## 

# Worksheet Week 2

## Part 1: Methods

Create a new project.

Write static methods in the same project for each of the following.

For each exercise write code within the main() method to test it.

1. Write a method with the following signature:

static int SumOddNumbers (int num1, int num2)

That returns the sum of all odd numbers between the two integer arguments (inclusive) passed to it. For example:

SumOddNumbers(2,5) returns 8.

Write a few test cases for this method.

What unusual inputs do you need to account for?

What happens if one or both of your inputs is negative?

1. Write the method with the following signature:

static bool IsSortedAscending(int[] anArray)

which returns true if all the values in the array are sorted, with the smallest coming first otherwise returning false.

Write a number of test cases for this.

Are there any special cases you need to consider.

1. A website only allows users in the age bracket 18 to 21 inclusive to access its content. Write a method that accepts the age as an int argument and indicates whether it is possible to access the site. Your method shall return a boolean value. The signature of the method should be:

static bool IsValidAge (int age)

Write a set of test cases, how many do you think you need?

1. Write a method named AlltheNines that accepts an int array as an argument and stores the value 9 in each element.

How can you test this method? What is the difference between having an array as a parameter or having one of the other types.

1. Write a method named CountPasses that accepts an int array as an argument and returns a count of the number of elements with a value greater than or equal to 40.

The signature of the method should be:

static int CountPasses(int[] marks)

Write a few test cases for this method.

What “edge” cases do you need to test for?

1. Write a method called CountPases that accepts two arguments. The first is an integer array and the second is an integer. The method returns the number of elements with a value greater than or equal to the second argument.

static int CountPasses(int[] marks, int passValue)

Notice that we now have two methods in the same class with the same name. They can be distinguished from each other at compile time because their parameter lists are different. This is called **method overloading.**

Write a set of tests for the second CountPasses method.

1. Write a method that uses a **switch** statement to return the cost of a product, where the method receives a product code as a string argument.

The cost of each product is listed below:

|  |  |
| --- | --- |
| Product Description | Cost |
| “ABC” | 10.10 |
| “XYZ” | 69.34 |
| “FR45” | 34.0 |
| “S34”,”G65”,”F34” | These are all 5 |
| None of the above | Signal error with a cost of -999 |

The signature of the method should be:

static decimal GetProductCost(string productCode)

Note: A Switch is one way of doing this, there are other ways. If you have time explore some of the other ways and try and figure out the advantages or disadvantages these would have when compared to using a switch.

1. Write a method with the following signature:

static int SumOddNumbers (int num1, int num2)

That returns the sum of all odd numbers between the two integer arguments (inclusive) passed to it. For example:

SumOddNumbers(2,5) returns 8.

Write a few test cases for this method.

What unusual inputs do you need to account for?

What happens if one or both of your inputs is negative?

1. A tool rental shop charges €10.00 per day to rent a lawnmower for each of the first five days. The company charges €8.00 per day for each additional day. The minimum charge for any given rental period is €15.00. Write a method that accepts the numbers of days rental as a parameter and returns the rental charge.

Write a few test cases for this method.

What unusual inputs do you need to account for?

1. Write a method that returns the discount rate for a holiday based on the number of children going on the holiday. The discount rates are listed below. Your method will have one parameter, the number of children.

|  |  |
| --- | --- |
| Number of Children | Discount rate |
| 0 | 0% |
| 1-2 | 5% |
| 3-5 | 10% |
| 5+ | 15% |

1. Write a method that takes as input the balance in a bank savings account, an annual interest rate, and a number of years that the money will be on deposit. The method will calculate the total compound interest earned over the number of years and return the new balance. For example, €200 saved for 3 years at 5% will result in a new balance of €231.53.

static decimal CalculateCompoundBalance(decimal balance, decimal rate, int term)

Note: Decimal is the preferred type when dealing with money. It is more precise than the double type. You need to be careful when testing floating types.

https://learn.microsoft.com/en-us/dotnet/csharp/language-reference/builtin-types/floating-point-numeric-types

1. Write a method:

static string Encrypt(string str)

That returns the string str with each adjacent pair of characters swapped. For example:

Encrypt(“my secrets”) returns “yms ceerst”

(Hint: a string can be thought of as an array of characters

Hint: use a for loop to step through the characters in the string)

The length of the string is obviously important when you test this.

