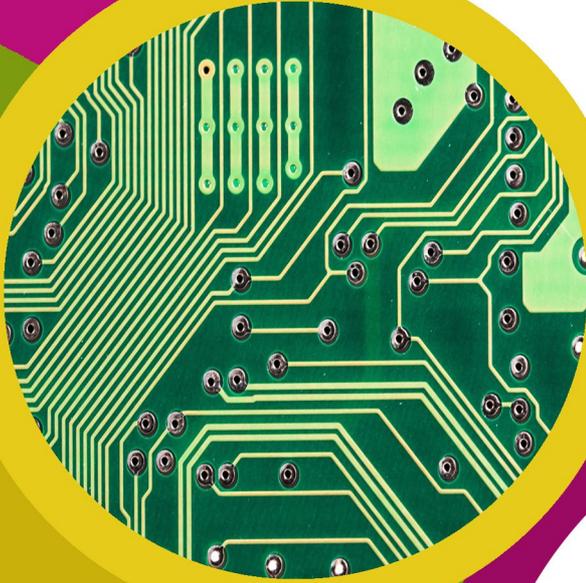


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Algorithms II Workbook



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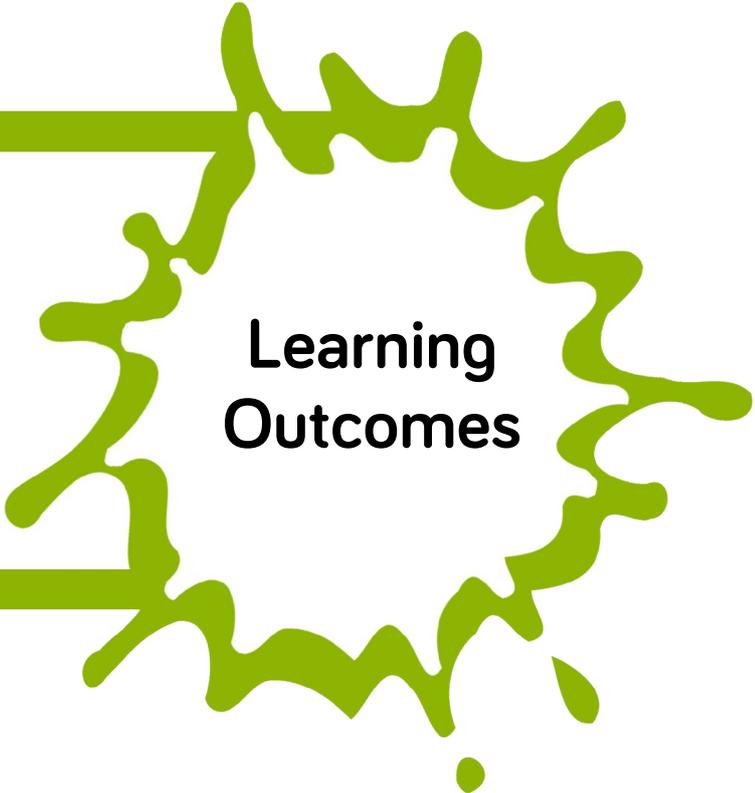


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Overview

In this workshop we are going to develop the art of planning, designing and implementing algorithms in Python.

1. Improved knowledge of subroutines using functions in Python.
2. Greater experience of designing, writing, and implementing algorithms to solve real world mathematical problems.
3. Greater experience in applying algorithms to other STEM subjects.



Learning Outcomes

Attendee Prerequisites

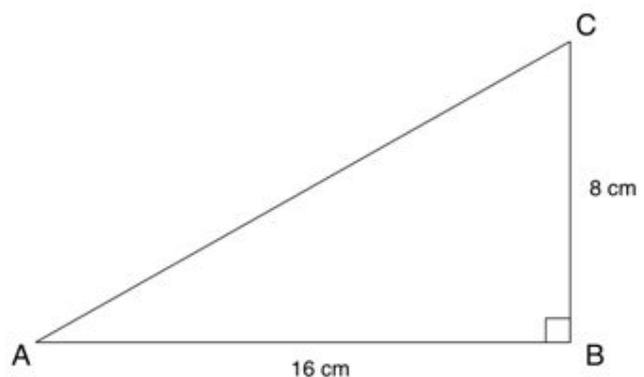
1. Intermediate experience in Python Programming.

