# Exercises: Data Types and Methods

Problems for exercises and homework for the [“Programming Fundamentals” course @ SoftUni](https://softuni.bg/courses/programming-fundamentals).

## Centuries to Minutes

### Write program to enter an integer number of centuries and convert it to years, days, hours and minutes

### Examples

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |
| 1 | 1  100  36524  876576  52594560 |  | 5 | 5  500  182621  4382904  262974240 |

### Hints

* Use a different data type for every data conversion

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#0](https://judge.softuni.bg/Contests/Practice/Index/171%230)

## Circle Area (12 Digits Precision)

### Write program to enter a radius r (real number) and prints the area of the circle with exactly 12 digits after the decimal point.

### Examples

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |
| 2.5 | 19.634954084936 |  | 1.2 | 4.523893421169 |

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#2](https://judge.softuni.bg/Contests/Practice/Index/171%232)

## Exact Sum of Real Numbers

Write program to enter n numbers and print their exact sum:

### Examples

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |
| 2  1000000000000000000  5 | 1000000000000000005 |  | 2  0.00000000003  333333333333.3 | 333333333333.30000000003 |

Check your solution [here: https://judge.softuni.bg/Contests/Practice/Index/171#3](here:%20https://judge.softuni.bg/Contests/Practice/Index/171%233)

## Elevator

Calculate how many courses will be needed to **elevate n persons** by using an elevator of **capacity of p persons.** On the **first line** you receive **number of people n** and on the **second line** – **capacity p** of the elevator.

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 16  3 | 6 |

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#4](https://judge.softuni.bg/Contests/Practice/Index/171%234)

## Special Numbers

A **number** is special when its **sum of digits is 5, 7 or 11**

For all numbers **1…n** print the number and if it is special

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 20 | **1 -> False**  **2 -> False**  **3 -> False**  **4 -> False**  **5 -> True**  **6 -> False**  **7 -> True**  **8 -> False**  **9 -> False**  **10 -> False**  **11 -> False**  **12 -> False**  **13 -> False**  **14 -> True**  **15 -> False**  **16 -> True**  **17 -> False**  **18 -> False**  **19 -> False**  **20 -> False** |

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#5](https://judge.softuni.bg/Contests/Practice/Index/171%235)

## Triples of Letters

Write a program to read an integer **n** and print all **triples** of the first **n small Latin letters**, ordered alphabetically:

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 3 | **aaa**  **aab**  **aac**  **aba**  **abb**  **abc**  **aca**  **acb**  **acc**  **baa**  **bab**  **bac**  **bba**  **bbb**  **bbc**  **bca**  **bcb**  **bcc**  **caa**  **cab**  **cac**  **cba**  **cbb**  **cbc**  **cca**  **ccb**  **ccc** |

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#6](https://judge.softuni.bg/Contests/Practice/Index/171%236)

## Greeting

Write a program that enters first name, last name and prints "**Hello, <first name> <last name>. You are <age> years old.**"

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| Svetlin Nakov 25 | Hello, Svetlin Nakov. You are 25 years old. |

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#7](https://judge.softuni.bg/Contests/Practice/Index/171%237)

## Day Of Week

Print the day name (in English) by day number (1...7)

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 1 | Monday |
| 5 | Friday |

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#8](https://judge.softuni.bg/Contests/Practice/Index/171%238)

## Animal type

### Write a program to print animal type by its name: dog -> mammal; crocodile, tortoise, snake -> reptile; others -> unknown

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| dog | mammal |
| snake | reptile |
| cat | unknown |

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#9](https://judge.softuni.bg/Contests/Practice/Index/171%239)

## Filled Square

Draw at the console a **filled square** of size **n** like in the example:

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| 4 | **--------**  **-\/\/\/-**  **-\/\/\/-**  **--------** |

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#10](https://judge.softuni.bg/Contests/Practice/Index/171%2310)

