Exercises 2

Mathematical functions, random numbers, problem solving

1.

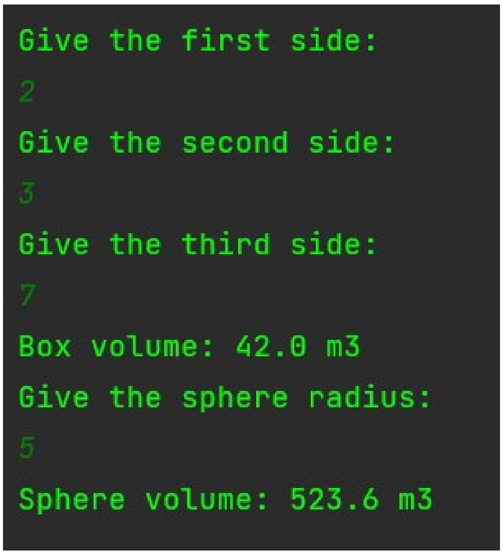
a) Create an application that asks the user the lengths of the three sides of a box in decimal format (float). Calculate the volume of the box, and print the result. (volume V = a * b * c)

b) Continue the application and ask the user the radius of a sphere, and calculate the volume of the sphere (V). Ask the radius in decimal format.

Use this formula in your application: $V = \frac{4}{3} \cdot \pi \cdot r^3$. Round the result into two decimals.

Note! Check if your application calculates the sphere volume correctly. For example, with the radius of 1.0, the volume should be 4.19.

Example of the application running:

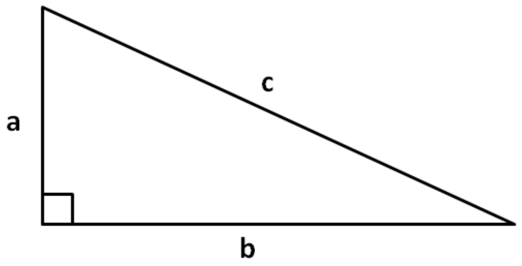


```
Give the first side:
2
Give the second side:
3
Give the third side:
7
Box volume: 42.0 m3
Give the sphere radius:
5
Sphere volume: 523.6 m3
```

Filename of the exercise = ***exercise2_1.py***

Typical code amount ***: 12-18 lines*** *(empty lines/comments not included)*

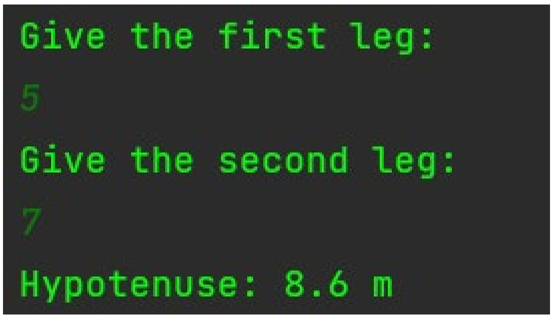
2. Create an application that asks the user the sides (or legs, as they are called in mathematics) of a right triangle (a and b), and calculates the length of the hypotenuse (c), based on them. **Round the result into two decimals.**



Note: Pythagorean theorem: $a^2 + b^2 = c^2$,
which means the hypotenuse $\boldsymbol{c} = \sqrt{\boldsymbol{a^2 + b^2}}$

Ask the values of **a** and **b** from the user with input()!

