. We](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=40.0888) [arrange the test by creating a new](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=43.473124999999996) [instance of the class and setting the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=45.049) [properties to test data. We also define](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=47.138) [our expected result. We expect that the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=50.701499999999996) [method will return true since we are](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=53.367000000000004) [providing valid data. We act by calling](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=55.7885) [the Validate method, and we assert that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=58.84928571428571) [the expected and actual values are equal.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=61.375) [Build similar tests for invalid scenarios.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=64.05414285714286) [We'll create a test with a missing](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=67.06433333333334) [LastName. This test ensures that given an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=70.39125000000001) [email address, but no name, the method](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=72.57400000000004) [returns false because the last name is not](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=75.2177142857143) [provided. Let's open the Test Explorer,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=78.63162500000001) [pin it, and run these tests. And they both](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=81.09585714285713) [pass. Yay. As you write your code,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=85.54462499999998) [consider immediately writing the test for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=88.151) [that code, or you can use a test first](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=90.181) [approach whereby you write the test, then](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=93.314) [write code to pass that test. Either way,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=96.24799999999999) [it's very beneficial to have unit tests to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=99.11657142857142) [test the logic of your application. They](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=102.11366666666666) [can catch most bugs in your code right](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=104.593) [after you've written it while you still](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=106.497) [remember the details of the requirements.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=108.313) [And if you later change any code, you can](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=111.211) [rerun the test to ensure that any future](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=113.712) [changes or enhancements don't break your](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=115.87233333333333) [existing code. Now that our Validate](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=118.30357142857143) [method is working, it's a good time to cover a few more method terms.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=2&mode=live&start=120.791)

[Terms](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live)

[When working with class methods, there are](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=2.142) [a few specialized terms to know. Let's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=3.9624999999999995) [discuss these terms in the context of our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=6.5028749999999995) [code. You may hear the term method](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=8.626375) [signature or function signature. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=11.982) [signature of a method is comprised of its](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=15.476625) [name and the type of each of its formal](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=17.668272727272726) [parameters. The signature does not include](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=21.22572727272726) [the return type. The system uses the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=23.831) [signature to match up the calls to that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=26.325000000000003) [function. So c1.Retrieve is matched to the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=29.4066) [Retrieve with no parameters. And](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=32.21128571428571) [c2.Retrieve (7) is matched to the Retrieve](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=35.197285714285705) [with a single integer parameter. Each](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=38.182) [method's signature in a class must be](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=40.76559999999999) [unique, but since the signature includes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=44.04722222222223) [both the name and the parameters, we can](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=46.313) [have multiple methods with the same name](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=49.044500000000006) [if the parameter lists differ. That takes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=52.21266666666666) [us right to the next term, overloading.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=55.56711111111112) [The term overloading is used to describe](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=58.791) [methods that have the same name, but](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=60.557) [different parameters. In this example, the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=63.355) [first Retrieve method takes one integer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=66.04614285714284) [parameter. The second Retrieve method](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=69.12425) [takes no parameters. The Retrieve methods](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=71.63800000000002) [are then overloaded. Since overloaded](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=74.415) [members have the same name, they should](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=76.46766666666667) [provide variations of the same](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=78.82557142857141) [functionality. In this example, both](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=81.1645) [overloads retrieve customers. If one](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=84.47885714285715) [method retrieved customers and the other](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=86.84642857142856) [retrieved customer types, for example,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=88.8235) [they should not have the same name because](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=90.70674999999999) [they don't provide similar functionality.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=93.69885714285715) [The next term is contract. Let's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=96.696) [right-click on the class file, and select](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=98.99816666666666) [Outlining, Collapse to Definitions so we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=101.99633333333333) [can see all of the properties and methods](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=105.08644444444444) [for this class. The properties and methods](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=106.87025) [declared with a public access modifier](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=109.51333333333335) [comprise the class contract. That is to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=112.12633333333332) [say, the class makes a promise that it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=115.18700000000003) [will provide the defined properties and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=117.847375) [methods to any other code in the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=120.02842857142856) [application that needs them. Over time,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=122.95757142857141) [the code can extend the contract by adding](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=125.09799999999998) [new properties and methods, but it should](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=127.696) [not remove properties and methods or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=130.18642857142856) [modify a method signature once the class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=132.35642857142855) [has been deployed to production. This](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=135.69114285714284) [contract is also called the class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=138.05949999999999) [interface. We'll talk a lot more about](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=141.00249999999997) [interfaces later in this course. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=143.07614285714288) [Customer class now has properties and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=146.090875) [methods. Does that mean we are done? Not](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=148.56212500000007) [quite. But before we move on, let's undo](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=151.41685714285714) [our outlining. Right-click on the class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=155.1425) [file and select Outlining, Toggle All Outlining.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=3&mode=live&start=157.38419999999996)

[Building a Class: Constructors](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live)

[In this demo, we look at class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=2.688) [constructors. A class constructor is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=6.800500000000001) [basically a special kind of method named](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=8.497714285714284) [with a class name that is executed each](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=10.837555555555555) [time an instance of the class is created.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=13.79685714285714) [Constructors are normally defined at the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=17.309) [top of the class, above the properties.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=19.091) [Use a snippet to create the constructor,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=22.299) [ctor, short for constructor, Tab, Tab. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=25.11) [code inside the constructor is used to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=29.647000000000002) [initialize the object. In many cases in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=31.32) [C#, the properties of the object default](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=34.86000000000001) [to valid values, so there is no need to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=37.1185) [initialize them in this constructor.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=40.551249999999996) [Because this method is executed when an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=42.73) [object of the class is created, it is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=44.108) [important that the body of the constructor](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=46.8185) [create the object in a usable state. That](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=48.452625000000005) [is to say there should be no code in the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=51.8153) [constructor that could generate an error.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=54.30914285714285) [A constructor with no parameters is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=56.89) [referred to as the default constructor.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=58.637) [Add additional constructors with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=62.01) [parameters as required. If there is no](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=64.10119999999999) [need for code in the constructor, don't](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=66.67733333333331) [create one. An implicit default](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=69.39066666666666) [constructor is defined automatically.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=72.14928571428572) [Let's create one more constructor. Since](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=74.703) [the CustomerId has a private setter, the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=77.68857142857144) [CustomerId cannot be set from outside of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=80.46885714285715) [the customer class. Let's allow setting of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=83.15275) [the ID with a constructor. This will be](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=86.0961111111111) [helpful for use in our unit tests. Notice](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=89.13140000000001) [that we now have two constructors with the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=91.94800000000001) [same name and different parameters, so we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=94.51133333333333) [have overloaded the constructor. And now](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=97.82728571428571) [that we have an overloaded constructor, we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=100.691) [need to define the default constructor as](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=102.41742857142859) [well, otherwise we won't be able to create](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=104.98485714285714) [an instance of an object without the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=107.56175) [parameter. An implicit default constructor](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=110.11466666666668) [is not automatically created when there](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=112.42900000000002) [are overloaded constructors defined. Now](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=114.8616) [the first cut of our customer class is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=118.6916) [done. Yay. But what about our other classes?](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=4&mode=live&start=121.11239999999998)

[Building the Remaining Classes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live)

[Now that we've covered the basics of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=2.58) [creating a class, adding properties to the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=3.836) [class, creating methods, and defining](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=6.536) [constructors, we can repeat that process](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=9.514) [for the remaining classes. Want to give it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=12.457) [a try on your own? If so, stop the video](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=15.400333333333332) [now and build these three classes,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=18.236444444444437) [skipping the crossed out properties. Ready](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=21.023714285714284) [to see my solution? First, the Product](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=25.1562) [class. It has a default constructor, which](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=28.261999999999993) [is the constructor with no parameters, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=30.203250000000004) [an overloaded constructor with a ProductId](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=33.157833333333336) [parameter, similar to the customer class.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=35.29914285714286) [Here are the auto-implemented properties](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=38.912) [for the current price; ProductDescription,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=40.657) [ProductId, and ProductName. Notice that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=43.581) [the current price is defined with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=46.85128571428571) [decimal?. The question mark denotes a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=48.82216666666667) [nullable type. A nullable type is a value](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=52.088625) [type such as an integer or a decimal that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=54.78055555555555) [allows definition of the value or a null.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=57.68411111111111) [It is useful if the code needs to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=61.229) [distinguish between not set and 0. In this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=62.936) [case, the price of 0 is a valid price, but](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=66.62819999999999) [it's not valid to have no price. Using a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=69.32077777777778) [nullable value makes that distinction. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=73.15485714285715) [Product class also defines methods, stubs](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=76.13283333333332) [for Retrieve and Save, and the Validate](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=78.6146) [method. Is this similar to what you](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=81.58575000000002) [defined? Let's look next at the Order](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=84.60885714285718) [class. The Order class also has a default](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=87.19285714285711) [constructor and a constructor that passes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=89.409) [in the OrderId. The order has two](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=91.9) [properties; the OrderDate and OrderId.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=94.717) [We'll add the customer shipping address](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=97.761) [and order items later. Notice that we're](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=99.53614285714286) [using DateTimeOffset. The DateTimeOffset](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=103.46349999999998) [value type tracks the date, time, and time](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=105.43466666666669) [zone offset. It's a great type to use when](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=109.01800000000001) [the date can be set in different time](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=111.442) [zones. For example, someone in Detroit can](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=113.85566666666665) [place an order at 10 A.M., and someone in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=116.24357142857144) [Paris can place an order at 10 A.M., but](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=118.79522222222225) [those orders were not actually placed at](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=121.64885714285714) [the same time. By keeping the time zone](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=123.66088888888889) [offset, we can correctly compare dates](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=125.988) [from different time zones. The question](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=128.08028571428568) [mark, again, denotes a nullable type,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=130.9455) [meaning it can hold the value of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=132.71371428571427) [DateTimeOffset or a null. This is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=135.86333333333337) [especially useful for date types as there](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=138.13525) [is no good default value. The order also](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=140.27949999999998) [has similar methods; Retrieve, Save, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=143.91499999999996) [Validate. Lastly, the OrderItem class.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=148.62525) [Like the other classes, it has a default](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=152.192) [constructor and a constructor that takes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=154.508) [the OrderItemId. It has a set of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=156.477) [properties; OrderItemID, ProductId,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=159.161) [PurchasePrice, and Quantity. Notice,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=162.459) [again, that the PurchasePrice uses a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=164.70100000000002) [nullable of decimal. The OrderItem class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=166.913) [also has the same standard Retrieve, Save,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=169.5444285714286) [and Validate methods. We have now created](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=173.78700000000003) [all of the classes, but are they the right](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=177.85000000000005) [classes? Are these classes taking on too](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=181.46683333333334) [much responsibility? We'll answer these](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=184.26550000000003) [questions in the next module. Let's finish](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=186.49337500000001) [off this module with some checklists we can use as we implement methods in C#.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=5&mode=live&start=189.41071428571428)

[Checklists and Summary](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live)

[When creating class methods, set the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=2.783) [appropriate access modifier. To access the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=5.6406) [method from other classes and projects,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=8.082749999999999) [set the access modifier to public. Specify](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=9.918142857142856) [the desired return type. This is the type](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=13.8742) [returned from the method. Use void if](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=17.157) [there is no return type, and be sure to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=19.309624999999997) [give the method a good name. As methods](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=21.852) [are actions, method names are often verbs](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=24.052714285714284) [such as Validate, Retrieve, and Save. Test](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=26.889999999999997) [your methods with unit tests when unit](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=30.757) [testing methods define tests for valid and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=33.613) [invalid scenarios, and be sure to organize](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=36.161) [each test. Arrange to create an instance](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=39.715) [of the class and set up test data. Act to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=42.374) [call the method being tested, and Assert](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=45.60157142857143) [to determine the result of the test.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=48.13377777777778) [Methods have some unique terminology. A](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=51.164) [method's signature is its name and set of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=54.4725) [parameters. The signature does not include](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=57.66850000000002) [the return type. The system uses the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=60.02675000000001) [signature to match the method call to the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=62.259000000000015) [appropriate method. Overloading describes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=65.06333333333333) [methods that have the same name, but](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=66.70899999999999) [different signatures. In this example, the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=69.88979999999998) [first Retrieve method takes one integer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=72.50442857142855) [parameter, and the second takes no](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=74.799) [parameters. The Retrieve method is then](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=77.22066666666667) [overloaded. Since overloaded members have](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=80.1048) [the same name, they should provide](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=82.4128) [variations of the same functionality. All](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=85.105) [properties and methods defined using the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=88.31450000000001) [public access modifier define the class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=90.46875) [contract. That is to say the class makes a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=93.80924999999996) [promise that it will provide the defined](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=96.21488888888884) [properties and methods to any other code](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=98.31885714285715) [in the application that needs them. A](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=100.36875) [constructor is a special method that is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=103.73825) [executed each time an instance of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=105.637) [class is created. The constructor name is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=107.63900000000001) [the name of the class. Constructors can be](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=110.28214285714283) [overloaded as shown here. The default](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=113.473) [constructor has no parameters, and the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=116.353) [second constructor has an ID parameter. In](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=119.002) [these last two modules, we walked through](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=122.1904) [building and testing an initial version of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=124.4817142857143) [our customer class and looked at the code](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=126.87214285714288) [for the start of the remaining entity](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=129.09366666666668) [classes. Now let's move on to the second](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=131.75033333333334) [step of building an object-oriented application; separating responsibilities.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m4-building-classes2&clip=6&mode=live&start=134.17011111111108)

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[Our Customer class creates new customers](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=0) [and validates customer data. It has](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=4.938) [methods to retrieve existing customer data](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=7.9686666666666675) [and save changes, and we have not even](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=10.105500000000001) [considered how to manage addresses. Sounds](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=13.683714285714288) [like the Customer class is trying to do](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=16.472250000000003) [too much. Welcome back to Object- Oriented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=18.602857142857143) [Programming Fundamentals in C#, from](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=21.666) [Pluralsight. My name is Deborah Kurata,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=24.238166666666668) [and this module details how to keep our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=26.698124999999997) [classes focused by separating](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=29.723) [responsibilities to other classes. When a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=31.767) [business is small, it's easy for the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=35.971333333333334) [president of the company to be responsible](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=37.6) [for everything; sales, marketing,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=39.775) [operations, and so on. As the company](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=42.332) [grows, getting more customers and more](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=45.709) [employees, this is no longer practical.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=48.198333333333345) [The president needs to delegate some](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=50.827) [responsibilities to others. The same is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=52.781) [true as we build our applications. When a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=56.49833333333333) [class has few responsibilities, it's easy](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=59.528666666666666) [for that class to contain all of the code](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=61.45400000000001) [to handle those responsibilities. As an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=63.997666666666674) [application grows, the class can take on](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=66.64175) [more responsibilities than it can manage](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=68.68657142857143) [by itself. In this module, we think](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=70.754) [through the responsibilities of our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=73.417) [classes and make them more focused by](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=75.23725) [delegating appropriate responsibilities to other classes.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=0&mode=live&start=78.207)

[Separation of Concerns](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live)

[So far in this course, we identified an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=2.912) [initial set of classes and their members](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=5.01) [based on the requirements. The second key](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=7.296) [step in building an object- oriented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=10.012875) [application is to look at each of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=11.61275) [resulting classes and determine whether it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=14.230666666666668) [is focused or taking on too much](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=16.71288888888889) [responsibility. Does the class need to do](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=20.065111111111115) [everything specified for it or should it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=22.108285714285717) [be broken into additional classes? This](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=24.048250000000003) [step follows the principle of separation](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=27.12066666666667) [of concerns. The idea is that an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=29.089000000000002) [application should be decomposed into](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=31.902125) [parts with minimal overlap and each part](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=33.87566666666666) [responsible for a separate concern.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=37.494625) [Separating responsibilities minimizes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=39.954) [coupling, maximizes cohesion, simplifies](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=42.167) [maintenance, and improves testability, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=45.7845) [who wouldn't want that? Let's look at each](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=48.352333333333334) [of these factors in detail. Coupling is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=50.97800000000001) [the degree to which classes are dependent](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=54.33375) [on other classes or external resources.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=56.626571428571424) [The fewer dependencies the class has, the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=60.398) [easier it is to write, test, maintain, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=63.165625) [update over time. If there are too many](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=65.90925) [dependencies in a class, consider moving](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=68.45012499999999) [some of those dependencies to another](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=70.114) [class. For example, each of these classes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=73.21674999999999) [has code to retrieve and save data using](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=75.89999999999998) [the data access layer, making them tightly](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=78.26525000000004) [coupled to that layer. We can reduce that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=81.22116666666668) [coupling by extracting the retrieve and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=84.13325000000003) [save operations into separate classes.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=86.04183333333334) [Cohesion is a measure of how related](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=89.797) [everything in a class is to the purpose of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=91.957) [the class. If there are properties or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=94.411) [methods in a class that are not truly](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=97.085) [related to the purpose of the class, they](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=99.071) [should be moved to another class. For](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=101.623) [example, there is a lot of work required](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=104.245875) [to manage an address. There are quite a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=106.7292) [few properties, and there are requirements](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=109.86200000000001) [such as appropriate address formatting](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=111.61533333333333) [based on the country. Does it really make](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=113.71328571428572) [sense for the customer to manage all of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=116.54749999999999) [this and the order as well? By moving](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=118.93360000000001) [address functionality into its own class,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=122.172) [we maximize cohesion in each class. Why](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=125.18375) [bother concerning ourselves with coupling](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=129.11599999999999) [and cohesion? When there is low coupling,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=131.21166666666667) [there is a reduced probability that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=133.73987500000004) [changes to one class adversely affects](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=135.528) [other classes, making maintenance easier.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=138.40639999999996) [And low coupling makes testing more](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=141.813) [straightforward because the class has](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=143.532) [minimal dependencies on other classes.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=145.336) [When there is high cohesion, there is a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=149.094) [higher probability that a feature request](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=151.142) [will affect only a small number of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=153.531) [classes, simplifying maintenance. And high](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=156.11925000000008) [cohesion helps produce a focused,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=159.13228571428573) [well-defined, and complete class, making](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=161.253) [it easier to understand and test. Classes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=163.97528571428572) [with both low coupling and high cohesion](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=167.03285714285713) [are easier to understand, test, maintain,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=169.86783333333335) [and extend. Let's take another look at our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=173.58633333333333) [entity classes and see if they have any](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=176.72671428571422) [responsibilities that can be best be delegated to other classes.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=1&mode=live&start=179.255)

[Revisiting the Class Diagram](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live)

