Challenges – 2.2 Programming techniques

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Variable naming, input and output

Easy challenges!

Question 1:

What is a variable?

Question 2:

Explain what makes a good variable name.

Question 3:

Describe how a constant is different from a variable

Question 4:

Code a solution that will prompt the user to input a number, multiply it by ten and output the result to the user.

Question 5:

Modify that solution to output the result to the user in this format: <original number> + “x10=” + <result>.

Question 6:

Code a solution that will ask the user for three numbers and then output the numbers in the opposite order from which they were input.

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Medium challenges!

Question 7:

Given 3 variables, code a solution to output the values of all three, then assign the value of one variable to the other two and output all three variables again.

Question 8:

Given 2 variables, code a solution that swaps their values.

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Variable Data Types

Easy challenges!

Question 1:

Explain why variables can be of different types.

Question 2:

For each of these variables, choose the most appropriate data types, provide a sample value and justify your choice:

1	Username	
2	PhoneNumber	
3	Registered	
4	Counter	
5	DivisionResult	
6	PIN	
7	FileName	
8	AmountOwed	
9	Male	
10	YearOfBirth	
11	DateOfBirth	
12	Sorted	
13	VotedYes	
14	SecretMessage	
15	SPEED_OF_LIGHT	

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Question 3:

Provide five examples of variable casting.

Question 4:

Given 4 variables holding words, join them with spaces into a readable sentence.

Ext: use a constants SPACE and FULL_STOP in your code.

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Medium challenges!

Question 5:

Newton's Second Law of Motion states that acceleration of an object moving in space is directly proportional to the magnitude of all forces that act on this object in the same direction as its movement, and inversely proportional to the mass of the object. If a catapult throws a rock with mass of 10 kg forward at the force of 50 Newtons (unit of force, where 1 Newton = 1kg m/sec^2). Code a solution that can calculate the rock's acceleration.

Question 6:

A pupil wrote the following lines of code:

```
YearOfBirth:=”1990”
CurrentYear:=”2016”
Age:=CurrentYear-YearOfBirth
OUTPUT Age
```

Can you spot any problems with this code? If yes, how would you fix them?

Question 7:

Write a program that can generate a random 4 digit PIN, made up of digits 0-9.

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Variables Operators

Easy challenges!

Question 1:

Explain, with examples, the purpose of operators and how they are used with variables.

Question 2:

For each of these operators, identify the associated data type (could be more than one):

	Operator	Data type
1	Addition	
2	AND	
3	ASCII	
4	CHR	
5	Concatenation	
6	Division	
7	Equal	
8	Escape/whitespace characters	
9	Exponentiation	
10	integer division	
11	Larger	
12	Lowercase	
13	modular division	
14	Modulus	
15	Negation	
16	NOT	
17	Not equal	
18	OR	
19	Quotient	
20	Smaller	
21	Split	
22	Subtraction	
23	Titlecase	
24	UPPERCASE	

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Given the necessary inputs, calculate the volume of the following shapes (PI is 3.142, and r is radius, h is height, where V is volume):

Question 3:

Volume of a sphere: V=4/3(PI*(r**3))

Question 4:

Volume of a cylinder: V=PI*(r**2)*h

Question 5:

Volume of a cone: V=PI*(r**2) *h/3

Question 6:

A pupil wants to write a program that can tell if a number is odd or even. Which operator can he use for this and why this operator?

Question 7:

Here is an assignment statement for a Boolean variable:

```
CodeValid:=Cond1 OR  (Cond1 AND Cond2)
```

Complete the truth table below for this statement:

Cond1	Cond2	CodeValid
FALSE	FALSE	
FALSE	TRUE	
TRUE	FALSE	
TRUE	TRUE	

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Question 8:

Here is an assignment statement for a Boolean variable:

CodeValid:=(Cond1 AND Cond2) OR NOT(Cond1)

Complete the truth table below for this statement:

Cond1	Cond2	CodeValid
FALSE	FALSE	
FALSE	TRUE	
TRUE	FALSE	
TRUE	TRUE	

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Medium challenges!