Example of the application running:



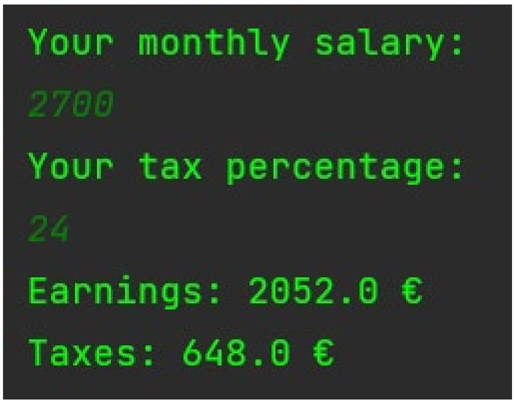
```
Give the first leg:
5
Give the second leg:
7
Hypotenuse: 8.6 m
```

Filename of the exercise = ***exercise2_2.py***

Typical code amount ***: 6-10 lines*** *(empty lines/comments not included)*

3. Create an application that asks the user their monthly salary and their tax percentage. Calculate the amount of money the user can have for themselves, and the amount of money that goes to taxes. **Round the end result into two decimals**. Finally, print the results.

Example of the application running:



```
Your monthly salary:
2700
Your tax percentage:
24
Earnings: 2052.0 €
Taxes: 648.0 €
```

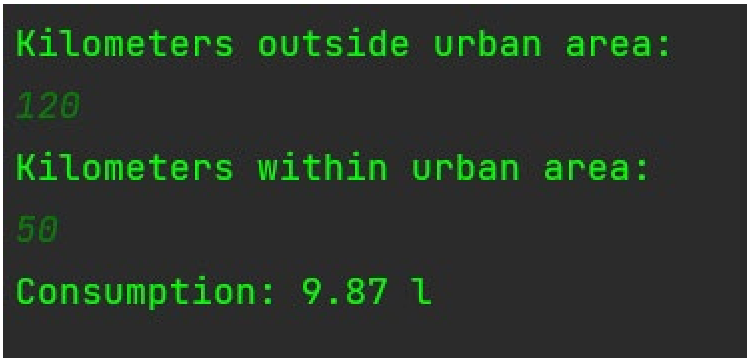
Filename of the exercise = ***exercise2_3.py***

Typical code amount ***: 8-12 lines*** *(empty lines/comments not included)*

4. Create an application that calculates the actual fuel consumption with a given road trip. Ask the user for driven kilometers outside urban area, and the kilometers driven in an urban area.

In this application, your vehicle's fuel consumption is **5.1 liters per 100 km outside urban area** and **7.5 liters per 100 km within an urban area**.

Example of the application running:



```
Kilometers outside urban area:
120
Kilometers within urban area:
50
Consumption: 9.87 l
```

In the example above, the outside urban consumption would be 6.12 l, and inside urban consmpution would be 3.75 l, the total thus being: 9.87 l.

Filename of the exercise = ***exercise2_4.py***

Typical code amount ***: 7-12 lines*** *(empty lines/comments not included)*

5. Using random numbers

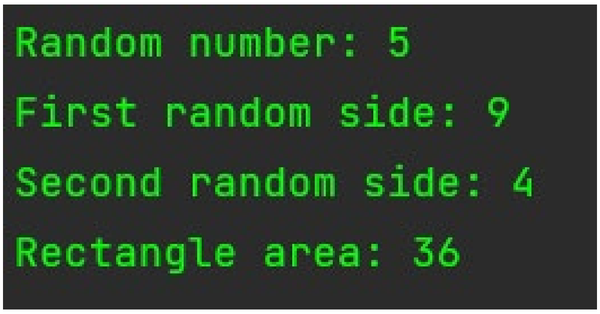
a) Generate a random value between 1 and 10 by using Python, and print it.

b) Print the area of a rectangle (a * b), where the lengths of the sides have been randomly generated from values between 2 and 10. Print the lengths of the sides as well as the area. Print everything into separate lines.

Note! Don't use input() at all in this exercise!

Remember to check out on how to use random-module from the materials!