## Practice Integer Numbers

Create a new C# project and create a program that **assigns integer values** to **variables**. Be sure that each **value** is stored in the **correct variable type** (try to find the most suitable variable type in order to save memory). Finally you need to **print** all variables to the console.

|  |  |
| --- | --- |
| **Input** | **Output** |
| -100  128  -3540  64876  2147483648  -1141583228  -1223372036854775808 | -100  128  -3540  64876  2147483648  -1141583228  -1223372036854775808 |

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#11](https://judge.softuni.bg/Contests/Practice/Index/171%2311)

## Practice Floating Point Numbers

Create a new C# project and create a program that **assigns floating point values** to **variables**. Be sure that each **value** is stored in the **correct variable type** (try to find the most suitable variable type in order to save memory). Finally you need to **print** all variables to the console.

|  |  |
| --- | --- |
| **Input** | **Output** |
| **3.141592653589793238**  1.60217657  7.8184261974584555216535342341 | **3.141592653589793238**  1.60217657  7.8184261974584555216535342341 |

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#12](https://judge.softuni.bg/Contests/Practice/Index/171%2312)

## Practice Characters and Strings

Create a new C# project and create a program that **assigns character and string values** to **variables**. Be sure that each **value** is stored in the **correct variable**.

|  |  |
| --- | --- |
| **Input** | **Output** |
| **Software University**  **B**  **y**  **e**  **I love programming** | **Software University**  **B**  **y**  **e**  **I love programming** |

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#13](https://judge.softuni.bg/Contests/Practice/Index/171%2313)

## Variable in Hexadecimal Format

Write a program that receives a number in hexadecimal format (0x##) convert it to decimal format and print it. Use [Convert.ToInt32()](https://msdn.microsoft.com/en-us/library/1k20k614(v=vs.110).aspx).

|  |  |
| --- | --- |
| **Input** | **Output** |
| **0xFE** | **254** |
| **0x37** | **55** |
| **0x10** | **16** |

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#14](https://judge.softuni.bg/Contests/Practice/Index/171%2314)

## Boolean Variable

Write a program that receives string, converts it to Boolean variable and prints it on the console.

Use [Convert.ToBoolean()](https://msdn.microsoft.com/en-us/library/86hw82a3(v=vs.110).aspx).

|  |  |
| --- | --- |
| **Input** | **Output** |
| **True** | **True** |
| **False** | **False** |

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#15](https://judge.softuni.bg/Contests/Practice/Index/171%2315)

## Strings and Objects

Declare two **string variables** and assign them with “Hello” and “World”. Declare an **object variable** and assign it with the **concatenation** of the first two variables (mind adding an interval between). Declare a third **string** variable and initialize it with the value of the object variable (you should perform type **casting**).

|  |  |
| --- | --- |
| **Input** | **Output** |
| **Hello**  **World** | **Hello World** |

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#16](https://judge.softuni.bg/Contests/Practice/Index/171%2316)

## Exchange Variable Values

Declare two integer variables a and b and assign them with 5 and 10 and after that exchange their values by using some programming logic. Print the variable values before and after the exchange.

|  |  |
| --- | --- |
| **Input** | **Output** |
| 5  10 | Before:  a = 5  b = 10  After:  a = 10  b = 5 |

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#17](https://judge.softuni.bg/Contests/Practice/Index/171%2317)

## Employee Data

A marketing company wants to keep record of its employees. Each record would have the following characteristics:

* First name
* Last name
* Age (0...100)
* Gender (m or f)
* Personal ID number (e.g. 8306112507)
* Unique employee number (27560000…27569999)

Declare the variables needed to keep the information for a single employee using appropriate primitive data types. Use descriptive names. **Print** the data at the console.

|  |  |
| --- | --- |
| **Input** | **Output** |
| Amanda  Jonson  27  f  8306112507  27563571 | First name: Amanda  Last name: Jonson  Age: 27  Gender: f  Personal ID: 8306112507  Unique Employee number: 27563571 |

