https://www.physicsandmathstutor.com/past-papers/a-level-computer-science/aqa-paper-1/

Specimen 2015

https://filestore.aqa.org.uk/resources/computing/AQA-75171-SQP.PDF

0 6 Create a folder/directory called **Question6** for your new program.

One method for converting a decimal number into binary is to repeatedly divide by 2 using integer division. After each division is completed, the remainder is output and the integer result of the division is used as the input to the next iteration of the division process. The process repeats until the result of the division is 0.

Outputting the remainders in the sequence that they are calculated produces the binary digits of the equivalent binary number, but in reverse order.

For example, the decimal number 210 could be converted into binary as shown in **Figure 7**.

Figure 7

```
210 ÷ 2 =  105   remainder 0
105 ÷ 2 =  52    remainder 1
 52 ÷ 2 =  26    remainder 0
 26 ÷ 2 =  13    remainder 0
 13 ÷ 2 =  6     remainder 1
  6 ÷ 2 =  3     remainder 0
  3 ÷ 2 =  1     remainder 1
  1 ÷ 2 =  0     remainder 1
```

The sequence 0, 1, 0, 0, 1, 0, 1, 1 which would be output by this process is the reverse of the binary equivalent of 210 which is 11010010.

What you need to do

Task 1
Write a program that will perform the conversion process described above. The program should display a suitable prompt asking the user to input a decimal number to convert and then output the bits of the binary equivalent of the decimal number in reverse order.

Task 2
Improve the program so that the bits are output in the correct order, e.g. for 210 the output would be 11010010.

Task 3
Test the program works by entering the value 210.

Save the program in your new **Question6** folder/directory.

Evidence that you need to provide
Include the following in your Electronic answer document.

0 6 . 1 Your PROGRAM SOURCE CODE after you have completed both **Task 1** and **Task 2**.

If you complete **Task 1** but do not attempt **Task 2** then a maximum of 9 marks will be awarded.

[12 marks]

0 6 . 2 SCREEN CAPTURE(S) for the test showing the output of the program when 210 is entered.

The marks for this test will be awarded whether the binary digits are output in reverse order or in the correct order.

[2 marks]

June 2017

0 7 One method that can be used to compress text data is run length encoding (RLE). When RLE is used the compressed data can be represented as a set of character/frequency pairs. When the same character appears in consecutive locations in the original text it is replaced in the compressed text by a single instance of the character followed by a number indicating the number of consecutive instances of that character. Single instances of a character are represented by the character followed by the number 1.

Figure 9 and **Figure 10** show examples of how text would be compressed using this method.

Figure 9

Original text: `AAARRRRGGGHH`
Compressed text: `A 3 R 4 G 3 H 2`

Figure 10

Original text: `CUTLASSES`
Compressed text: `C 1 U 1 T 1 L 1 A 1 S 2 E 1 S 1`

What you need to do

Task 1
Write a program that will perform the compression process described above. The program should display a suitable prompt asking the user to input the text to compress and then output the compressed text.

Task 2
Test the program works by entering the text `AAARRRRGGGHH`.

Task 3
Test the program works by entering the text `A`.

Evidence that you need to provide
Include the following in your Electronic Answer Document.

0 7 . 1 Your PROGRAM SOURCE CODE.

[12 marks]

0 7 . 2 SCREEN CAPTURE(S) for the test showing the output of the program when `AAARRRRGGGHH` is entered.

[1 mark]

0 7 . 3 SCREEN CAPTURE(S) for the test showing the output of the program when `A` is entered.

[1 mark]

June 2018

0 5 Write a program that checks which numbers from a series of numbers entered by the user are prime numbers.

The program should get a number from the user and then display the messages:

- `"Not greater than 1"` if the number entered is 1 or less
- `"Is prime"` if the number entered is a prime number
- `"Is not prime"` otherwise.

The user should then be asked if they want to enter another number and the program should repeat if they say that they do.

A prime number is a positive integer that will leave a remainder if it is divided by any positive integer other than 1 and itself.

You may assume that each number entered by the user is an integer.

If your program only works correctly for some prime numbers you will get some marks for this question. To get full marks for this question, your program must work correctly for any valid integer value that the user enters.

Evidence that you need to provide
Include the following in your Electronic Answer Document.

0 5 . 1 Your PROGRAM SOURCE CODE.

[12 marks]

0 5 . 2 SCREEN CAPTURE(S) showing the result of testing the program by:

- entering the number `1`
- then choosing to enter another number
- then entering the number `5`
- then choosing to enter another number
- then entering the number `8`
- and then choosing not to enter another number.

