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Naming Identifiers

Naming Variables, Methods, Classes, Etc.

Telerik Software Academy
Learning & Development
http://academy.telerik.com

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General Naming Guidelines

General Naming Guidelines

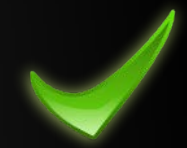
- Always use English
  - How will you feel if you read Vietnamese code with variables named in Vietnamese?
  - English is the only language that all software developers speak
- Avoid abbreviations
  - Example: `scrpCnt` vs. `scriptsCount`
- Avoid hard-to-pronounce names
  - Example: `dtbgRegExPtrn` vs. `dateTimeBulgarianRegExPattern`

Use Meaningful Names

- Always prefer meaningful names
  - Names should answer these questions:
    - What does this class do? What is the intent of this variable? What is this variable / class used for?
  - Examples:
    - `FactorialCalculator`, `studentsCount`, `Math.PI`, `configFileName`, `CreateReport`
  - Incorrect examples:
    - `k`, `k2`, `k3`, `junk`, `f33`, `KJJ`, `button1`, `variable`, `temp`, `tmp`, `temp_var`, `something`, `someValue`

Names Should Be Meaningful in Their Context

- Whether a name is meaningful or not depends on its context (its enclosing type)
- Examples of meaningful names:
  - `Generate()` in the class `LabyrinthGenerator`
  - `Find(string fileName)` in the class `FileFinder`
  - `Deposit(decimal amount)` in the class `Account`
- Examples of meaningless names:
  - `Generate()` in the class `Program`
  - `Find(string name)` in the class `Program`



Fake Meaningful Names

- Junior developers often use "fake" meaningful names that are in fact meaningless
  - Bad naming examples:
    - `Topic6Exercise12`, `LoopsExercise12`, `Problem7`, `OOPLecture_LastExercise`
  - Yes, `Topic6Exercise12` indicates that this is solution to exercise 12, but what is it about?
    - Sum of numbers or Tetris game?
  - Better naming:
    - `MaximalNumbersSubsequence`

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Naming Classes, Types and Application Components

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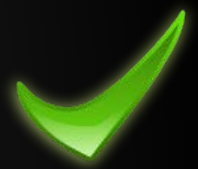
Naming Classes and Types

- Naming types (classes, structures, etc.)
  - Use `PascalCase` character casing
    - In C#, JavaScript, Java, PHP
  - Examples:
    - `RecursiveFactorialCalculator`, `TreeSet`, `XmlDocument`, `IEnumerable`, `Color`, `TreeNode`, `InvalidTransactionException`, `MainForm`
  - Incorrect examples:
    - `recursiveFactorialCalculator`, `recursive_factorial_calculator`, `RECURSIVE_FACTORIAL_CALCULATOR`



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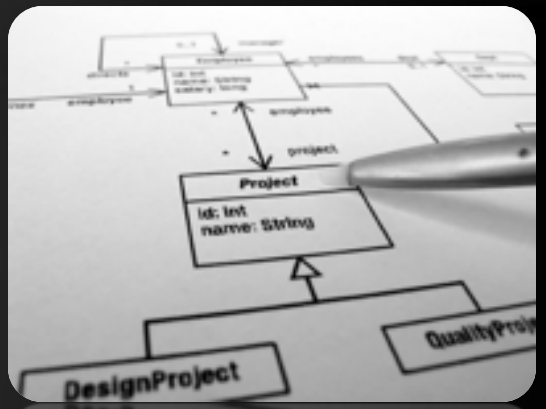
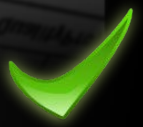
Naming Classes and Structures in C#, JavaScript, C++ and Java

- Use the following formats:
  - [Noun]
  - [Adjective] + [Noun]
- Examples:
  - `Student`, `FileSystem`, `BinaryTreeNode`, `Constants`, `MathUtils`, `CheckBox`, `Calendar`
- Incorrect examples:
  - `Move`, `FindUsers`, `Fast`, `ExtremlyFast`, `Optimize`, `Check`, `FastFindInDatabase`