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#18](https://judge.softuni.bg/Contests/Practice/Index/171%2318)

## Reverse Chars

### Write a program to ask the user for 3 letters and print them in reversed order.

### Examples

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |  | **Input** | **Output** |
| A  B  C | CBA |  | x  Y  z | zYx |  | G  g  n | ngG |

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#19](https://judge.softuni.bg/Contests/Practice/Index/171%2319)

## Centuries to Nanoseconds

Write program to enter an integer number of centuries and convert it to years, days, hours, minutes, seconds, milliseconds, microseconds, nanoseconds

### Examples

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |
| 1 | 1  100  36524  876576  52594560  3155673600  3155673600000  3155673600000000  3155673600000000000 |  | 5 | 5  500  182621  4382904  262974240  15778454400  15778454400000  15778454400000000  15778454400000000000 |

### Hints

* Use a different data type for every data conversion

Check your solution here: [https://](https://judge.softuni.bg/Contests/Practice/Index/172)[judge.softuni.bg/Contests/Practice/Index/171#1](https://judge.softuni.bg/Contests/Practice/Index/171#1)

## Convert Speed Units

### Create a program to ask the user for a distance (in meters) and the time taken (as three numbers: hours, minutes, seconds), and display the speed, in meters per second, kilometers per hour and miles per hour.

### Assume 1 mile = 1609 meters

### Input

* On first line you receive – **distance in meters**
* On second – **hours**
* On third – **minutes**
* On fourth – **seconds**

### Output

Every number in the output should be precise up to 6 digits after the floating point

* On first line – speed in **meters per second** (m/s)
* On second line – speed in **kilometers per hour** (km/h)
* On third line – speed in **miles per hour** (mph)

### Examples

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |  | **Input** | **Output** |
| 1000  1  1  0 | 0.2732241  0.9836066  0.6113155 |  | 10000  0  20  30 | 8.130081  29.26829  18.19036 |  | 200000  2  5  0 | 26.66667  96  59.66439 |

### Hints

* Search in internet how to convert units
* Float is big enough for the calculations

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#20](https://judge.softuni.bg/Contests/Practice/Index/171%2320)

## Rectangle Properties

### Create a program to calculate rectangle’s perimeter, area and diagonal by given its width and height.

### Examples

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |
| 10  5 | 30  50  11.1803398874989 |  | 22.1  10.2 | 64.6  225.42  24.3402958075698 |

### Hints

* Use **Math.Sqrt()** to calculate square root

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#21](https://judge.softuni.bg/Contests/Practice/Index/171%2321)

## Vowel or Digit

### Create a program to check if given symbol is letter, vowel or any other symbol

### Examples

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |  | **Input** | **Output** |
| a | vowel |  | 9 | digit |  | g | It’s another symbol |

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#22](https://judge.softuni.bg/Contests/Practice/Index/171%2322)

## Integer to Hex and Binary

### Create a program to convert a decimal number to hexadecimal and binary number and print it

### Examples

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |  | **Input** | **Output** |
| 10 | A  1010 |  | 420 | 1A4  110100100 |  | 256 | 100  100000000 |

### Hints

* Use [**Convert.ToString(number, base)**](https://msdn.microsoft.com/en-us/library/14kwkz77(v=vs.110).aspx)and ToUpper()

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#23](https://judge.softuni.bg/Contests/Practice/Index/171%2323)