[Let's start with the Customer class. Yes,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=2.14) [the Customer class needs to track the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=4.723375) [customer's name. Email address? Maybe. If](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=6.49) [the application allowed tracking of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=10.171000000000001) [multiple email addresses for a customer,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=11.954571428571429) [then maybe not. To make our decision, we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=14.12075) [go back to the subject matter experts and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=17.167222222222225) [ask about the email address. The answer is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=19.316428571428574) [that they currently only want to track one](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=22.223285714285723) [email address. They may change their minds](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=25.253249999999994) [about this sometime in the future. Okay,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=27.236142857142852) [but should we deal with multiple email](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=29.64842857142857) [addresses now, just in case? Following the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=32.03066666666667) [YAGNI principle, which stands for, you](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=35.305) [aren't going to need it, don't put in any](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=37.36600000000001) [feature that may be needed in the future.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=39.771000000000015) [So we'll leave it as a single email](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=42.475) [address property in the Customer class.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=44.37722222222224) [How about the home and work addresses. An](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=47.447) [address requires quite a few properties;](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=50.733285714285714) [multiple lines for a street address, city,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=53.285) [state, province, zip code, or other postal](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=55.349) [code, country, and an address type to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=57.576) [identify whether an address is for home or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=60.332) [work or whatever. Plus, there are specific](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=63.081) [business rules and different address](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=65.743) [formats for different countries. This](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=67.176) [sounds like something that has enough](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=69.98214285714286) [functionality to stand on its own. Let's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=71.555) [define an Address class to take on those](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=74.53575) [responsibilities. Notice that we still](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=77.3335) [have the address fields in the Customer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=79.3972857142857) [class, but now they are simple instances](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=81.511) [of our new Address class. Now how about](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=84.448) [the methods in our Customer class?](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=88.15333333333334) [Validate? Yeah, that makes sense. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=90.214) [Customer class should be responsible for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=92.913) [validating its own data. Retrieve? Hmmm,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=94.619) [depending on the data access technology](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=97.51833333333333) [you are using; Entity Framework, ADO.NET,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=100.2782) [or some other third-party framework, the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=103.008) [code in the retrieve could be extensive](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=105.44800000000001) [and complex. It doesn't make sense for the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=108.55266666666668) [Customer class to take on the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=110.79842857142853) [responsibility of retrieving the data from](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=112.43599999999998) [the data store. Save, same thing. Since](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=114.57542857142857) [both the retrieve and save are dealing](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=117.30399999999999) [with the data store, it would make sense](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=119.68450000000001) [to put both of those responsibilities](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=121.69177777777779) [together in a separate class. By](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=123.30633333333333) [convention, the class responsible for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=126.816) [retrieving and saving the data for an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=128.806) [entity is called a Repository class. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=130.557) [customer repository includes methods such](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=135.07999999999998) [as Retrieve and Save. A side note here. As](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=137.5552) [we just discussed, a common practice when](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=141.48375) [separating responsibilities is to put code](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=143.93479999999997) [dealing with a data store into its own](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=146.42366666666672) [class. There are many other common](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=149.71162500000005) [practices for defining an appropriate set](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=151.78714285714292) [of classes and their associated](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=153.94199999999995) [relationships. These common practices are](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=156.82466666666664) [called design patterns. There is a design](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=159.9531428571428) [pattern called the repository pattern,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=162.72728571428576) [which we are using in a simplified form](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=164.215) [here. Now let's look at the Product and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=167.71366666666668) [Order classes. It makes sense to use the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=171.23077777777777) [repository pattern for them as well. Each](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=173.5375714285714) [Repository class includes methods such as](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=176.4826666666667) [the Retrieve and Save, but what about](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=178.850625) [Order Item? We'll talk about that class in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=181.333) [the next module. For now, let's build these new classes.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=2&mode=live&start=184.084)

[Building the Address Class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=3&mode=live)

[In this demo, we build the Address class.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=3&mode=live&start=2.352) [If you want to try building this class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=3&mode=live&start=4.752) [yourself, stop the video now. Are you](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=3&mode=live&start=6.316) [ready to see my solution? We are back in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=3&mode=live&start=10.38942857142857) [Visual Studio with our ACM solution open.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=3&mode=live&start=13.401111111111113) [Here is the Address class that I created.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=3&mode=live&start=15.68757142857143) [It has two constructors similar to the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=3&mode=live&start=19.069857142857142) [Customer class. I created the address](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=3&mode=live&start=22.498) [properties quickly using the prop snippet](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=3&mode=live&start=25.021333333333338) [for defining auto- implemented properties.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=3&mode=live&start=27.07514285714285) [And here is our Validate method. For our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=3&mode=live&start=30.101) [purposes, only the postal code is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=3&mode=live&start=33.306000000000004) [required. That's good enough for now. Let's move on to the repositories.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=3&mode=live&start=35.712000000000025)

[Building a Repository Class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=4&mode=live)

[A Repository class handles the interaction](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=4&mode=live&start=2.24) [with the data store. In this demo, we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=4&mode=live&start=4.515) [build the Customer Repository. Let's add](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=4&mode=live&start=8.722499999999998) [the Customer Repository class to our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=4&mode=live&start=11.592) [ACM.BL project. Right-click on the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=4&mode=live&start=13.8285) [project, and select Add, Class. Name it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=4&mode=live&start=16.836) [CustomerRepository, and be sure to set the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=4&mode=live&start=21.005714285714287) [class access modifier to public. I'll](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=4&mode=live&start=24.98) [paste the code for the body of the class,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=4&mode=live&start=27.647444444444446) [and we can talk through it. Code in the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=4&mode=live&start=29.405142857142856) [Retrieve method accesses the data store](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=4&mode=live&start=32.674285714285716) [and retrieves a single customer by ID.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=4&mode=live&start=34.29457142857143) [Since we want to stay focused on](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=4&mode=live&start=36.57566666666667) [object-oriented programming, not on data](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=4&mode=live&start=39.252) [access techniques, I skipped the actual](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=4&mode=live&start=41.803) [data access code and instead added](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=4&mode=live&start=44.365) [temporary code to the Retrieve, so it will](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=4&mode=live&start=47.002) [return a populated customer instance. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=4&mode=live&start=49.416) [Save method accesses the data store to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=4&mode=live&start=52.712374999999994) [save user changes. For now, it simply](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=4&mode=live&start=54.829) [returns true assuming that the save](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=4&mode=live&start=57.60828571428572) [process was successful. That gives us a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=4&mode=live&start=59.79925) [start for some repository code. Now let's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=4&mode=live&start=62.969555555555566) [go to the Customer class and delete the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=4&mode=live&start=65.37971428571429) [Retrieve and Save methods that were there.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=4&mode=live&start=67.87085714285712) [What do we want to do next? If you said](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=4&mode=live&start=70.4127) [test our repository code, you've got the right idea.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=4&mode=live&start=74.24142857142856)

[Testing a Repository Class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live)

[In this demo, we build a unit test for our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=2.843) [Customer Repository class. Our test folder](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=5.144) [only contains a class for the customer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=8.645624999999999) [tests. We want a separate class for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=10.745857142857142) [testing the customer repository.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=13.764666666666665) [Right-click on the test project, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=16.048) [select Add, Unit Test. Change the file](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=18.162) [name to CustomerRepositoryTest, and select](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=21.698999999999998) [to automatically change the class name.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=24.545499999999997) [Let's change the test method name to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=28.051) [RetrieveValid, and follow our standard](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=30.02) [layout; Arrange, Act, Assert. First, we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=33.294) [arrange. Create an instance of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=37.58171428571429) [repository and use the quick action to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=39.614) [insert the using. Then, define the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=42.33) [expected values. We'll use the object](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=45.728500000000004) [initializer syntax we discussed earlier in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=48.16671428571428) [this course. Recall from the Customer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=50.5482) [Repository class that we expect a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=53.066333333333326) [customerId of 1, and here are the values](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=55.494714285714274) [we set in the Retrieve method for the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=57.78044444444444) [remaining properties. Hmmm, what's wrong](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=60.84266666666666) [with this code? Well, we can't set the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=63.203) [customerId because the customerId property](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=65.99614285714289) [setter is private. How are we going to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=68.21249999999998) [test this? Luckily, we created a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=71.20628571428574) [constructor that takes the customerId](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=73.26466666666668) [property as a parameter. So we can use](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=75.4682857142857) [that here instead. Remove the Id property,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=78.75285714285712) [and pass the Id in to the constructor.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=81.19988888888886) [Next, we act by calling the method we are](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=84.17414285714287) [testing. Lastly, we assert to determine](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=87.8691666666667) [the result of the test. Our first thought](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=90.33685714285717) [may be something like this, but when](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=93.20450000000002) [comparing objects, what does equality](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=96.00383333333338) [actually mean? Unless we specified](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=99.17366666666668) [otherwise, two objects will only be equal](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=101.94649999999999) [if they reference the same object. Let's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=104.29475000000001) [open Test Explorer, pin it, and run the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=108.56133333333334) [test. As expected, it fails because, in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=112.08300000000001) [this case, we have two different objects.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=114.79788888888886) [The one created with the new keyword here](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=117.163) [and one returned from the Retrieve method](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=120.32300000000002) [here. So even if they have the same](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=123.51975000000002) [property values, they are not the same](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=125.89225) [object, and are, therefore, not equal. How](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=128.58) [do we then compare these objects? One way](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=132.2702857142857) [is to compare each property. Rerun the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=135.16685714285717) [test, and now the test passes. If desired,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=138.34575) [you can build additional tests for invalid](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=142.13871428571431) [values such as attempting to request a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=144.32642857142858) [customer that's not there. Now what about the repositories for the other classes?](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=5&mode=live&start=147.16766666666666)

[Building the Remaining Repositories](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live)

[In this demo, we build the remaining](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=2.317) [Repository classes for Product and Order,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=4.023) [along with their unit tests. If you want](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=7.196) [to try building these classes yourself,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=10.367250000000002) [stop the video now. Are you ready to see](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=11.956999999999999) [my solution? The code in the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=16.493857142857145) [ProductRepository class is similar to the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=18.612142857142853) [CustomerRepository class. Code in the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=21.977200000000003) [Retrieve method would access a data store](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=24.264500000000005) [and retrieve a single product by ID. I](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=26.45488888888889) [instead added temporary code to return a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=30.200125) [populated product instance. Your hard](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=32.336) [coded data may look different than that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=35.34414285714285) [shown here. The Save method would access a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=37.5145) [data store to save user changes. For now,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=40.186249999999994) [it simply returns true denoting that the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=43.64757142857143) [save process was successful. Now let's go](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=46.42766666666667) [to the Product class and delete its](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=49.340374999999995) [Retrieve and Save methods. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=51.72533333333333) [ProductRepository unit test looks like](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=54.78057142857143) [this. Make sure your expected product](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=57.463428571428565) [matches your hard coded product data.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=59.853333333333325) [Looking at the OrderRepository, similar to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=63.486) [the other repositories, I once again](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=67.24239999999999) [temporarily hard coded values so our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=70.02742857142856) [retrieve will return data. Notice how I'm](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=72.75) [setting the date. I'm using the current](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=75.75549999999998) [year and a specific date and time zone.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=77.80250000000001) [The Save method would access a data store](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=81.349) [to save user changes. For now, again, it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=83.582) [simply returns true denoting that the save](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=86.95242857142856) [process was successful. And let's not](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=89.90885714285712) [forget to go to the Order class and delete](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=91.881) [the Retrieve and Save methods that are](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=94.30000000000001) [there. The OrderRepository unit test looks](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=97.23799999999999) [like this. Again, be sure your expected](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=100.64157142857144) [order matches your hard coded order data.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=103.90199999999999) [Let's try out our unit tests, and they all](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=108.182) [pass. We have now successfully separated](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=113.15809999999995) [the responsibilities in our entity classes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=115.31683333333335) [to minimize coupling and maximize](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=118.02799999999998) [cohesion, leaving us with more focused](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=121.02520000000001) [classes. All the logic to manage addresses](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=124.39416666666665) [is in a separate Address class, and code](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=126.54) [that accesses the data store is in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=129.34400000000002) [Repository classes. Let's finish this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=132.7779999999999) [module with some checklists we can use as](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=134.403) [we evaluate our classes and separate out responsibilities.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=6&mode=live&start=136.64137499999995)

[Checklists and Summary](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live)

[After using the requirements to define an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=2.816) [initial set of classes, evaluate them for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=4.716) [coupling and cohesion. Recall that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=7.901) [coupling is the degree to which classes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=10.24275) [are dependent upon other classes or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=12.299428571428571) [external resources. To reduce coupling,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=14.6) [extract dependencies into their own](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=18.143) [classes. Minimizing coupling makes an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=21.354666666666667) [application easier to test and maintain](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=23.688999999999993) [because the dependencies are encapsulated.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=25.828428571428564) [For example, each of our entity classes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=29.292) [had Retrieve and Save methods that would](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=31.651) [access a data store. Decouple the main](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=33.612285714285704) [entity classes from the data store by](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=36.33357142857144) [adding a repository class to encapsulate](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=38.82925000000001) [the data access logic. Cohesion is a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=41.182333333333325) [measure of how related the members of a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=44.44912500000001) [class are to the purpose of the class. To](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=47.28033333333332) [increase cohesion, extract unrelated](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=50.919) [members into their own classes. Maximizing](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=53.172714285714285) [cohesion makes an application easier to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=56.581) [understand, test, and maintain because](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=59.504999999999995) [each class is more focused on a single](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=61.66571428571428) [purpose. For example, there are quite a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=65.084) [few properties and business rules for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=67.24300000000001) [managing an address. Improve cohesion by](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=69.2025) [moving the responsibility for managing](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=71.59185714285715) [address into a separate class. We've](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=73.99499999999999) [covered a few additional concepts. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=77.77633333333334) [principle of separation of concerns is the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=80.57128571428572) [idea that an application is decomposed](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=83.37028571428571) [into classes with minimal overlap. Each](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=85.646) [class is responsible for a separate](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=89.39587499999999) [concern. Our Customer class is now](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=91.88512499999996) [concerned only with managing a customer.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=93.72000000000003) [The Address class is concerned with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=96.629) [managing addresses, and the Customer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=98.204) [Repository class is concerned with getting](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=100.524) [data into and out of the data store. YAGNI](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=102.942) [is the acronym for you aren't going to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=106.532875) [need it. It is a principle that focuses on](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=109.10166666666666) [what is important for today. How many](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=111.94833333333334) [times have you built in some hook or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=114.57522222222222) [designed in a feature that was never](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=116.46050000000001) [actually implemented or later implemented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=118.382) [entirely different? We can't see what the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=121.449) [future will bring, so it is best to focus](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=124.2) [on what is needed for today. You can think](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=126.622) [of design patterns as common practices or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=129.75574999999998) [best practices for defining appropriate](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=132.116) [sets of classes and their relationships.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=134.77442857142856) [If you are interested in learning more](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=138.437) [about design patterns, there are courses](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=139.722) [in the Pluralsight library on that topic.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=141.7628571428572) [The Design Patterns On-Ramp course is a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=144.953) [great place to start. In this module, we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=147.401) [evaluated each class for coupling and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=151.14399999999998) [cohesion to determine whether the class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=153.60366666666667) [had too many responsibilities. Let's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=156.69433333333336) [proceed to the third step of building an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=159.061) [object-oriented application; establishing the relationships between the classes.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m5-responsibilities&clip=7&mode=live&start=161.52766666666668)

[Establishing Relationships](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live)

[Introduction](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live)

[Our classes need to relate to each other](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=0) [so they can interact. Welcome back to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=4.525333333333333) [Object- Oriented Programming Fundamentals](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=7.574999999999998) [in C#, from Pluralsight. My name is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=9.5298) [Deborah Kurata, and this module walks](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=12.665333333333335) [through how to define the relationships](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=15.100571428571428) [between classes and implement those](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=17.72733333333333) [relationships in code. Looking at the list](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=20.695500000000003) [of tasks for building an object-oriented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=23.587500000000006) [application, we've identified the first](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=25.775333333333332) [cut of our classes with their properties](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=27.602285714285717) [and methods. We analyzed the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=30.32166666666667) [responsibilities of those classes and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=32.3815) [moved some of those responsibilities to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=34.18066666666666) [other classes to minimize coupling and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=36.7096) [maximize cohesion. The third key step is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=40.6594) [to look at the relationships between those](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=43.15955555555556) [classes. The relationships define how the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=46.20625) [objects interact and work together to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=48.69900000000001) [perform the operations of the application.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=51.276) [To interact and communicate, there must be](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=55.336) [a relationship between the objects. Take,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=57.613) [for example, a feature to display an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=60.654333333333334) [order. Here is a user interface component](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=63.16966666666666) [with a form to display an order summary.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=65.05075000000001) [Here is the business logic component with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=68.045) [Order Repository, Order, and Order Item](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=70.302) [classes. As its name suggests, the order](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=74.13000000000004) [summary form displays a summary of an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=76.48485714285718) [order. To get the data to display, it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=79.18214285714284) [creates an instance of the Order](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=81.31533333333331) [Repository class and uses the resulting](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=83.67457142857143) [object to call its Retrieve method. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=86.1722857142857) [Order Repository Retrieve method retrieves](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=89.02400000000002) [order information from a data store. It](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=91.4252) [creates an order object and uses it to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=94.191875) [populate the properties of the order with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=96.89599999999999) [the data retrieved from the data store.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=98.9642857142857) [The order summary also needs the order](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=101.88) [item detail. So the Order Repository](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=104.56955555555554) [creates order item objects for each](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=106.66142857142856) [product included in that order and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=108.79914285714284) [populates the properties of each order](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=111.15885714285713) [item. The Order Repository Retrieve method](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=113.76733333333334) [then returns the fully populated order and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=116.85633333333334) [order item objects to the user interface.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=120.06766666666667) [The form uses these objects to display the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=123.304) [order and order item data on the form.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=125.595) [This example shows how relationships](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=128.594) [between these classes allow the objects to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=131.075) [work together to perform a specific](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=134.075) [operation. In this module, we begin by](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=137.87900000000008) [defining relationships between our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=140.46899999999997) [classes. Then we more formally identify](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=143.07799999999997) [the basic types of relationships in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=145.52828571428566) [object-oriented programming and examine](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=148.09359999999998) [those types in detail, starting with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=149.85100000000003) [collaboration and composition. We](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=153.57549999999998) [implement composition two different ways](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=156.52716666666666) [using object references and using IDs.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=159.088) [Lastly, we examine another type of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=162.851) [relationship; inheritance. Let's get started.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=0&mode=live&start=164.325)

[Defining the Relationships](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live)

[These are the classes that we have defined](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=2.827) [so far. Let's remove the list of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=4.609) [properties and methods and rearrange the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=7.075) [classes so we can see the relationships](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=9.278) [more easily, and let's add an address](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=11.692) [repository to retrieve and save address](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=14.309) [information. If the Customer class was the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=18.143857142857144) [only class with an address, we could](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=20.13975) [consider skipping the address repository](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=22.29557142857142) [and instead serializing the address](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=24.4674) [information with the customer information,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=27.007199999999997) [but since we have an address in both the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=29.253857142857143) [Customer class and the Order class, we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=32.289375) [want the address to retrieve and save](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=34.412) [separately. To define the appropriate](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=37.340500000000006) [relationships, let's start with the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=39.87600000000001) [Customer class. The customer class has a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=42.006000000000014) [home address and an office address, so the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=44.202374999999996) [customer and address are related. Looking](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=46.666428571428575) [at the Order class, the order has a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=49.77077777777778) [customer, has a shipping address, and it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=52.137) [has a set of order items. Each order item](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=55.392) [must be associated with a product because](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=58.47975) [only products that the company has can be](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=60.80966666666667) [ordered. And looking at the repository](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=64.60059999999999) [classes, the Product Repository populates](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=67.08983333333336) [or saves an instance of the Product class.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=69.18400000000001) [The Order Repository populates or saves an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=72.427) [instance of the Order class, and so on. So](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=75.136) [these are the many relationships between](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=78.69857142857143) [our classes. But before we implement these](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=80.676) [relationships, it's important to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=83.688) [understand what type of relationships these are.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=1&mode=live&start=85.64880000000001)