Naming Interfaces in C#

- Following formats are acceptable:
  - 'I' + [Verb] + 'able'
  - 'I' + [Noun], 'I' + [Adjective] + [Noun]
- Examples:
  - `IEnumerable`, `IFormattable`, `IDataReader`, `IList`, `IHttpModule`, `ICommandExecutor`
- Incorrect examples:
  - `List`, `iFindUsers`, `IFast`, `IMemoryOptimize`, `Optimizer`, `FastFindInDatabase`, `CheckBox`

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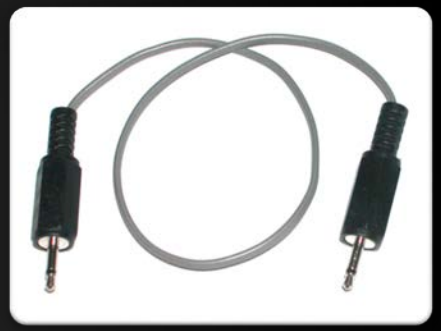
Naming Interfaces in JS / Java

- Following formats are acceptable:
  - [Verb] + 'able'
  - [Noun], [Adjective] + [Noun]
- Examples:
  - `Serializable` , `Enumerable`, `Comparable`, `Runnable`, `CharSequence`, `OutputStream`
- Incorrect examples:
  - `list`, `FindUsers`, `Run`, `Inumber`, `OPTIMIZER`, `IMemoryOptimize`, `FastFindInDatabase`



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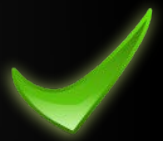
Naming Enumerations in C#

- Several formats are acceptable:
  - [Noun] or [Verb] or [Adjective]
- Use the same style for all members
- Examples:
  - `enum Day {Monday, Tuesday, Wednesday, …},`
    `enum AppState {Running, Finished, …},`
    `enum WindowState {Normal, Maximized, …}`
- Incorrect examples:
  - `enum Color {red, green, blue, white},`
    `enum PAGE_FORMAT {A4, A5, A3, LEGAL, …}`



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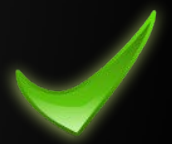
Naming Enumerations in Java / JS

- Several formats are acceptable:
  - [Noun] or [Verb] or [Adjective]
- Use `PascalCase` for the enumeration and `CAPITALS` for its members
- Examples:
  - `enum Suit {CLUBS, DIAMONDS, HEARTS, SPADES}`, `enum Color {RED, GREEN, BLUE, …}`
- Incorrect examples:
  - `enum Color {red, green, blue, white}`, `enum PAGE_FORMAT {A4, A5, A3, LEGAL, …}`



Naming Special Classes

- Attributes
  - Add `'Attribute'` as suffix
  - Example: `WebServiceAttribute`
  - Incorrect example: `WebService`
- Collection Classes
  - Add `'Collection'` as suffix
  - Example: `StringsCollection`
  - Incorrect example: `ListOfStrings`

Naming Special Classes (2)

- Exceptions
  - Add `'Exception'` as suffix
  - Use informative name
  - Example: `FileNotFoundException`
  - Incorrect example: `FileNotFoundError`

- Delegate Classes
  - Add `'Delegate'` or `'EventHandler'` as suffix
  - Example: `DownloadFinishedDelegate`
  - Incorrect example: `WakeUpNotification`

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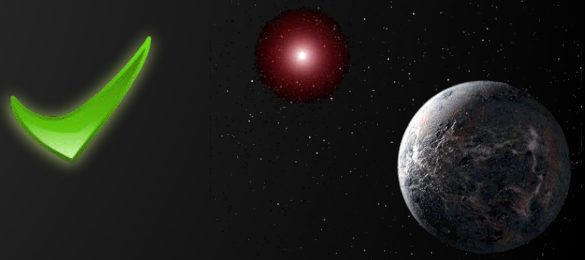
The Length of Class Names

- How long could be the name of a class / struct / interface / enum / delegate?
  - The name should be as long as required
  - Don't abbreviate the names if this could make them unclear
  - Your IDE has autocomplete, right?

