Clean Classes and Clean Methods

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Helping .NET developers create amazing applications

Recommendations and Guidelines

- Naming conventions for classes and methods
- Best practices for defining classes and methods
- Access modifiers
- Namespaces

Favoring Readability

Current Situation

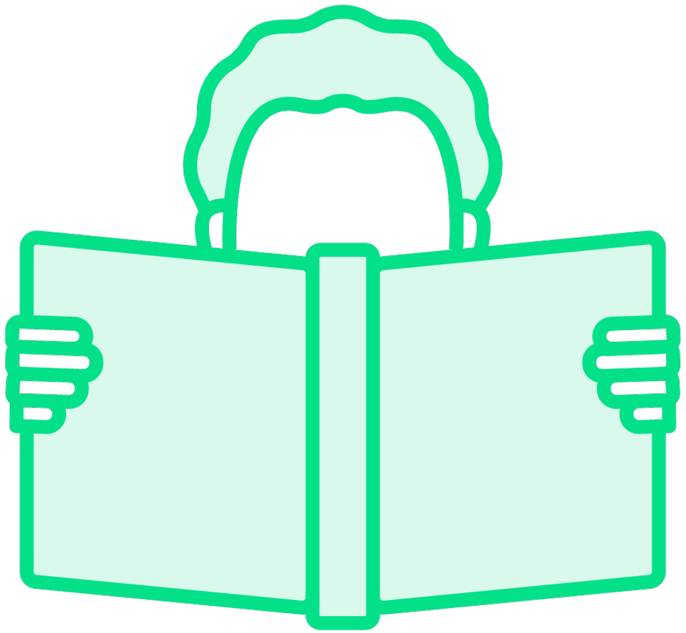
Hard to read

Not easy to test

Potential bugs

Favor Readability

Favor Readability



Code should be understood by humans

Use comments as required

- Do not overuse comments

Code lines should be read as an article

- Small explanations when required

Wes Dyer

Make it correct, make it clear, make it concise, make it fast.

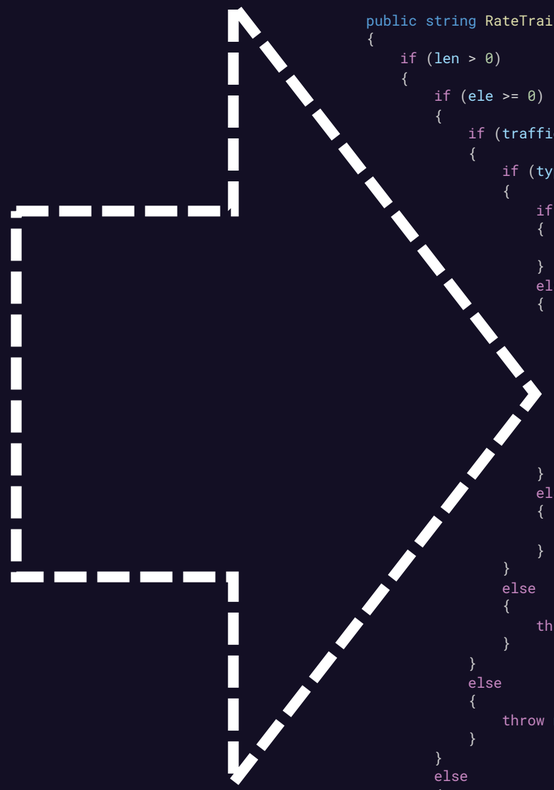
In that order.