[Types of Relationships](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live)

[Object-oriented programming defines three](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=2.301) [basic types of relationships.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=4.563) [Collaboration, or uses a, defines a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=7.025) [relationship where one object collaborates](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=9.970333333333333) [with, or uses, another object that is not](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=11.98725) [otherwise related. For example, you may](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=16.484) [collaborate with a coworker to complete a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=18.878857142857143) [task. In our class diagram, the customer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=21.6112) [repository uses a customer object to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=24.113) [populate on a retrieve. Composition, or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=26.979) [has a, defines the relationship where an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=29.8245) [object is composed of other objects it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=32.49357142857142) [needs. For example, a car has a motor and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=35.79999999999999) [has a steering wheel. In our class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=38.85139999999997) [diagram, an order has a customer, an order](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=41.71216666666666) [has a shipping address, and an order has a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=44.459444444444465) [set of order items. Without those, it's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=47.58449999999999) [not much of an order. You may see the has](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=50.4815) [a relationship broken into two distinct](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=53.84024999999999) [categories. Aggregation, when an object is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=56.943000000000005) [composed of multiple objects that can](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=59.373571428571424) [exist outside of the relationship. For](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=62.127) [example, an order has a customer, but a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=65.8515) [customer can't exist without the order.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=68.96150000000004) [The relationship is simply aggregating, or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=71.706) [bringing together, the objects for a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=74.574625) [purpose. Composition is then limited to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=77.44037500000002) [those relationships where the related](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=79.30133333333336) [objects don't otherwise exist. The object](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=81.53880000000001) [owns its related objects, and if the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=84.85833333333333) [object is destroyed, the related objects](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=87.54899999999999) [are also destroyed. For example, an order](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=90.01799999999999) [has a set of order items. The order items](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=93.02499999999998) [have no context without an order. In this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=96.61633333333334) [course, we'll use the general term of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=99.76925) [composition to cover both categories.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=101.82849999999999) [Inheritance, or is a, is the third type of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=104.801) [relationship defined in object-oriented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=107.946) [programming. We don't yet have an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=110.51000000000002) [inheritance relationship in our class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=112.23683333333335) [diagram. Conceptually, we could define a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=114.7932) [business type of customer is a customer, a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=117.10133333333334) [residential type of customer is a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=120.25642857142857) [customer, and so on. As you think about](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=121.825) [the relationships between your classes,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=124.78499999999998) [keep in mind that we are not looking at](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=126.62671428571427) [general relationships, but rather](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=129.94599999999997) [relationships with respect to our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=132.10475) [application requirements. We don't care if](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=135.10733333333332) [a customer has a pet for our particular](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=137.04980000000003) [application, but we do care that the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=138.95257142857145) [customer has an address. Now let's look at each of these relationships in detail.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=2&mode=live&start=141.733)

[Collaboration](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live)

[A collaboration, or uses a relationship](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=2.281) [exists whenever an object from one class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=5.263) [uses one or more instances of another](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=7.60375) [class it is not otherwise related to. At](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=10.43575) [run time, objects interact by providing](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=14.073714285714287) [services to each other. The entity](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=16.466) [repository relationships are an example of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=19.448) [this type. The customer repository uses a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=22.2415) [customer object to populate on a retrieve](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=25.45333333333334) [and to serialize on a save. Same for the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=27.86250000000001) [order, product, and address repositories.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=32.157875) [Let's see what collaboration looks like in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=34.661) [the code. Here we are back in Visual](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=36.687) [Studio with the ACM solution open. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=39.742) [repository classes we have created are all](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=43.32257142857143) [similar, so let's look at the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=45.62242857142857) [CustomerRepository as an example. In the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=47.341) [Retrieve method, the repository uses an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=50.901) [entity class to create a new instance and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=53.19725) [populate it from information in the data](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=55.96528571428571) [store. At this point, we have simply hard](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=58.159375) [coded values. This allows us to run the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=60.8745) [code without having the data access layer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=63.61685714285714) [in place. In the Save, the repository uses](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=65.8995) [a entity class, taking in a customer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=69.262) [instance as a parameter. It can then use](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=72.32150000000001) [the information from that instance to save](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=75.0055) [the information to the data store.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=76.96785714285716) [Recognize a collaborative relationship](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=79.1342) [when you see a class use an instance of an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=80.951375) [otherwise unrelated class to perform an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=84.72328571428571) [operation. So that's an example of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=87.72500000000001) [collaboration. Next, let's look at composition.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=3&mode=live&start=90.76616666666663)

[Composition](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=4&mode=live)

[A composition, or has a relationship](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=4&mode=live&start=2.405) [exists whenever an object from one class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=4&mode=live&start=5.368142857142858) [is composed of one or more objects from](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=4&mode=live&start=7.890000000000001) [another class. The customer address](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=4&mode=live&start=11.344555555555555) [relationship is an example of this type.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=4&mode=live&start=13.122500000000002) [The Customer class has a home address and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=4&mode=live&start=16.116) [has a work address. The order is also](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=4&mode=live&start=18.666) [composed of other objects. Each order has](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=4&mode=live&start=21.935) [a customer, each order has a shipping](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=4&mode=live&start=25.369333333333334) [address, each order has a set of order](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=4&mode=live&start=27.836624999999998) [items, and each order item has a product.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=4&mode=live&start=30.525666666666666) [How do we implement these relationships?](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=4&mode=live&start=34.419) [Composite objects often contain references](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=4&mode=live&start=37.945) [to their constituent objects as](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=4&mode=live&start=40.709) [properties. The Customer class has home](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=4&mode=live&start=43.707333333333324) [address and work address properties. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=4&mode=live&start=45.696999999999996) [Order class has customer, shipping](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=4&mode=live&start=48.5128) [address, and order items properties. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=4&mode=live&start=50.72833333333333) [Order Item class has a Product property.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=4&mode=live&start=54.001125) [Composite relationships also have a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=4&mode=live&start=56.739) [cardinality, that is to say they have a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=4&mode=live&start=58.814) [one- to-one, one-to-many, or many-to-many](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=4&mode=live&start=61.3117777777778) [relationship. For example, each order has](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=4&mode=live&start=65.07839999999999) [one and only one customer. Each order has](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=4&mode=live&start=67.64700000000002) [one or more order items. Let's see what](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=4&mode=live&start=71.02937499999999) [composition relationships look like in code.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=4&mode=live&start=74.66666666666666)

[Composition: References](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live)

[This demo implements a composition](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=2.702) [relationship, specifically the customer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=4.593) [address relationship. We are looking at](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=7.219) [the Customer class. According to the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=11.526285714285713) [application specification, each customer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=14.125399999999999) [has a home address and has an office](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=15.849222222222222) [address. When creating a customer object](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=18.31133333333333) [at run time, the customer object](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=20.61285714285714) [references two address objects; one for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=22.952) [the home address and one for the work](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=25.61257142857144) [address. We could add two properties to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=28.44825000000001) [the Customer class, each of type Address.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=30.554000000000002) [Alternatively, we could create a list of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=34.567) [addresses that more easily allows for any](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=37.054) [number of related addresses. So that's it.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=40.316) [A simple property establishes the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=44.144000000000005) [composition or has a relationship between](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=46.162333333333336) [the Customer class and Address class. But](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=48.891) [there is one small issue we should](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=51.96028571428572) [consider when using a list as one of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=54.489125) [properties. The list does not have a good](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=57.7506) [default value. Earlier in this course, we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=60.64111111111111) [talked about constructors. A constructor](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=63.48825) [should ensure that an object is in a valid](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=65.4042857142857) [state when the object is constructed. We](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=68.49599999999998) [didn't initialize our customerId or string](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=71.097) [values because the system initialized](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=73.2666) [those types to default values for us. But](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=75.55666666666667) [for a list, the default is null. If any](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=79.216) [code attempts to access the AddressList](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=83.01157142857143) [property, the code will throw a null value](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=84.66785714285714) [exception. To prevent this exception,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=88.21766666666667) [we'll modify the constructor to create an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=90.48042857142859) [appropriate instance of the address list.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=92.93419999999999) [Any other code can then access this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=95.764) [property without getting a null value](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=97.642) [exception. We could add this same line of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=101.4965714285714) [code to the default constructor, but then](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=103.51310000000004) [we have repeated code. A better technique](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=105.7706666666667) [is to modify the default constructor to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=108.85857142857142) [call this constructor by inserting a colon](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=111.88428571428568) [and the this keyword. We pass in a 0 since](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=114.93328571428574) [the constructor we are calling requires an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=118.64322222222224) [ID parameter. This technique is called](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=121.85525000000003) [constructor chaining. Use it any time one](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=124.83533333333334) [constructor needs to call another. In this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=127.33025) [case, the default constructor calls the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=129.88460000000003) [parameterized constructor, providing a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=132.054) [default customerId value of 0. Now the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=135.07099999999997) [address list is always initialized](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=138.48942857142856) [regardless of how the customer object is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=140.373) [constructed. So we've just seen an example](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=143.91150000000007) [of composition. In composition style](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=146.85300000000004) [relationships, an object from one class is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=149.45524999999998) [constructed of objects from other classes.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=151.85200000000006) [In this case, the construction of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=154.92) [customer object constructs a list of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=156.703) [addresses objects. At this point, we have](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=158.804) [an initialized empty list of addresses,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=162.26328571428573) [but we don't currently have an address](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=164.17871428571428) [repository, so we have no way to populate the address list with data.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=5&mode=live&start=167.11237500000001)

[Populating the Referenced Objects](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live)

[In this demo, we walk through how to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=2.481) [populate our referenced object,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=4.292) [specifically the addresses. The Customer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=6.45) [class now establishes the compositional](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=10.015333333333334) [relationship by constructing a set of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=12.33225) [addresses when the customer object is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=15.370124999999998) [constructed, but that's not enough. When](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=17.687833333333334) [populating a customer object, where would](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=20.8614) [the data for these addresses come from? If](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=23.309571428571427) [the Address class was only used by the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=25.961375) [Customer class, the customer repository](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=28.7624) [could take the responsibility of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=30.4665) [retrieving and saving the address. But](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=32.46442857142857) [since the Address class is used by several](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=35.401125) [classes, we'll build a separate address](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=37.56333333333333) [repository and use it to retrieve the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=40.32371428571429) [addresses for our customer. I've already](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=43.525) [created the Address Repository class and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=46.247) [added the basic code. As with all of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=49.13033333333333) [other repository classes, the Address](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=52.549428571428585) [Repository class has Retrieve and Save](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=54.571999999999996) [methods. The Retrieve method creates a new](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=57.554249999999996) [instance of the Address class and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=59.84471428571427) [populates it from data retrieved from the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=61.91550000000001) [data store. We hard coded an address so we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=64.67699999999999) [can use it for testing purposes. The Save](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=67.1801) [method takes an address object in as a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=70.2685) [parameter, then returns true to denote](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=72.964) [that the save operation was successful.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=75.169) [The code in between depends on your](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=77.918) [selected data access strategy. Looking](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=79.519) [again at this Retrieve method, it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=82.9325) [retrieves a single address. When](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=85.8272) [retrieving the customer's addresses, it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=88.6362) [would be better to retrieve all of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=90.78788888888889) [customer's addresses at one time, so let's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=92.635) [add another method to the address](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=96.03466666666668) [repository. The method is public, so other](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=98.77866666666671) [parts of the application can retrieve](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=100.57799999999996) [addresses. Since there could be multiple](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=103.32725) [addresses for a specified customer, the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=105.54785714285713) [method returns an IEnumerable of Address.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=107.79042857142856) [An IEnumerable is the recommended way to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=111.704) [return a sequence of data because the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=114.479) [results are more flexible for the callers](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=116.672) [of the method. We'll name the method](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=118.738) [RetrieveByCustomerId, and pass in the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=121.437) [customerId. I'll paste the body of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=125.97449999999999) [code. Here we define the list of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=128.72571428571428) [addresses, and add a few hard coded](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=131.24785714285716) [addresses to the list, so we can run the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=133.11233333333328) [application without having the data access](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=136.05900000000003) [code in place. Since we want to populate](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=138.7274285714286) [the customer's addresses when we populate](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=141.41614285714286) [the other customer data, we modify the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=143.29233333333337) [CustomerRepository to use the address](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=146.023) [repository. In the CustomerRepository,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=149.79216666666662) [first, create a private property for the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=152.028) [address repository. Then build a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=155.31349999999998) [constructor, and create an instance of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=157.1315714285714) [address repository in that constructor.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=159.79325) [This establishes a collaborative](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=162.257) [relationship between the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=163.785) [CustomerRepository and AddressRepository.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=166.28775) [Lastly, modify the retrieve to call the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=169.475) [new RetrieveByCustomerId method, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=172.142) [populate the address list. Call the ToList](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=175.26479999999998) [method on the returned IEnumerable to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=178.13471428571427) [return the result as a list. ToList is a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=180.30724999999998) [link method. Now when any code requests to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=184.66220000000004) [retrieve a customer, this method will](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=186.997) [retrieve and populate the customer and its](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=189.1023333333333) [associated addresses. Let's test what we've done so far.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=6&mode=live&start=193.27085714285715)

[Testing a Composition Relationship](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live)

[In this demo, we walk through how to test](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=2.914) [a composition relationship, specifically](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=4.8481000000000005) [the relationship between the customer and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=7.8114) [address. Our CustomerRepository Retrieve](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=11.141666666666667) [method now populates the customer and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=14.042399999999999) [addresses. To ensure our new code is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=17.927999999999997) [working, let's add a test to the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=20.523428571428582) [CustomerRepositoryTest file. Before we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=22.2) [begin, a side note. The CustomerRepository](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=25.993) [Retrieve method now calls the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=28.803800000000003) [AddressRepository to retrieve the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=31.447200000000002) [addresses for the customer. This](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=33.573) [establishes the collaborative relationship](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=35.79875) [between the CustomerRepository and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=37.65475) [AddressRepository. Writing a unit test for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=41.046) [this retrieve means that we are no longer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=43.77837500000001) [just testing the CustomerRepository, but](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=45.99774999999998) [the AddressRepository as well. Some](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=49.1904) [developers don't allow testing of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=51.9855) [collaborators in a unit test. Rather, they](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=53.753) [fake or mock the collaborator to ensure](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=56.957428571428565) [the test is only testing the specific unit](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=59.43175) [of code, but that means that a developer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=61.8375) [could not write a test for this code until](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=64.31966666666666) [they've learned how to properly write](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=66.95142857142856) [testing fakes and mocks. Pragmatically,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=69.306) [it's much more important to have tests, so](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=71.5645) [if our tests use the collaborators, so be](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=74.538375) [it. The tests can be re-factored later as](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=78.10725000000002) [needed or desired. With that said, I'll](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=80.745) [open the CustomerRepositoryTest file, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=83.8006) [paste our new test. We arrange the test by](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=86.8308) [creating a new instance of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=89.688125) [CustomerRepository. Then we create a new](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=92.71175) [Customer instance with an ID of 1 and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=94.80649999999999) [specifying the properties for the expected](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=97.41375000000002) [customer. This code uses a collection](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=100.14674999999998) [initializer to set up the list of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=102.52142857142859) [addresses. The generic list used here is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=105.247) [provided in the System.Collections](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=107.76625) [.Generic library, so use the quick action](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=110.0945) [to add the needed statement. We act by](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=113.92649999999998) [calling the customerRepository.Retrieve](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=116.82879999999999) [method, retrieving the customer with an ID](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=118.54650000000001) [of 1. We assert by checking each of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=122.29825) [properties. Recall that we can't simply](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=125.66312499999998) [compare the expected customer instance to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=127.4507142857143) [the retrieved customer instance because](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=129.80099999999996) [those are only equal if they reference the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=131.925) [same customer, not two customer instances](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=135.37400000000005) [with the same property values. Now open](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=137.43371428571425) [the Test Explorer, pin it, and let's run](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=140.23600000000002) [all of the tests. And they all pass. Yay.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=143.72600000000006) [In this example, we implemented the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=147.783) [composition relationship between the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=149.707) [customer and address using an AddressList](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=151.529) [property that references address objects.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=154.685) [But there is another way to define a composition relationship.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=7&mode=live&start=157.925)

[Composition: Ids](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live)

[We've implemented the collaborative](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=3.382) [relationships between the repository and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=4.764) [entity objects and defined the composition](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=7.105) [relationship between the customer and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=10.264) [address by implementing a property in the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=11.746) [Customer class for the list of addresses.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=14.608) [Now when a customer is populated, the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=17.916) [customer's list of addresses is also](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=20.510375) [populated. This solution assumes that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=23.710624999999997) [every time a customer is retrieved, that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=25.356571428571428) [the addresses are needed as well. Let's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=27.868999999999996) [implement the composition relationship](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=30.685857142857145) [between the order and the customer and the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=32.453) [order and the address using a different](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=35.24325000000001) [technique. When populating the order](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=38.49740000000001) [object, the order doesn't care about the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=40.8944) [customer details such as home and work](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=42.953142857142865) [addresses. The order has its own address](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=46.155999999999985) [property. So instead of a property that is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=48.90442857142859) [a reference to the customer, which would](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=50.684499999999986) [then load all of the customer details,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=53.00128571428571) [let's instead establish the relationship](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=55.657) [between the order and the customer by](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=57.956) [adding a property for the customer ID.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=60.048) [Same for the shipping address. We'll](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=63.48) [define a simple integer property for the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=65.86642857142857) [address ID in the order. There are several](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=68.519) [advantages to using ID properties instead](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=71.90457142857143) [of object properties to establish a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=74.331) [relationship between classes. It reduces](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=77.77260000000001) [coupling because the class no longer has a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=80.57285714285713) [reference to its related class. In our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=83.51674999999999) [example, the order class does not need to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=86.14125) [directly reference the customer or address](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=88.62528571428572) [classes. And it can be more efficient](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=90.69457142857144) [because loading an object does not load](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=93.87533333333333) [the data for its dependencies. In our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=96.97228571428572) [example, the order repository does not](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=100.21400000000001) [need to load all of the customer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=102.63250000000001) [information and the shipping address each](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=104.407) [time it loads the order. Let's see what](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=107.639) [this looks like in the code. This is the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=110.541) [Order class we created earlier in this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=113.54225) [course. For the relationship between the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=116.09333333333333) [order and the customer, we'll define an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=118.28800000000001) [ID. I'll use a snippet, prop, Tab, Tab,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=121.30550000000001) [int, Tab, CustomerId. And then for the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=126.55749999999999) [relationship between the order and the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=130.0618571428571) [address, prop, Tab, Tab, int, tab,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=132.441125) [ShippingAddressId. That's it. When the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=136.5115) [order repository populates the order,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=139.76733333333334) [these ID properties are populated, but not](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=142.10899999999998) [the customer or address details. To finish](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=145.03828571428573) [off the properties for this class, let's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=148.16933333333336) [define the composition relationship](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=151.1464285714286) [between the order and the order items](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=152.92260000000002) [using references by defining a list of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=156.37057142857148) [order items; prop, Tab, Tab,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=159.8596666666666) [ListOrderItem, Tab, OrderItems. Since the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=163.66049999999998) [generic list is in the Systems.Collections](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=166.9374285714286) [.Generic library, use the quick action to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=169.22666666666666) [add the using statement. And we'll modify](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=173.20522222222223) [the constructor to initialize the list as](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=175.54850000000002) [we did with the address list. Initialize](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=177.44750000000005) [the OrderItems in the constructor here.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=180.142) [Then chain the constructor here. The order](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=184.018) [now has a customer as defined by this ID,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=187.3898888888889) [has a shipping address as defined by this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=190.54375) [ID, and has a set of OrderItems as defined](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=193.98160000000001) [by this list. We have now looked at](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=197.57425) [collaboration and composition relationships. What about inheritance?](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=8&mode=live&start=201.23942857142862)