- Examples: `FileNotFoundException`, `CustomerSupportNotificationService`
- Incorrect examples: `FNFException`, `CustSuppNotifSrvc`

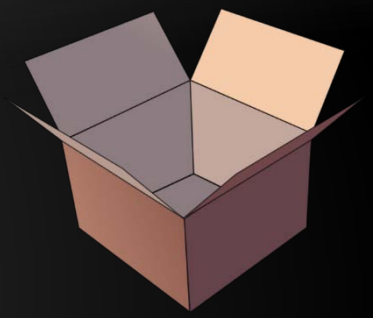
Naming Namespaces in C#

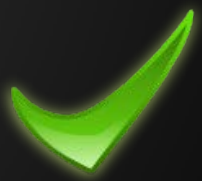
- Namespaces naming guidelines
  - Use PascalCase
- Following formats are acceptable:
  - `Company . Product . Component . …`
  - `Product . Component . …`
- Example:
  - `Telerik.WinControls.GridView`
- Incorrect examples:
  - `Telerik_WinControlsGridView, Classes`

Naming Java Packages / JS Namespaces

- Packages naming guidelines
  - Use camelCase
- Following formats are acceptable:
  - `com . company . product . component . ...`
  - `product . component . ...`
- Example:
  - `com.apple.quicktime`, `hibernate.core`
- Incorrect examples:
  - `IBM.DB2.Data`, `ibm.db2_data`, `Tetris.UI`





Naming Project Folders

- Project folders' names should follow the project namespaces / packages
- Examples:
  - `com`
    - `apple`
      - `quicktime`
  - `Telerik.WinControls.GridView`
- Incorrect examples:
  - `com_apple_quicktime`, `quicktime.src`

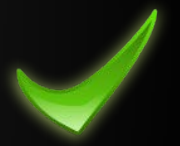
Naming Files in C# / Java

- Files with source code should have names matching their content
  - File containing a class `Student` should be names `Student.cs` / `student.java`
- Example:
  - `StudentDAO.cs`, `Constants.java`, `CryptographyAlgorithms.cs`

- Incorrect examples:
  - `Program.cs`, `SourceCode.java`, `_d2.cs`, `WebApplication1.jsp`, `Page1.aspx`

Naming Files in JavaScript

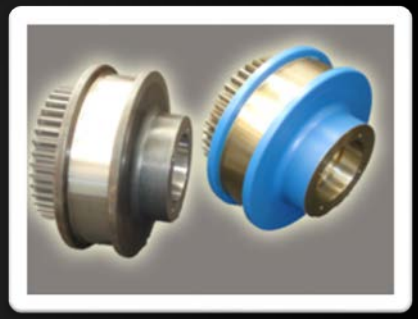
- Use small letters and hyphens for JavaScript file names (+ optionally `.min` + version)
  - Put a single library / component in a single file
- Examples:
  - `jquery-1.8.2.min.js`, `widgets.js`, `kendo.common.min.js`, `scriptaculous.js`



- Incorrect examples:
  - `KendoUI.js`, `jQuery_classes.js`, `MyAjax.Library.js`, `jQuery-1.8.2.js`

Naming .NET Assemblies

- .NET assembly names should follow the root namespace in its class hierarchy
- Examples:
  - `Oracle.DataAccess.dll`
  - `Interop.CAPICOM.dll`
  - `Telerik.WinControls.GridView.dll`
- Incorrect examples:
  - `OracleDataAccess.dll`
  - `Telerik_WinControlsGridView.dll`



Naming JAR Files in Java

- JAR files names should consist of single word or several words separated by hyphen
  - Can contain version information
- Examples:
  - `xalan25.jar`
  - `ant-apache-log4j.jar`
- Incorrect examples:
  - `Ant.Apache.Log4J.jar`
  - `Oracle.JDBC.Drivers.jar`

Naming Applications

- Applications should be named meaningfully
  - Use [Noun] or [Adjective] + [Noun]
  - Use `PascalCase`
- Examples:
  - `BlogEngine`
  - `NewsAggregatorSerivice`
- Incorrect examples:
  - `ConsoleApplication4`, `WebSite2`
  - `zadacha_14`, `online_shop_temp2`

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Naming Methods and Method Parameters

Naming Methods

- Methods naming guidelines
  - Use meaningful method names
  - Method names should answer the question:
    - What does this method do?
  - If you cannot find a good name for a method, think about whether it has a clear intent

- Examples: `FindStudent`, `LoadReport`, `Sinus`
- Incorrect examples: `Method1`, `DoSomething`, `HandleStuff`, `SampleMethod`, `DirtyHack`