Question 9:

Code a solution where a character is replaced with the one that follows it in the alphabet (ASCII table position), e.g. “a” becomes “b”, “x” becomes “y”, etc.

Question 10:

Convert 4 character string of a binary number to a decimal value, e.g. “0110” is 6.

Question 11:

A pupil has been struggling to keep up with making notes in class. It was taking too long for her to write things in full. She develops a shorthand system, where all words longer than 5 characters, are shortened to two first characters, followed by a dash, followed by the two last characters of that word.

For example, “plus” would not be shortened, but “addition” becomes “add-on”, “economics” becomes “ec-cs”, etc.

Design a program that will use this system on any text string.

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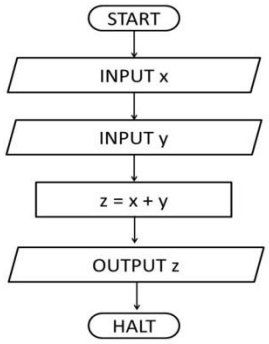
Sequencing

Easy challenges!

The following process is shown with a flowchart.



Question 1:

What is the output, if the inputs are 5,6?

Question 2:

Rewrite this process in pseudocode.

Question 3:

Create a flowchart for any of the algorithms we have covered.

Question 4:

Create a pseudocode solution for any of the algorithms we have covered.

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Question 5:

Given the following function, rewrite it as a procedure:

```
Num:=5
FUNCTION Doubler(x)
        RETURN x*2
END FUNCTION
OUTPUT Doubler(Num) // Prints “10”
```

Question 6:

Rewrite the procedure in Question E2A.1D to have parameters

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The following code refers to the questions below.

```
PROCEDURE BodyMassIndex(weight,height, metric)
        EMPTY=""
        BMI:=0
        Message:=EMPTY
        INPUT Name
        BMI:=weight/(height*height)
        IF metric=False THEN BMI=BMI*703
        IF BMI>=40 THEN
                Message:="Morbidly obese"
        ELSE IF BMI>=30 THEN
                Message:="Obese"
        ELSE IF BMI<=25 THEN
                Message:="Overweight"
        ELSE IF BMI>=18.5 THEN
                Message:="Normal Weight"
        ELSE
                Message:="Normal Weight"
        END IF
        OUTPUT "You are " + Message
END PROCEDURE
```

Question 7:

State the names of the parameters of the subroutine.

Question 8:

This code contains an error. Identify it and provide a correction.

Question 9:

What kind of an error is it?

Question 10:

Give an example of how you would refer to this code from elsewhere in a program.

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Question 11:

Programmers sometimes talk of “calling a procedure”. What is this referring to? Provide an example to illustrate.

A mobile network operator allows customers to call the automated support number. Once a customer connects, they are asked to listen to the … choices and enter a number on their phone corresponding to the menu. At any time, a customer can press zero to hear the first/main menu again.

The following procedures and functions exist to control the process, in no particular order:

```
customerCallReceived()
terminateCall()
getCustomerPassword()
connectToSales()
getMenuChoice()
tellBalance()
retrieveCustomerDetails()
connectToTechSupport()
```

Question 12:

Which of these are functions and which are procedures? Justify your answer.

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Medium challenges!

A vending machine allows a customer to put the coins in, then use the button pad to choose their product, which include chocolate bars, crisps, and bottled water. All chocolate bars are priced at £0.65, crisps at £0.50, water at £1, if the money is insufficient, a message is displayed “Insufficient coins”.

Question 13:

Design a top-down solution that would model the operation of this vending machine (pseudocode or flowchart). Your solution will contain the following subprograms:

acceptCoins(), getProductChoice(), retrievePrice(Product), checkSufficientCoins(amountPaid,Price) , dispenceItem(), moveCoinsToSafeBox()

Question 14:

Some of these subprograms feature variable names inside the brackets. What is the meaning of these?