[Inheritance](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live)

[We've ignored one of the statements in the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=2.775) [original application requirements. The new](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=4.524) [system must manage business, residential,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=7.751666666666667) [government, and educator types of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=9.6102) [customers. We don't currently have](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=12.239) [anything in our model to handle customer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=14.319) [types. There are several ways we can](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=17.102375000000002) [handle these types. One option is to use](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=19.678666666666658) [inheritance. Inheritance provides a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=23.85383333333333) [mechanism for defining classes that are a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=25.827000000000005) [more specialized version of another class.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=28.786833333333334) [For example, we already have a Customer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=32.215) [class. We could create additional classes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=35.38250000000001) [that define more specific types such as a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=37.54916666666666) [business customer class, residential](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=41.182) [customer class, and so on. The Customer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=43.351333333333336) [class in this example is referred to as](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=46.85314285714286) [the parent or base class. Each specialized](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=49.788875) [class is called a child or derived class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=52.9465) [because it is a derived special case of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=55.946000000000005) [the class above it in the hierarchy. Each](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=58.9746) [child class inherits, or takes on, the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=62.10028571428571) [members of its parent class. In our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=65.70349999999999) [example, the business customer class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=68.58185714285715) [inherits all of the members of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=70.284) [Customer class, including the customer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=72.22474999999997) [name, email address, and so on. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=74.754) [specialized business customer class would](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=78.14280000000001) [only need to implement the additional](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=80.103) [features for the specific type. In this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=82.173) [way, the specific classes leverage reuse](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=85.54185714285714) [in that they are using the properties and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=87.61087500000001) [methods already defined in the parent](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=90.26774999999999) [class. Each class in a lower branch of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=93.11024999999997) [hierarchy has an is a relationship to the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=95.447) [class above it in the hierarchy. So a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=98.447) [business customer is a customer and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=101.77875) [inherits all of the properties and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=103.866) [behaviors defined for the customer, a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=105.543) [residential customer is a customer, and so](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=108.44016666666667) [on. If the requirements warranted it, we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=111.1587142857143) [could expand the hierarchy even further](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=113.87785714285714) [and define local government customers, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=116.3014) [state government customers, and so on.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=119.2786) [When implementing inheritance in C#, a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=122.473) [class can only have one parent class. C#](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=125.48975) [does not support multiple inheritance.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=128.868) [There can be any number of inheritance](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=131.873) [levels. From customer, to educator, to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=134.5863750000001) [high school, to teacher, and so on.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=136.90962499999998) [Defining subtypes using an inheritance](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=139.756) [hierarchy can be helpful when first](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=141.91) [thinking about the classes and their](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=144.293) [relationships, but they are not always](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=146.065) [useful when defining the classes to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=148.664) [implement. Only build an inheritance](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=151.7608571428571) [relationship between classes if the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=153.9626) [derived classes have specialized](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=156.11257142857139) [properties or behaviors that require](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=157.95659999999998) [unique code. And you can significantly](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=160.83066666666667) [leverage code reuse from the base class.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=163.48400000000004) [Let's think about these customers. Will](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=166.767) [there really be much difference in the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=169.32762499999998) [code for business verses residential](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=171.18) [verses government verses educator](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=173.63999999999996) [customers? If not, the easiest way to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=176.41949999999997) [define the subtypes is with a simple type](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=178.98649999999995) [property. We'll see how to use inheritance](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=182.87942857142852) [to reuse code in a later module. For now,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=184.87924999999996) [let's add a customer type property to the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=188.2295) [Customer class to handle the type of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=190.9558) [customer. Here in the Customer class,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=194.05610000000007) [let's add a CustomerType property. That](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=196.53900000000004) [should do it. The class now has a property](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=200.36411111111113) [that represents the type of customer.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=202.83842857142858) [Let's finish this module with some](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=205.679) [checklists you can use as you define the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=207.185) [relationships between the classes and your applications.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=9&mode=live&start=209.586)

[Checklists and Summary](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live)

[A class has a collaboration or uses a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=2.482) [relationship when the class uses another](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=5.297) [class that is otherwise unrelated. For](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=8.222) [example, the customer repository uses a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=11.962666666666667) [customer instance to populate data.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=14.966666666666667) [Implement this relationship by creating an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=17.795) [instance of the collaborating class and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=19.872) [accessing its properties or calling its](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=22.226) [methods. A class has a composition, or has](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=25.92028571428572) [a, relationship if the class is made up](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=29.030625) [of, or composed, of parts from other](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=31.912249999999997) [classes. For example, an order isn't an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=35.41185714285715) [order unless it has a customer, shipping](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=38.209750000000014) [address, and set of order items. There are](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=40.89883333333334) [two ways to implement a composition](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=44.95071428571429) [relationship. Implement composition with a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=47.4675) [reference property if you want to retain](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=50.092400000000005) [and load the related object, or list of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=52.417333333333346) [objects, as part of the main object. In](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=55.501999999999995) [this example, the order retains its set of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=58.625625) [order items. Implement composition using](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=61.4086) [an ID property instead if you want to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=64.348) [retain the relationship, but don't always](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=67.268) [need all of the related object's data. In](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=69.828) [this example, the order has a CustomerId](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=73.5435) [to establish the relationship between the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=76.081) [order and the customer. A class has an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=78.033) [inheritance, or is a, relationship when](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=82.21999999999998) [defining classes that are a more](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=84.16799999999999) [specialized version of another class. For](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=86.85257142857142) [example, here we define more specialized](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=89.86266666666667) [versions of the Customer class. This](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=92.23066666666666) [relationship is useful when understanding](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=95.128) [the business requirements. But only](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=97.5115) [implement this relationship if the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=100.5082857142857) [specific class type adds unique code. In](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=102.094) [this example, the derived types did not](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=106.09049999999999) [add any unique code, so we implemented the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=108.124) [CustomerType as a simple type property in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=111.158) [the Customer class instead of inherited](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=114.086) [classes. Recall the first two pillars of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=118.47885714285717) [object- oriented programming we discussed](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=121.01700000000001) [earlier in this course? Abstraction helps](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=122.88200000000002) [us map the business requirements to an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=125.64728571428573) [initial set of classes. Encapsulation](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=128.11271428571428) [helps keep our properties and method code](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=130.47950000000003) [protected within the class and only](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=133.97466666666674) [accessible through a public programming](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=136.3785714285714) [interface. Inheritance is the third pillar](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=139.45233333333334) [of object- oriented programming. It helps](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=142.0187142857143) [us leverage reuse. Speaking of reuse, now](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=145.5632) [that our classes and their relationships](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=149.4245) [are defined, let's take a focused look at](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=151.19650000000001) [reuse. We'll revisit inheritance and how](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=155.304) [we can use it and other object-oriented programming techniques to reuse code.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m6-relationships&clip=10&mode=live&start=157.67757142857138)

[Leveraging Reuse through Inheritance](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live)

[Introduction](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live)

[It is said that the power of object-](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=0) [oriented programming is in its promise of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=4.172) [reuse. Welcome back to Object-Oriented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=7.688624999999998) [Programming Fundamentals in C#, from](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=9.947000000000001) [Pluralsight. My name is Deborah Kurata,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=13.075599999999998) [and this module demonstrates how to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=15.137374999999999) [leverage reuse through inheritance. We've](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=17.881571428571426) [already identified the first cut of our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=20.769714285714283) [classes with their properties and methods](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=23.129333333333335) [using the words from the requirements. We](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=25.213714285714286) [analyzed the responsibilities of those](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=28.632333333333335) [classes and moved some of those](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=30.494) [responsibilities to other classes. This](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=32.636) [keeps each class focused on its purpose.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=36.20775) [We then identified and implemented the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=38.999) [relationships between those classes. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=41.352) [relationships define how the objects](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=44.545) [interact and work together to perform the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=45.945) [operations of the application. The fourth](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=48.782) [key task when building an object-oriented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=51.84771428571429) [application is to leverage reuse. For](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=53.990833333333335) [existing code, this involves locating](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=58.01233333333333) [similar functionality and extracting that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=60.024) [commonality into reusable classes or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=62.65) [components. This task can also involve](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=66.19500000000001) [some precognition, identifying potential](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=68.4506666666667) [commonality and building reusable common](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=71.298) [classes and components, and interfaces. We](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=73.90374999999999) [can use object-oriented programming](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=78.50240000000001) [techniques to leverage reuse, build a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=79.984) [class with common functionality, and share](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=82.73542857142859) [it through collaboration or composition.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=85.06399999999998) [We saw this in action with the Address](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=88.686) [class. Any class can reuse the Address](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=91.32777777777775) [class to manage address functionality,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=93.17825000000003) [extract common code into a base class, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=96.253) [inherit from that class. Each child class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=98.94319999999999) [reuses the properties and behaviors of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=101.35657142857144) [base class. Build fully encapsulated](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=104.15039999999999) [components. For example, we could build a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=107.18525000000001) [library of common utilities and reuse them](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=109.33075) [in any application. Define interfaces to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=112.49812499999997) [work with a set of classes in a common,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=114.86474999999999) [reusable way. And copy and paste. Yeah, we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=118.44700000000003) [could copy some code and paste it to reuse](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=122.00575000000002) [it. This is often jokingly called cut and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=125.16062500000002) [paste inheritance. But by making a copy of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=128.60888888888888) [the code, there are then two or more](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=130.9867500000001) [places that the code resides. When a bug](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=132.78433333333334) [is found in one copy, someone needs to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=134.96500000000006) [remember to update every other copy. This](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=137.7798571428572) [takes time and is prone to error, so it's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=140.30400000000003) [not a great idea. We looked at](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=143.65611111111107) [collaboration and composition earlier in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=146.4985) [this course. We build a reusable component](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=148.53749999999997) [and examine interfaces later in this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=151.22814285714293) [course. The remainder of this module](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=154.47980000000004) [focuses on inheritance. We begin with a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=158.13437499999998) [look at the .NET Object class as an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=161.04977777777776) [example of leveraging reuse through](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=163.763) [inheritance. Sometimes you want different](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=166.0844) [functionality than a base class provides.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=168.7102857142857) [In that case, you can override the default](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=171.664) [base class functionality and provide a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=173.793) [more specific implementation. We'll dive](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=176.40814285714288) [into this concept and look at an example.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=179.8244) [We then cover polymorphism, which is the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=183.186) [fourth and final pillar of object-oriented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=185.739) [programming. Lastly, we build our own base](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=189.25071428571422) [class with common functionality for all](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=191.91950000000003) [the entity classes and demonstrate how to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=194.17066666666665) [inherit from this base class. Before we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=197.0218571428572) [get started, let's look at the secrets of reuse.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=0&mode=live&start=200.1974285714286)

[Secrets of Reuse](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=1&mode=live)

[Psst, come here once. Let me tell you the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=1&mode=live&start=2.408) [secrets of reuse success. Build a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=1&mode=live&start=6.620777777777779) [functionality once. Test that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=1&mode=live&start=9.139000000000001) [functionality with unit tests. Be sure to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=1&mode=live&start=11.317666666666668) [retain the tests for regression testing.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=1&mode=live&start=14.587000000000002) [Of course, the most important part,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=1&mode=live&start=16.891) [actually reuse the resulting class,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=1&mode=live&start=18.827) [component or interface. This may require](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=1&mode=live&start=21.007) [some processes to ensure all team members](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=1&mode=live&start=24.144714285714286) [know what is available for reuse. And if](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=1&mode=live&start=26.59466666666667) [you need to later update, extend, or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=1&mode=live&start=29.545250000000003) [enhance that functionality, you only have](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=1&mode=live&start=31.93875) [to enhance it in one place. When a bug is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=1&mode=live&start=34.34466666666666) [found or a change is required, update that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=1&mode=live&start=36.78866666666666) [functionality once and retest it. All the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=1&mode=live&start=39.50179999999999) [code that reuses the shared functionality](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=1&mode=live&start=42.42937499999998) [will immediately have the fix or support](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=1&mode=live&start=44.5122) [the new feature. Reusing existing classes,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=1&mode=live&start=47.71487499999999) [components, and interfaces has many](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=1&mode=live&start=51.21175) [advantages. It reduces the amount of code](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=1&mode=live&start=54.154199999999996) [you need to write, which reduces the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=1&mode=live&start=56.049333333333344) [development and maintenance time and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=1&mode=live&start=58.42366666666667) [associated costs. Plus, it reduces bugs](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=1&mode=live&start=61.44440000000001) [because the reused piece can be tested](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=1&mode=live&start=64.22285714285715) [independently. Now let's get started with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=1&mode=live&start=67.84159999999999) [a look at techniques for leveraging reuse through inheritance.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=1&mode=live&start=69.430375)

[The .NET Object Class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live)

[We've been talking about inheritance for a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=2.792) [while now. We talked about how we could](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=4.336) [define an inheritance relationship for our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=6.976) [customer types, but since we didn't need](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=8.993) [any specific properties or behavior in our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=11.827) [derived classes, we opted to implement our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=14.247) [customer type as a simple integer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=16.794) [property. So you may have been wondering](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=19.81114285714285) [when you would see inheritance](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=21.310750000000006) [implemented, but actually you've already](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=23.940250000000002) [been using inheritance in the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=26.20933333333333) [demonstrations so far. How, you ask? .NET](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=28.463) [has a class called object. This name is a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=32.421) [bit confusing because the object class is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=36.56150000000001) [not an object, it's a class named Object.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=38.58433333333334) [Every class we create, and I mean every](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=41.69166666666667) [class we create, inherits from this Object](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=45.65128571428573) [class. Since every class inherits from](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=49.00579999999999) [this Object class, all the members defined](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=51.199428571428584) [in the Object class are available and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=53.654428571428554) [reusable from the derived classes. Let's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=56.70549999999999) [take a look. We are back in Visual Studio](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=59.692) [with the ProductRepository class open.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=62.749) [Let's try a few things here. Since the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=65.994) [built-in .NET object is a class, we can](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=69.10325000000002) [create an instance of it; Object myObject](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=72.23471428571429) [= new Object. If we type myObject., we see](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=75.69699999999999) [the list of methods available on the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=80.32566666666666) [object class. The ToString method returns](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=83.5753333333333) [a string representing the current instance](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=85.998) [of the class. The default implementation](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=88.44585714285712) [of the ToString method in the Object class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=90.80499999999998) [returns the fully qualified name of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=93.4897142857143) [type. Let's write it out to the console](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=96.53099999999998) [using an interpolated string. Since every](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=98.93799999999997) [class we create automatically inherits](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=102.152) [from object, every object from each of our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=104.0435) [classes has a ToString method. Looking at](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=107.711) [the Product class, we didn't create a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=110.3682) [ToString method. But going back to the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=113.00833333333335) [repository, if we type product., we see](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=115.44883333333335) [that our product instance does have a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=117.78900000000004) [ToString method that it inherits from the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=120.29400000000003) [.NET Object class. Let's write that out to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=122.89042857142857) [the console as well. Note that we did not](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=125.895) [have to define this inheritance](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=129.1544444444444) [relationship. When we create a class, .NET](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=131.539) [automatically inherits from the .NET](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=134.909) [Object class. We don't currently have a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=137.564) [user interface to run this code, so we'll](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=140.671) [run it by executing the unit test. Open](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=143.8631111111111) [the Test Explorer, and pin it. Select to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=146.92185714285714) [run the ProductRepository RetrieveTest. In](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=150.81533333333334) [the bottom portion of Test Explorer, click](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=154.02242857142858) [the Output link, and we see that the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=156.27844444444443) [ToString method displays the full class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=158.658) [name of the .NET Object class and the full](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=160.898) [class name of our Product class. Going](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=164.009) [back to the ProductRepository class,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=167.504) [Visual Studio itself makes use of this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=170.124) [inheritance relationship when displaying](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=172.528) [information while debugging. It uses the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=174.94) [ToString method from the object class to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=177.79174999999998) [display the fully qualified type name for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=180.02685714285715) [any object variable in the tooltips. To](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=183.141) [see what I mean, let's put a breakpoint in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=186.6581111111111) [after we create the instance of our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=188.85999999999999) [product so we can view the product object.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=190.771) [In Test Explorer, right-click and select](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=194.52) [to debug the test so it'll stop on the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=196.8488571428572) [breakpoint. Hover over the product](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=200.53655555555557) [instance variable. Notice the tooltip](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=202.86433333333338) [provides a string description of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=204.72950000000003) [class. Internally, Visual Studio is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=207.16100000000003) [calling the ToString method. Since every](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=209.45899999999997) [class we create implicitly inherits from](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=212.2873333333333) [the Object class, Visual Studio can reuse](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=214.884) [the inherited properties and methods with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=218.00733333333338) [any instance of any class. That makes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=220.644) [features such as displaying the data](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=224.37985714285713) [tooltip possible. Click the red square to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=226.76166666666666) [stop the test. The key point when](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=230.46850000000003) [leveraging reuse with inheritance is that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=233.17814285714286) [every derived class has access to the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=235.5597142857143) [properties and methods of the class it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=238.19675) [inherits from. Code in the base class is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=240.707) [available for use by the derived classes,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=243.2893333333333) [so we can call the Object class ToString](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=245.3645555555556) [method from the Product class, or from the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=248.32449999999997) [Customer class, or from any class. But](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=251.12285714285716) [what if we want to change the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=253.6265) [functionality of one of the base class methods for a specific derived class?](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=2&mode=live&start=256.29925000000003)

[Overriding Base Class Functionality](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live)

