Python School Exercises

Python School (pythonschool.net) provides a way for existing ICT teachers to gain the knowledge and skills necessary to teach Computing and Computer Science in schools.

The materials are designed to enable you to gain the experience necessary to teach Computing at Key Stage 3, GCSE and A-Level.

These are the exercises extracted from pythonschool.net

The site has notes and videos that explain the various aspects of the language

# Introduction to Python

## Exercises

Using the skills demonstrated above:

* Write a program to input two messages and output them to a user.
* Write a program to input two whole numbers add them together and print the result to the screen.

Tip: When inputting numbers, use int(input()) instead of input() - more on this later.

# String Operation and Math Unit Exercises

## Basic Exercises

1. Write a program that will ask the user for four integer numbers and then add these numbers together before displaying the answer. The input and output should be user friendly.
2. Write a program that will ask the user for three integer numbers and then multiply the first two together before dividing the result by the third number. The input and output should be user friendly.
3. Write a program that will ask the user for two numbers a then divide one by the other. The number of times one goes into another and the remainder should be displayed. For example, If 3 and 2 were entered: 3/2 = 1 remainder 1. The input and output should be user friendly.
4. Improve the previous program to show only the integer part of the answer.
5. Both a fridge and a lift have heights, widths and depths. Work out how much space is left in the lift once the fridge is inside. Assume that the fridge dimensions will fit. The input and output should be user friendly.
6. Write a program that asks the user for the amount of money they will take on holiday and convert this into the equivalent amount in Euros, ignoring any Cents that might result from the conversion. The input and output should be user friendly.
7. Improve the above program so that it will tell you how many 50,20,10 and 5 Euro notes you would receive for a given value of Pounds.

## Math unit exercises

1. Calculate the circumference and area of a circle when the user enters a radius. Round the answers to 2 decimal places. The input and output should be user friendly.
2. A circular swimming pool is x metres in diameter. What volume of water does it contain if the pool is the same depth at all points?
3. A plane is travels 20km on a course heading 60 degrees from north. Write a program that will calculate how far north and how far east has the plane travelled at this point?
4. Generalise the previous program so that it will work for any distance entered and degrees from north.
5. A road is inclined at an angle of 1 degree to the horizontal. Find the vertical height climbed when a car travels 1 km up the hill.
6. The foot of a ladder is 1.5m from a vertical wall. The ladder makes an angle of 68 degrees with the horizontal. How far up the wall does the ladder reach?
7. The string of a balloon is 120m long and makes an angle of 70 degrees with the horizontal. What is the height of the balloon.

## String Exercises

1. Create a program that will allow the user to enter a quote by a famous person. Output this quote in upper case, lower case, capitalise and title formats.
2. Improve the program so that the user can replace a one word with another word.
3. Improve the program so that the user can print out only part of the quote.

# The IF Statement

## Exercise

Write a function that asks the user how old they are. Tell them if they are old enough to vote. Then extend the program tell them how many years it is until they can retire (assume at age 65).

# More on IF

## Exercises

1. Write a function that asks the user to input a number between 1 and 20. Give a response which indicates if the number is either within the range, too high or too low.
2. Write a function which inputs the names of two football teams, and the score of one team followed by the score of the other team. Your function should calculate how many points each team gets (3 for a win,1 for a draw, 0 if they lose).

## Exercises

1. Extend exercise 5 from the previous set of additional exercises. As well as outputting how much volume remains in the lift, state whether the fridge would fit based on its dimensions. The program should tell you which dimension is the problem if it won't fit into the lift.
2. Create a program which will ask the user for a distance and whether you will be travelling on Motorway, A-road or through town for the duration of travel. The program should output the minimum amount of time it will take to reach that distance.
3. Ask the user to enter the current month, the program should output whether the month is in Winter, Spring, Summer or Autumn.
4. Extend exercise 3 so that it will tell you the number of days in the given month (ignore leap years!).
5. Create a program which will allow the user to enter the state of two switches (either 1 (on) or 0 (off)). The program should work out if both switches are on and then output the message 'the light is on'. Otherwise, the program should output the message 'the light is off'.
6. Amend your program so that the program will switch the light on if either of the switches is on.
7. Create a program which asks the user for 3 numbers representing the year, month and day e.g 1982 10 08 and then outputs in the form 8th October 1982.
8. Create a program which will troubleshoot printing problems. The program should ask questions like 'is the printer turned on?' and 'is there paper in the printer'.
9. Create a program which will ask for your recent exam score out of 60 and tell you what grade you got and how many more marks you would have needed to get the next grade up. You can decide on the grade boundaries yourself.
10. Extend exercise 4 so that it takes into consideration leap years - [Wikipedia Leap Years](http://en.wikipedia.org/wiki/Leap_year).

# The Maze Game

In this task we have given you a [starter program](http://pythonschool.net/basics/programs/dayOnetask.py). It is a very simple game where you win if you find a pot of gold in the middle of a maze. Your task is to extend this what the program can do.