Question 15:

Take one of the subprograms and design it (pseudocode or flowchart)

Question 16:

It is possible that the machine can be out of stock on certain items, in this case, when that item is chosen by customer, the machine outputs “Out of stock” and offers user to get their money back or make another selection. Design a top-down solution that would model the operation of this vending machine (pseudocode or flowchart). Your solution will contain the following subprograms:

acceptCoins(), getProductChoice(), retrievePrice(Product), checkSufficientCoins(amountPaid,Price) , checkInStock(Product), dispenceItem(), moveCoinsToSafeBox(),getChoiceMoneyBack(), refundCoins()

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Question 17:

Given this procedure that draws an equilateral Triangle with the size of each side at 100, rewrite it to be more abstract and flexible through the use of parameter passing – with a procedure parameter for size.

```
SIZE=100  //global constant
PROCEDURE Triangle()
        FOR i=1 TO 3  /counter-controlled iteration
                FORWARD(SIZE)
                LEFT(120)
        NEXT i
END PROCEDURE
Triangle() //calling the procedure
```

Question 18:

Make the procedure even more abstract by letting the number of sides to be another parameter, the procedure will draw any Polygon. Hint: all angles in a closed polygon add up to 365 degrees.

Question 19:

Using the information from Question E2A.5A, design a flowchart that represents the most logical sequence of these subprograms.

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Selection

Question 1:

What is selection and where do we use it?

Question 2:

What happens when a programmer is using the IF/ELSE IF/ELSE structure and the IF condition and the ELSE IF condition are both true? Illustrate with an example.

Question 3:

Consider the following code:

```
A:=5
B:=4
AA:=11
A:=9
A:=12
```

What is the value of A?

Question 4:

Consider the following code:

```
A:=5
B:=4
AA:=11
IF B<=A THEN
        A:=9
ELSE
        A:=12
END IF
```

What is the value of A?

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Question 5:

A program reports how many persons signed up for an event. E.g. “1 **persons** signed up for Choir”, “23 **persons** signed up for the Naval Docks trip”.

```
BEGIN Report
        INPUT num
        INPUT event
        OUTPUT STR(num)+ “ persons signed up for “ + event
HALT
```

This looks less than professional in the case of a single person signing up to an event – it should really say “1 **person** signed up for Choir”. Modify the program accordingly.

Question 6:

Given the following code, rewrite this with IF/ELSE IF/ELSE instead of SWITCH.

```
INPUT Entry
SWITCH Entry
      CASE >100
            Entry:=Entry*0.75-10
      CASE <10
            Entry:=0
      DEFAULT
            Entry:=Entry-10
END SWITCH
Result:=Entry*2
IF Result> 35 THEN
      OUTPUT STR(Result) + “Pass”
ELSE
      OUTPUT STR(Result) + “Fail”
END IF
```

What is the output in each of these cases:

Question 7:

Entry is 120

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Question 8:

Entry is 90

Question 9:

Entry 52

Question 10:

A programmer is coding a menu interface which displays 3 options to the user. The use then presses 1 for the first option, 2 for the second option, 3 for the third option, each of these calls a procedure such as option1(), option2(), option(3). Code a solution that will validate user input to be only 1, 2 or 3 and then call the corresponding procedure.

You are writing a program for an airline that calculates the price for oversized baggage (if any) that air travellers have to pay. The rules are given as follows:

Any baggage that is under 10 kg and is no larger than 40 by 30 cm, ignoring depth, can go free of charge.

Any baggage that doesn't satisfy the first criteria, up to 20 kg and 60 by 40 cm, costs £50.

Any baggage that doesn't satisfy the first and second criteria, is charged £10 per kg.

Baggage over 100 kg and 150 by 150 cm is not allowed at all and should be sent separately by freight. In this case, the cost variable gets assigned an rogue value of -99.

Question 11:

What is the purpose of using a "rogue value"?

Question 12:

Design an algorithm for this problem.

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Question 13:

What will the cost be for the following pieces of baggage:

	Cost (£)	Weight (kg)	Length (cm)	Width (cm)
1		120	90	60
2		90	100	60
3		13	60	40
4		22	60	40
5		9	30	20
6		50	150	100

Question 14:

Add your own test data, trying to test every condition.

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Medium challenges!