[In this demo, we override base class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=2.612) [functionality for a specific derived class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=4.857) [to provide a more specialized](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=7.798) [implementation. Recall that the ToString](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=11.284666666666665) [method in the object class displays the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=12.94085714285714) [name of the class type. For the Object](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=15.558222222222224) [class, it displays System.Object. For our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=19.272428571428573) [Product class, it displays ACM.BL](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=22.301000000000002) [.Product. It would be much more useful if](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=25.401000000000007) [the ToString method provided a string more](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=27.26262500000001) [specific to the derived class, especially](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=30.246) [when used with debugging. For example, it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=32.9486) [would be great if the Customer class could](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=35.873875000000005) [write its own implementation of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=38.6755) [ToString method that displayed the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=41.257999999999996) [customer name. And the product class could](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=43.606) [have its own implementation of ToString](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=46.104375) [that displayed the product name. That way](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=48.3954) [we could better see which object we are](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=50.86400000000001) [working with. Luckily for us, we can do](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=53.73842857142858) [just that. We can override the base class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=56.780000000000015) [member in our derived classes. Let's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=59.19600000000001) [override the ToString method in the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=62.34685714285714) [Product class. With Visual Studio, it's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=64.26) [easy to override any inherited member.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=67.53585714285715) [Just type override, space, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=70.049) [IntelliSense provides the list of members](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=72.97616666666667) [available to override. The list includes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=75.1465) [any overridable members in any class above](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=78.3595) [it in the hierarchy. Our Product class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=81.285) [inherits from object, so we see the object](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=84.20100000000002) [class's overridable members in the list.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=87.20457142857143) [We'll pick ToString. Note that not all](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=89.75) [members of a class are overridable. We'll](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=92.914) [talk more about that later in this module.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=95.93733333333333) [Visual Studio automatically creates a set](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=99.076) [of default code. This default code simply](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=101.304) [calls the ToString method in the base](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=104.478) [class. We want to display information](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=107.18437499999996) [about the current instance, so let's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=109.17100000000003) [return the ProductName instead. Notice](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=111.39966666666666) [that the quick action is offering a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=114.76855555555555) [suggestion. Since this method is a single](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=117.44644444444444) [line, we can shorten this syntax using](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=119.74128571428575) [expression bodied members. Expression](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=122.24914285714289) [bodied members leverage lambda expressions](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=124.45899999999999) [instead of statement blocks to shorten the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=127.12540000000001) [syntax. Now let's rerun the unit test and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=131.29549999999995) [view the data tooltip. Right-click on the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=133.53477777777772) [ProductRepository RetrieveTest, and select](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=136.059) [Debug Selected Tests. The debugger will](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=139.73899999999998) [stop at the breakpoint we set in the last](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=142.38071428571428) [clip. Hover over the product object, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=145.38366666666673) [we see the product name. Wow. That is much](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=147.78325000000004) [more helpful than just seeing ACM.BL](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=152.27562500000002) [.Product. It is now providing information](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=154.09983333333332) [on which product this object variable](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=157.3478333333333) [represents. Click to stop the test. To](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=159.8114285714286) [make debugging easier, consider overriding](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=163.74425) [the ToString method in every entity class.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=165.59733333333332) [We can then more easily see information](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=168.0938571428571) [about each instance from that class while](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=170.70699999999997) [debugging. Open the Customer class and add](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=174.02140000000003) [the override, returning the full name. And](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=176.49914285714289) [in the Order class, returning the order](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=179.86175) [date and ID. We can also use the ToString](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=181.967) [method in our code for logging information](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=185.125) [about a specific instance. Now is a good](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=187.383) [time to introduce another term; polymorphism.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=3&mode=live&start=190.79850000000002)

[Polymorphism](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live)

[Polymorphism is an impressive sounding](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=2.171) [word that basically means many shaped. In](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=4.980166666666666) [object-oriented programming, polymorphism](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=8.576333333333334) [is the concept that a single method, such](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=10.025) [as the ToString method, can behave](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=13.145999999999999) [differently depending on the type of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=15.758333333333335) [object that calls it. If the base class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=17.872) [calls ToString, ToString displays the full](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=20.822000000000003) [class name. If an order object calls](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=23.45666666666667) [ToString, it displays the order date and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=26.488666666666663) [ID. If a customer object calls ToString,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=29.291571428571427) [it displays the customer's full name, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=31.965) [if a product object calls ToString, it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=34.56542857142857) [displays the product name. So a method can](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=37.3134) [have different shapes. The application](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=40.614999999999995) [determines which shape of the method to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=42.315333333333335) [use at the time of execution based on the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=44.43) [type of instance that called it. This](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=47.050000000000004) [demonstrates inheritance-based](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=49.720666666666666) [polymorphism, whereby a base class defines](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=51.286) [a method, and any derived class can](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=54.243) [override that method to provide its own](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=56.444) [implementation, basically providing its](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=58.823) [own shape for the method. Polymorphism](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=61.02139999999999) [allows us to work with groups of classes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=63.795) [in a uniform way. We saw this when we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=66.50133333333332) [looked at the data tooltips. Visual Studio](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=69.87199999999997) [leverages polymorphism to display the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=72.448) [appropriate information in the data tip](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=74.63933333333333) [based on the type of object. Now that we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=76.7865) [have covered how to use a base class and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=79.7685) [override its methods, let's see how to create a base class of our own.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=4&mode=live&start=82.3246)

[Building a Base Class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live)

[So far, the demonstrations have pretty](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=2.449) [much ignored the save functionality. Why?](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=4.142714285714287) [Because there's all sorts of fiddliness](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=7.261166666666666) [involved when we have to actually save](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=9.524833333333333) [data. Is it a new item? Then there may be](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=12.08625) [specialized operations to perform. To](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=16.44) [track if the item is new, each entity](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=18.220000000000002) [class needs an IsNew property. Is the data](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=20.36342857142857) [actually changed? If we display data to a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=24.401999999999997) [user, they may look at it and not actually](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=26.764800000000008) [change anything, so we don't need to save](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=29.58571428571429) [it. To track whether the user has made](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=32.24542857142857) [changes, each entity class needs a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=34.72287500000001) [HasChanges property. Is the data valid? To](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=37.74699999999999) [track that, each entity class needs an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=40.58442857142855) [IsValid property that calls its Validate](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=43.497142857142855) [method to determine if the data is valid.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=45.651714285714284) [What if the user deleted the item? It is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=48.667) [normally good practice not to actually](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=51.71657142857143) [delete any data, especially if that data](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=53.469750000000005) [is related to other data in the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=55.962500000000006) [application. For example, an order is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=58.691500000000005) [associated with a customer. If the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=61.33088888888887) [customer is deleted, the order can't be](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=63.5965) [displayed. Instead, add an EntityState](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=65.87483333333333) [property to track whether an item is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=68.649) [active or deleted. So every entity needs](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=70.96950000000004) [another property; EntityState. Do we want](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=73.5115714285714) [to add each of these properties to every](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=77.79866666666666) [entity class? I don't think so. Let's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=80.2825) [instead define a base class that has these](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=83.42012499999998) [properties. Every entity class can then](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=86.95666666666669) [inherit from this base class to access all](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=89.16685714285714) [these new properties. When building a base](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=93.12266666666665) [class, we have two choices. We can build](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=96.07088888888887) [an abstract class or a concrete class. An](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=98.56125) [abstract class is an incomplete class with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=101.3027142857143) [at least one property or method that has](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=104.28442857142856) [not been implemented. Because an abstract](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=107.39528571428572) [class is incomplete, it can't be](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=109.79050000000001) [instantiated. That means we can't use the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=112.5725) [new keyword to create one. An abstract](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=114.5) [class is intended for use as a base class,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=117.1072857142857) [and not used on its own. Define an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=120.03940000000003) [abstract class using the abstract keyword.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=122.82557142857142) [A concrete class is a normal class like](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=125.842) [we've been creating so far in this course.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=128.449) [A concrete class can be instantiated. That](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=131.463) [means we can use the new keyword to create](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=134.517) [one. A concrete class can be used as a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=136.639875) [base class or on its own. When creating a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=139.95950000000002) [class, a concrete class is created by](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=143.43837500000004) [default. No additional keyword is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=145.91933333333333) [required. Our new EntityBase class is only](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=148.15242857142857) [meant to be used as a base class, so we'll](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=151.52277777777778) [build it as an abstract class. There is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=154.72175) [one more concept to cover before we dive](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=157.66774999999998) [into building our base class, and that is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=159.73585714285716) [a sealed class. A sealed class is a class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=162.86999999999998) [that cannot be extended through](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=166.04133333333328) [inheritance. Sealing a class prevents](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=168.15866666666665) [extension and customization. If you build](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=171.0898571428571) [a class and want to ensure that no other](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=173.5813333333333) [classes extend or override its](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=176.34857142857143) [functionality, consider marking it as](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=178.65157142857143) [sealed. Seal a class using the sealed](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=181.5894285714286) [keyword. Since we are building a base](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=184.79642857142855) [class, we want it to be extended and not](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=187.3201428571429) [sealed. But if we don't want any other](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=190.35955555555563) [code to extend our entity classes such as](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=192.17922222222225) [our customer or product classes, we could](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=194.82985714285707) [seal them. Now, let's build our base class.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=5&mode=live&start=198.345)

[Demo: Building a Base Class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live)

[In this demo, we'll build the base class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=2.259) [for our entity classes. In it, we'll](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=4.247) [declare the properties each entity class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=7.276857142857143) [needs to perform the save operation.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=9.486249999999998) [Create a base class like any other class.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=13.039) [Right-click on the ACM.BL project, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=15.809) [select Add, Class. Name the class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=18.86025) [EntityBase. Ensure the class is public,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=22.40325) [and let's mark it as abstract so it can](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=24.854375) [only be used as a base class. Now we are](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=27.31972727272727) [ready to add our new properties using the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=30.23588888888889) [property snippet. The IsNew property](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=33.69566666666666) [defines whether the object represents a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=35.6555) [new entity such as a new customer. For the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=37.543125) [IsNew, use propg to define a property with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=40.958999999999996) [a getter and private setter. We don't want](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=44.32155555555556) [any other code defining whether the entity](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=46.91428571428571) [is new. It's a Boolean, and we'll call it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=49.247400000000006) [IsNew. What is the appropriate access](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=53.327000000000005) [modifier for this property? Use public if](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=55.154285714285706) [any class can access the property. Use](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=57.60475000000001) [private if only the base class can access](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=60.41142857142856) [this property. Use protected if the base](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=63.628428571428586) [class and all derived classes can access](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=66.005) [this property. We could make it protected](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=69.07166666666666) [so only the entity classes could access](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=71.53987500000001) [it, but we may want to also access it from](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=74.1694) [the associative repository classes, so](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=76.90820000000002) [let's leave it public. The HasChanges](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=80.244) [property defines whether the entity has](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=82.79733333333333) [been changed. I'll place the properties in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=85.399) [alphabetical order. Use prop to create the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=88.86628571428574) [property. It's also a Boolean. We'll name](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=91.8388333333333) [it HasChanges, and we'll leave it public](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=94.63499999999999) [as well. IsValid defines whether the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=97.2312857142857) [entity's data is currently valid. It's a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=100.41783333333333) [read-only property, and we'll call the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=103.42200000000001) [entity's Validate method to determine if](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=105.4425) [the class data is valid. I'll paste the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=107.81083333333333) [code. Each of our entity classes has a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=111.1495) [Validate method. So can we just call their](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=114.17455555555554) [Validate method here? Hmmm, no. The base](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=117.15433333333335) [class does not know about the properties](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=119.65700000000002) [and methods defined in the child classes.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=121.84685714285716) [We'll deal with that later. Let's just](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=124.166625) [return true for now. Lastly, EntityState](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=127.13399999999999) [defines whether the item is active or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=129.9364) [deleted. For this property, we'll define](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=133.335) [an enum for the valid values; active and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=135.28725000000006) [deleted. Then use prop, set the type to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=138.97549999999995) [that enum type, EntityStateOption, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=141.56055555555565) [call it EntityState. That's it. Now that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=144.95250000000004) [we have the base class in place, we can](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=149.15888888888892) [inherit from it. We want each of our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=152.45885714285717) [entity classes to inherit from our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=155.05050000000003) [EntityBase class. Let's start with the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=157.57980000000003) [Product class. To inherit from a base](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=160.16633333333334) [class, add a colon after the class name](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=162.36322222222222) [and specify the name of the base class. In](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=164.787) [our case, it's EntityBase. That's it.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=168.43766666666664) [That's all we have to do to inherit from a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=170.89922222222222) [base class. Let's try it out. Ensure that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=174.196) [our breakpoint is still defined in the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=177.0345714285714) [ProductRepository class. Then debug the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=179.261) [ProductRepository RetrieveTest. Hover over](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=183.9704) [the product, open the data tip, and we see](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=186.39475) [that the product instance has all the base](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=189.43075) [class properties. Cool. Let's stop the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=192.30519999999999) [debugger. Looking back at the EntityBase](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=196.4568) [class, let's revisit the IsValid property.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=198.79083333333338) [We want this property to call the Validate](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=201.988) [method of the appropriate entity object.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=203.914) [The IsValid property can't call our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=206.937) [derived class validate methods, but it can](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=209.09871428571427) [call a local validate method. Let's add](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=211.54700000000008) [one here. Now we can call this method in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=214.897) [our Validate getter. We are getting a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=218.08259999999999) [quick action suggestion to convert this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=220.71999999999997) [one-line getter to an expression body](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=222.38233333333332) [property. Let's take that suggestion and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=224.94833333333335) [shorten our syntax. We'll ignore this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=228.02624999999995) [error for now. The last step then is to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=230.7515) [simply override this Validate method in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=233.58325) [every entity class that inherits from this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=235.932) [class. The IsValid property here in our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=239.06439999999995) [base class makes use of polymorphism to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=241.95049999999995) [call the correct shape of the validate](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=244.88528571428571) [method, calling the appropriate Validate](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=248.09300000000005) [function based on the entity type. In the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=250.37219999999996) [Product class, let's add the override](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=253.56985714285713) [keyword to our Validate method. But it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=255.60533333333333) [doesn't work. We see an error; can't](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=258.9645) [override inherited member because it is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=261.4612857142856) [not marked virtual, abstract, or override. Now what?](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=6&mode=live&start=263.70642857142866)

[Preparing Overridable Base Class Members](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live)

[By default, class members are sealed and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=2.26) [cannot be overridden. That was the cause](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=4.811) [of our error. Expose members using](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=7.279) [abstract or virtual. When do we use which?](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=9.991) [Abstract methods are just a placeholder](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=14.525) [with no implementation. Use abstract if](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=16.566) [the base class defines the method, but has](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=19.85875) [no default code for the method. But note](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=22.46733333333333) [that we can only add abstract methods to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=25.509999999999998) [an abstract class because defining an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=28.273666666666664) [abstract method leaves our class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=30.63066666666667) [incomplete. The derived class must then](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=32.48533333333334) [override each abstract method. Specify an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=35.9174) [abstract method using the abstract](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=39.464333333333336) [keyword. Virtual methods have a default](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=41.24983333333333) [implementation that can optionally be](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=44.5974) [overridden. We can add virtual methods to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=46.961285714285715) [abstract or concrete classes. Use virtual](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=50.404) [if it makes sense to have default code in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=53.38225) [the method. The derived class then has the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=56.413599999999995) [option to override any virtual method.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=59.24599999999998) [Specify a virtual method using the virtual](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=62.307) [keyword. Recall that earlier in this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=65.64774999999999) [module, we overrode the ToString method.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=67.89750000000001) [The ToString method is a virtual method.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=70.937) [It had a default implementation it used if](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=73.647) [we didn't override it. Our EntityBase](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=76.249) [class has no default validation logic.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=78.95733333333334) [Only the entity classes have a logic to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=81.62733333333334) [determine if their data is valid. So we'll](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=84.9328) [use abstract for our base class Validate](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=87.6605) [method. Let's give it a try. To prepare](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=89.98957142857142) [our base class member so it can be](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=94.0455) [overridden, let's add the abstract](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=96.40125) [keyword. An abstract method has no](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=98.98687499999997) [implementation, so we don't need a method](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=101.60983333333333) [body, and instead, add a semicolon. Going](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=103.75042857142861) [back to the Product class, we see that our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=107.33833333333332) [Validate method is valid, no syntax error.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=110.0375) [Our overridden method is called whenever](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=113.05314285714284) [the IsValid property is accessed on an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=115.87333333333332) [instance of the Product class. Now that we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=119.05037500000002) [have our EntityBase properties in place,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=122.38300000000001) [it's time to use their functionality.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=124.82374999999999) [We'll use the EntityBase properties in our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=128.138) [repository class Save method, starting](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=130.425) [with the ProductRepository. I'll paste the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=133.4785) [code, and we can talk through it. We first](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=136.23775) [declare a variable defining whether the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=138.95157142857138) [operation was successful, and set it to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=141.16179999999997) [true. We check whether the product has](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=144.2006666666667) [changes. If it has no changes, we don't](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=146.9484285714286) [need to save. Then we check if it's valid.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=149.47109999999995) [The IsValid will call our overridden](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=152.224) [Validate method. If the product has](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=154.54) [changed and is valid, we check the IsNew](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=156.99) [property to call either an insert or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=159.999) [update operation. If the product is not](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=163.48966666666675) [valid, we return false. Let's test our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=166.6664444444444) [Save method. In the ProductRepositoryTest](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=169.95559999999998) [class, I'll paste a test for a valid and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=172.76200000000003) [invalid scenario. For the valid scenario,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=176.8636000000001) [we arrange the test by creating an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=179.14800000000005) [instance of the ProductRepository, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=181.37849999999997) [define an updated product. We act by](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=183.587) [calling the Save method, and then confirm](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=187.43057142857143) [that the save was successful. Since we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=190.06875000000002) [aren't yet actually saving anything,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=192.53333333333333) [success is simply that the data was valid.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=193.851) [For our invalid test, we arrange the test](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=197.37366666666668) [by creating an instance of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=200.746) [ProductRepository, but this time, our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=202.88799999999998) [updated product has a null current price,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=204.98957142857142) [which our validation should catch as](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=207.53587499999998) [invalid. We again act by calling the Save,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=210.73312499999992) [and confirm that the save was not](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=213.676) [successful. Open Test Explorer, pin it,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=216.44975000000005) [and run the ProductRepositoryTests. They](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=218.85037499999993) [pass. We now have a base class that all of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=223.04555555555555) [the entity classes can use. Feel free to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=226.916) [inherit from it in each of the remaining](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=229.4774) [entity classes, and repeat the Save code](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=231.64416666666668) [in each of the repository classes. Let's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=235.04525) [finish this module with some checklists for leveraging reuse through inheritance.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=7&mode=live&start=238.08033333333333)

[Checklists and Summary](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live)

[One of the driving forces behind object-](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=2.805) [oriented programming is reuse. This module](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=4.399) [focused on leveraging reuse through](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=7.908666666666667) [inheritance. With inheritance, we can](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=10.11675) [define a base class with common](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=12.545749999999998) [functionality and inherit from that class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=14.21) [to reuse that functionality. An abstract](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=16.869) [class is an incomplete class with one or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=20.32114285714286) [more members that are not implemented.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=23.49866666666667) [Because an abstract class is incomplete,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=26.128) [it can't be instantiated, meaning we can't](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=28.631) [use the new keyword to create an instance.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=31.407) [Use abstract when creating a base class.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=34.298) [Each derived class then implements the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=37.739) [members that are not implemented in the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=39.791) [base class. Use the abstract keyword to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=41.735) [define a class as an abstract class. A](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=44.787) [sealed class is a concrete class that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=48.329375) [can't be extended through inheritance. Use](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=50.516) [the sealed keyword to prevent overriding](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=53.77633333333333) [the class functionality. Before a base](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=56.22) [class method can be overridden, that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=59.49985714285713) [method must be defined as abstract or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=61.24957142857143) [virtual. An abstract method is a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=64.86233333333334) [placeholder with no implementation. Use it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=67.6587142857143) [if the base class does not have a default](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=70.33842857142857) [implementation for the method such as in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=73.493) [our validate example. The method must then](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=76.207) [be overridden in the derived class.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=79.45800000000003) [Abstract methods can only be used in an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=81.77966666666666) [abstract class. A virtual method has a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=85.69033333333333) [default implementation and can be used in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=88.1353333333333) [an abstract or a concrete class. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=90.43499999999996) [method can be overridden in the derived](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=94.13237500000001) [class if needed. Here again are the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=95.549) [pillars of object-oriented programming.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=98.388) [Abstraction helps us map the business](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=101.069) [requirements to an initial set of classes.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=102.954) [Encapsulation helps keep our properties](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=105.972) [and method code protected within the class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=108.209) [and only accessible through a public](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=110.811) [programming interface. Inheritance helps](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=112.639) [us reuse code by inheriting properties and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=115.18433333333333) [methods from a base class. Polymorphism is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=117.8765) [the fourth and final key characteristic of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=121.03133333333335) [object- oriented programming. It allows us](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=124.197) [to write a method with many shapes. A](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=127.32299999999998) [single method such as ToString or Validate](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=130.08371428571428) [can behave differently depending on the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=132.476) [type of object that calls it. That gives](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=135.2155) [us the ability to override base class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=137.69100000000003) [methods in the derived class to provide](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=139.852) [more unique functionality. In this module,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=142.865) [we covered reusable classes. Now let's build a reusable component.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m7-reuse&clip=8&mode=live&start=146.57300000000004)