Favor Readability

```
public string RateTrail(decimal len, decimal ele, string traffic, string type)
{
    if (len > 0)
    {
        if (ele >= 0)
        {
            if (traffic != null)
            {
                if (type != null)
                {
                    if (len > 20 || ele > 400)
                    {
                        return "hard";
                    }
                    else if ((10 < len && len < 20) || (100 < ele && ele < 400))
                    {
                        if (traffic == "heavy")
                        {
```

Favor Readability

It really looks like an arrow!



```
public string RateTrail(decimal len, decimal ele, string traffic, string type)
{
    if (len > 0)
    {
        if (ele >= 0)
        {
            if (traffic != null)
            {
                if (type != null)
                {
                    if (len > 20 || ele > 400)
                    {
                        return "hard";
                    }
                    else if ((10 < len && len < 20) || (100 < ele && ele < 400))
                    {
                        if (traffic == "heavy")
                        {
                            return "hard";
                        }
                        else
                        {
                            return "moderate";
                        }
                    }
                    else
                    {
                        return "easy";
                    }
                }
                else
                {
                    throw new TrailException("type cannot be null");
                }
            }
            else
            {
                throw new TrailException("traffic cannot be null");
            }
        }
        else
        {
            throw new TrailException("ele cannot be null");
        }
    }
    else
    {
        throw new TrailException("len cannot be null");
    }
}
```

Demo

Favor Readability

Guard Clause

“Fail fast” method

One condition validated at a time

- If fails, execution stops immediately
- Meaningful error is thrown

Easy to read, understand, and maintain

Guard Clause

```
if (length < 0) throw new Exception(“Length cannot be null");

if (length > 255) throw new Exception(“Unexpected size");
```

Defining a Class

Defining a Class

What Is a Class in C#?

Data structure that may contain

- Data members like constants and fields
- Function members like methods, properties, and events
- Nested types

Vehicle

Vehicle.cs

```
public class Vehicle
{
    // ...

    public void Move(Key Key)
    {
        // Turn on
        // Move vehicle
    }
}
```

Instantiate Vehicle

Vehicle.cs

```
// ...
Vehicle vehicle = new();
vehicle.Move();
// ...
```

Parts of a Class

Signature

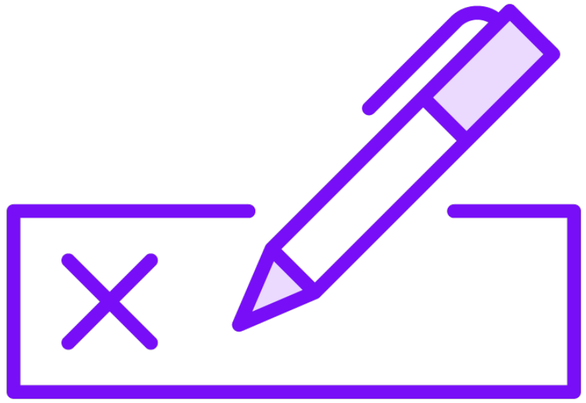
Fields

Properties

Constructors

Methods

Signature



Unique identifier for each class

Access modifier

- Inner, public, private...

Class keyword

Class name

Fields and Properties

Fields are variables that hold data

```
private int productId;
```

Property implements get and set

```
public int ProductId
{
    get { return productId; }
    set { productId = value; }
}
```

Fields and Properties

Fields are variables that hold data

```
private int productId;
```

Property implements get and set

```
public int ProductId
{
    get { }
    set { }
}
```