Question 15:

FizzBuzz is a game of maths skill. Participants seat in a circle and say out the numbers, starting from 1. If the number they are due to say is divisible by 3, they will say “Fizz” instead of 3, and if the number they are due to say is divisible by 5, they say “Buzz”. The last rule, if the number is divisible both by 3 and 5, a participant will say “FizzBuzz”. All the other numbers are said as they are. A typical start of FizzBuzz is: “one”,”two”,”fizz”,”four”,”buzz”,”fizz”,”seven”,”eight”,”fizz”, “buzz”, etc. Design an algorithm that will accept an input and decide where it is Fizz, Buzz, FizzBuzz or some other number.

Question 16:

A drive-through roadside cafe is located on a vantage lookout point with picnic tables and a parking lot. There is a 10% surcharge for stay-in customers, with take-away customers being charged less as they tend to leave less of a mess that costs money to clean up. The café sells:

Coffee, in 3 sizes: small (£1), medium(£1.25) and large (£1.40). Additionally, coffee can be offered as decaffeinated, with or without milk, with or without sugar.

Muffins, all £2

Water, in 2 sizes: 1L (£1.10) and 1.5L (£1.30).

There is a numeric pad positioned by the driveway next to the café, where customers see their service options on the screen and then they use the pad to indicate their choices. Then they drive up to a window to receive their purchase and pay. A computer connected to the numeric pad, collects this information and works out the price, then sends this information to the terminal located in the café’s kitchen, so that everything is ready by the time a customer drives up to the service window.

You are given the following code:

```
order:=""
price:=0
SM_COFFEE:=1
MD_COFFEE:=1.25
LG_COFFEE:=1.4
MUFFIN:=2
ONE_L_WATER:=1.1
ONE_HALF_L_WATER:=1.3
SURCHARGE=1.1

OUTPUT "Press 1 to buy coffee, 2 for no coffee"
INPUT choice //no validation
IF choice=1 THEN
    OUTPUT "Press 1 for small, 2 for medium, 3 for large" //cof. size
```

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```
    INPUT choice //no validation
    //quantity
    OUTPUT "How many coffees of this type?"
    INPUT quantity //no validation
    IF choice=1 THEN
        order:=order+" small coffee"
        price=price+SM_COFFEE*quantity
    ELSE IF choice=2 THEN
        order:=order+" medium coffee"
        price=price+MD_COFFEE*quantity
    ELSE IF choice=3 THEN
        order:=order+" large coffee"
        price=price+LG_COFFEE*quantity
    END IF
    //milk
    OUTPUT "Press 1 for black coffee, 2 for white"
    INPUT choice //no validation
    IF choice=1 THEN
        order:=order+" black"
    ELSE IF choice=2 THEN
        order:=order+" white"
    //sugar
    OUTPUT "Press 1 for no sugar, 2 for sugar"
    INPUT choice //no validation
    IF choice=1 THEN
        order:=order+" no sugar"
    ELSE IF choice=2 THEN
        order:=order+" with sugar"
END IF
```

Question 17:

Complete the program that will present the customer with the choice of products that the café sells, quantities of each item purchases and their choice for staying in or taking their purchase with them.

For testing of your program, the café supplied the following sample orders:

1 Small black coffee, 1 Muffin, take-away

1 Medium white and sugar coffees, 2 Large White No Sugar coffee and 1.5L water bottle, stay-in.

1 Medium Decaf black with sugar coffee, 1 Small White With Sugar coffee, 2 Muffins, 1L water, take-away.

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Iteration

A computer program contains the following instructions