Example of the application running:



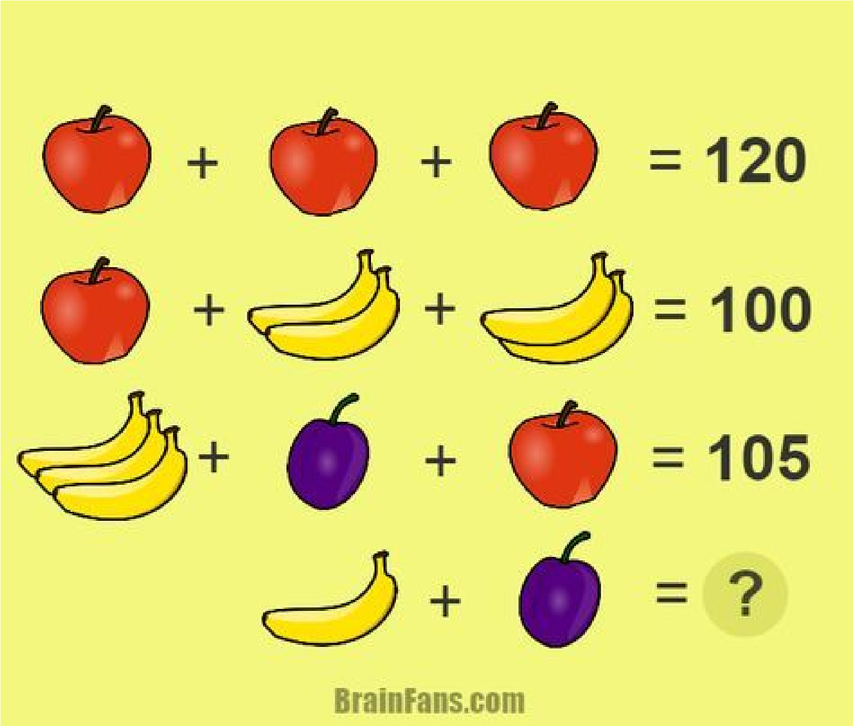
```
Random number: 5
First random side: 9
Second random side: 4
Rectangle area: 36
```

Filename of the exercise = ***exercise2_5.py***

Typical code amount ***: 8-12 lines*** *(empty lines/comments not included)*

ADVANCED EXERCISES!