Best practice

Use properties to encapsulate fields

Constructors

A constructor is a method that is executed when a new class instance is created

Zero, one, or more constructors

Can have parameters or be parameterless

Typically used to initialize instance fields and properties

Best Practices for Constructors

Default constructor

Provide parameterized constructors

Name the constructors parameters with the same names

Avoid performing heavy work

Demo

Defining Class

Class Naming, Ordering, and Comments

Major Guidelines

Use PascalCasing for naming

Use nouns

Be specific

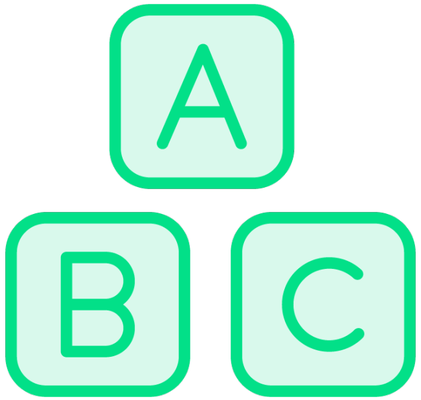
Single responsibility

Avoid abbreviations

Ordering

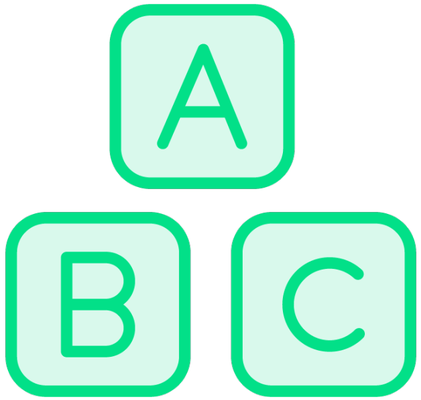
- Create one class per code file and avoid large classes

Use XML comments



UniversityStudent

PascalCasing



Student

PascalCasing

Use Nouns

Person

Vehicle

Product

Figure

Be Specific

UniversityStudent

Truck

Kayak

Circle

Use Specific Names

Do

User
Logging
Email
AmazonBucket
Maps
Report
Forecast

Don't

WebsiteMu
Utility
Common
XavierFunctions

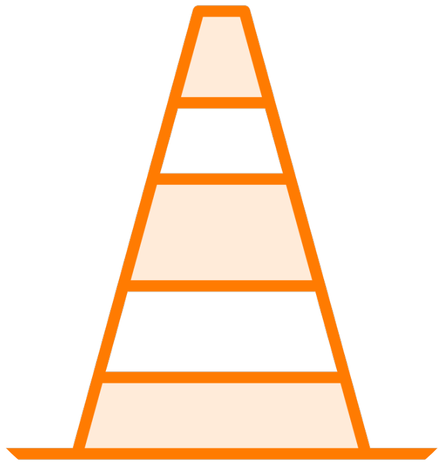
Single Responsibility

The class must have one and only one purpose

Single Responsibility

The class must have one and only one purpose

```
public class Person
{
    public string FirstName;
    public string LastName;
    public string Id;
}
```



Avoid

Abbreviations

Generic suffixes and prefixes

Suffixes and underscores

Ordering

Fields

Properties

Methods

Create one class per code file

XML document comments

Used to define the structure of the output documentation

XML Comments

Great for documentation

```
/// <summary>
/// Contains the information about a Kayak sold at CarvedRock.
/// </summary>
public class Kayak
{
    // ...
}
```

