The deadline for this exercise sheet is **Monday, 16.04.2018, 8:00.**

1 Variable Types

Assume you're enrolled in a Psychology class. Your final grade is dependent on your performance in homework, a midterm exam and an experiment as a final project.
Note: Save your answers for this task in a simple text file.

1.1

You just wrote the midterm and after correcting, your professor thinks it might be handy to have the exam results for each student digitally accessible. Which variable types would you use for variables to save the following things in? Explain your answers.

1. the student's name
   Solution: string, since we need to represent a bunch of characters
2. the student's matriculation number
   Solution: int or string, both work. If the system is like the UOS one, int is just fine.
3. the student's exam grade
   Solution: float, university grades are (often) floats
4. if the student passed the exam or not
   Solution: boolean, there are only two options.

1.2

Fast foward some time, you need to conduct the experiment. In the experiment you present subjects with a short stimulus and measure their score based on reaction. Which variable types would you use for the following variables in your experiment?

1. subject id
   Solution: int, subjects are usually anonymised and represented by a number
2. subject age
   Solution: int, for children we can go by month, for adults months are usually not relevant
3. subject sex
   Solution: boolean, sex is not gender and since we need to have a representative sample outliers are in most cases excluded

4. stimulus onset in ms
   Solution: float or int, depending on the accuracy needed
5. reaction time in ms
   Solution: float or int, depending on the accuracy needed
6. subject test group (A, B, or C)
   Solution: string or int, You can correlate a,b,c with 0,1,2. Both work
7. subject scores
   Solution: int or float, depending on calculation of score
8. subject overall score
   Solution: float, often an average or other statistical measure, which are mostly non integers

2 Some Math

In this task, you will have to write two small Python programs. Please save each of them in a separate file.

2.1 Finishing up on that experiment

Finishing up your experiment you need to calculate an overall performance. Each subject in the end has 4 scores, and you calculate their overall performance with the following formula

$$\frac{4 * Score1 + Score2 + 0.5 * Score3 + \sqrt{Score4}}{2\pi}$$

Note: Totally arbitrary forumla with probably no real world use.
You can approximate π with 3.14 or you can use the following to get pi in python:

```
1 import math
2
3
4 print(math.pi)
```

Write a function that calculates and returns the overall performance of a subject when you pass it the five scores. **Solution:**

```
1 import math
2
3
4 def overall_score(score1, score2, score3, score4, score5):
5     # instead of `**0.5` `math.sqrt` could be used
6     # saving the result in a variable to avoid overly lenghty code
7     return 4*score1 + score2 + 0.5*score3 + score4**0.5 / (2*math.pi)
```

2.2 The Prof's turn

After you completed your Psychology class, your professor now wants to determine your final grade. It is composed of your homework grade by 20%, your midterm grade by 30% and your final project grade by 50%.
Write a Python script which will calculate the final grade out of those three grades and print the result. Try to use suitable names for your variables and test your program with a few different values.

Solution:

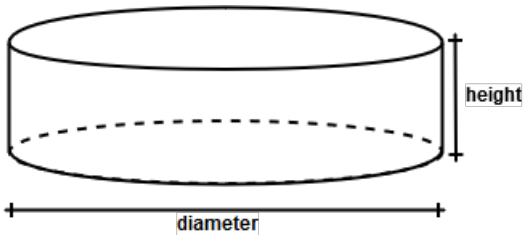
```
1 def final_grade(homework, midterm, project):
2     return 0.2*homework + 0.3*midterm + 0.5*project
```

2.3 Time for Cake

After passing the class, you want to treat yourself by baking a chocolate cake. You find a nice recipe for the dough online. The quantities of the ingredients are perfect to make one cake in a circular cake mould with a diameter of 28cm and a height of 8cm. However, you only have a cake mould with a diameter of 24cm and a height of 6.5cm.
Write a script that contains a function to determine by which factor you need to multiply the cake ingredients to make the perfect amount of dough for your smaller cake moulds and prints the result.
What is the factor if you only have a cake mould with a 20cm diameter/6cm height or 18cm diameter/6cm height?

Solution:

```
1  # technically pi is not needed for the calculation as it is reduced in
       the division
2  import math
3
4  # take the height and diameter of the recipe and the ones that you need
       to fit
5  # then returns the factor by which the ingredients need to be
       multiplied
6  def recipe_factor(height, diameter, orig_height=28, orig_diameter=8):
7      orig_volume = orig_height * (orig_diameter / 2)**2 * math.pi
8      new_volume = height * (diameter / 2)**2 * math.pi
9      return new_volume / orig_volume
10     # alternatively:
11     # return (orig_diameter / diameter)**2 * (orig_height / height)
12
13 print("For your 24 by 6.5 cm mould multiply the ingredients by: ",
14     str(recipe_factor(24, 6.5)))
15 print("For your 20 by 6 cm mould multiply the ingredients by: ",
16     str(recipe_factor(24, 6.5)))
17 print("For your 18 by 6 cm mould multiply the ingredients by: ",
18     str(recipe_factor(24, 6.5)))
```


height
diameter