

# C# Intermediate: Classes, Interfaces and OOP

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## INHERITANCE - Exercises

### Read this first

I've designed these exercise to help you apply what you have learned in this section. Make sure to do these exercises before moving on to the next chapter if you want to get the most out of this course.

#### **Where are the answers?**

I have deliberately decided not to provide the answers. Why? Because I want to make a great programmer out of you, not a lazy programmer who is used to copying/pasting code from various sources, without knowing what is happening!

In the real world, when you are at work, your job is to solve a problem. No one (including myself) knows the answers to real world problems initially. So we need to research, think, try different ideas, and see what works best. And that's exactly the kind of attitude I would like to see in you. If I give you the answers, you're going to get lazy and quickly look at the solution. This way, your programming brain will not be trained and you will always be dependent on other people's answers in the real-world.

So, do your best to solve these problems. They are not excessively hard, and any student who has taken all the lectures in this section should be able to solve these problems with a little effort. If you get stuck along the way, post your question in the discussion area. I'm happy to help you out. But please check the discussion area first to make sure no one has asked the same question before. This way, you'll save both your and my time.

So, let's get started!

## Exercise: Design a Stack

A Stack is a data structure for storing a list of elements in a LIFO (last in, first out) fashion.

Design a class called Stack with three methods.

```
void Push(object obj)
object Pop()
void Clear()
```

The **Push()** method stores the given object on top of the stack. We use the “object” type here so we can store any objects inside the stack. Remember the “object” class is the base of all classes in the .NET Framework. So any types can be automatically upcast to the object. Make sure to take into account the scenario that **null** is passed to this object. We should not store null references in the stack. So if null is passed to this method, you should throw an `InvalidOperationException`. Remember, when coding every method, you should think of all possibilities and make sure the method behaves properly in all these edge cases. That’s what distinguishes you from an “average” programmer.

The **Pop()** method removes the object on top of the stack and returns it. Make sure to take into account the scenario that we call the `Pop()` method on an empty stack. In this case, this method should throw an `InvalidOperationException`. Remember, your classes should always be in a valid state and used properly. When they are misused, they should throw exceptions. Again, thinking of all these edge cases, separates you from an average programmer. The code written this way will be more robust and with less bugs.

The **Clear()** method removes all objects from the stack.

We should be able to use this stack class as follows:

```
var stack = new Stack();
stack.Push(1);
stack.Push(2);
stack.Push(3);

Console.WriteLine(stack.Pop());
Console.WriteLine(stack.Pop());
Console.WriteLine(stack.Pop());
```

The output of this program will be

```
3
2
1
```

**Note:** The downside of using the object class here is that if we store value types (eg int, char, bool, DateTime) in our Stack, boxing and unboxing occurs, which comes with a small performance penalty. In my C# Advanced course, I’ll teach you how to resolve this by using generics, but for now don’t worry about it.

**Real-world use case:** Stacks are very popular in real-world applications. Think of your browser. As you navigate the web, the address of each page you visit is stored in a stack. As you click the Back button, the most recent address is popped. This is because of the LIFO behaviour of stacks.