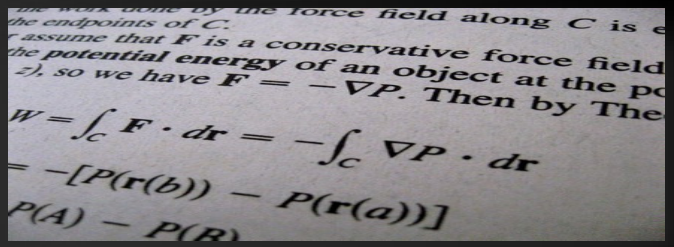
Naming Methods (2)

- Use `PascalCase` for C# and `camelCase` for JavaScript, PHP and Java
  - Example (C#): `LoadSettings`
  - Example (JS/PHP/Java): `loadSettings`
- Prefer the following formats:
  - [Verb], [Verb] + [Noun], [Verb] + [Adjective] + [Noun]

- Examples: `Show`, `LoadSettingsFile`, `FindNodeByPattern`, `ToString`, `PrintList`
- Incorrect examples: Student, Generator, Counter, White, Approximation, MathUtils

Methods Returning a Value

- Methods returning values should describe the returned value
- Examples:
  - `ConvertMetersToInches`, not `MetersInches` or `Convert` or `ConvertUnit`



  - `Meters2Inches` is still acceptable
  - `CalculateSinus` is good but `Sinus` is still acceptable
- Ensure that the unit of measure is obvious
  - Prefer `MeasureFontInPixels` to `MeasureFont`

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Single Purpose of All Methods

- Methods should have a single purpose!
  - Otherwise they cannot be named well
  - How to name a method that creates annual incomes report, downloads updates from internet and scans the system for viruses?
  - `CreateAnnualIncomesReportDownloadUpdatesAndScanForViruses` is a nice name, right?
- Methods that have multiple purposes (weak cohesion) are hard to be named
  - Need to be refactored instead of named

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Consistency in Methods Naming

- Use consistent naming in the entire project
  - `LoadFile`, `LoadImageFromFile`, `LoadSettings`, `LoadFont`, `LoadLibrary`, but not `ReadTextFile`
- Use consistently the opposites at the same level of abstraction:
  - `LoadLibrary` vs. `UnloadLibrary`, but not `FreeHandle`
  - `OpenFile` vs. `CloseFile`, but not `DeallocateResource`
  - `GetName` vs. `SetName`, but not `AssignName`

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The Length of Method Names

- How long could be the name of a method?
  - The name should be as long as required
  - Don't abbreviate
  - Your IDE has autocomplete

- Examples (C#):
  - `LoadCustomerSupportNotificationService`, `CreateMonthlyAndAnnualIncomesReport`
- Incorrect examples:
  - `LoadCustSuppSrvc`, `CreateMonthIncReport`

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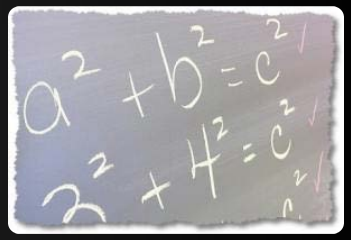
Naming Method Parameters

- Method parameters names
  - Preferred form: [Noun] or [Adjective] + [Noun]
  - Should be in `camelCase`
  - Should be meaningful
  - Unit of measure should be obvious



- Examples: `firstName`, `report`, `speedKmH`, `usersList`, `fontSizeInPixels`, `font`

- Incorrect examples: `p`, `p1`, `p2`, `populate`, `LastName`, `last_name`, `convertImage`

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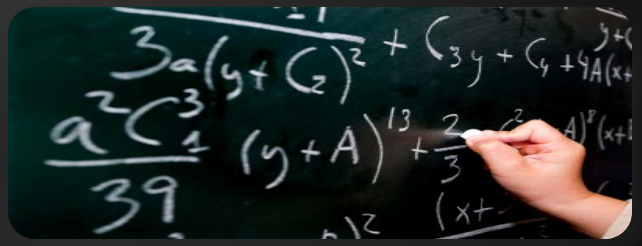
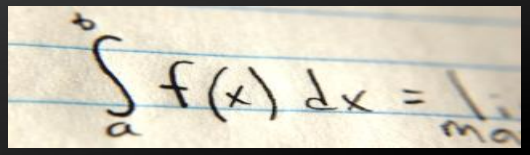
Naming Variables and Constants