6. Straight out the social media! Let's use Python to solve a visual equation. Let's take a look at this example first:

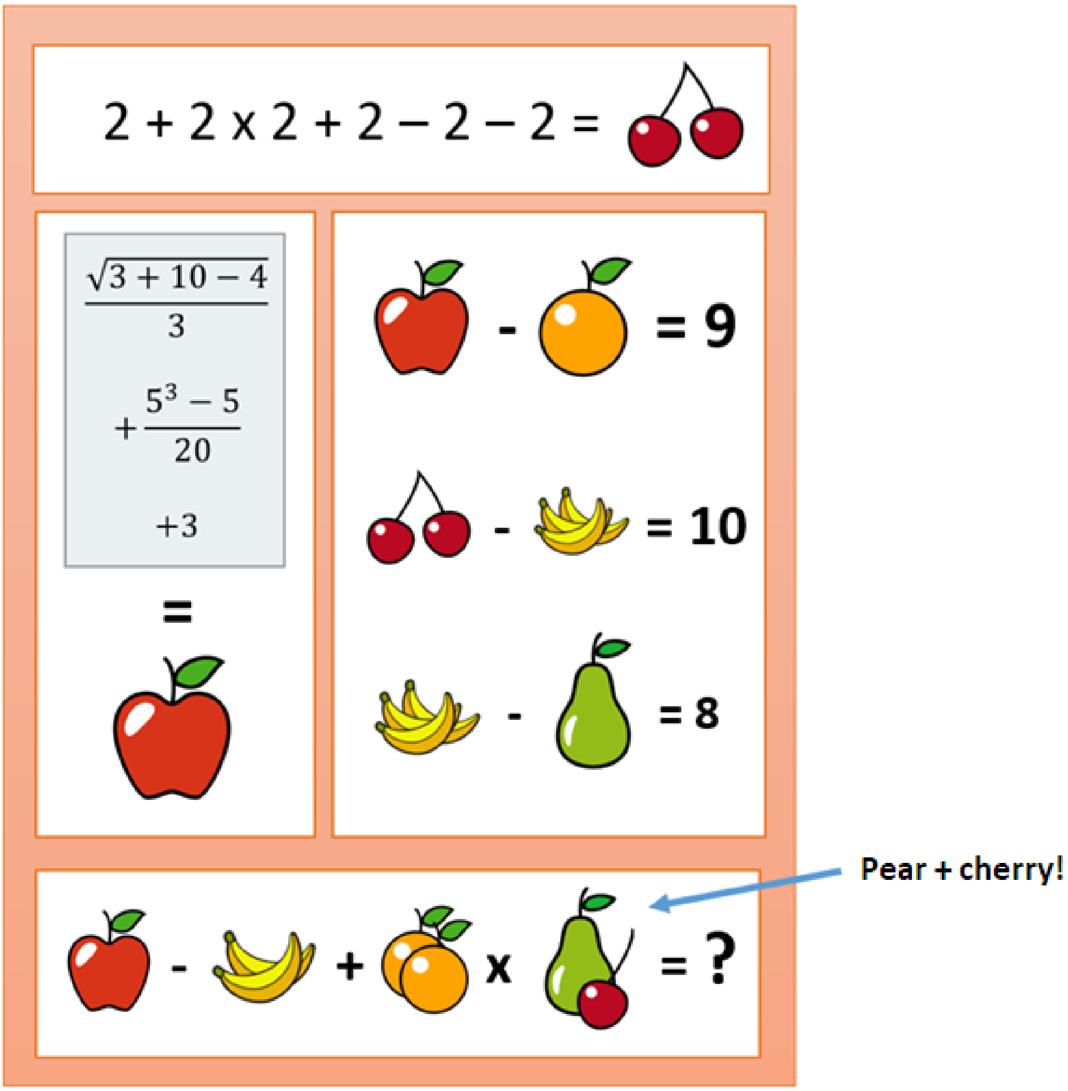


Source: https://www.pinterest.com/pin/736338607795513051/

We could solve this "puzzle" by using Python like this:

```
# 1st row -> there's 3 apples in the picture, therefore:
apple = 120 / 3

# 2nd row -> 4 bananas = 100 - apple
# which means 1 banana = (100 - apple) / 4
# with parentheses we can guarantee the correct division
banana = (100 - apple) / 4

# 3rd row -> plum = 105 - apple - 3 bananas
plum = 105 - apple - (banana * 3)

# 4th row, the solution -> banana + plum
result = banana + plum
result = int(result)

# answer in this case = 35
print(f"Result = {result}")
```

Use the same approach to solve this visual puzzle:



Note: Use variables and calculations. In this exercise, it is more important to have a correct way of solving than the exactly correct answer. Don't calculate the phases in your own head, let Python do the calculations for you instead!

Filename of the exercise = ***exercise2_6.py***

Typical code amount ***: 6-10 lines*** *(empty lines/comments not included)*

7. Create an application that solves a quadratic equation. Ask the user for the variable values (a, b and c), do the calculations, and print the result (= different value(s) of x)

The quadratic equation:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

Note: Solving a quadratic equation can provide three different kinds of answers. You can get two values for the x, only one value for the x, or the x might not have any real value.

At this point you can only care about situations, where x provides two different values.

You can find more information about the quadratic equation from the internet!

Extra task: Later, when we go through conditional statements, you can improve this exercise by taking into account the other possibilities as well (only one value, or no value at all). We are going to cover conditional statements right after the basics.

After learning conditionals, return a new version of this exercise that can take care of all of the three situations: two values for x, one value for x and no real values. Return the new version to codePost afterwards!

Filename of the exercise = ***exercise2_7.py***

Typical code amount ***: 12-24 lines*** *(empty lines/comments not included)*