[Building Reusable Components](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live)

[Introduction](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live)

[As we build our applications, we often](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=0) [find ourselves writing general purpose](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=4.213125000000001) [code that is not specifically business](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=6.393666666666667) [logic, code like string handling or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=9.456600000000002) [logging. Welcome back to Object-Oriented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=12.153333333333332) [Programming Fundamentals in C#, from](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=14.388599999999997) [Pluralsight. My name is Deborah Kurata,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=17.241000000000003) [and this module continues the discussion](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=19.710374999999992) [on leveraging reuse by building a reusable](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=22.0812) [component. C# applications are developed](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=27.16983333333334) [by building one or more components and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=29.554333333333332) [using object- oriented programming](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=32.072428571428574) [techniques to define and build the classes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=33.763799999999996) [within each component. In this diagram, we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=37.3882857142857) [defined four components. Two components in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=41.06285714285713) [the user interface layer, one for the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=43.779999999999994) [desktop application using WPF, and one for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=46.86457142857142) [a web front end. There could be more user](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=49.829857142857136) [interface components for other](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=52.37150000000001) [technologies. The business layer has one](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=54.662000000000006) [component, which we have been building](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=57.46050000000001) [throughout this course. We are only](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=59.781875000000014) [showing three of the classes within this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=61.698875) [component to keep the diagram manageable.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=63.975750000000005) [But this layer can include many more](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=66.912) [classes and additional components. There](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=68.85) [is also a component in the data access](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=72.262625) [layer that handles calls to the database](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=74.36885714285715) [through ADO.NET, Entity Framework, or some](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=77.4618) [other data access technology. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=81.33466666666666) [repository classes call this component to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=84.02566666666667) [access the database. Each component is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=86.78475) [created within Visual Studio by adding a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=89.38650000000001) [new, separate project. So far, we created](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=92.8482857142857) [one project; ACM.BL, so we have one](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=97.05757142857145) [component. And we created a project for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=100.65360000000001) [the unit test that is not shown in this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=102.40066666666671) [diagram. Each component can be separately](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=105.10185714285717) [compiled and deployed. Are these](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=107.53566666666669) [components reusable? In this diagram, the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=110.58466666666668) [business layer component is reused by the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=113.398) [WPF and web user interface components.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=116.54866666666668) [Both use the logic included in the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=120.454) [business logic layer. And if we build](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=122.55837499999997) [generalized data access code, we may be](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=125.54785714285713) [able to reuse the data access layer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=127.87200000000003) [component over multiple projects. As we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=130.32333333333332) [develop these components, we may find](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=133.1666666666667) [ourselves writing general purpose code](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=135.74266666666662) [that does not belong to any layer such as](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=137.6592857142857) [code to perform string operations, code to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=141.02299999999994) [perform logging, code to email](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=144.24079999999998) [notifications or receipts, and so on.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=146.752) [Let's build a new component to define a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=149.33266666666665) [reusable library of general purpose](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=152.6123333333333) [classes. The result can be used in any](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=154.621125) [application. In this module, we build a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=158.622) [reusable component and build a unit test](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=161.69342857142854) [to test that component. We then walk](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=164.07100000000003) [through how to use that component from our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=166.6694285714285) [business logic component. Static classes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=168.94257142857137) [are often used in these types of reusable](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=171.19200000000004) [components, so we look at what static](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=174.64928571428564) [classes are and when and why you would use](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=176.84900000000007) [one. And lastly, we examine how to add](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=180.18685714285706) [reusable methods to existing classes,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=182.86287500000006) [including .NET classes using extension methods. Let's get started.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=0&mode=live&start=185.764)

[Scenario](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live)

[We again meet with the subject matter](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=2.825) [experts and they bring an issue to our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=4.409) [attention. Much of the product data for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=7.610777777777778) [our ACM application is coming from another](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=9.418000000000003) [system. That third-party system is storing](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=12.576166666666667) [product names without spaces. When our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=15.023166666666665) [application retrieves that data, instead](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=19.18733333333333) [of Sonic Screwdriver, two words, it is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=21.277166666666666) [provided as SonicScrewdriver with no](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=24.881249999999998) [spaces. The customer is often confused by](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=27.651874999999993) [this when using our system. Can we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=29.827500000000004) [reinsert the needed spaces before](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=32.42942857142857) [displaying the name? The code can assume](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=34.887499999999996) [that a space should be inserted before](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=37.45566666666666) [each uppercase letter. We say no problem,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=39.992) [and get to work. We are back in Visual](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=44.15599999999999) [Studio with the Product class open. Since](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=47.46487500000001) [the product data store contains the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=49.77614285714285) [product name without spaces, we want to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=51.9645) [add code to the product name getter to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=54.107333333333344) [insert the appropriate spaces. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=57.308428571428564) [ProductName property is currently an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=60.052166666666665) [auto-implemented property, so we can't add](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=62.008) [code to the getter or setter. Our first](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=64.683) [step then is to convert the auto-](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=67.57222222222221) [implemented property into a fully-defined](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=69.547) [property. I'll paste the code. Now we want](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=73.08783333333335) [to add code in the getter to insert spaces](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=75.64166666666667) [into the ProductName. Let's think about](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=78.280375) [that a moment. Do we really want to write](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=81.28512500000002) [all that code here in the getter? Wouldn't](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=84.30500000000002) [it be better as a separate method? That](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=86.78837500000002) [will make it easier to build and test.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=89.93144444444444) [Let's write the method down here. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=93.479) [method needs to return a string, and we'll](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=95.63057142857143) [call it InsertSpaces. In the body of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=98.52879999999999) [method, we could use the ProductName field](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=101.20200000000001) [as the source string to start with, but](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=102.93785714285715) [this will be easier to test if we pass the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=105.48366666666665) [source string in as a parameter. We have](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=108.60979999999999) [just defined a signature for a general](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=111.21825) [purpose method that takes in any string](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=112.81242857142857) [and inserts spaces. Does that method](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=115.815) [belong here? Should the Product class have](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=119.5074) [responsibility for converting strings? And](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=121.541) [what if we want to use this method from](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=124.66669999999999) [other classes? When you find yourself](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=126.419) [creating general purpose methods such as](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=129.353) [this, consider putting them in a general](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=131.448) [purpose class. And if the resulting class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=133.737) [is reusable throughout the current](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=136.486) [application and possibly other](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=138.29) [applications, consider creating a reusable](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=140.72) [library of general purpose classes. Code](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=143.344) [libraries are a convenient way to package](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=146.503) [and reuse a set of classes. Let's delete](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=148.78857142857143) [this method from our product class and build a code library for it instead.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=1&mode=live&start=151.69457142857144)

[Building a Reusable Component](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live)

[In this demo, we build the start of a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=2.572) [general purpose library of reusable](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=4.684) [functionality. Most applications make some](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=8.368166666666667) [use of common functionality such as for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=10.450714285714287) [logging or a specialized set of data](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=13.163428571428575) [handling, or like in our case, general](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=16.2418) [purpose string handling. To build a new](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=19.808666666666674) [component, we start with a new project.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=22.168777777777773) [Right-click on the Solution, and select](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=24.114666666666665) [Add, New Project. Select the desired](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=27.34) [language, then select Class Library ( .NET](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=30.702999999999996) [Framework) as the template. Give the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=33.96985714285714) [project a general name. Don't use the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=36.24685714285715) [solution prefix such as ACM if this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=38.94583333333334) [library may be used by other applications.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=41.672333333333334) [Since our fictitious company name is Acme,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=45.427) [let's just call it Acme.Common. The first](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=48.247) [class in our component will handle](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=51.74528571428571) [strings, so let's rename the Class1 file](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=53.121) [to StringHandler, and select Yes to rename](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=56.103428571428566) [the class. Ensure the class is set to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=59.43) [public so it can be accessed from outside](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=62.293875) [the component. Now we write our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=64.908) [InsertSpaces method. I'll paste the code,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=68.50599999999999) [and we can talk through it. The method is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=70.34150000000001) [public, so it can be used by any other](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=73.20133333333331) [component. It returns a string, and it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=76.40433333333331) [takes in the string to process. The method](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=78.91866666666671) [initializes a result variable, which will](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=82.50266666666666) [be our return value. It skips processing](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=85.17355555555554) [of the source string if it's null or empty](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=87.773625) [or other whitespace. If the source string](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=91.04100000000003) [contains something, it loops through each](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=94.00133333333335) [letter in the string looking for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=96.12349999999999) [uppercase. If it finds an uppercase](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=98.73033333333333) [letter, it inserts a space and continues.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=101.05833333333332) [Since code in this component could be](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=104.494) [reused throughout this application and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=106.532) [other applications, unit testing is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=109.239) [crucial. So our next step is to write the unit tests.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=2&mode=live&start=112.66400000000002)

[Testing the Reusable Component](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live)

[In this demo, we write the unit tests for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=3.01) [our reusable component. Because the code](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=5.342) [we are testing is in a new project, we'll](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=8.933300000000001) [create a new test project for it.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=10.980714285714285) [Right-click on the Tests folder, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=13.569) [select Add, New Project. On the left,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=16.3324) [select the desired language and then Test.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=19.783714285714286) [Then select the Unit Test Project from the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=22.505750000000003) [list of templates. We'll name it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=25.5865) [Acme.CommonTest. And be sure to put it in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=29.262249999999998) [our Tests folder. Next, we'll set a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=32.4752) [reference to the Acme.Common component so](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=34.21485714285714) [that tests can access the component](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=36.217499999999994) [classes. Right-click on References, Add](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=39.605500000000006) [Reference, Select Projects Solution, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=42.82219999999999) [check Acme.Common. Rename the UnitTest](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=46.53166666666665) [file StringHandlerTest, and select Yes to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=50.324799999999996) [rename the class. Now we are ready to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=53.51428571428571) [write our unit tests. Our first unit test](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=56.791) [is for a valid example. I'll paste the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=59.803888888888885) [code, and we can talk through it. In the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=62.14037499999999) [Arrange, we set the source string and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=64.36449999999999) [expected result, then create the instance](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=67.13819999999998) [of our StringHandler class. Use the quick](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=69.25233333333333) [action to define the appropriate using](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=72.23933333333335) [statement. We act by calling the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=75.33866666666668) [InsertSpaces method, passing in the source](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=78.17100000000002) [string. Then we Assert the expected](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=80.8654) [matches our actual result. Spoiler alert;](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=82.8837142857143) [our test is going to fail. Did you catch](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=85.66314285714286) [it when we walked through the InsertSpaces](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=88.7716666666667) [code? Let's run the test and see. Open the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=91.62320000000001) [Test Explorer, and pin it. Right-click on](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=95.22942857142857) [the new test project, and select to run](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=97.88266666666665) [the tests. Yep, it failed. Navigate down](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=100.68999999999998) [to our new InsertSpacesTest to see the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=103.81587499999998) [details. Our code inserted a space before](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=107.46179999999998) [the first uppercase letter as well.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=110.11375000000004) [Looking back at the StringHandler class,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=113.158) [we could address that by adding code to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=115.479) [check for the first letter, or we could](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=117.79) [just trim spaces from the result. Let's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=120.099) [try the test again, and it passes. Going](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=123.984625) [back to the test project, let's add](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=128.713) [another test to the StringHandlerTest](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=130.82233333333335) [class. This time we'll test if the input](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=132.929) [string already has spaces, that we don't](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=136.10512500000007) [add another space. In the Arrange, we set](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=138.4662857142857) [the source with an existing space. We](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=141.17737500000004) [expect that the result won't add another](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=144.57111111111112) [space. Then we create the instance of our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=148.0508888888889) [StringHandler class. We act by calling the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=150.367) [InsertSpaces method, passing in the source](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=153.766) [string. Then we Assert the expected](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=157.126) [matches our actual result. Do you think](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=159.23600000000002) [this one will pass? Let's run it and see.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=162.11433333333326) [This one failed as well. Looking closely](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=165.851) [at the result, we can see that our code](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=169.081) [inserted an extra space. Going back to the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=172.57042857142858) [StringHandler class, we could fix this in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=176.52166666666665) [several ways. We could remove any spaces](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=179.10671428571425) [in the string before we start, but that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=181.16712500000006) [may produce invalid results if the letter](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=183.98314285714284) [after the space is not uppercase. We could](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=186.19399999999996) [add code to check for a space, and then](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=189.71122222222223) [skip check in the next letter, or we could](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=192.00125000000003) [simply trim off any extra spaces before we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=194.98137499999996) [add a space. Let's try running all our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=197.90400000000002) [tests. And they all pass. Consider adding](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=202.33599999999996) [several more tests to cover other common](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=205.21314285714288) [scenarios such as null or empty strings,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=207.8948571428571) [long strings, short strings, all uppercase](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=210.117) [strings, and so on. At this point, let's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=212.27833333333334) [assume we've written those tests, and they](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=215.08528571428576) [all pass. Then it's time to use this component.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=3&mode=live&start=217.60300000000004)

[Using the Reusable Component](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live)

[A reusable component is not very useful](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=2.618) [unless, of course, it's reused. In this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=5.65) [demo, we walk through how to reuse a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=8.796222222222223) [reusable component. Looking at the Product](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=12.075666666666667) [class, we want to remove spaces from the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=14.947500000000002) [ProductName, so we want to use our new](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=18.262400000000007) [reusable component from our Product class.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=20.550624999999997) [First, we need to set a reference to the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=23.348) [reusable component. In the ACM.BL project,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=25.225) [right-click on the References node and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=29.721) [select Add Reference. Ensure that Projects](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=32.11575) [is selected on the left, and check](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=34.65342857142858) [Acme.Common on the right. Our ACM.BL](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=37.646285714285725) [project can now use any public class from](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=40.65625) [the common component. In the ProductName](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=43.9202) [getter, create an instance of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=46.72775000000001) [StringHandler class. Use the quick action](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=49.27357142857143) [to add the appropriate using statement. We](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=51.209) [can then use that instance to call the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=53.402571428571434) [InsertSpaces method, passing in our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=56.94199999999999) [backing variable. We return the result.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=59.558600000000006) [Now the ProductName provided by this class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=62.852) [will always insert appropriate spaces in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=64.976) [the name. And if the code must also store](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=67.232) [the name without spaces, we could add a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=70.527) [remove spaces method to our common](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=72.974) [component and call it from the setter. But](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=75.053) [let's step back for a moment, and look at](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=78.69171428571428) [this code. Why do we need to create an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=81.15540000000001) [instance? The StringHandler class does not](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=84.08637499999995) [maintain state. It has no properties.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=86.73328571428573) [Wouldn't it be easier to use if we could](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=89.544) [just call this method without first](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=91.591) [creating the instance? The good news is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=93.491) [that we can. That's what static classes are for.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=4&mode=live&start=96.72742857142859)

[Static Classes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live)

[When creating a method in a normal class,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=2.092) [define the method signature in the class,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=4.854) [and implement the method body. We call the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=7.178) [method by creating an instance of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=10.423375000000002) [class using the new keyword and using that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=12.624250000000002) [instance to call the method, passing in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=15.363) [any required parameters. This is how we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=18.225600000000004) [have the code now, but there is another](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=21.0385) [way. A static class is a class that cannot](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=23.922200000000007) [be instantiated. That means we can't](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=27.86379999999999) [create an instance of it using the new](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=29.574) [keyword. Because there is no instance, we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=32.2864) [access the members of a static class using](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=34.78550000000001) [the class name. The syntax is then more](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=37.81666666666666) [concise because we don't have to create](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=40.59212500000001) [the instance first. Properties and methods](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=43.17442857142858) [in a static class must also be declared](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=45.30957142857143) [static. A static class is often used as a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=48.564200000000014) [container for utility methods that don't](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=51.367111111111114) [require instant state. Our StringHandler](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=54.06066666666666) [class is definitely designed to be a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=57.3086) [container for utility methods, so we can](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=60.025000000000006) [change it to be a static class by adding](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=62.20400000000001) [the static keyword. Its methods must also](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=65.60549999999998) [then be static. We call the method](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=69.27485714285716) [directly using the class name. No instance](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=72.19066666666666) [is required. Let's try out the static](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=75.26950000000001) [keyword. We are looking at the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=79.30583333333335) [StringHandler class. To make this class a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=81.701) [static class, we add the static keyword to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=83.60899999999997) [the class definition. As soon as we do, we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=86.37166666666667) [see an error; can't declare instance](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=89.23966666666664) [members in a static class. This is telling](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=91.28462499999999) [us that the members must also be static.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=93.98687500000001) [We make the InsertSpaces method static by](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=96.53114285714284) [adding the static keyword to the method](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=99.36414285714285) [definition. Looking at the error list, we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=102.3185) [now have even more errors. That's because](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=104.73700000000002) [the code currently uses the new keyword to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=107.62966666666668) [create an instance of the class. Now that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=110.33099999999999) [the class is static, we can no longer use](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=113.21799999999999) [the new keyword. Let's start with the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=115.8612) [Product class. We don't need to create the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=118.82600000000001) [instance, we instead call the static](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=121.1815714285714) [method using the class name. The code in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=122.91112500000003) [the getter is now simplified. Cool. We](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=125.79350000000002) [can't forget the unit tests, so let's fix](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=128.58771428571427) [them as well. Remove the code to create](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=131.554) [the instance here and here. Then call the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=134.166) [method using the class name. Let's run all](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=137.10649999999998) [the tests to ensure all is well. And they](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=140.0305) [all pass. Yay. Static classes are great,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=143.97925) [but use them sparingly. If you need](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=148.223) [instances, don't use the static keyword.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=151.32833333333332) [Classes in the business layer, for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=153.905) [example, need to track data for each](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=155.8335714285715) [instance. Customer A has one set of data,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=158.6715714285714) [customer B has a different set of data, so](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=161.215) [having an instance is required. Limit the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=164.08183333333332) [use of static classes to general purpose](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=166.87824999999998) [support classes. Now, do we want to take](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=169.51166666666666) [our utility methods a step further? Yes,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=172.7523333333333) [yells the crowd. Let's extend the concept of static methods with extension methods.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=5&mode=live&start=175.69728571428567)

[Extension Methods](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live)