```
j:=0
FOR i=1 TO 5
        j:=j+i
NEXT i
OUTPUT j
```

Question 1:

Name the two constructs used in the program:

Question 2:

State the value that will be output:

Question 3:

The value of j depends on the value of i. Complete the table below:

When i =…	j is…	How many lines of code have been executed?
NULL	0	1
1	0	2
1	1	3

Question 4:

For each of the variables i and j, complete the table below:

Iteration	i	j
	1	0

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Question 5:

Explain what this algorithm does.

Question 6:

Write a program that counts from 0 to 1o and then back down.

Question 7:

Modify the previous solution, so that instead of displaying numbers one by one to the screen, the program joins them into a string that will look like this: "012345678910"

Question 8:

Modify the solution now to count down skipping every other number

Question 9:

The ASCII code for "A" is 65. Use a condition-controlled loop and then the counter-controlled loop to display the alphabet.

Question 10:

This was all capital letters. Research where lowercase "a" is in the ASCII table and repeat the exercise with lowercase letters.

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Question 11:

Write a program that can take a phrase and replace all characters with the ones following them in the alphabet, e.g. ABBA becomes BCCB. "z" becomes "a". Hint: you can use CHAR() to convert a number into an ASCII character that is stored under that number in the ASCII table; and you can use ASCII() to get the ASCII code of a character.

Question 12:

Modify your solution not to change punctuation or whitespace characters.

Question 13:

Generate a sequence where every item in a sequence is 2.5 larger than the previous one.

You are given the code for a program that loops adding numbers.

```
a:=12
b:=2
total:=0
FOR i=1 TO 7
      total:=total+a+b-i
      a:=a+1
      b:=b+2
NEXT FOR
```

Question 14:

What is the sum after 5 iterations?

Question 15:

After 6 iterations?

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Question 16:

Create a trace table for all variables.

Question 17:

Write a program that needs to compute averages of 3 sets of floats

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Medium challenges!

Question 18:

Extend the FizzBuzz program from Question M2B.1 to include iteration, so that a computer "plays" the game, starting at 1 and all the way to 100:

We are given a phrase "The UK has announced that the amphibious landing ship RFA Mounts Bay will join naval vessels from Germany, Canada, Turkey and Greece in the area."

Question 19:

Write a program that will make every other letter uppercase, lowercase e.g. ThE Uk HaS, etc.

Question 20:

Now let's make all vowels upper case, all consonants - lower case, where vowels are: i,o,a,e,u

Question 21:

Now reverse the condition and vowels are now lower case, consonants - upper

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Arrays

Question 1:

Explain what is meant by an array.

We are given the following:

Array Numbers[78,1,45,23,98,57]

State the value of the following items:

Question 2:

Numbers[0]

Question 3:

Numbers[3]

Question 4:

Numbers[5]

Question 5:

Write an algorithm to output the value of the last array element of **any** array

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We are given two integer arrays.

Array Nums1[34,67,23]

Array Nums2[10,12,15]

Question 6:

Write an algorithm to calculate the sum of items in both arrays.

Question 7:

Write an algorithm to generate an array of sums of individual items from Nums1 and Nums2, e.g. Nums3[44,79,18]

Question 8:

Write an algorithm to generate an array that includes both of these arrays' items in one longer array, e.g. Nums4[34,67,23,10,12,15]

Question 9:

Write an algorithm to generate a 2D array from these two 1D arrays.

Question 10:

Given a comma-separated list of numbers, write an algorithm to add them up and output the total.

Question 11:

Modify your solution for Question M2D.3A to only add up even numbers

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Question 12:

Modify your solution to only add up every other number

Question 13:

Modify your solution so that rather than adding up the array elements, the program will find out the sum of the changes from item to item, e.g. instead of adding up 24, 26, 45, ... just add 2 (26-24), 19 (45-26),...

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Medium challenges!

Question 14:

Given a 1D array, find the middle index, write an algorithm to swap all elements with indices after the middle index with those which have indices smaller than the middle index. E.g.

ARRAY Test[**"Bob","Nora",**"Jack","Peter","Amir"] has 5 elements, so, assuming zero-based array, the middle index is 2, which stores "Jack". Leaving "Jack" in place, the swap will result in this array:

Test["Peter","Amir","Jack", **"Bob","Nora"**]. Your solution should work for an array of any odd size, not just size 5.

Question 15:

However, what about arrays of even size, e.g. 4, 6, 8, etc elements? Our Python code which is based on the algorithm - crashed!

