

AS and A LEVEL COMPUTER SCIENCE

Topic Exploration Pack

Programming Techniques

Task 1

Find a definition for the following words as they relate to programming:-

- modularity
- argument
- function
- subroutine
- variable
- data type
- constant
- local variable
- parameter
- procedure
- scope
- global variable

Task 2

Basic programming tasks

- a. Assuming knowledge of what a variable is; write a simple program that asks for a number and outputs the square of that number. Save it as Square_1.
- b. Change the previous program to use branching to decide whether the input is valid, i.e. is it a number? Save it as Square_2.
- c. Change the program to use iteration to allow more than one attempt at entering a number. Save it as Square_3.
- d. Further change the program to allow a user to quit the program. Save it as Square_4.
- e. Use a different type of iteration to print all the squares for numbers 1 to 10.
- f. (Stretch and challenge) write a program to calculate all the prime numbers up to 100 and output the result in a formatted style.



AS and A LEVEL COMPUTER SCIENCE

Task 3

Extend Square_4 to run from a procedure (no need to use parameters yet, just put the whole thing in a procedure). Save it as Square_7.

Using Square_4 again, create a procedure to just calculate the square root and use parameters to pass the values into and out of that procedure. Save it as Square_8.

Create an algorithm to change this to a recursive solution.

Discuss the differences between iteration and recursion and where it would be appropriate to use either.

Task 4

Implement a [Caesar cipher](#), both encoding and decoding. The key is an integer from 1 to 25. This cipher rotates the letters of the alphabet (A to Z). The encoding replaces each letter with the 1st to 25th next letter in the alphabet (wrapping Z to A). So key 2 encrypts “HI” to “JK”, but key 20 encrypts “HI” to “BC”.

In encrypt mode, your program should allow the user to input a message and the value of the key. It should then output the coded message.

In decrypt mode, your program should allow the user to input an encrypted message and the value of the key. It should then output the decrypted message.

Please use the template provided to plan your program **before** you start coding it.

