

MA1008 Introduction to Computational Thinking

Week 8 Programs: Functions

1. Using the function in Q8 in the tutorial, write a program that reads in two 2D vectors and print their sum.
2. The horizontal distance travelled by a projectile is given by the equation

$$d = \frac{v^2}{2g} \left(1 + \sqrt{1 + \frac{2g y_0}{v^2 \sin^2 \theta}} \right) \sin 2\theta$$

where

- d is the total horizontal distance travelled by the projectile.
- v is the velocity at which the projectile is launched.
- g is the gravitational acceleration, usually taken to be 9.81ms^{-2} .
- θ is the angle at which the projectile is launched, in radians
- y_0 is the initial height of the projectile.

Write a function that calculates d with the other variables given as parameters to the function, except g , which is a constant and therefore should not be treated as a variable. Write a program that asks the user for appropriate inputs and uses the above function to calculate the horizontal distance travelled. Print the result.

3. A dice game.
 - i. Write a function that simulates the rolling of a dice, returning a random value between 1 and 6 .
 - ii. Write another function that returns the sum of the values of rolling the dice three times, and whether the three values are the same.
 - iii. Write a program using the above two functions, to print “Big” if the sum is 11 and above, “Small” if it is 10 and below, and “Jackpot” if the three dice values are the same, regardless of the sum.

(check this website for how to generate random numbers in Python:

<https://www.pythoncentral.io/how-to-generate-a-random-number-in-python/>)

4. Write a program that returns the number of days from 1 Jan 2019 to a given date in 2019, inclusive. Do so by providing a function that returns the number of days in a particular month. Here is an example dialogue, where the month is represented by an appropriate number:

```
Enter the day of the month: 12
```

```
Enter the month: 6
```

```
The number of days from 1/1/2019 to 12/6/2019 is 163
```

5. A dictionary called `revenue` is used to record the daily incomes from different shops of a chain, with the location of the shop as the key and the daily income as the value. If the record contains three shops so far, the dictionary may look like this:

```
revenue = {"Jurong":1620.55, "Bedok":2598.60, "Sengkang":1886.40}
```

Write a function called `add_income` with three parameters, the dictionary (`revenue`), a particular shop (`shop`) and a float (`income`) for recording the daily revenue. The function adds the new income to the given shop if the shop already exists in the dictionary, otherwise a new key-value pair is created, with `shop` as the key and `income` as the value. Write a program using this function to generate and print the data for the revenues of different shops. You may create the names of your shops and their revenues.