

Outline

1 final exam on Friday 4 August 2023, at 10AM

- general information
- policies for the final exam

2 some example questions

- strings, lists, dictionaries
- scope of variables in functions
- working with files
- list comprehensions
- exception handling
- GUI design

MCS 260 Lecture 44
Introduction to Computer Science
Jan Verschelde, 2 August 2023

review of Python programming

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general information

The exam will take place on Friday 4 August, from 10AM till noon.

If an emergency prevents you from participation, please contact me as soon as you are able to so we can schedule a makeup exam in finals week.

The final exam is comprehensive and covers the entire course.

Please review the posted answers to the midterm and the quizzes.

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policies for the final exam

The exam will be online, similar to the midterm exam.

- 1 The questions will be emailed to you.
- 2 Your answers must be in a Jupyter notebook, uploaded into gradescope.

Some of the types of questions you could expect:

- Translate pseudo code or flow chart into Python code.
- Execute Python code and write computed values.
- Define a function based on its specification.
- Give code for a method in a class.

This review contains some preliminary examples of questions which may help you prepare for the Python part of the final exam.

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strings, lists, dictionaries

The most important composite data structures in Python are strings, lists, and dictionaries.

Convert the string `"123.45 euro"` into `"135.80 dollar"`.

- 1 Use a dictionary to store the exchange rates:
 - ▶ one euro is 1.10 dollar;
 - ▶ one dollar is 0.91 euro.
- 2 Write Python code to extract the number and currency type from strings such as `"123.45 euro"` and `"135.80 dollar"`.
- 3 Use the dictionary to make the string that represents the converted amount of money.

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scope of variables in functions

Consider the code below:

```
(a, b) = (2, 3)
def update(u, v):
    r = u + v
    return r
a = update(a, b)
print(a)
```

Answer the following questions:

- (1) Which variables are global? _____
- (2) Which variables are local? _____
- (3) What does the code print? _____
- (4) Complete the table below with values for a, b, u, v, and r.

	a	b	u	v	r
before the call to <code>update(a, b)</code>					
during the call, just before <code>return r</code>					
after the call to <code>update(a, b)</code>					

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working with files

The Unix command `cal` produces a calendar as

```
August 2023
Su Mo Tu We Th Fr Sa
      1  2  3  4  5
 6  7  8  9 10 11 12
13 14 15 16 17 18 19
20 21 22 23 24 25 26
27 28 29 30 31
```

Assume that this output of `cal 8 2023` is on file `cal.txt`.
Design an algorithm that, given a number between 1 and 31,
returns the day of the week.

For example, if the given number is 4, then `Fr` is returned.
Write Python code for the script.

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list comprehensions

Use a list comprehension to compute the coordinates of the points of a regular n-gon.

The points lie on a circle with radius one.

The list on return is a list of tuples with the x- and y-coordinates of the points.

The formula for the coordinates (x,y) is

$$\left(\cos \left(\frac{2k\pi}{n} \right), \sin \left(\frac{2k\pi}{n} \right) \right).$$

more list comprehensions

Take the list of the coordinates of the corner of a regular n -gon and ...

- 1 Make a list of pairs of consecutive points.
Each pair in this list spans a line segment.
- 2 Compute a list of differences of the pairs in the list.
Now we have a list of vectors.
- 3 For each line segment, compute its length, and take its sum.

For a large enough number of points, the sum equals 2π .

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exception handling

Write a Python function `prompt_integer()` that returns a user given integer.

The function must ask the user *each time* to retry when the conversion of the input into an integer fails.

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GUI design

Design a GUI for a currency convertor:

- one euro is worth 1.10 dollar;
- one dollar equals 0.91 euro.

Some types of questions concerning this GUI:

- 1 Describe a design for this GUI.
What kind of widgets will you use?
- 2 Given a picture of the design, name the types of widgets.
- 3 Given the design, write the constructor in the object oriented implementation to define the layout of the GUI.
- 4 Given the constructor, with all the data attributes defined, write code for the callback method in the GUI.