[An extension method allows us to add](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=2.241) [methods to any existing type without the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=4.237) [source code of the type, without](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=7.341) [inheritance, without recompiling, without](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=9.6395) [any changes at all to the original type.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=12.230444444444444) [Since we aren't modifying the original](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=15.306) [type, extension methods are great for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=17.086) [adding methods to .NET types such as](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=19.886) [string. Adding methods to a .NET type](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=23.383375000000008) [means that the type appears in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=25.636499999999995) [IntelliSense with all the built-in methods](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=27.579285714285714) [for that type. From the perspective of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=30.078500000000002) [code using the method, it looks like the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=32.620875000000005) [method is a member of the extended type.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=34.64987499999999) [Only static methods in static classes can](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=38.068) [be extension methods. Wouldn't it be cool](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=40.769) [if our InsertSpaces method existed as a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=44.96557142857142) [method on the .NET string class? It would](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=47.19950000000001) [then appear in IntelliSense as just](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=49.87642857142858) [another string method like IndexOf or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=52.22149999999999) [Length. To change our current static](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=55.520999999999994) [InsertSpaces method to an extension](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=58.0755) [method, we simply add the this keyword](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=60.6906) [before the first parameter. The method](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=63.252) [then becomes an extension method on the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=65.76299999999999) [class defined in that first parameter. In](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=68.38187500000002) [this example, that type is string. Then,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=71.55842857142858) [instead of calling the method using our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=74.36485714285715) [class name, we call it using the string](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=76.6085) [itself. In this example, we want to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=80.35650000000005) [InsertSpaces into the ProductName string,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=82.5667142857143) [so that's the string we call it with, just](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=84.61414285714287) [like calling other string methods such as](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=87.80099999999997) [trim. This syntax makes it so easy to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=90.74983333333331) [read. Very cool. Let's extend the .NET](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=93.88812499999996) [string class with our InsertSpaces method.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=96.97600000000004) [Looking at the StringHandler, changing our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=101.059) [static InsertSpaces method into an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=103.4634) [extension method is very easy. An](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=105.98128571428573) [extension method must reside in a static](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=108.4388888888889) [class. Yep, this class is already static.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=111.35711111111114) [The extension method itself must be](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=114.829) [static. Yep, this method is already](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=117.40214285714283) [static. Then add a this in front of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=120.19183333333334) [first parameter of the method. This](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=122.75377777777773) [parameter then no longer represents a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=125.40066666666667) [parameter passed to the method, rather, it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=127.70233333333334) [represents the type being extended. In our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=130.5152857142857) [case, it is extending the string class.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=133.91833333333332) [And to be a good citizen, let's add a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=136.674) [documentation comment to our method for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=138.843) [IntelliSense to use. Type ///, and our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=141.149) [comment is generated. In the comment,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=144.9937142857143) [describe the purpose of this method.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=147.25314285714282) [Inserts spaces before each capital letter](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=149.05433333333332) [in a string. Looking at our error list,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=151.92499999999998) [notice that this does not break any of our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=154.92325000000002) [existing code. The method can still be](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=158.40925000000001) [called like a static method, but now it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=160.22325000000006) [can also be called as a method on the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=162.786625) [extended class. Let's change the Product](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=166.47025000000005) [class getter. We can now call the method](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=169.21166666666664) [directly on the string itself. Type](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=171.53600000000006) [\_productName., and notice that our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=175.36624999999998) [InsertSpaces method now appears in the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=177.97385714285716) [list with the .NET string methods. And we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=180.47833333333335) [see our documentation comment. Since we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=184.1736666666667) [are now calling the method using the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=186.71750000000003) [string instance, we don't need to pass in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=188.530375) [the string as a parameter. To see this in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=191.2241666666667) [action, let's make the same change to the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=194.22811111111108) [unit tests. In the StringHandler test, our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=197.0474) [string is source, so we call the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=199.6531428571428) [InsertSpaces on the source string. Going](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=202.173) [back to Test Explorer, rerun the tests,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=204.6725) [and they all pass. Another benefit of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=209.45850000000004) [extension methods is discoverability. If](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=214.56714285714284) [another developer is looking for a way to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=217.136875) [insert spaces, when the developer types](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=219.69514285714286) [source., the extension methods appear in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=222.156) [IntelliSense. No need to hunt around for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=226.37657142857137) [or remember the name of the class in the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=228.50466666666662) [component. This might help your reusable](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=231.29900000000006) [code get reused more often. Now that we've](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=233.22742857142862) [looked at static and extension methods, which should we use when?](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=6&mode=live&start=236.3122857142858)

[Static Method vs. Extension Method](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live)

[When creating reusable methods and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=2.82) [reusable classes within a reusable](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=4.896666666666667) [component, when should we define a simple](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=7.4128) [static method, and when should we instead](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=9.86057142857143) [define an extension method? To make this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=12.362428571428575) [choice, consider the following questions;](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=15.414857142857143) [is the primary parameter to the method an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=18.421) [instance? Does the method logically](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=21.515222222222214) [operate on that instance? Is it desirable](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=23.665999999999997) [for the method to appear in IntelliSense](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=26.263666666666666) [for that type? If the answer to these](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=28.55475) [questions is yes, then consider defining](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=32.2485) [an extension method. Otherwise, the static](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=34.81400000000001) [method will do. Let's consider these](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=37.714499999999994) [questions with our InsertSpaces method. Is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=39.92850000000001) [the primary method parameter an instance?](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=42.28750000000001) [Yes, it's an instance of a string. Does](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=45.695499999999996) [the method logically operate on that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=48.715375) [instance? Yes, it inserts spaces into that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=51.291625) [string. Is it desirable for the method to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=54.299285714285695) [appear in IntelliSense for that type? Yes,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=56.50544444444444) [InsertSpaces makes sense as a member of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=59.50571428571429) [the string class and should appear in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=61.975875) [IntelliSense for any string. Based on](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=64.117) [these criteria, it makes sense that we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=67.2842857142857) [made our InsertSpaces method an extension](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=69.43128571428572) [method. When determining whether a static](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=71.6112) [method should instead be an extension](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=74.17000000000002) [method, ask yourself these questions. Now](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=76.06916666666666) [let's finish off this module with some](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=79.536625) [checklists we can use as we build reusable components.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=7&mode=live&start=81.263)

[Checklists and Summary](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live)

[In this module, we walked through how to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=2.229) [build a reusable component. Create a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=4.507) [separate project for each reusable](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=7.974500000000001) [component. For example, you may want one](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=10.160750000000004) [reusable component for common UI](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=12.549714285714286) [functionality, one as a more general](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=15.072600000000001) [purpose library, and one specifically for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=17.732714285714295) [accessing a data store. Build a library of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=20.491000000000003) [general purpose methods in the component.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=23.581571428571422) [Organize the method's logically into](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=25.7265) [classes. A StringHandler class contains](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=28.423666666666666) [string methods. A logging service contains](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=31.135666666666673) [logging methods, and so on. Reuse the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=33.691666666666656) [component in any application you build.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=36.386624999999995) [When building reusable components, we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=39.883) [often define static classes. A static](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=42.200199999999995) [class is a class that cannot be](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=45.41080000000001) [instantiated. A static class is sealed,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=48.35710000000003) [meaning it can't be extended through](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=50.456749999999985) [inheritance. Define a static class using](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=53.474000000000004) [the static keyword. Use a static class to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=56.27337499999999) [organize utility methods. Every method in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=59.84787500000001) [a static class must be static. Define a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=62.63766666666667) [method as static with a static keyword.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=66.37677777777778) [Access a static member with the class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=69.582) [name. Use static methods to create](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=72.28137500000003) [reusable utility methods. Sometimes, we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=74.63116666666664) [may want to make our static method an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=77.23314285714287) [extension method. An extension method adds](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=81.26928571428569) [a method to an existing type without](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=83.3295) [modifying the original type. The method](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=85.88759999999999) [must be static. Define a method as an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=89.24142857142859) [extension method by adding this to the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=92.435125) [first parameter. The type of that first](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=94.99300000000001) [parameter is then the type that is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=97.15849999999999) [extended. In this example, we extend the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=99.77819999999998) [string type. Access an extension method](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=102.85375000000002) [using the extended class instance. In this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=105.21333333333331) [example, we extend string, so we use the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=109.19233333333332) [string instance to access the method. By](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=112.56259999999997) [building a reusable library of general](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=115.286) [purpose classes, you have a reusable](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=117.5) [component that you and your team can use](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=119.97) [for your current and future projects. Now](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=122.824) [let's look at one more way to leverage reuse; defining interfaces.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m8-reusable-components&clip=8&mode=live&start=126.33755555555555)

[Understanding Interfaces](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live)

[Introduction](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live)

[Interfaces provide a clean way to work](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=0) [with a set of classes in a common manner.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=4.4625) [Welcome back to Object-Oriented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=7.669) [Programming Fundamentals in C#, from](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=9.6986) [Pluralsight. My name is Deborah Kurata,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=12.866800000000001) [and this module is all about interfaces.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=15.300749999999999) [From Wikipedia: In computing, an interface](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=20.216) [is a shared boundary across which two or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=23.33342857142857) [more separate components of a computer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=26.376624999999997) [system exchange information. The exchange](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=28.68225) [can be between software, computer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=32.20333333333333) [hardware, peripheral devices, humans, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=34.9675) [combinations of these. Hence, the boundary](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=38.614399999999996) [between the user in an application is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=40.99025) [called the user interface. In web](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=43.45666666666667) [development, the boundary between a back](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=46.59171428571429) [end that provides services and the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=48.89842857142857) [front-end clients requesting those](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=51.043) [services is called a web API, or web](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=53.527800000000006) [application programming interface. And in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=57.108250000000005) [an object-oriented application, the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=60.985600000000005) [boundary between each class and the rest](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=62.69128571428572) [of the application is called a class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=64.9981111111111) [interface. But what exactly is a class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=68.57588888888884) [interface? In this module, we begin by](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=72.44700000000002) [examining what a class interface is. Then](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=75.08524999999997) [we define our own interface and implement](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=78.373) [that interface in our entity classes.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=81.354) [Lastly, we cover how to leverage](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=84.552) [interface- based polymorphism to build](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=86.75657142857146) [more generalized and reusable code. Let's get started.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=0&mode=live&start=89.16720000000001)

[Class Interface](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live)

[Every class has a basic class interface](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=2.934) [comprised of its public members. Each of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=5.45) [the public properties and methods are part](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=8.264285714285714) [of that interface. By declaring a property](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=10.549800000000001) [or method as public in the class, that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=13.172) [member automatically becomes part of that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=16.22233333333333) [class interface. There is no special code,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=19.107666666666663) [keyword, or configuration required. Other](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=21.611500000000003) [parts of the application communicate with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=24.648) [this class through this interface. Access](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=26.947666666666667) [the public property to work with data from](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=29.667285714285715) [the class. Call a public method to execute](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=32.4025) [code in the class. So a class interface is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=35.32440000000002) [basically what a class looks like to the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=38.295249999999996) [rest of the application. Each class we've](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=41.30866666666668) [created so far in this course has a class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=43.65475000000001) [interface defined by its public properties](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=46.50199999999999) [and methods. And we've been using that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=49.216499999999996) [interface to work with our classes.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=51.592499999999994) [Diagrammatically, interfaces are sometimes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=54.87825) [shown with a connector that looks like a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=56.68450000000001) [lollipop attached to the class. The idea](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=59.604) [is that other classes connect to this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=62.29675) [class via this connector. In this example,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=64.373) [the interface for our Customer class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=67.47342857142857) [includes the LastName, FirstName, other](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=69.88719999999999) [defined public properties, and a Validate](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=72.558) [method. And the interface for our Product](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=76.05939999999998) [class includes the ProductName,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=78.38057142857147) [CurrentPrice, other defined public](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=80.79124999999999) [properties, along with a Validate method.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=83.04275000000001) [In C#, we can define additional interfaces](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=86.672) [for our classes. We define an interface](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=89.486) [using the interface keyword. By](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=92.667) [convention, the interface name begins with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=95.39366666666668) [an I. Like a class, the interface defines](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=97.65033333333332) [a set of related properties and methods,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=100.6187142857143) [but unlike a class, an interface does not](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=103.19385714285713) [provide any code for those properties and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=106.65050000000002) [methods, only the signature. Any class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=109.70242857142857) [that implements the interface provides the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=112.76666666666668) [code for each property and method](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=115.03628571428573) [specified in the interface. Say we want to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=117.2852) [add a general purpose logging service to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=120.832) [our application. We define an ILoggable](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=123.426) [interface with a Log method. If we want to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=126.33799999999998) [log both customer and product information,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=129.95599999999996) [we implement the ILoggable interface in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=132.1124) [both classes. Each class then provides the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=135.88350000000003) [code for every property and method in the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=138.738375) [interface. In this example, there is only](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=141.83666666666664) [one method, so each class implements that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=144.395) [Log method. The application can work with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=147.89685714285721) [a class through any of its interfaces. For](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=150.19257142857148) [example, the application can work with the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=153.43714285714287) [Customer class through its basic class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=155.61242857142858) [interface, shown in blue, to access the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=157.499) [LastName or FirstName properties or call](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=160.375) [the Validate method. Or the application](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=163.164) [can work with a customer class through the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=165.72250000000003) [ILoggable interface, shown in purple. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=168.755) [application code can use this interface](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=171.36900000000003) [and call the Log method on the customer.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=173.55525000000003) [Same with the Product class. Code can](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=176.74575000000002) [access the class through its basic class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=179.64999999999998) [interface or through the ILoggable](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=181.98557142857143) [interface. Let's illustrate these concepts further with metaphors.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=1&mode=live&start=185.14342857142853)

[Interface Metaphors](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live)

[There are several metaphors to aid in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=2.365) [understanding interfaces. Think of an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=3.883) [interface as defining a role that an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=7.1678749999999996) [object can play. Consider a person. A](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=9.321) [person has a default set of properties and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=11.8655) [behaviors that comprise their default](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=15.022666666666668) [person interface. Depending on the person,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=18.1142) [they may also have the IParent role and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=20.8935) [have parental properties and behaviors.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=23.901333333333337) [They may have the IPartner role and the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=26.771) [IEmployee role. Anyone can interact with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=29.264) [this person through one of their roles. In](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=32.546) [our scenario, the Customer class has its](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=36.223625) [default class role and its ILoggable role](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=38.734) [to log out customer information. Or to say](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=42.567) [it another way, an object performs the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=46.210499999999996) [logging role through its ILoggable](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=48.43214285714284) [interface. Another common metaphor for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=51.51966666666666) [understanding interfaces is a contract.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=53.962) [Think of an interface as a contract that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=57.202) [specifies the set of properties and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=59.643) [methods that must be available on any](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=61.69328571428569) [implementing object. In this example, our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=65.27125000000001) [ILoggable contract has only one method,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=67.95971428571428) [Log. If the customer class implements the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=71.2835) [ILoggable interface, it is contractually](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=73.957) [obligated to implement the Log method. Any](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=76.801) [other part of the application can depend](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=80.36999999999999) [on that contract. That means we can write](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=82.5805) [generalized code that works with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=86.60185714285717) [potentially unrelated classes through a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=88.61419999999998) [common interface and be guaranteed that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=90.78457142857143) [the interface methods are implemented. Now](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=93.85) [let's walk through a scenario to better](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=97.1595) [understand how to leverage reuse through interfaces.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=2&mode=live&start=99.011)

[Setting up the Demo](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live)

[A common requirement in many applications](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=2.249) [is to log important information. We can](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=4.515) [log information helpful for resolving](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=7.855666666666667) [bugs. If a bug occurs, the support team](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=9.542833333333332) [can look at the log to determine the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=12.250666666666667) [current application's state and what the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=14.475600000000002) [system was doing when the bug occurred. We](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=16.868699999999997) [can log information for security purposes.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=19.60442857142857) [System administrators can identify who did](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=22.415) [what when. We can log information for data](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=24.758) [analysis, which features of the system are](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=27.767) [used most often. There are many different](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=30.767) [ways we can build logging into our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=33.206) [application, including buying third-party](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=35.064) [products. For our example, we'll create](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=38.476000000000006) [our own logging mechanism. We've already](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=41.03257142857142) [created a reusable library component we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=44.60066666666667) [called Acme.Common. We'll create a general](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=47.659499999999994) [purpose logging service in that component.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=50.488333333333344) [The service will write the logging](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=53.086) [information to a log file, but how will](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=54.364) [this service know what information to log?](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=57.307) [The required information is different for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=60.495) [each class. We need each class to be](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=62.451) [responsible for defining what it wants](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=65.491) [logged to the log file. To accomplish our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=67.315) [objective, let's add a Log method to both](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=70.40328571428573) [our Customer and Product classes. Here we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=73.86855555555555) [are back in Visual Studio and looking at](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=76.953) [the Customer class. Let's add a Log](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=79.6726) [method. We could add a method that looks](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=82.7096) [like this using string concatenation to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=84.955) [build up the string to log, but that's a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=86.89385714285716) [bit long and cumbersome. Let's shorten it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=90.24159999999998) [up to this. Cool. This syntax leverages](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=92.8325) [the expression bodied method feature that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=95.88500000000002) [uses a lambda operator to reduce the code](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=98.41985714285713) [for a one-line method. It also makes use](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=101.71455555555553) [of the interpolated string syntax.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=104.59899999999998) [Prefixing the string with a dollar symbol](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=106.2482857142857) [allows us to write the string using](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=108.81875) [placeholders for our data values instead](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=111.18516666666667) [of string concatenation. Comparing the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=114.003) [syntax, you'll see that it is equivalent](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=116.46525000000001) [to the longer form. Now let's add a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=118.4202) [similar Log method to our Product class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=121.2321111111111) [using an expression bodied method and an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=123.15633333333334) [interpolated string. Next, let's create a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=126.79700000000001) [logging service class in the Acme.Common](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=129.66157142857145) [component. Right-click on the Acme.Common](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=132.85025) [project, and select Add, Class. Name that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=135.53359999999995) [class LoggingService. We want the class to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=139.94500000000002) [be public so it can be accessed from](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=142.33290909090914) [anywhere in the application and static so](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=144.457) [we don't have to instantiate it. In that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=147.53733333333335) [class, let's create a public method for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=150.27325) [the logging, and call it WriteToFile.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=152.26142857142855) [Because it is a utility method, we'll make](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=155.06) [it static. And since it doesn't return](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=157.58575) [anything, we'll set the return type to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=159.72014285714286) [void. We pass in a list of all of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=161.893) [objects to log. Hmmm, what kind of list is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=164.773) [this? Well, we could define just a list of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=169.41250000000002) [type Object, then we can put anything in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=171.57333333333338) [the list. Now we want to loop through each](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=174.69099999999997) [item and call its Log method. We can then](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=177.39511111111105) [write the results into our file. For our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=180.83599999999998) [purposes, we'll just write to the console](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=183.11675000000002) [for now. But when I type item., only the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=184.79524999999998) [members from the Object class appear.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=188.93974999999998) [Attempting to call the Log method doesn't](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=191.372) [work. Now what? Any ideas? Well, we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=194.157125) [finally come back to the purpose of this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=197.96974999999998) [module. Let's define an interface. We](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=200.97528571428575) [could then implement that interface in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=204.32214285714286) [each class and access each instance here](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=206.309) [using that common interface. Let's comment](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=209.773) [this line out for now and define an interface.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=3&mode=live&start=212.63199999999998)

[Defining an Interface](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live)