# program written by Sue Sentance

import time

def main():

 print("You are trying to find your way through a maze to the centre where ")

 print("there is a pot of gold!")

 print("What you don't know is that this is a dangerous maze with traps and hazards.")

 print()

 print("Starting maze game ...")

 print()

 print("You enter the maze...")

 time.sleep(2) # time.sleep is just used to build up the suspense!

 print("You reach a opening in the wall and go through it...")

 print()

 time.sleep(2)

 print("You can go left (L) or right (R)")

 answer = input("Make your choice ... ")

 print("You chose",answer,"... what will happen? ...")

 time.sleep(2)

 print("You turn the corner...")

 time.sleep(2)

 print("You walk forward a few steps...")

 time.sleep(2)

 if answer == "R":

 print("...and fall down a trap door and are never seen again....")

 else:

 print("...and see a beautiful grassy path lined with trees with a pot of gold at the end!")

main()

Your task is to extend this [starter program](http://pythonschool.net/basics/programs/dayOnetask.py) to include more challenge and more twists and turns! Perhaps you could add three directions to choose from, or more choices to make.

After you have made some extensions you might like to use the random function. This will make your program more fun as the computer will randomly decide whether the option chosen by the user leads to the pot of gold or to a trap door!

To do this the following information will be useful.

* import random needs to be added at the top of the program
* random.randint(1,5) will generate a random number between 1 and 5
* random.choice(["a","b","c"]) will generate a random choice of either a, b or c

# FOR Loops

## Exercises

Using the skills demonstrated above:

* Write a program that will ask the user for a message and the number of times they want that message displayed. Then output the message that number of times.
* Write a program that will calculate the average (mean) of a set of numbers. This time, the user is to be asked how many numbers are to be averaged, they must then enter this number of numbers. Your program will calculate and display the average of those numbers.

# Making a quiz

In this task we have given you a [starter program](http://pythonschool.net/basics/programs/dayonetask2.py). It is a very simple quiz with one multiple choice question about farming. Your task is to extend this program's functionality.

# Day One task 2 written by Sue Sentance

def quiz():

 print("Here is a quiz to test your knowledge of farming...")

 print()

 print("This week has a farming theme so we need to see what you know already about farms")

 print()

 print("Question 1")

 print("What percentage of land is used for farming? ")

 print()

 print("a.... 25%")

 print("b.... 50%")

 print("c.... 75%")

 print()

 answer = input("Make your choice >>>> ")

 if answer == "c":

 print("Correct!")

main()

Extend the quiz that builds on the one shown in the video in the following ways:

* Introduce some feedback if the answer is not correct
* Give the user two chances to get the question right then tell them the answer
* Include two more questions about farming in your quiz. Some [sample questions are here](https://github.com/pythonschool/Basics/blob/master/6%20-%20Files/animals.txt), and below
* Keep a score of how many questions the user gets right

The total amount of land used for farming in the UK is,a. 25%,b. 50%,c. 75%,c

Which of these is not true? Wheat is used to make,a. plastic,b. bread,c. carpets,c

The amount of European Union money spent on agricultural projects to improve the environment is,a. £50 million,b £150 million,c £300 million,b

Which of these crops is not grown by farmers in the UK?,a. Hemp,b. Maize,c. Rice,c

Which of the following is false?,a. The Environment Agency helps prevent flooding,b. The Environment Agency looks after food standards,c. The Environment Agency encourages care of the environment,b

In a supermarket a pint of milk costs about 28p. The farmer gets paid,a. 9p,b. 17p,c. 21p,a

Silage is,a. the manure/waste from cows,b. stored grass,c. a rock band with attitude,b

The number of trees that farmers have planted in the last ten years is approximately,a. 30 million,b. 60 million,c. 90 million,c

Margarine comes from,a. Cows,b. Oilseed crops,c. Barley,b

Which of the following is not farmed in the UK?,a. worms,b. snails,c. ground beetles,c

# Iteration Exercises

## Basic Exercises

1. Create a program that will ask the user for a number and then print out a list of number from 1 to the number entered and the square of the number. For example, if the user entered '3' then the program would output:
	* 1 squared is 1.
	* 2 squared is 4.
	* 3 squared is 9.
2. Create a program which will produce the times table for an number entered by the user.
3. Write a program that will add together a series of numbers until the user enters a rogue value of 0. The program will then display the total.
4. Create a program which will count down from 10 to 0, indicating how long there is to go before time runs outs. When time runs out it should display a suitable message.

## (Hopefully) Challenging Exercises

1. Create a program that uses linear search to check that a given character is in a given string.
2. Extend the previous exercise so that it will display the string showing instances of the provided character and blank characters for the remaining letters. For example, if the string was "hello" and the user entered "l" the program would display " \_ l l ".

## (Hopefully) Very Challenging Exercises

1. Create a program which will convert a given decimal up to 255 into its **8-bit** binary equivalent.
2. Extend the previous exercise to convert the binary number to hexadecimal.
3. Create a program to convert from hexadecimal to decimal.

## Difficult Exercises

1. Extend (Hopefully) Challenging Exercise 2 so that it will allow you to check for another character (until a rogue value is entered) and displays an appropriate message based on the result. For instance, if you entered 'e' you would see " e l l \_ " and if you entered 'm' you would see "m is not in " \_ l l \_".
2. Improve the previous exercise so that it is a complete game of hangman for two players which gives a set number of guesses to the user and displays an appropriate message for the winner.