Avoid large classes

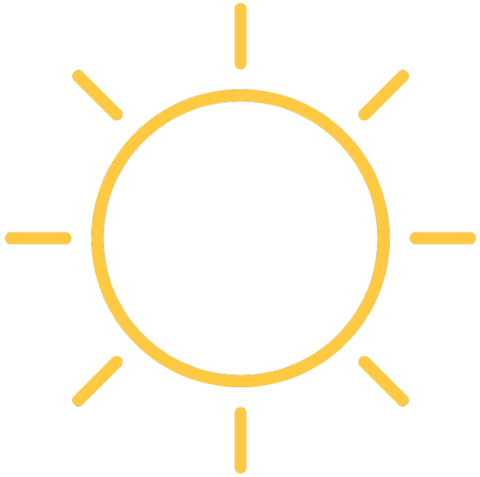
This one really helps

Demo

Class naming and ordering

Static Classes

Static Classes



Great scenarios

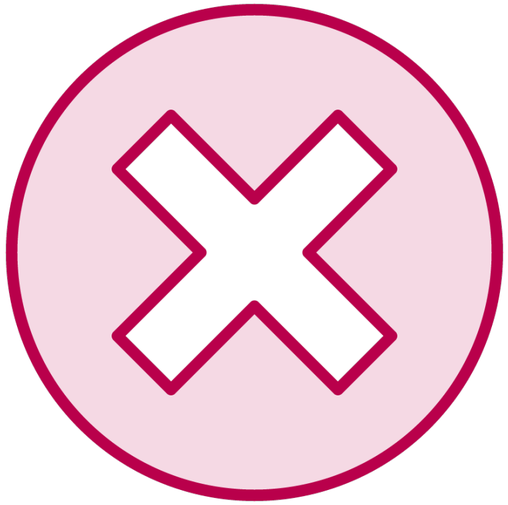
Dangerous scenarios

A static class is a special type of class that cannot be instantiated

Do

Static classes should be very small and straight to the point

Useful for common code library components



Don't

Use them as function containers

Store state that can be overwritten between calls to the static methods

A Class

```
public class CheckoutFunctions
{
    public decimal CalculateTax(decimal total, string twoLetterStateCode)
    {
        var rate = twoLetterStateCode switch
        {
            // Oregon, Alaska, Montana
            "OR" or "AK" or "MT" => 0.0M,
            // North Dakota, Wisconsin, Maine, Virginia
            "ND" or "WI" or "ME" or "VA" => 00.05M,
            // California
            "CA" => 0.0825M,
            // most US states
            _ => 0.06M,
        };
        return total * rate;
    }
}
```

A Static Class

```
public static class CheckoutFunctions
{
    public decimal CalculateTax(decimal total, string twoLetterStateCode)
    {
        var rate = twoLetterStateCode switch
        {
            // Oregon, Alaska, Montana
            "OR" or "AK" or "MT" => 0.0M,
            // North Dakota, Wisconsin, Maine, Virginia
            "ND" or "WI" or "ME" or "VA" => 00.05M,
            // California
            "CA" => 0.0825M,
            // most US states
            _ => 0.06M,
        };
        return total * rate;
    }
}
```

Static Method

```
public static class CheckoutFunctions
{
    public static decimal CalculateTax(decimal total, string twoLetterStateCode)
    {
        var rate = twoLetterStateCode switch
        {
            // Oregon, Alaska, Montana
            "OR" or "AK" or "MT" => 0.0M,
            // North Dakota, Wisconsin, Maine, Virginia
            "ND" or "WI" or "ME" or "VA" => 00.05M,
            // California
            "CA" => 0.0825M,
            // most US states
            _ => 0.06M,
        };
        return total * rate;
    }
}
```

Invoke Static Method

```
var tax = CheckoutFunctions.CalculateTax(50.0M, "US");
```

Methods and Functions

Methods and functions are the same in C#

Defining a Method

Code block with a series of statements

- Performs a specific functionality

Called by its name

Declared in a class, struct, or interface

- Access level specified
  - Public, private, protected…
- Optional modifiers like abstract or sealed

Parameters can be by value or reference

Return value specified, including void

Methods

```
/// <summary>
/// Calculates the area of a circle
/// </summary>
/// <param name="radius">Circle radius</param>
/// <returns>The area of a circle with the provided area</returns>
public double CalculateCircleArea(double radius)
{
    const float pi = 3.14F;
    double area = pi * radius * radius;
    return area;
}
```

Clearer Code Intent

Organize code into small and specific pieces

Create well-named methods that represent what each method does

- Use the naming guidelines

Clearer Code Intent

Dirty

```
// If we have a shopping cart with a list of
products and need to calculate the total to
charge:
// <summary>
// Calculate the total of the shopcart
// </summary>
private int
total_pricesOfshopcart_list(List<int> l)
{
    int r = 0;
    for (var i=0;i<l.Count;i++)
    {
        temp = l[i].price;
        r = r + temp;
    }
    return r
}
```

Clean

```
public int CalculateTotalShopcart(List<int>
products)
{
    return products
    .Sum(product => product.price);
}
```

Less Code

Dry: Don't repeat yourself

Less code

Don't

```
string season;
// Check if is a winter product:
if (product.winter != "null") {
    season = "winter";
}
// Check if is a spring product:
if (product.spring != "null") {
    season = "spring";
}
// And more repeated code...
// Check if it's a valid winter category
product
if (season != "winter"){
    return false;
}
```

Do

```
private bool ValidProductRequest(Product
product, string seasonCategory)
{
    // Additional checks can be included
    if (product.seasonCategory ==
seasonCategory)
    {
        return true;
    }
}
```