```
Traceback (most recent call last):
  File "C:/Users/IA/Documents/Writing/OCR gcse
computerscience Dec2015GCSE commission/ocrSwap
ArrayElements.py", line 7, in <module>
    test[i]=test[i+middle+1]
IndexError: list index out of range
>>>
```

Modify your solution to only accommodate even sized arrays.

Question 16:

Create a universal solution that works for both odd and even array sizes.

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Question 17:

Write a program that converts raw test scores to letter grades

where grade boundaries are given a 2D array:

Array Boundaries[["A*","90"],["A","80"],["B","70"],["C","60"],["D","50"]]

Question 18:

Extend the program to input a 1D array of scores to convert to grades.

Question 19:

Modify the program to get the score information from a 2D array of data which contains pupils' names and scores.

0	1	2	3	4
Bob	Nora	Rezaq	Peter	Jon
56	78	92	85	67

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Data Persistence Files

Question 1:

Create an algorithm to read a text file and count number of characters in it.

Question 2:

Modify the algorithm to count all instances of “the”.

Question 3:

Modify the algorithm to count all instances of all words starting with “a”

Question 4:

Create an algorithm to read two text files, and then write their contents to the third file.

Question 5:

Now modify your solution to read another input file and add its contents to the output file from the previous task.

Question 6:

Create an algorithm to load a text out of a file and write to another file backwards.

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Medium challenges!

Question 7:

A file contains the text of a letter to a person named “Bob”. Write a program that will read the contents of the file and replace all instances of “Bob” with “Nora”, overwriting the original data.

Question 8:

The mail merge. You are given two text files: one file is a letter template, which, instead of actual names, contains a word “<name>”; the other file is a list of names. Create an algorithm to generate individually addressed letters or wedding invites.

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Records and SQL

Easy challenges!

Question 1:

This Record doesn't seem to be properly set up. Fix it!

RECORD= Machine(STRING Name, STRING CHAR=4 Type, FLOAT CHAR=8 Cost)

Question 2:

Assuming that a machine's cost can't exceed 9,999, what is the maximum length of one record? Estimate the maximum size of a file containing 200 records, assuming 10% overhead (additional data stored in the file that is in addition to the record data itself).

Question 3:

Create an array of 3 machines. Assume these machines have just been purchased and we need to know how much we must pay. Code the solution to arrive at that amount.

TYPE RECORD Machine(STRING VARCHAR=10 Name, STRING CHAR=4 Type, FLOAT Cost)

SQL

A school has sent a few teams to an Athletics competition. You are given a table of athletes who won Gold, Silver, Bronze. Multiple age categories were involved, so it is possible to have more than one medal in the same category, as the multiple medals were awarded to different age groups.

The Athletes table

Name	Medal100m	Medal300m	Medal1km	Injured
Emma	Bronze	No medal	Gold	True
Bob	No medal	Bronze	No medal	False
Cecil	Silver	No medal	Silver	False
Nora	No medal	Gold	Bronze	False
Amir	No medal	No medal	No medal	True
Dosha	No medal	Bronze	Bronze	False

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Each record follows this structure:

Athlete(Name, Medal100m, Medal300m, Medal1km, Injured)

Question 4:

Write an SQL SELECT query to return all complete records.

Question 5:

Write an SQL SELECT query to return all complete records in alphabetic order.

Question 6:

Write an SQL SELECT query to return all complete records in reverse alphabetic order.

Question 7:

Write an SQL SELECT query to return complete records of all those who won Silver medals in 100m.

Question 8:

Write an SQL SELECT query to return complete records of all those who won medals in 100m.

Question 9:

Write an SQL SELECT query to return complete records of all those who won Bronze medals.

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Question 10:

Write an SQL SELECT query to return complete records of all those who won Gold medals and are not injured.

Question 11:

Write an SQL SELECT query to count how many athletes got Bronze in 100m

Question 12:

Write an SQL SELECT query to return complete records of all those who won any medals.

Question 13:

Write an SQL SELECT query to list the names of all those who won medals.

Question 14:

Write an SQL SELECT query to list all those with medals not injured.

Question 15:

Write an SQL SELECT query to list all those who won 2 of the same medals, e.g. two Bronze or 2 Silver

Question 16:

Write an SQL SELECT query to return Name and the Injured status, with those Injured (Injured=”FALSE”) listed first.

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Question 17:

Write an SQL SELECT query to find all those who got no medals.

Question 18:

Write an SQL SELECT query to find all athletes who have letter “o” in their name.

Question 19:

Write an SQL SELECT query to find all athletes who have names shorter than 5 characters.

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Medium challenges!

Consider this two-table database.

The Customers table where each record follows this structure:

Customers(CustomerID CHAR=3, Name VARCHAR=10, Industrial BOOLEAN)

CustomerID	Name	Industrial
"101"	"Bob"	"FALSE"