[An interface specifies only the definition](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=2.95) [or signature of the properties and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=5.551) [methods, that is, it defines the name and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=8.567285714285715) [data type for each property and the name](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=10.93977777777778) [and return value for each method along](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=13.231250000000003) [with the type and order of the method](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=15.545125) [parameters. The interface does not include](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=19.158666666666672) [any implementation. There is no code in an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=22.31042857142857) [interface, only signatures. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=26.152999999999995) [implementation is provided by the class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=27.891285714285715) [that implements the interface. To define](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=29.957) [an interface, add a new interface item to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=33.60625) [the project. By convention, we prefix the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=36.42533333333333) [interface name with an I. Be sure to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=39.50112500000001) [specify the public access modifier so any](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=42.145) [class can use the interface. Then define](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=44.84525000000001) [the members of the interface by adding the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=47.94871428571429) [property, method, event, or indexer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=50.659000000000006) [signatures. Note that an interface cannot](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=53.412333333333336) [define constants, fields, operators, or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=56.12100000000001) [constructors. There is no need for an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=60.28900000000001) [access modifier on the members. All](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=62.76066666666669) [members of an interface are public. An](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=64.56228571428572) [interface does not provide an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=67.18742857142857) [implementation, so there is no code in the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=69.15775000000001) [interface, only the property and method](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=71.7775) [signatures. Let's build an interface to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=74.3206) [support the logging feature. An interface](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=77.66133333333332) [is normally created in its own file,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=80.50725) [similar to a class. We'll define the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=83.1044) [interface as part of the Acme.Common](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=85.95025) [project, so it can be used by any](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=87.531125) [component or application. Right-click on](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=90.85925) [the Acme.Common project, and select Add,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=94.2444) [New Item. Pick the interface template.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=97.653) [Following common conventions, interfaces](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=101.282) [begin with the letter I, and the Interface](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=103.25233333333333) [name reflects its purpose. In this case,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=106.74642857142858) [we'll call it ILoggable. Any class that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=109.83342857142857) [implements this interface becomes](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=112.71650000000001) [loggable. Be sure to make the interface](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=114.23228571428572) [public. We only want one method, Log. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=116.932875) [Log method returns a string containing the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=121.28914285714285) [information to log. We could add any](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=123.606) [number of other members, but that's all we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=126.69200000000001) [need. Notice that we don't add any curly](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=129.42360000000002) [braces or any code to the Log method and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=131.53887500000008) [terminate its signature with a semicolon.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=134.299) [Once an interface is defined, it can be](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=137.365) [implemented in any class that wants to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=139.77466666666663) [take on the loggable role or support the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=141.85422222222223) [loggable contract. The implementation is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=144.768) [specified in the class that implements the interface. Let's see how that works.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=4&mode=live&start=147.737)

[Implementing an Interface](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live)

[Implementing an interface in a class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=2.306) [requires two steps. First, add the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=4.4) [interface to the class signature. Insert a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=7.235625000000001) [colon and the name of the interface. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=9.86411111111111) [class is now set to implement the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=12.555666666666665) [interface. Separate multiple interfaces](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=15.493333333333329) [with commas, then implement every member](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=17.8654) [of the interface. That involves writing](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=21.095) [code for every property, method, event, or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=23.583999999999996) [indexer specified in that interface. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=26.502666666666666) [member must be public, non-static, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=29.895666666666667) [have the same name and signature as the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=32.615125) [interface member. By default, a class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=35.24066666666666) [always has its basic class interface. A](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=38.21799999999999) [class can implement any number of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=41.21642857142858) [additional interfaces. Implementing an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=44.696) [interface essentially adds the lollipop to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=47.074999999999996) [the class. For example, if the Customer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=49.568599999999996) [class implements the ILoggable interface,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=51.94383333333334) [it gets another lollipop. If it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=54.679) [implemented an IEmailable interface, that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=57.562666666666665) [would be another lollipop. Any code in the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=59.9734) [application can work with this class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=63.199500000000015) [through its default role using any of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=65.05257142857143) [class interface members. Or work with this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=68.21050000000001) [class through its ILoggable role, calling](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=70.53728571428573) [the Log method. Or work through its](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=72.88599999999998) [IEmailable role, calling the Send method.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=76.46866666666665) [Let's implement our ILoggable interface in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=79.695) [our entity classes. Let's start with the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=82.379) [Customer class. Implement the ILoggable](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=85.62) [interface by adding the interface to the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=88.36) [class signature after the colon. Recall](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=90.565) [that EntityBase is the base class that the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=94.11442857142858) [Customer class inherits from. Add a comma](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=97.177) [and the name of the interface. Note that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=99.87633333333335) [all interfaces must be listed after any](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=102.51042857142856) [base class. Use the quick action to add](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=105.625) [the needed using statement. The ILoggable](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=108.36850000000003) [interface requires a Log method. We](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=111.25540000000002) [already have that method here. So that's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=114.5445) [it. Let's repeat this for the Product](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=116.96300000000001) [class. Implement the ILoggable interface](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=119.3974) [by adding the interface to the class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=122.04642857142856) [signature. The using statement's already](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=124.4064) [here. We needed it when calling our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=126.91799999999999) [InsertSpaces extension method. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=129.77475) [ILoggable interface requires a Log method.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=132.43885714285716) [We already have that method here. What if](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=135.234) [we didn't already have a Log method? Let's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=139.73555555555555) [see what it would look like by](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=142.097625) [implementing the ILoggable interface in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=143.257) [the Order class. We again add the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=145.611) [interface to the class signature. Use the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=148.18) [quick action to add the needed using](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=151.04324999999997) [statement. Notice that the interface has](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=152.81199999999998) [an error; Order does not implement](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=155.58014285714287) [interface member ILoggable.Log. We know](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=157.939) [what's causing this. When we implement an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=162.0432) [interface, we must add code for each of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=164.21619999999996) [its properties and methods. Visual Studio](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=166.39833333333326) [can do this for us. Use the quick action](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=168.89077777777783) [and select Implement interface. This](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=173.16) [automatically adds the signature for all](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=175.3985) [of the members of the interface. We just](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=177.712) [need to provide the implementation. Now](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=180.57571428571427) [that we have multiple classes that use the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=183.03662500000002) [ILoggable interface, we can fix up the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=185.27625) [logging service we started earlier by leveraging polymorphism.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=5&mode=live&start=187.889)

[Interface-based Polymorphism](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live)

[Recall that polymorphism means many](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=2.147) [shapes. In object-oriented programming,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=5.146999999999999) [that means that a method can have the same](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=7.165) [signature, but different implementations](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=9.434) [in different classes. Earlier in this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=11.864399999999998) [course, we leveraged inheritance-based](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=15.166999999999998) [polymorphism. We defined a Validate method](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=18.418) [in the EntityBase class and overrode it in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=20.71128571428572) [our derived entity classes. Any code that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=24.063857142857135) [calls the Validate method executes the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=27.76557142857143) [correct shape of that method based on the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=30.026714285714284) [type of object that called it. We can also](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=32.936666666666675) [leverage polymorphism through interfaces.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=36.82185714285715) [At this point, our Log method is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=39.667) [polymorphic. It has many shapes. One shape](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=43.06024999999999) [in the Customer class logs customer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=45.547500000000014) [information. Another shape in the Product](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=48.71260000000001) [class logs product information, and so on.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=50.8077142857143) [We could have dozens of shapes of the Log](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=53.997) [method. Any code that calls the Log method](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=56.99850000000001) [executes the correct shape of that method](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=59.767999999999994) [based on the type of object that called](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=62.02250000000002) [it. Let's see how we can take advantage of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=65.03657142857143) [interface-based polymorphism. Here is the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=67.042) [LoggingService class. When we last saw](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=72.4464) [this class, we had defined a list of items](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=74.19844444444443) [to log. Those items could include customer](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=76.60333333333334) [instances or product instances, so we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=79.192) [declared a list of objects so that we](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=82.66780000000001) [could put both customers and products on](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=84.775) [the list. Now that both classes implement](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=86.859) [the same interface, we can use the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=89.86) [interface as the type to strongly type our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=92.161) [list. Let's change Object to ILoggable.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=96.1085555555556) [This allows us to work with each item in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=100.187) [the list through its ILoggable interface.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=102.033) [When we hover over item, we see that it is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=105.56) [of type ILoggable, and when we type item.,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=108.366) [we see the object methods and our Log](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=112.342) [method, so we can call it to perform our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=114.625) [logging. Our generalized logging code does](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=118.56340000000003) [not need to know anything about any of our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=120.21885714285715) [entity or other classes. It just requires](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=122.91800000000002) [any class that wants to participate in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=126.16714285714284) [logging implement the ILoggable interface.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=128.7731666666667) [Then the LoggingService provides that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=132.149) [logging, calling the class unique shape of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=133.944) [the Log method to obtain the data to log.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=136.65) [Think about how useful this would be in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=140.146) [any common code. Let's try out our logging](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=142.41177777777787) [service with a unit test. I've created](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=145.984) [this test under the Tests folder in the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=149.00657142857142) [Acme.CommonTest project in the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=152.25949999999997) [LoggingServiceTest code file. The Arrange](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=154.76575) [section creates a list of changed items.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=157.44428571428574) [It creates a customer with a set of values](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=159.41985714285713) [and adds it to the list. It then creates a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=162.30380000000002) [product with a set of values and adds it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=164.86633333333333) [to the list. Since we implemented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=167.43528571428575) [ILoggable in the Order class, we could add](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=169.53614285714283) [an order here as well. The Act section](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=172.45411111111108) [calls the WriteToFile method in the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=175.35049999999995) [LoggingService. We may want to consider](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=178.0465) [refactoring the WriteToFile so we can](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=179.91100000000006) [inspect the string written to the file for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=181.955) [easier testing. We would then have a value](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=185.17457142857148) [to assert. Or if the code was actually](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=188.03799999999998) [writing to a file, in the Assert we could](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=190.07599999999996) [open the file to validate the result. But](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=192.27866666666662) [for now, we can use the output link to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=195.3478) [view the result. Let's run the test. Find](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=197.47) [the test in Test Explorer, right-click,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=201.4115) [and select Run Selected Tests. Click on](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=203.88666666666666) [the test to view the details, and click](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=208.063) [Output to view the result. It output our](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=210.44828571428573) [two changed objects. Nice. Looking again](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=213.89050000000003) [at our LoggingService WriteToFile method,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=217.4088) [we were able to call each item's Log](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=219.14242857142855) [method by leveraging interface-based](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=222.238) [polymorphism. Each class that implemented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=225.17200000000003) [the ILoggable interface was contractually](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=228.2243333333333) [obligated to have a Log method. This loop](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=231.028) [knows which log method to call based on](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=234.62600000000003) [the underlying type of object. When it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=237.21325000000004) [iterates through to a customer object, it](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=239.69157142857145) [calls the Log method in the Customer class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=241.906875) [through its ILoggable interface. If it's a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=244.9957142857143) [product object, it calls the Log method in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=248.58033333333336) [the Product class through its ILoggable](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=250.797) [interface, and so on. Now that we've seen](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=253.33079999999998) [polymorphism in action, let's identify the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=257.9385714285715) [key benefits of interfaces in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=259.84299999999996) [polymorphism. An interface provides strong](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=262.7163333333333) [typing when working with objects through](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=265.01566666666673) [that interface. We then get the benefit of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=267.6373333333333) [IntelliSense and better syntax checking.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=270.1512499999999) [An interface defines commonality among](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=272.88) [otherwise unrelated classes. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=275.021) [application can use that interface to work](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=277.7938571428571) [with the set of classes that implement the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=279.755875) [interface. Interface-based polymorphism](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=282.2366666666667) [aids in building generalized utility](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=284.4456) [methods that can leverage class unique](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=286.999) [functionality. For example, our general](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=290.052) [purpose logging service logs unique data](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=292.1506666666667) [from unrelated classes by calling one of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=294.433) [the many shapes of the Log method. This is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=297.07525000000004) [why interfaces are used throughout .NET](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=300.5327499999999) [and in many design patterns. Now let's](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=303.36955555555556) [finish off this module with some](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=306.35775) [checklists we can use as we define and implement interfaces.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=6&mode=live&start=307.674)

[Checklists and Summary](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live)

[We discussed several metaphors for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=2.074) [understanding interfaces. Interfaces](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=3.667) [define a role that an object can play in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=6.53275) [the operation of the application.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=9.985714285714286) [Interfaces define a contract specifying](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=12.585) [the set of properties and methods that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=15.150833333333335) [must be provided by any implementing](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=17.553250000000002) [object. Basically, an interface is](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=20.673399999999994) [comprised of a list of properties,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=22.600571428571435) [methods, events, and iterators denoting](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=24.677599999999998) [the data and operations that an object can](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=26.574999999999996) [perform. Every class has a basic interface](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=30.802500000000002) [defined by the public properties and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=33.72328571428572) [methods of the class. The application uses](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=36.04133333333335) [this interface to work with the class in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=38.51028571428572) [its primary role, accessing its public](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=41.288000000000004) [properties, and calling its public](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=43.80275) [methods. We can define any number of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=46.697999999999986) [additional interfaces. Define an interface](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=50.20849999999999) [using the interface keyword. Specify the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=52.710571428571434) [signatures of the interface members with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=55.42) [no code. Any class can implement an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=58.325) [interface. Implement an interface by](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=62.60933333333333) [adding it to the class signature after a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=64.285) [colon. Define multiple interfaces](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=67.30639999999998) [separated by commas. The class must then](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=69.72150000000002) [write code for every property and method](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=73.026) [defined in that interface. Polymorphism](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=76.17414285714284) [means many shapes. In the context of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=79.21125) [interfaces, we specify a method name and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=82.61749999999998) [an interface, and write code for that](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=85.7098) [method in each class that implements the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=88.30337499999997) [interface, giving that method its many](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=91.5888) [shapes. This allows us to work with](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=94.536) [otherwise unrelated classes in a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=96.60285714285712) [generalized, reusable way. Only one short module left.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m9-interfaces&clip=7&mode=live&start=99.20660000000001)

[Final Words and Next Steps](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=0&mode=live)

[Introduction](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=0&mode=live)

[C# is a modern, general purpose,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=0&mode=live&start=0) [object-oriented programming language. Now](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=0&mode=live&start=5.659) [that you know more about object- oriented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=0&mode=live&start=8.879857142857142) [programming concepts, you can better](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=0&mode=live&start=11.116666666666665) [leverage the features of C# to build](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=0&mode=live&start=13.755624999999998) [well-crafted and testable applications.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=0&mode=live&start=17.023) [Welcome back to Object-Oriented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=0&mode=live&start=19.719) [Programming Fundamentals in C#, from](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=0&mode=live&start=21.718200000000003) [Pluralsight. My name is Deborah Kurata,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=0&mode=live&start=24.882) [and the final words in this course include](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=0&mode=live&start=27.273624999999996) [a brief recap and a look at next steps to further your study.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=0&mode=live&start=30.037124999999996)

[Recap](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live)

[When given a specification for a feature](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=2.654) [or a new application, start by identifying](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=4.816125000000001) [the classes from the requirements or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=7.617571428571429) [specification. Object-oriented programming](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=10.911333333333333) [represents the entities and concepts of an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=12.575999999999999) [application as a set of classes. Each](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=15.847142857142856) [class has properties that define the data](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=18.791428571428572) [each object will manage. Each class has](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=21.501428571428573) [methods, which are the actions and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=24.759000000000007) [behaviors that each object can perform.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=26.84714285714286) [Then analyze the classes you identified](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=29.818) [and separate responsibilities as needed.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=32.488857142857135) [Minimize coupling by ensuring each class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=36.123) [has a single purpose. Maximize cohesion by](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=38.936) [reviewing the properties and methods of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=42.03399999999999) [each class to confirm each one belongs to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=44.314571428571426) [that class. Single-focus classes simplify](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=47.932000000000016) [maintenance and improve testability. No](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=50.598749999999995) [class is an island, so the next step is to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=53.8303) [look at relationships. The relationships](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=57.208) [between the classes define how the objects](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=59.7892) [created from those classes work together](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=62.29428571428571) [to perform the operations of the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=64.527) [application. Leverage reuse wherever](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=67.98125) [possible. The power of object-oriented](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=70.8045) [programming lies in its promise of reuse.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=73.11620000000002) [By extracting commonality among a set of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=76.103) [classes into a separate class, you have](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=78.665) [more reusable code. Extensive reuse of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=82.2722) [existing proven classes not only shortens](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=85.55149999999999) [development time, it also leads to more](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=88.61359999999999) [robust applications. There are several](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=92.20399999999998) [ways to achieve reuse, including](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=94.2712857142857) [extracting common functionality into a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=96.1705) [base class using inheritance. Reuse](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=98.92966666666666) [through a component library of general](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=101.1845) [purpose classes and reuse through](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=103.43957142857143) [interfaces. This course also identified](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=107.27742857142857) [the four pillars, or characteristics, of](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=109.53966666666666) [object-oriented programming; abstraction,](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=113.37733333333333) [encapsulation, inheritance, and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=116.656) [polymorphism. Abstraction describes an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=120.3472) [entity in simple terms, ignoring the](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=123.128) [irrelevant details. It reduces complexity](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=126.749) [by focusing only on what is important for](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=129.52614285714282) [the purpose of this specific application.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=132.68800000000002) [Encapsulation allows for hiding the data](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=136.662) [and the implementation within the class.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=140.12) [The data is stored in backing fields and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=143.831) [accessible to the rest of the application](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=146.21) [through property getters and setters. The](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=148.422) [code is only accessed through the class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=151.55455555555554) [interface. Inheritance allows derived, or](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=154.73644444444434) [child, classes to reuse all the code in](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=157.27499999999995) [the base or parent class. We created an](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=160.49333333333334) [EntityBase class that contained a standard](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=163.9974285714286) [set of properties and a Validate method.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=165.9122857142857) [Each entity class then inherited from this](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=169.179) [EntityBase class to reuse its](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=171.635) [functionality. But in some cases, we don't](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=174.93750000000006) [want to reuse the base class](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=177.2213333333333) [functionality, so we leverage](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=179.77300000000002) [inheritance-based polymorphism by](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=181.86949999999996) [overriding the method. The idea behind](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=183.92059999999998) [inheritance-based polymorphism is that a](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=187.8365) [base class can define a method and any](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=189.83414285714284) [derived class can override that method to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=192.75300000000001) [provide its own definition and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=195.4067142857143) [implementation, basically, providing its](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=198.54066666666668) [own shape for the method. Another way to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=201.03625) [leverage polymorphism is with interfaces.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=204.726) [The idea behind interface-based](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=207.19599999999997) [polymorphism is that an interface can](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=209.678) [define a method, and any class can](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=212.624) [implement that interface to define its own](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=215.4412857142857) [code for that method, basically providing](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=217.771) [its own shape for the method. Generalized](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=219.9225) [code can then access the appropriate shape](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=223.19966666666664) [based on the type of object that called](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=225.39957142857142) [it. Let's finish up this module with a look at next steps.](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=1&mode=live&start=228.52225000000004)

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Defensive coding techniques help](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=2&mode=live&start=19.96033333333332) [you write great, maintainable code and](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=2&mode=live&start=21.791000000000004) [help you keep that code great after](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=2&mode=live&start=23.97) [maintenance activities, multiple](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=2&mode=live&start=26.605400000000007) [developers, and the ravages of time. Clean](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=2&mode=live&start=28.660666666666668) [Code is a reader-focused development style](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=2&mode=live&start=32.332) [that produces software that's easy to](https://app.pluralsight.com/player?course=object-oriented-programming-fundamentals-csharp&author=deborah-kurata&name=oop-fundamentals-csharp-m10-final-words&clip=2&mode=live&start=34.69871428571429) [write, read, and maintain. 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