## \*Comparing Floats

Write a program that **safely compares floating-point numbers** (double) with precision eps = 0.000001. Note that we cannot directly compare two floating-point numbers a and b by a==b because of the nature of the floating-point arithmetic. Therefore, we assume two numbers are equal if they are more closely to each other than a fixed constant eps. Examples:

|  |  |  |  |
| --- | --- | --- | --- |
| **Number a** | **Number b** | **Equal (with precision eps=0.000001)** | **Explanation** |
| 5.3 | 6.01 | false | The difference of 0.71 is too big (> eps) |
| 5.00000001 | 5.00000003 | true | The difference 0.00000002 < eps |
| 5.00000005 | 5.00000001 | true | The difference 0.00000004 < eps |
| -0.0000007 | 0.00000007 | true | The difference 0.00000077 < eps |
| -4.999999 | -4.999998 | false | Border case. The difference 0.000001 == eps. We consider the numbers are different. |
| 4.999999 | 4.999998 | false | Border case. The difference 0.000001 == eps. We consider the numbers are different. |

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#24](https://judge.softuni.bg/Contests/Practice/Index/171%2324)

## Print Part Of ASCII Table

Find online more information about [ASCII](http://www.ascii-code.com/) (American Standard Code for Information Interchange) and write a program to **prints part of the ASCII table** of characters at the console. On the first line of input you will receive **the char index you should start with** and on the **second line - the index of the last character** you should print.

|  |  |
| --- | --- |
| **Input** | **Output** |
| 60  65 | < = > ? @ A |
| 69  79 | E F G H I J K L M N O |
| 97  104 | a b c d e f g h |
| 40  55 | ( ) \* + , - . / 0 1 2 3 4 5 6 7 |

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#25](https://judge.softuni.bg/Contests/Practice/Index/171%2325)

## \*Different Integers Size

### Given an input integer, you must determine which primitive data types are capable of properly storing that input.

### Input

* You receive **N** – integer which can be arbitrarily large or small

### Output

You must determine if the given primitives are capable of storing it. If yes, then print:

**{N} can be fitted in:**

**\* dataType**

If there is more than one appropriate data type, print each one on its own line and order them by size  
**(sbyte < byte < short < ushort < int < uint < long)**

If the number cannot be stored in one of the four aforementioned primitives, print the line:

**{N}** **can't be fitted anywhere**

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| -150 | -150 can be fitted in:  \* short  \* int  \* long |
| **Input** | **Output** |
| 150000 | 150000 can be fitted in:  \* int  \* uint  \* long |
| **Input** | **Output** |
| 1500000000 | 1500000000 can be fitted in:  \* int  \* uint  \* long |
| **Input** | **Output** |
| 213333333333333333333333333333333333 | 213333333333333333333333333333333333 can't be fitted anywhere |

### Hints

* Use **try..catch** construction

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#26](https://judge.softuni.bg/Contests/Practice/Index/171%2326)

## Hello, name!

Write a method that receives a name as parameter and prints on the console. “Hello, <name>!”

### Examples

|  |  |
| --- | --- |
| **Input** | **Output** |
| Peter | Hello, Peter! |

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#27](https://judge.softuni.bg/Contests/Practice/Index/171%2327)

## Max Method

### Create a method GetMax() with two integer (int) parameters, that returns maximal of the two numbers. Write a program that reads three numbers from the console and prints the biggest of them. Use the GetMax() method you just created.

### Examples

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |
| 1  2  3 | 3 |  | -100  -101  -102 | -100 |

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#28](https://judge.softuni.bg/Contests/Practice/Index/171%2328)

## English Name Of The Last Digit

### Write a method that returns the English name of the last digit of a given number.

### Examples

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |
| 1024 | four |  | 512 | two |

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#29](https://judge.softuni.bg/Contests/Practice/Index/171%2329)

## Numbers In Reversed Order

### Write a method that prints the digits of a given decimal number in a reversed order.

### Examples

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |
| 256 | 652 |  | 1.12 | 21.1 |

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#30](https://judge.softuni.bg/Contests/Practice/Index/171%2330)

1. **Fibonacci Numbers**

Define a method **Fib(n)** that calculates the nth [Fibonacci number](https://en.wikipedia.org/wiki/Fibonacci_number). Examples:

|  |  |
| --- | --- |
| **n** | **Fib(n)** |
| 0 | 1 |
| 1 | 1 |
| 2 | 2 |
| 3 | 3 |
| 4 | 5 |
| 5 | 8 |
| 6 | 13 |
| 11 | 144 |
| 25 | 121393 |

