

Assignment 5 - More Graphics, Dates and Plotting

- The problems of this assignment must be solved in Python.
- The TAs are grading solutions to the problems according to the following criteria:
<https://grader.eecs.jacobs-university.de/courses/350112/2018.1gB/Grading-Criteria-Python.pdf>

Problem 5.1 *Approximate π I*

(1 point)

Presence assignment, due by 18:30 h today

Write a program that computes an approximate value of π as described below.

Using `graphics.py`, create a square window with the side length of `d` (e.g., 400 resulting in a window of 400x400). Repeatedly create and draw 10000 random points within this window.

If $\left(x - \frac{d}{2}\right)^2 + \left(y - \frac{d}{2}\right)^2 \leq \frac{d^2}{4}$ (i.e., the generated point (x, y) is inside the circle with the radius $\frac{d}{2}$), then color the point red and count it. Otherwise color the point blue. Plot all the points using the `plotPixelFast()` method from the class `GraphWin`.

For every 100th point compute and print the ratio of the points inside the circle and the total number of points and then multiply this value by 4. This value gives you an approximation for π . Print these values on the screen. Also use the `plotPixel()` method to plot at least one pixel to actually show results.

Upload one file: `appropi.py`.

Problem 5.2 *Approximate π II*

(1 point)

Presence assignment, due by 18:30 h today

Modify your program from **Problem 5.1** such that it takes two parameters. The first parameter specifies the size of the window, while the second specifies number of points to be generated. The program should exit with an informational message, if any of the two parameters are not valid. The size of the window should not exceed 1000x1000 pixels.

Upload one file: `appropiparam.py`.

Problem 5.3 *Coloring pixels*

(1 point)

Write a program to create a graphic window of size 255 by 255 pixels. Fill the window with pixels. Each pixel's color should be unique, so there should not be two pixels that have the same color. You can use the `color_rgb(val_r, val_g, val_b)` function to generate different colors where `val_r, val_g, val_b` $\in [0, 255]$.

You can use `plotPixelFast()` to plot individual pixels. Then plot every 150th pixel using `plotPixel()` to actually show results.

Upload one file: `colorpixels.py`.

Problem 5.4 *Compute days*

(1 point)

Use the following link to learn about date objects in Python (Section 8.1.3):

<https://docs.python.org/3/library/datetime.html>

The last total solar eclipse in Europe was on the 21th of August, 2017. Write a program which computes how many days have passed since then and prints the result on the screen.

Upload one file: `eclipse.py`.

Problem 5.5 *Compute age*

(1 point)

Write a program to determine the age in years of a person. One should enter the date of birth either in the `dd.mm.yyyy` or in the `yyyy-mm-dd` format (both should be possible). Then the age in years has to be printed on the screen.

Remember that there is an `in` operator and that strings have the `split()` method.

You can assume that the input will be valid.

Upload one file: `age.py`.

Problem 5.6 *Plotting simple data*

(1 point)

Write a program that prints x and x^2 to a file named `square.dat`. Then plot the data using the program `'gnuplot'`. The interval of the values should be -5 to 5 .

If you cannot install `gnuplot` locally on your computer you can use this online version to check and generate your plot: <http://gnuplot.respawned.com/>

Upload two files, the program and the output of the plotting as a "png" file: `plotting.py` and `result.png`.

How to submit your solutions

Name the programs `a5_x.py`.

Each program **must** include a comment on the top like the following:

```
# JTSK-350112
# a5_1.py
# Firstname Lastname
# myemail@jacobs-university.de
```

You have to submit your solutions via *Grader* at

<https://grader.eecs.jacobs-university.de>.

If there are problems (but only then) you can submit the programs by sending mail to

`k.lipskoch@jacobs-university.de` **with a subject line that starts with JTSK-350112.**

Please note, that after the deadline it will not be possible to submit solutions. It is useless to send solutions then by mail, because they will not be accepted.

Your code must compile without any warning under python3.x.

This assignment is due by Tuesday, May 8th, 10:00 h