Recap Algorithms

In your own words write your definition of an algorithm:

Calculating the Hypotenuse

Write an equation that can be used to calculate the hypotenuse. Use that equation to calculate the hypotenuse for the problem below:



ABC is a right-angled triangle.

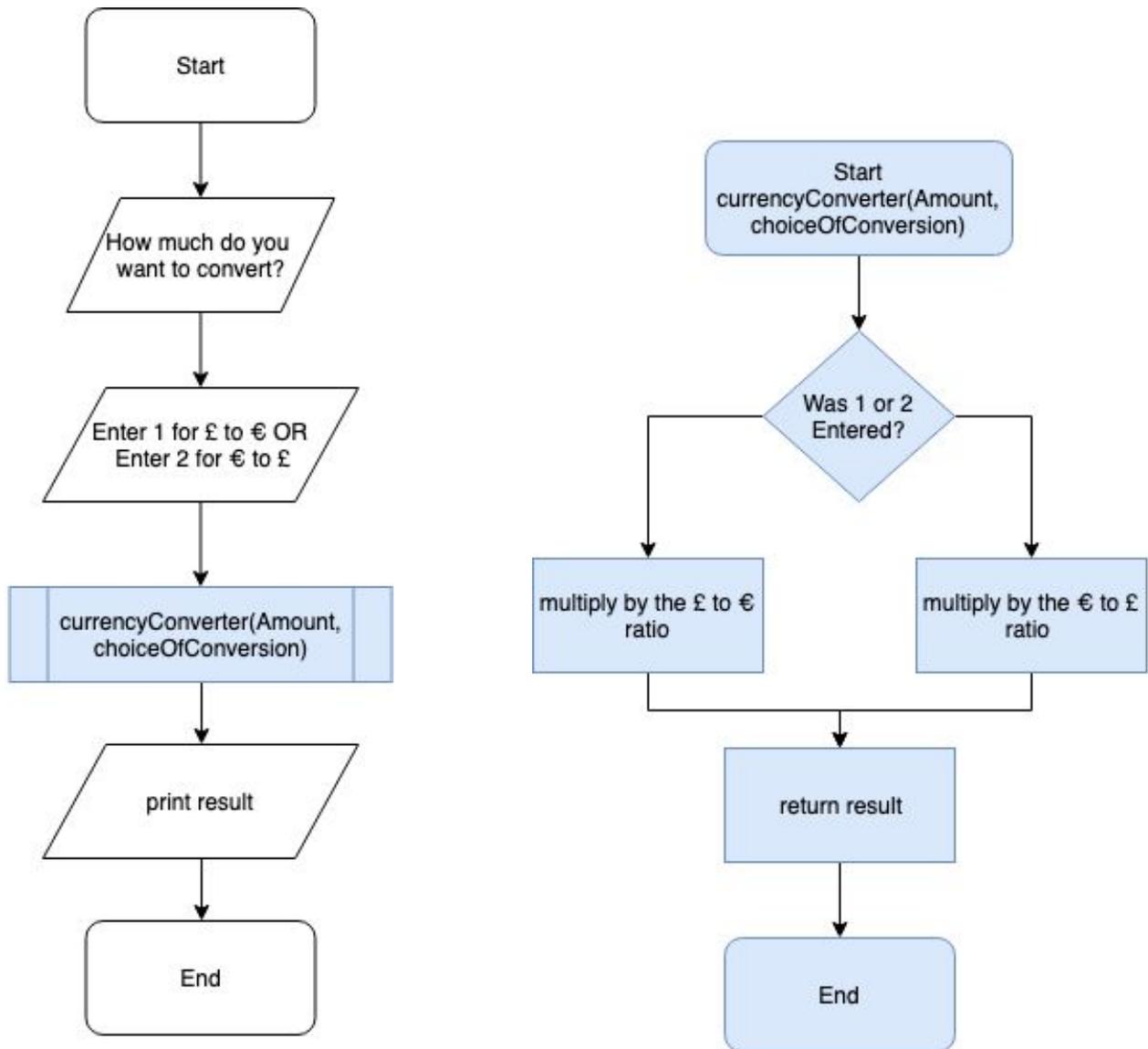
AB = 16 cm.