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#31](https://judge.softuni.bg/Contests/Practice/Index/171%2331)

1. **Prime Checker**

Write a Boolean method **IsPrime(n)** that check whether a given integer number **n** is [prime](https://en.wikipedia.org/wiki/Prime_number). Examples:

|  |  |
| --- | --- |
| **n** | **IsPrime(n)** |
| 0 | false |
| 1 | false |
| 2 | true |
| 3 | true |
| 4 | false |
| 5 | true |
| 323 | false |
| 337 | true |
| 6737626471 | true |
| 117342557809 | false |

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#32](https://judge.softuni.bg/Contests/Practice/Index/171%2332)

1. **Primes in Given Range**

Write a method that calculates **all prime numbers in given range** and returns them as list of integers:

|  |
| --- |
| static List<int> FindPrimesInRange(startNum, endNum)  {  …  } |

Write a method to **print a list of integers**. Write a program that enters two integer numbers (each at a separate line) and prints all primes in their range, separated by a comma.

Examples:

|  |  |
| --- | --- |
| **Start number End number** | **Output** |
| 0  10 | 2, 3, 5, 7 |
| 5  11 | 5, 7, 11 |
| 100  200 | 101, 103, 107, 109, 113, 127, 131, 137, 139, 149, 151, 157, 163, 167, 173, 179, 181, 191, 193, 197, 199 |
| 250  950 | 251, 257, 263, 269, 271, 277, 281, 283, 293, 307, 311, 313, 317, 331, 337, 347, 349, 353, 359, 367, 373, 379, 383, 389, 397, 401, 409, 419, 421, 431, 433, 439, 443, 449, 457, 461, 463, 467, 479, 487, 491, 499, 503, 509, 521, 523, 541, 547, 557, 563, 569, 571, 577, 587, 593, 599, 601, 607, 613, 617, 619, 631, 641, 643, 647, 653, 659, 661, 673, 677, 683, 691, 701, 709, 719, 727, 733, 739, 743, 751, 757, 761, 769, 773, 787, 797, 809, 811, 821, 823, 827, 829, 839, 853, 857, 859, 863, 877, 881, 883, 887, 907, 911, 919, 929, 937, 941, 947 |
| 100  50 | *(empty list)* |
| Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#33](https://judge.softuni.bg/Contests/Practice/Index/171%2333) | |

## Master Numbers

### A master number is an integer that holds the following properties:

### Is symmetric (palindrome), e.g. 5, 77, 282, 14341, 9553559

### Its sum of digits is divisible by 7, e.g. 77, 313, 464, 5225, 37173

### Holds at least one even digit, e.g. 232, 707, 6886, 87578

### Write a program to print all master numbers in the range [1…n]

### Examples

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |
| 600 | 232  383  464  545 |  | 5000 | 232  383  464  545  626  696  707  858  1661  2552  3443  4334 |

### Hints

1. Write 3 help methods – **IsPalindrome(int num)**, **SumOfDigits(int num)**, **ContainsEvenDigit(int num)**
2. Loop through all numbers in range [1..n] and check every number with the helper methods.

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#34](https://judge.softuni.bg/Contests/Practice/Index/171%2334)

## \*Factorial

### Write a program that calculates and prints the n! for any n in the range [1…100].

### Examples

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |
| 5 | 120 |  | 100 | 93326215443944152681699238856266700490715968264381621468592963895217599993229915608941463976156518286253697920827223758251185210916864000000000000000000000000 |

### Hints

* Use **BigInteger** from System.Numerics

Check your solution here: [https://judge.softuni.bg/Contests/Practice/Index/171#35](https://judge.softuni.bg/Contests/Practice/Index/171%2335)