"102"	"Nora"	"TRUE"
"105"	"Cecil"	"TRUE"
"112"	"Amir"	"FALSE"
"114"	"Helga"	"TRUE"

The Jobs table where each record follows this structure:

Jobs(JobID CHAR=4, CustomerID CHAR=3, Estimate FLOAT, Completed BOOLEAN, Paid BOOLEAN)

JobID	CustomerID	Estimate	Completed	Paid
"1051"	"101"	2456	"FALSE"	"TRUE"
"1052"	"102"	900	"TRUE"	"TRUE"
"1053"	"102"	12890	"FALSE"	"FALSE"
"1054"	"112"	870	"TRUE"	"FALSE"
"1061"	"105"	1100	"FALSE"	"FALSE"

Using the Jobs and Customers tables given above…

Question 20:

Write an SQL SELECT query to return complete records from jobs for all unfinished jobs.

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Question 21:

Write an SQL SELECT query to get complete records from customers whose jobs haven't been completed.

Question 22:

Write an SQL SELECT query to get names of customers whose jobs haven't been completed.

Question 23:

Write an SQL SELECT query to get names of customers who have unpaid jobs.

Question 24:

Write an SQL SELECT query to get the names of industrial customers

Question 25:

Write an SQL SELECT query to get all jobs ordered by non-industrial customers.

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Question 26:

Write an SQL SELECT query to get all jobs ordered by industrial customers.

Question 27:

Write an SQL SELECT query to get all jobs ordered by industrial customers, except Nora.

Question 28:

Write an SQL SELECT query to get all jobs with estimate less than 900.

Question 29:

Write an SQL SELECT query to get all customers that made orders under 900.

Question 30:

Write an SQL SELECT query to get all customers that ordered more than 1000 worth of roofing.

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Question 31:

Write an SQL SELECT query to get the names of customers who have unpaid orders under 1000.

Question 32:

Write an SQL SELECT query to count the number of jobs that are for industrial customers

Question 33:

Write an SQL SELECT query to count the number of unfinished jobs that are for industrial customers

A school's VLE system uses record structure to store account information. It has a field for a subject name taken by a pupil which is set up to be CHAR(5). Unfortunately, many subjects have names longer than that. The solution is to store them in abbreviated form, with a first few characters of the subject name followed by a number of characters that didn't "fit".

E.g. "Algebra" has 7 characters, so it will be shortened to "ALGE3", and "Critical Thinking" (17 characters) to "CRI12".

Question 34:

Explain how "Critical Thinking" is shortened to "CRI12".

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Question 35:

Develop an algorithm to shorten any subject name input by a user, e.g. “Physical Education”.

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Stretch / Extension Challenges!

(Range is the difference between max and min.)

Question 36:

Task A: Find the range of values given 2 numbers.

Question 37:

Task B: Find the range of values given a 1D array

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Question 38:

Task C: Find the range of values given a 2D array.

Question 39:

Task D: Find the range of values given a record array.

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Question 40:

Task E: Find the range of values given using SQL

Question 41:

Design a solution that takes 4 numbers from a user and outputs their sum, max and min.

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Question 42:

Repeat this task but only for the 3 largest items out of this array.

Question 43:

A teacher wants to set up random pairs out of pupils to participate in a task, where Group A pupils are advanced and Group B pupils need assistance. Design the solution that will do that.

Group A	Bob	John	Nora	
Group B	Cecil	Rezaq	Ralph	Troy

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Question 44:

Taking register is a repetitive task, a teacher repeats the same operation, if a

supply teacher needs to register a form, he/she would ask which form, assuming we have at least two files with form names where files names are in the format <form_name.txt>.

A teacher would find the first name in the student list, read it out, mark as either present or not present, then find the second name in the list, read it out, mark as either present or not present, etc.

We can easily express this operation with this pseudocode.

Write a program that reads a list of students from a file, then displays them on a screen one at a time, with the prompt for the user to either mark them as “p” for present or “n” for not present.

Once every name has been processed, the program will display the list, with the names in one column and the “p” or “n” in another. This gets saved to a new file which name is a concatenation of the form name and today's date + "CSV" extension.

Question 45:

How would you code a solution to displaying all the names of files in a folder?

USE OS //Initialise Operating System API

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Question 46:

Now only output the files with extension “TXT”

Question 47:

Modify the solution to also show the count of how many files have the “TXT” extension.

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Question 48:

Modify the solution, so that the contents of all the files with names starting with “LOG” are merged into one file called “all_logs.txt”.

Question 49:

Revisit our earlier question on converting binary number in string format to decimal values. Modify the solution to use iteration.

