Homework 1

Exercises 1-4 are insipred by exercises from Think Python by Allen B. Downey and adapted by Siyuan Huang and Miles Chen.

For personal use only. Do not distribute or post online.

Instructions

Install Anaconda and use Jupyter Notebook as your development environment.

Each question should have its own cell. Cells must indicate the question that is being answered.

Questions that can be answered with a sentence or text should be answered with markdown cells. Questions that are to be answered with a calculation or code should be answered with a code cell.

It is important that appropriate outputs are properly displayed and visible. Cells that do not display the required output will not be awarded credit even if the code inside the cell is correct.

1. Problem 1

Please answer the following questions. (5 points each)

(A) In a print statement, what happens if you leave out one of the parentheses, or both? What kind of error messages does Python produce for these mistakes? Try the following operations to help you find your answers.

- `print "Hello, world!"`
- `print("Hello, world!"`

(B) If you are trying to print a string, what happens if you leave out one of the quotation marks, or both? What kind of error messages does Python produce for these mistakes?

- `print(Hello, world!)`
- `print(Hello, world)`

- `print("Hello, world)`

(C) You can use a minus sign to make a negative number like `-2`. Explain what happens if you put a plus sign before a number, like `+2`. Explain what happens if you put several `+` or `-` operators in a row. Do spaces make a difference here? Try the following operations to help you write your explanations.

- `3 + +2`
- `3 - +2`
- `3 + -2`
- `3 - -2`
- `3--2`
- `3 + + +2`
- `3 - - - - -2`
- `3-----2`
- `3*--2`
- `3-*-2`

(D) In math notation, leading zeros are ok, as in `09`. What happens if you try this in Python? What about `011`? Search the internet for information about Python and leading zeros and write a sentence summarizing your findings.

(E) Explain what happens if you have two values with no operator between them, like `3 2`.

2. Problem 2

Use Python as a calculator. Enter the appropriate calculation in a cell and be sure the output value is visible. (5 points each)

(A) How many seconds are there in 42 minutes 42 seconds?

(B) There are 1.61 kilometers in a mile. How many miles are there in 10 kilometers?

(C) If you run a 10 kilometer race in 42 minutes 42 seconds, what is your average 1-mile pace (time to complete 1 mile in minutes and seconds)? What is your average speed in miles per hour?

3. Problem 3

Try more operations in your Jupyter Notebook to answer the following questions. When appropriate make sure the output value is visible. (4 points each)

(A) We've seen that `n = 42` is legal. What about `42 = n`? What is the error message?

(B) Is the following a legal statement? `x = y = 1`

(C) In some languages every statement ends with a semi-colon `;`. What happens if you put a semi-colon at the end of a Python statement? What function do semi-colons serve in Python?

(D) What happens if you put a period at the end of a statement?

(E) Explain the difference between the following two lines:

- `n = 42`
- `n = 42.`

4. Problem 4

Write functions for the following problems.

(A) (10 points) The volume of a sphere with radius r is $\frac{4}{3}\pi r^3$. Write a function `sphere_volume(r)` that will accept a radius as an argument and return the volume.

Use the function to find the volume of a sphere with radius 5.

Use the function to find the volume of a sphere with radius 15.

(B) (10 points) Suppose the cover price of a book is \$24.95, but bookstores get a 40\% discount. Shipping costs \$3 for the first copy and 75 cents for each additional copy. Write a function `wholesale_cost(books)` that accepts an argument for the number of books and will return the total cost of the books plus shipping.

Use the function to find the total wholesale cost for 60 copies.

Use the function to find the total wholesale cost for 10 copies.

(C) (10 points) A person runs several miles. The first and last miles are run at an 'easy' pace. Other than the first and last miles, the other miles are at a faster pace.

Write a function `run_time(miles, warm_pace, fast_pace)` to calculate the time the runner will take. The function accepts three input arguments: how many miles the runner travels (minimum value is 2), the warm-up and cool-down pace, the fast pace. The function will print the time in the format `minutes:seconds`, and will return a tuple of values: `(minutes, seconds)`

Use the function to find the time to run a total of 5 miles. The warm-up pace is 8:15 per mile. The speed pace is 7:12 per mile.

For now, you can call the function using:

`run_time(miles = 5, warm_pace = 495, fast_pace = 432)`

Optional (+5 extra points):

You can look up the function `str.split()` at https://docs.python.org/3/library/stdtypes.htmlstr.split

So that the call can be made with minutes and seconds:

```
run_time(5, "8:15", "7:32")
```

5. Problem 5

(10 points)

You can use `import math` to gain access to math functions.

Create a function `polar(real, imaginary)` that will return the polar coordinates of a complex number. The input arguments are the real and imaginary components of a complex number. The function will return a tuple of values: the value of the radius r and the angle theta.

See: https://ptolemy.berkeley.edu/eecs20/sidebars/complex/polar.html

Show the results for the following complex numbers:

- 1 + i
- -2 - 3i
- 4 + 2i