What lengths of string do you think you should test?

How many tests do you need.

Note: If you have time look up String immutability

1. Write a static method called IsLeapYear which takes a year as an integer and returns true if that year is a leap year and false if the year was not a leap year.

**Note:**

* A year before 1582 is a leap year if it is divisible by 4.
* A year after 1582 is a leap year if it is a century year and divisible by 400 or not a century year and divisible by 4.
* **Hint: A number x is divisble by 4 if (x % 4 == 0)**

Write a set of test cases for this.

How many do you need?

Note A **Pure Method** is one that doesn’t have any side effects (doesn’t change the state of the program or do output) and and given the same input will always return the same output.

These are the easiest methods to test.

All of the above methods are pure methods, except for one.

Which method is not pure?

What do you think the advantages of using a pure method are?

## Part 2:

These are full programs with user input and output. Create a separate project in your solution folder for each of these.

1. The distance a vehicle travels can be calculated as follows

*Distance = speed \* Time*

For example if a train travels 40 km per hour for three hours, the distance travelled is 120 km. Write a program that asks for the speed of a vehicle and the number of hours it has travelled. It should use a loop to display the distance a vehicle has travelled for each hour of a time period specified by the user. For example, if the vehicle is travelling at 40kmp for a three hour period, it should display a report like

**Hour Distance Travelled**

1 40

2 80

3 120

Input validation: Do not accept negative number for speed and do not accept any value less that 1 for time travelled.

1. A program is required to input data and calculate the average rainfall over a period of years. The program should firstly ask for the number of years. The outer loop will iterate once for each year. The inner loop will iterate 12 times, once for each month. Each iteration of the inner loop will ask the user for the cm of rainfall for that month. After all data has been input, the program should display the number of months, the total cm of rainfall, and the average rainfall per month for the entire period.
2. A program is required to input data and calculate the average rainfall over a period of years. The program should firstly ask for the number of years. The outer loop will iterate once for each year. The inner loop will iterate 12 times, once for each month. Each iteration of the inner loop will ask the user for the cm of rainfall for that month. After all data has been input, the program should display the number of months, the total cm of rainfall, and the average rainfall per month for the entire period.
3. Write a program that will predict the size of a populations of organisms. The programs should ask for the starting number of organisms, their average daily population increase as a percentage and the number of days they will multiply. For example a population might begin with two, have a daily increase of 50%, and will be allowed to multiply for 7 days. The program should use a loop to show the size of the population for each day.
4. Write a program that asks the user to enter today’s sales for five stores. The program should then display a bar chart comparing each stores sales. Create each bar char by display row of asterisks. Each asterisk represents €100 of sales.

For example:

Enter sales for store 1: 1000

Enter sales for store 2: 1200

Enter sales for store 3: 1800

Enter sales for store 4: 800

Enter sales for store 5: 1900

Sales Bar Chart

Store1 \*\*\*\*\*\*\*\*\*\*

Store2 \*\*\*\*\*\*\*\*\*\*\*\*

Store3 \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Store4 \*\*\*\*\*\*\*\*

Store5 \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

1. Write a program that takes user input describing playing cards in the following shorthand notation

|  |  |
| --- | --- |
| A | Ace |
| 2..10 | Card values |
| J | Jack |
| Q | Queen |
| K | King |
| D | Diamonds |
| H | Hearts |
| S | Spades |
| C | Clubs |

Your program should print the full description of the card. For example:

Enter the card notation : QS

Queen of spades

or

Enter the card notation : 5H

Five of Hearts

Hint : consider string x = “QS”; you can access each individual character of the string using x[index], where index is position of the character we are interested in. In this case x[0] is ‘Q’ and x[1] is ‘S’

What methods might be useful if you were coding a simple game to play against the computer?