[1 mark]

June 2019

0 5 Write a program that gets **two** words from the user and then displays a message saying if the first word can be created using the letters from the second word or not.

For example:

- The word EAT can be formed from the word ATE as the first word uses one E, one A and one T and the second word also contains one of each of these letters.
- The word EAT can be formed from the word HEART as the second word contains one E, one A and one T which are the letters needed to form the first word.
- The word TO can be formed from the word POSITION as the second word contains one T and (at least) one O which are the letters needed to form the first word.
- The word MEET cannot be formed from the word MEAT as the second word only contains one E and two Es are needed to form the first word.

You may assume that the user will only enter words that consist of upper case letters.

Evidence that you need to provide
Include the following evidence in your Electronic Answer Document.

0 5 . 1 Your PROGRAM SOURCE CODE.

[12 marks]

0 5 . 2 SCREEN CAPTURE(S) showing the result of testing the program by entering:

- the word NINE followed by the word ELEPHANTINE.
- the word NINE followed by the word ELEPHANT.

[1 mark]

June 2020

0 5 Write a program that asks the user how many numeric digits they would like to enter and then gets the user to enter that number of numeric digits.

The program should calculate and display the number of times the most frequently entered numeric digit was input.

> **Example**
>
> If the user says they are going to enter four digits and then enters the digits 3, 4, 5 and 3, the program should display the value 2 as the most frequently entered digit was 3 and that digit was entered twice.

If more than one numeric digit had the same frequency and was the most frequently entered then instead of displaying the frequency, a message saying "`Data was multimodal`" should be displayed.

A numeric digit is 0, 1, 2, 3, 4, 5, 6, 7, 8 or 9

You may assume that the number that the user enters to state how many numeric digits there will be and the numeric digits entered by the user are all valid.

Evidence that you need to provide
Include the following evidence in your Electronic Answer Document.

0 5 . 1 Your PROGRAM SOURCE CODE.

[12 marks]

0 5 . 2 SCREEN CAPTURE(S) showing the result of testing the program by entering:

- the number 6 then the numeric digits 0, 1, 2, 1, 2 and 1
- the number 5 then the numeric digits 0, 1, 2, 2 and 1

[1 mark]

June 2021

0 7 A Harshad number is a positive integer which is exactly divisible by the sum of its digits. The first twelve Harshad numbers are 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12 and 18

- 36 is a Harshad number. The digits of 36 are 3 and 6; the sum of these digits is 9 as 3 + 6 = 9 and 36 is exactly divisible by 9 (36 ÷ 9 = 4)
- 300 is a Harshad number. The digits of 300 are 3, 0 and 0; the sum of these digits is 3 as 3 + 0 + 0 = 3 and 300 is exactly divisible by 3 (300 ÷ 3 = 100)
- 15 is not a Harshad number. The digits of 15 are 1 and 5; the sum of these digits is 6 as 1 + 5 = 6 and 15 is not exactly divisible by 6

Write a program that asks the user to enter a number, *n*, and will then calculate and display the *n*th Harshad number.

Example

If the user enters the number 12 then the program should calculate and display the twelfth Harshad number. The twelfth Harshad number is 18

You may assume that the number that the user enters will be a positive integer.

Evidence that you need to provide
Include the following evidence in your Electronic Answer Document.

0 7 . 1 Your PROGRAM SOURCE CODE.

[12 marks]

0 7 . 2 SCREEN CAPTURE(S) showing the result of testing the program by entering the number 600

[1 mark]

June 2022

0 5 Write a program that asks the user to enter a string. It should then change the order of the vowels in the string and display the result.

If there are *n* vowels in the string, the 1st vowel in the string should swap with the *n*th vowel in the string, the 2nd vowel in the string should swap with the (*n-1*)th vowel in the string, and so on.

The letters `a`, `e`, `i`, `o` and `u` are the only vowels.

Examples

If the user enters the string `horse` then the program should display the string `herso`.

If the user enters the string `goose` then the program should display the string `geoso`.

If the user enters the string `pinkfairyarmadillo` then the program should display the string `ponkfiaryarmidalli`.

If the user enters the string `nakedmolerat` then the program should display the string `nakedmolerat`.

If the user enters the string `lynx` then the program should display the string `lynx`.

If the user enters the string `pig` then the program should display the string `pig`.

You may assume the string that the user enters will only contain lowercase letters.

Evidence that you need to provide
Include the following evidence in your Electronic Answer Document.

0 5 . 1 Your PROGRAM SOURCE CODE.

[12 marks]

0 5 . 2 SCREEN CAPTURE(S) showing the results of three tests of the program by entering the strings `persepolis`, `darius` and `xerxes`.

[1 mark]