```
//Method 1
B:=”1110”
Decimal:=0
FOR i=0 TO 4
Decimal:=Decimal+INT(B[4-i-1])*2**i
NEXT i
OUTPUT Decimal
```

Python:

```
b="1110"
result=0
print("start iteration method 2")
for i in range(0,4):
   print(int(b[4-i-1])*2**(i+1))
   result=result+int(b[4-i-1])*2**i
print(result)
```

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```
""
#method 2
b="1110"
result=0
print("start iteration method 2")
for i in range(0,4):
    print(int(b[4-i-1])*2**(i+1))
    result=result+int(b[4-i-1])*2**i
print(result)
""
```

```
>>>
start iteration method 2
0
4
8
16
14
```

Question 50:

Extend your solution to accommodate 8 bit binary numbers (or any length binary).

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Iteration to many dimensions.

A 2D array got corrupted when it was saved to a text file. Its contents are given in a variable raw_data...

"Bob,123,Serge,Jenny,34,67

0,Peter,Nora,90,120,Noah

56.4,False,Chuck,Don,78,98"

Question 51:

Write an algorithm that would convert this into a string array (1D) and search it for the name "Chuck". If successful, it will return the index of "Chuck" in the array.

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Question 52:

Modify your solution to search not just for one name but for any of the names given below: Chuck, Johs, Bill, Serge

Question 53:

Given a 2D array, swap its columns around.

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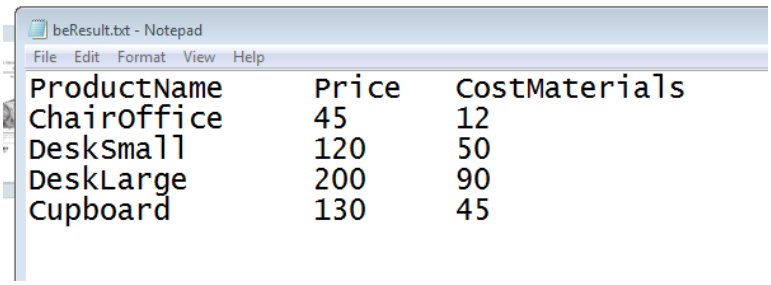
Question 54:

Break-even analysis is a useful business tool that serves to establish the minimum quantity of goods sold before all costs are recouped. The formula for it is

BE=FixedCost/(Price-VariableCost) where Variable Cost is in this case the Cost of Materials.



Given the following data file, create a program that calculates Break Even quantity for each product. Fixed Cost is £2000. For extensions, make it write the result to another file, and as an additional extension, style this file in HTML, including the use of table tags and images. (http://www.w3schools.com/tags/tag_table.asp)

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Question 55:

Write a part of an RPG game, e.g. starting out in the haunted house, facing 3 choices, etc. – take the program written in Python and express it in pseudocode. Modify the code given to make for a better game.

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