Better indentation

Another advantage

Good Methods (Usually) Fit in a Screen

Original.cs

```
if (AddProduct(productId))
{
    if (changeInventory)
        {
            // Many statements
            // Many statements
            // Many statements
            // Many statements
        }

   if (notifyCompany)
        {
            // Many statements
            // Many statements
        }
    // Many statements
}
```

Nice.cs

```
if (AddProduct(productId))
{
    if (changeInventory)
        ChangeProductInventory(productId);

   if (notifyCompany)
        SendNotification(productId);

   ModifyBill(addToBill, productId);
}
```

Flag Arguments

Don’t

Flag arguments may be a bad sign

```
private void AddProduct(Id ProductId,
bool changeInventory, bool
notifyCompany,  Bill addToBill)
{
    // Possibly, sending emails,
changing store inventory and billing are
separate concerns from adding a product.
}
```

Use as few parameters as possible

```
private void AddProduct(Id ProductId)
{
    // add product
}
private void ChangeInventory(Id
ProductId)
{
    // etc... and maybe the best place
for some of these is another class
}
```

Flag Arguments

Do

```
if AddProduct(productId)
{
    if (changeInventory)
        ChangeProductInventory(productId);

   if (notifyCompany)
        SendNotification(productId);

   ModifyBilll(addToBill, productId);
}
```

Fail Quickly

Do guard clauses, again

Don’t

```
private void RegisterRoute(string location,
string accessibility)
{
    if (!string.isNullOrWhitespace(location)) {
        if
(!string.isNullOrWhitespace(accessibility)) {
            // register the new route
        } else {
            throw new
ArgumentException("Location is required.");
        }
        throw new
ArgumentException("Accessibility details are
required.");
    }
}
```

Do

```
private void RegisterRoute(string location,
string accessibility)
{
    if (string.isNullOrWhitespace(location))
    {
        throw new ArgumentException("Location
required.");
    }
    if
(string.isNullOrWhitespace(accessibility))
    {
        throw new
ArgumentException("Accessibility details
required.");
    }
    // register the new route
}
```

Major Method Naming Guidelines

Naming Guidelines

Use verbs that indicate action

- Search, Find, Register, Login, Validate, Save…

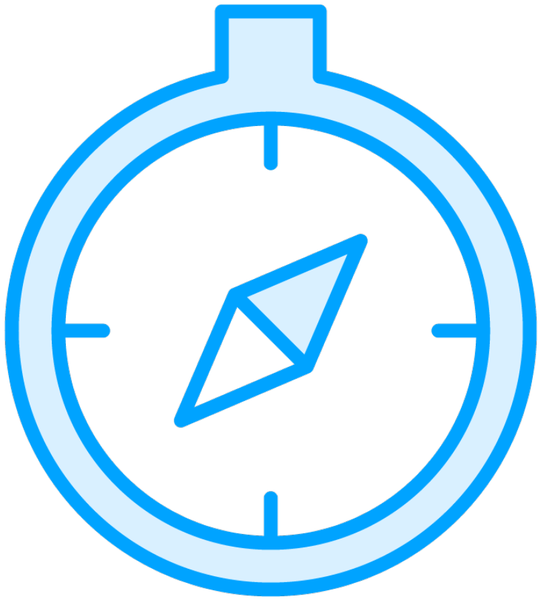
But avoid generic ones like do or use

Use get only when method has constant time complexity

- Retrieves a value without performing calculations

Boolean methods should begin with is, are, was, were…

Naming Guidelines



Do not describe arguments

- findUserByUserIdAndToken
- Can be simplified to
  - findUser(User userId, Token token)

Avoid abbreviations

- GetIdById
- Better GetPatientIdByCaseId

Methods use PascalCasing

Naming Guidelines

Always add XML document comments

```
/// <summary>
/// Validate the information about the payment status of the order sold on
CarvedRock
/// </summary>
/// <param name="orderId">Purchase order Id</param>
/// <returns>True if Payment Status is valid, False if not</returns>
public bool ValidatePaymentStatus(Id orderId)
{
    // Complicated code here
}
```

Namespaces and References

Namespaces are heavily used in C# programming in two ways

Namespace

Most of the classes under System.* and Microsoft.* is what's known as the .NET Base Class Libraries

Version

.NET 6

Search

System.Xml
ConformanceLevel
DtdProcessing
EntityHandling
Formatting

System.Xml Namespace

Reference

Provides standards-based support for processing XML.

