Exercise 1

QBio104 - WS24/25

(modified from Mayo Röttger and Andrea Schrader)

Programs should be written in Python according to the respective exercise description. The program must be correct in terms of syntax and semantic. If there exists a minimal solution using only a single pre-defined function, this function is not allowed. The weekly exercise should be uploaded on ILIAS as a single Jupyter Notebook (.ipynb). The assignment will be provided after the lecture on Wednesday and must be uploaded by Tuesday 8:00. Make sure that answers to questions are contained within the Jupyter Notebook that is uploaded on ILIAS. Use commented code when possible.

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1. Define a variable name in a notebook cell. Write a program, that displays a welcome message based on the content of variable name.

Example:

```
name = "Ben"
```

Ouptut

```
Hello Ben
```

Example:

```
name = "Lisa"
```

Output:

```
Hello Lisa
```

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2. Calculate in a cell which values are present in the variables a, b, and c, after each of the following instructions. Variable start values are a = 3 and b = 5.

(a) c = a - b

(b) b = a * c

(c) a = a + 1

(d) c+1

(e) a = c**b

---

3. Calculate in a cell the results obtained by the following instructions.

(a) 5 == 5

(b) 3 == 5

(c) 3 != 5

(d) "Homo Erectus" == "Homo Erectus"

(e) "Homo Erectus" == "Homo Sapiens"

(f) "Homo Erectus" != "Homo Erectus"

(g) "Homo Erectus" > "Homo Sapiens"

(h) "Homo Erectus" < "Homo Sapiens"

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4. How can you explain the results in tasks 3.g) and 3.h)?

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5. (a) What is the data type of the variable chromosome_count after the instruction?

```
chromosome_count=46/2
```

(b) Write an instruction that would result in chromosome_count having the data type int

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6. Write in a notebook cell two functions that given tree variables (species_a_count, species_b_count and species_c_count) calculate the sum and the mean. Provide the tree variables as shown below and the results should be printed on screen.

```
species_a_count=10
```

```
species_b_count=22
```

```
species_c_count=1
```

Output:

```
The sum is 33.
```

```
The mean is 11.
```

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7. Define the float variable gene_expression_fold_change. Write instructions to perform the following operations on gene_expression_fold_change: Squaring, Doubling, Calculation of square root (do not use a square root function for that, only basic operators).

```
gene_expression_fold_change = 3.0
```

Output

```
The square of 3.0 is 9.0.
```

```
The double of 3.0 is 6.0.
```

```
The square root of 3.0 is 1.7320508075688772.
```

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8. Calculate and print the results according to the previous exercise, but this time, each operation should be based on the result of the previous calculation.

```
gene_expression_fold_change = 3.0
```

Output

```
The square of 3.0 is 9.0.
```

```
The double of 9.0 is 18.0.
```

```
The square root of 18.0 is 4.242640687119285.
```

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9. Define two integer values. Write a program, that divides the first number by the second and displays the rest after division.

```
Plants = 23
```

```
Plants_per_pot = 5
```

Output

> When planting 23 plants in pots that can fit 5 plants each, we are left with 3 plants that cannot fully fill a pot

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10. Create a variable called leaf_count. Perform the following operations and print True if the result is even and False if the result is odd. In case you know them already, do not use if-statements.

> leaf_count = 5

Output

> False

> leaf_count = 2

Output

> True

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11. Define 2 float positive variables root_length_treatment and root_length_control with root_length_treatment smaller than root_length_control. Print a random value root_size that fits the following conditions:

> a. root_length_treatment ≤ root_size ≤ root_length_control.

> b. root_size < root_length_treatment

> c. root_size >= root_length_control

hint: use the help function for random!

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12. Read 2 user inputs and print the two together:

> Please provide a character string: Homo Please provide a character string: Sapiens

Output

> Concatenated string: HomoSapiens

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13. (a) Write a program, that reads a character string from the standard input and cast this character string into an int. Your input: 2 ... 2 casted into an int is 2.

(b) Is your program also working correctly, if you provide 2.0 as input? If not, please describe what is going on and explain why.

(c) Adjust your program, so that a float value can also be read as input.