BC = 8 cm.

Calculate the length of AC

Currency Converter

Write a program which can convert Pounds (£) to Euros (€), and vice versa. Implement the flowchart on the following slide in Python using functions.



Jacket Potato

A jacket potato vendor has asked you to write a program to help calculate prices for his shop. The customer will be asked two questions: would they like a medium or large size jacket potato as well as the number of toppings they would like.

Develop a Python program which prompts the user to enter the letter “M” for medium and “L” for large. Next, ask the user for the number of toppings they would like to have. The total price is calculated according to the following table:

	Up to 2 toppings	3 or more toppings
Medium Jacket Potato	£2.50 + 50p / topping	£2.50 + 40p / topping
Large Jacket Potato	£3.50 + 55p / topping	£3.50 + 45p / topping

Counting Heads

Create a program that allows you to repeatedly throw multiple coins and each time they've been thrown we remove them if they land on heads.

Your task is to simulate the amount of throws and how many coins are remaining after each throw.

Think about what values you will need to keep track of through the program.

Visualising The Program

Take the results from the program and add them to the excel sheet. Visualise the number of coins left after every throw in the form of a line graph.

Radioactive Decay & Half-Life

What is Radioactive Decay?

What is meant by the term Half-Life?

What applications does radioactivity have?

Recap Lists

Below, write your definition of a list:

Review Lists

Answer the following questions:

1. List A = [1,2,3,4,5,6,7]. What position is the number 3 in?

2. List B = [5,4,3,2,1]. B[2]=7. Write the list out below.

3. List C = [77,89,33,44,12,18]. What is the length of this list?

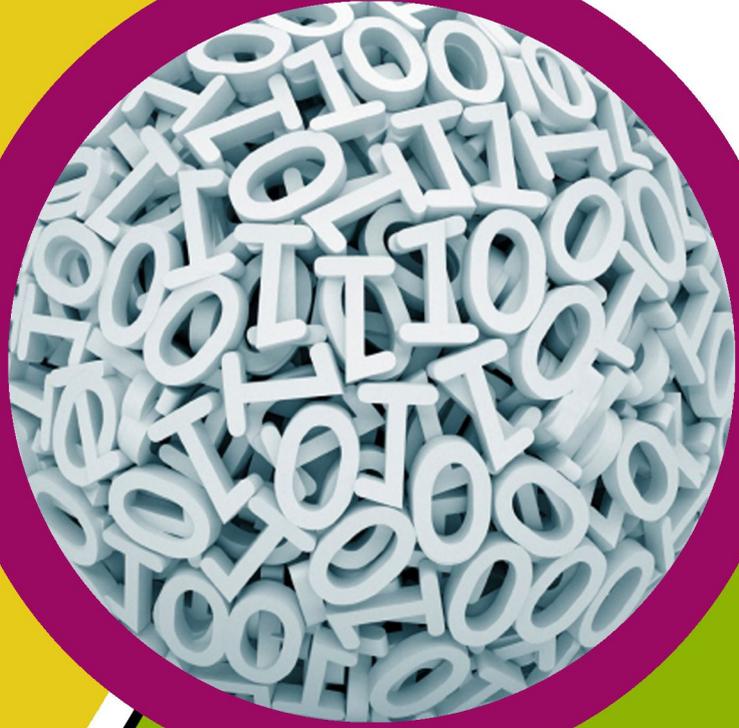
4. What function can we use to determine the length of a list?

Binary Search in Python

Use the space below to decompose the binary search algorithm. Create a flowchart to model how it behaves and consider what methods are required to implement binary search in Python.

Bubble Sort in Python

Use the space below to decompose the bubble sort algorithm. Create a flowchart to model how it behaves and consider what methods are required to implement bubble sort in Python.



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