Classes

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Version

.NET 6

Search

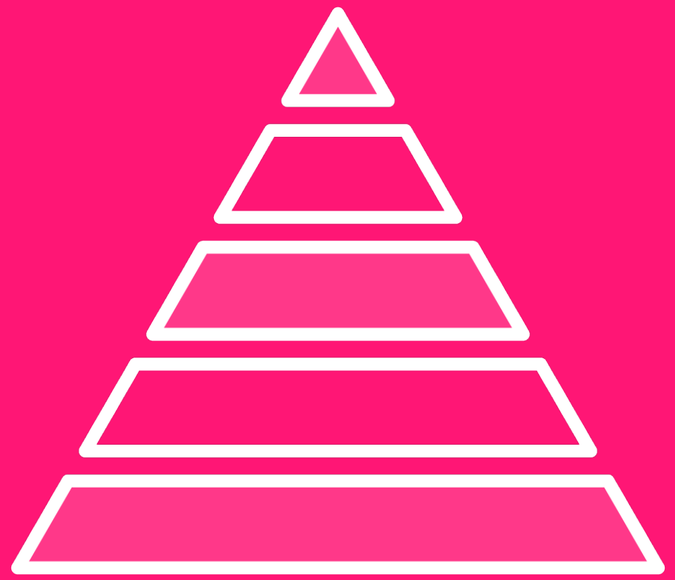
System.Text.Json
JsonCommentHandling
JsonDocument
JsonDocumentOptions
JsonElement
JsonElement.ArrayEnumerator
JsonElement.ObjectEnumerator
JsonEncodedText

System.Text.Json Namespace

Reference

Provides high-performance, low-allocating, and standards-compliant capabilities to process JavaScript Object Notation (JSON), which includes serializing objects to JSON text and deserializing JSON text to objects, with UTF-8 support built-in. It also provides types to read and write JSON text encoded as UTF-8, and to create an in-memory document object model (DOM) for random access of the JSON elements within a structured view of the data.

Classes



Declaring your own namespaces can help you control the scope of class and method names in larger programming projects

Namespace

Namespaces are declared like this

```
namespace CarvedRock.BL
{
    // class ... { ... }
}
```

Namespace

Namespaces are declared like this

```
namespace CarvedRock.UI.MAUI
{
    // class ... { ... }
}

namespace CarvedRock.UI.Web
{
    // class ... { ... }
}
```

Namespaces

Do

Follow <company>.<technology>.<feature>

Use Pascal Casing

Don’t

Use System or Microsoft in your own classes

Use a class name in the namespace

References help you use components from other namespaces

References

Do

References must be ONE-WAY

Don’t

Avoid excessive use of the ‘using static’ directive

Takeaway

Code should be understood by humans

- Favor readability

Make it correct, make it clear, make it concise, make it fast

- In that order

Never create “arrow code”

- Use guard clauses instead
- Fail fast

Takeaway

Class has

- Data members
- Function members
- Nested types

Includes

- Signature, fields, properties, constructors, and methods

Takeaway

Naming guidelines

- PascalCasing
- Use nouns
- Be specific, single responsibility, avoid abbreviations
- One file per class
- Ordering
  - Fields, properties, and then methods

Takeaway

A method and function in C#

- Are the same

Help organize functionality

Follow naming guidelines

- Use verbs that indicate action
- Avoid generic verbs
- Get only with constant time complexity
- Boolean methods
  - Start with is, are, was, were...

Takeaway

Use static classes for common code library components

- Beware of storing state

Use namespaces to organize functionality

- `<company>.<technology>.<feature>`