Naming Variables



- Variable names
  - Should be in `camelCase`
  - Preferred form: [Noun] or [Adjective] + [Noun]
  - Should explain the purpose of the variable
    - If you can't find good name for a variable check if it has a single purpose
    - Exception: variables with very small scope, e.g. the index variable in a 3-lines long for-loop
  - Names should be consistent in the project

Naming Variables – Example



- Examples:
  - `firstName`, `report`, `config`, `usersList`, `fontSize`, `maxSpeed`, `font`, `startIndex`, `endIndex`, `charsCount`, `configSettingsXml`, `dbConnection`, `createUserSqlCommand`
- Incorrect examples:
  - `foo`, `bar`, `p`, `p1`, `p2`, `populate`, `LastName`, `last_name`, `LAST_NAME`, `convertImage`, `moveMargin`, `MAXSpeed`, `_firtName`, `__temp`, `firstNameMiddleNameAndLastName`

More about Naming Variables

- The name should address the problem we solve, not to the means used to solve it
  - Prefer nouns from the business domain to computer science terms
- Examples:
  - `accounts`, `customers`, `customerAddress`, `accountHolder`, `paymentPlan`, `vipPlayer`

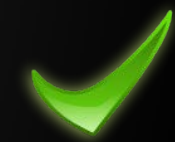
- Incorrect examples:
  - `paymentsPriorityQueue`, `playersArray`, `accountsLinkedList`, `customersHashtable`

Naming Boolean Variables

- Give to boolean variables names that imply `true` or `false`
- Use positive boolean variable names
  - Incorrect example:

```
if (! notFound) { … }
```

- Examples:
  - `hasPendingPayment`, `customerFound`, `validAddress`, `positiveBalance`, `isPrime`



- Incorrect examples:
  - `notFound`, `findCustomerById`, `player`, `programStop`, `run`, `list`, `isUnsuccessfull`

Naming Special Variables

- Naming counters
  - Establish a convention, e.g. [Noun] + 'Count'
  - Examples: `ticketsCount`, `customersCount`
- State
  - Establish a convention, e.g. [Noun] + 'State'
  - Examples: `blogParseState`, `threadState`
- Variables with small scope and span
  - E.g. loop counters
  - Short names can be used, e.g. `index`, `i`, `u`

Temporary Variables

- Do you really think temporary variables exist?
  - All variables in the program are temporary because are used temporary only during the program execution, right?
- Temporary variables can always be named better than `temp` or `tmp`:

```
// Swap a[i] and a[j]
int temp = a[i];
a[i] = a[j];
a[j] = temp;
```

```
// Swap a[i] and a[j]
int oldValue = a[i];
a[i] = a[j];
a[j] = oldValue;
```

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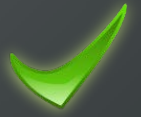
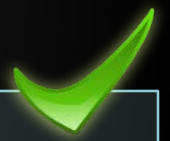
The Length of Variable Names

- How long could be the name of a variable?
  - Depends on the variable scope and live time
  - More "famous" variables should have longer and more descriptive name
- Acceptable naming examples:

```
for (int i=0; i<users.Length; i++)
  if (i % 2 == 0)
    sum += users[i].Weight;
```



```
class Student {
  public string lastName;
}
```



- Unacceptable naming examples:

```
class LinkedList {
  public int flag { get; set; }
}
```

```
class Student {
  private int i;
}
```

Naming Constants in C#

- Use CAPITAL_LETTERS for const fields and PascalCase for readonly fields

- Use meaningful names that describe their value
- Examples:

```
private const int READ_BUFFER_SIZE = 8192;
public static readonly PageSize DefaultPageSize = PageSize.A4;
private const int FONT_SIZE_IN_POINTS = 16;
```

- Incorrect examples:

```
public const int MAX = 512; // Max what? Apples or Oranges?
public const int BUF256 = 256; // What about BUF256 = 1024?
public const string GREATER = "&gt;"; // GREATER_HTML_ENTITY
public const int FONT_SIZE = 16; // 16pt or 16px?
public const PageSize PAGE = PageSize.A4; // Maybe PAGE_SIZE?
```

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Naming Constants in JavaScript, Java, PHP and C++

- Use CAPITAL_LETTERS for JavaScript / Java / PHP / C++ constants
- Use meaningful names
  - Constants should describe their value

