Exercises Prestudies Week 1 - FI

Input & Output

1. Text input and output

Write a program, which reads text input by the user, e.g. a name, and prints it back.

```
Please enter your name: NAME
Hello NAME, Welcome to the training!
```

Hint: Use the class `Scanner` to read input.

2. Formatting text output

Choose a simple Ascii art from the website https://www.asciiart.eu/. Print it on the console.
Your output could look like this:

```
       ______
      //  ||\ \
 _____//___||_\ \___
 )  _          _    \
 |_/ \_______/ \___|
___\_/_______\_/_____
```

Hint: Work with `System.out.println`. Also think about escaping certain symbols, like the backslash `\`.

3. Geometry

For two input values `a` and `b` calculate a few geometric results

- Area and perimeter of a rectangle
- Area and perimeter of a right triangle

Hints:

- Look for the formulas on Wikipedia.
- There is the class `Math`, which implements the square root function `Math.sqrt()`.

Datatypes & Variables

1. Data types

Declare variables with the smallest possible data type for the following statements and assign values.

1. Your initials
2. Population in Germany
3. Population on earth
4. Is currently daytime?
5. Goal strike quote (goals per game) of Mario Gomez at Bayern München
6. Length of the java program in weeks
7. The mathematical number PI

Concatenate the values with a descriptive string and print the lines on the console.

2. Formatting Text (bonus exercise)

Write a Java program, which reads an input string and formats it according to the following rules.

- A word starting preceded and followed by `_` will be displayed in all uppercase letters. (e.g. `_Academy_`).
- A word wrapped in `#` will be displayed in all lowercase letters. (e.g. `#Academy#`).
- Words without formatting symbols remain unchanged.
- The formatting symbols are not printed.

Example:

`"Everybody _said_, it can't be done. Then came one who did not #KNOW# that and just made it."`
will be converted to:
`"Everybody SAID, it can't be done. Then came one who did not know that and just made it."`

Operators

1. Time units 🗓️

Write a program, which divides a number of seconds (input) into its larger units.

```
Enter number of seconds: 244568879

7 years and 275 days and 15 hours and 47 minutes and 59 seconds
```

Hint: Ignore leap years and daylight-saving time, meaning you calculate with 365 days per year and 24 hours per day. Use the modulo operator.

2. Cylinder 🥫

Imagine, you need to calculate the amount of sheet metal to produce food cans.
A user will enter the circumference `c` and the height `h` of the cans.
Calculate the area of the geometrical cylinder.

- Diameter d of the lid: d = c / pi, where pi = 3,14
- Area of the lid: al = pi *(d / 2)* (d / 2)
- Area of the casing: ac = c * h
- Total required sheet area: at = 2 * al + ac

What is the volume of the can?

```
Circumference: 32
Height: 10

Sheet metal area: 482.97946840681203
Volume: 814.8973420340601
```

3. One line of code

Write the following code in a single line. The result must stay the same.

```
double x = 15.5;
double a = Math.sqrt(3.5 + x);
double b = a * 5;
double c = b / 3;
double d = x + 10;
double e = x - 4.1;
double f = d * e;
double g = c - f;

System.out.println(g);
```

Hint: You will need brackets.

4. Metropolis (Bonus exercise) 🏭

Write a program that checks whether a city is a metropolis. The following are the characteristics of a metropolis:

- Name: `String name`
- Capital Yes or No: `boolean isCapital`
- Population: `int population`
- Tax income per inhabitant: `double taxPerPerson`

Rule: A city is a metropolis if it is a capital and also has more than 100.000 inhabitants.
Or if it has more than 200-000 inhabitants and an annual tax income of at least 1.000.000.000 euros.

Hint: Be precise about “more than” and “at least”.

Examples:

```
Name of the city: München
Is München a capital ('true' or 'false')?
true
What is the population of München?
1200000
Tax income per inhabitant 1000

München is a metropolis, because it is a capital with a population of 1200000
```

```
Name of the city: Bielefeld
Is Bielefeld a capitol ('true' or 'false')?
false
What is the population of Bielefeld?
210000
Tax income per inhabitant 3000
Bielefeld is no metropolis.
```

Loops ➰

1. Guessing numbers 😕

Create a random number from 1 to 100, which the user must guess.
For every number entered, the program outputs whether the number is less than, greater or equal to the random number.
This way the user approaches the result step by step.
Hint: Random numbers can be created in various ways - e.g. `Math.random()`

2. Triangles

Draw a triangle multiple times, using a size which can be specified by the user.

```
How large should the triangles be? 4
How many triangles would you like? 2

*
**
***
****

*
**
***
****
```

3. Christmas tree (Bonus exercise) 🎄

This exercise has an increased difficulty.

"Christmas always comes so sudden". Draw already today a Christmas tree with a height of 5 lines plus one line for the trunk.

```
    *
   ***
  *****
 *******
*********
    I
```

Use a loop to draw the tree!
Bonus extension: Let the user decide, how high the tree should be.