- Examples:

```
public static final int READ_BUFFER_SIZE = 8192;
public static final PageSize DEFAULT_PAGE_SIZE = PageSize.A4;
public static final int FONT_SIZE_IN_POINTS = 16;
```

- Incorrect examples:

```
public static final int NAME = "BMW"; // What name? Car name?
public static final int BufSize = 256; // Use CAPITALS
public static final int font_size_pixels = 16; // CAPITALS
```

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Other Naming Guidelines

Names to Avoid

- Don't use numbers in the identifiers names
  - Example:
    - `PrintReport` and `PrintReport2`
    - What is the difference?
  - Exceptions:
    - When the number is part of the name itself, e.g. `RS232Port`, `COM3`, `Win32APIFunctions`
- Don't use Cyrillic or letters from other alphabet
  - `FindСтудентByName`, `DisplayΩ2Protein`

Never Give Misleading Name!

- Giving a misleading name is even worse than giving a totally unclear name
- Example:
  - Consider a method that calculates the sum of all elements in an array
  - Its should be named `Sum` or `CalculateSum`
  - What about naming it `CalculateAverage` or `Max` or `CheckForNegativeNumber`?
  - It's crazy, but be careful with "copy-paste"

What's Wrong with This Code?

```
FileStream fs = new FileStream(FILE_NAME, FileMode.CreateNew);
// Create the writer for data.
BinaryWriter w = new BinaryWriter(fs);
// Write data to Test.data.
for (int i = 0; i < 11; i++)
{
  w.Write( (int) i);
}
w.Close();
fs.Close();
// Create the reader for data.
fs = new FileStream(FILE_NAME, FileMode.Open, FileAccess.Read);
BinaryReader r = new BinaryReader(fs);
// Read data from Test.data.
for (int i = 0; i < 11; i++)
{
  Console.WriteLine(r.ReadInt32());
}
r.Close();
fs.Close();
```

Source: http://msdn.microsoft.com/en-us/library/36b93480.aspx

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Naming Identifiers

Questions?

http://academy.telerik.com

Homework

1. Refactor the following examples to produce code with well-named C# identifiers:

C#

```
class class_123
{
  const int max_count=6;
  class InClass_class_123
  {
    void Метод_нА_class_InClass_class_123(bool promenliva)
    {
      string promenlivaKatoString=promenliva.ToString();
      Console.WriteLine(promenlivaKatoString);
    }
  }
  public static void Метод_За_Вход()
  {
    class_123.InClass_class_123 инстанция =
      new class_123.InClass_class_123();
    инстанция.Метод_нА_class_InClass_class_123(true);
  }
}
```

Homework (2)

2. Refactor the following examples to produce code with well-named identifiers in C#:

C#

```
class Hauptklasse
{
  enum Пол { ултра_Батка, Яка_Мацка };

  class чуек
  {
    public Пол пол { get; set; }
    public string име_на_Чуека { get; set; }
    public int Възраст { get; set; }
  }

                        // continues at the next slide …
```

Homework (3)

```
  public void Make_Чуек(int магическия_НомерНаЕДИНЧОВЕК)
  {
    чуек new_Чуек = new чуек();
    new_Чуек.Възраст = магическия_НомерНаЕДИНЧОВЕК;
    if (магическия_НомерНаЕДИНЧОВЕК%2 == 0)
    {
      new_Чуек.име_на_Чуека = "Батката";
      new_Чуек.пол = Пол.ултра_Батка;
    }
    else
    {
      new_Чуек.име_на_Чуека = "Мацето";
      new_Чуек.пол = Пол.Яка_Мацка;
    }
  }
}
```

C#

Homework (4)

3. Refactor the following examples to produce code with well-named identifiers in JavaScript

```
function _ClickON_TheButton( THE_event, argumenti) {
  var moqProzorec= window;
  var brauzyra = moqProzorec.navigator.appCodeName;
  var ism=brauzyra=="Mozilla";
  if(ism)
  {
    alert("Yes");
  }
  else
  {
    alert("No");
  }
}
```

JavaScript

Homework (5)

4. Refactor and improve the naming in the C# source project "3. Naming-Identifiers-Homework.zip". You are allowed to make other improvements in the code as well (not only naming) as well as to fix bugs.

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