KIND POSITIVE YOURSELF

SDD
Assessment

H

Marking
Guidelines

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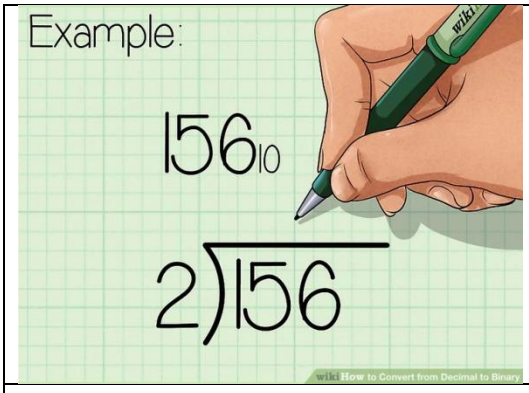
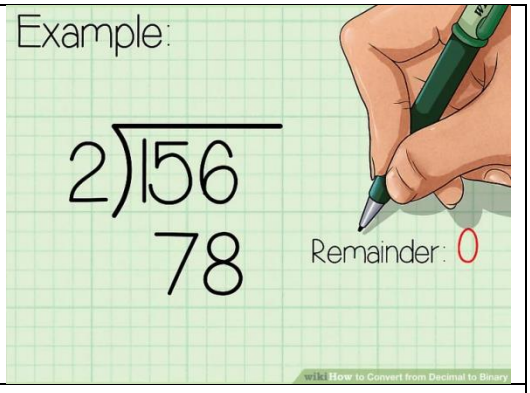
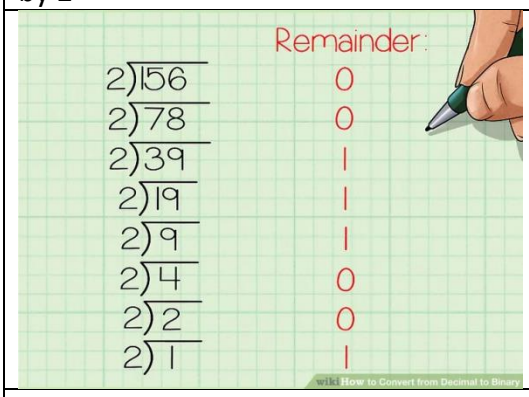
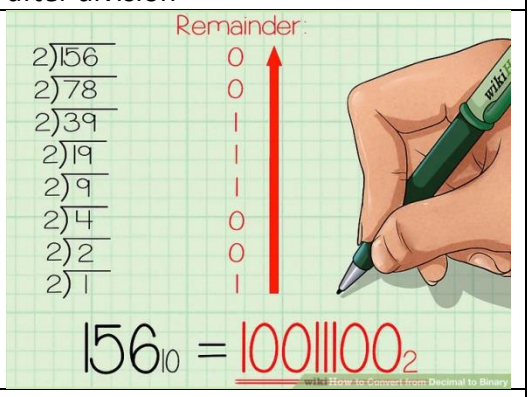
Question 1

A teacher challenges one of her pupils, Jo, to write a program to convert a decimal number into binary using the repeated division method shown below.

<table>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>Stage 1 – divide the decimal number by 2</td><td>Stage 2 – write down the remainder after division</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>Stage 3 – divide the result by 2 again and write down the remainder. Keep doing this until the result is 0 and you can't divide any more</td><td>Stage 4 – read the remainders from the bottom to the top to get the binary number.</td></tr>
</table>

Jo decides to use an array to store each remainder, find the length of that array and then reverse it to get the answer.

The top level algorithm for her program is shown below.

1. Get decimal number to convert	IN:-	OUT: decimalnumber
2. Convert to binary by repeated division	IN:_____	OUT: remainderList()
3. Find the length of the remainder list	IN:_____	OUT:_____
4. Reverse the remainder list	IN:_____	OUT:_____
5. Display the new reversed list	IN: newList()	

a. Complete the data flow in and out of steps 2, 3 and 4 5

1. Get decimal number to convert	IN:-	OUT: decimalnumber
2. Convert to binary by repeated division	IN: decimalnumber	OUT: remainderList()
3. Find the length of the remainder list	IN: remainderList()	OUT: length
4. Reverse the remainder list	IN: length, remainderList()	OUT:newList()
5. Display the new reversed list	IN: newList()	

b. Jo needs to write both procedures and functions in her program. Explain one difference between a procedure and a function. 2

A function can only return a single value (1 mark).
A procedure can return any number of values (1 mark)
The value of a function can be assigned to a variable (1 mark) a procedure has no value (1 mark)

c. Identify the pre-defined function required at Step 2 to complete the conversion. 1

modulus

Question 2

A simple drawing program is written using a combination of procedures and pre-written functions.

```
Line 1      PROCEDURE shape(length, angle, sides, colour)
Line 2          FOR loop FROM 1 TO sides DO
Line 3              pencolor(colour)
Line 4              forward(length)
Line 5              right(angle)
Line 6          END FOR
Line 7      END PROCEDURE

Line 8      FUNCTION colour() RETURNS STRING
Line 9          DECLARE colourList AS ARRAY OF STRING INITIALLY
    ["red","green","blue","pink","black"]
Line 10         SET col TO <random.choice(colourList)>
Line 11         RETURN col
Line 12     END FUNCTION

Line 13     SET edge TO colour()
Line 14     shape(100,60,6,edge)
Line 15     shape(100,120,3,edge)
```

a. Identify a formal parameter for shape 1

Any one from length, angle, sides, colour

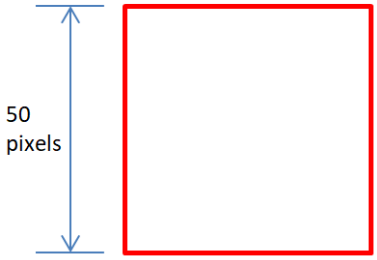
b. State the scope of the variable “edge” at Line 13 1

global

c. Describe what happens at Line 11 2

Value assigned to variable called col is passed back to main program and stored in the variable called edge at line 13 where the function was called

d. Write the code required at Line 16 to draw this shape. 1



Line 16 shape(50,90,4,red)

Question 3

The program below is used to display particular pupil records.

```
Line 1    DECLARE found INITIALLY false
Line 2    DECLARE counter INITIALLY 0
Line 3    DECLARE location INITIALLY -1
Line 4    DECLARE search_item INITIALLY ""
Line 5    RECEIVE search_item FROM KEYBOARD
Line 6    WHILE (found=false) OR (<counter = END OF LIST>) DO
Line 7            IF pupil[counter]=search_item THEN
Line 8                    SET found TO true
Line 9                    SET location TO counter
Line 10           END IF
Line 11           SET counter TO counter + 1
Line 12   END WHILE
Line 13   IF found=true THEN
Line 14           SEND pupil[location] & location TO DISPLAY
Line 15   ELSE
Line 16           SEND "Pupil is not found" TO DISPLAY
Line 17   END IF
```

The following data is stored in the pupil array:

Jack, Jakob, Jameel, Jess, Jenny, Jack, Joshua

State the output from the above program if Jack is entered at line 5 from the keyboard. 1

Jack 0

Question 4

```
Line 1    DECLARE allTimes INITIALLY [10.23, 10.1, 10.29, 9.9, 10.12, 10.34, 9.99, 9.58]
Line 2    DECLARE fastestTime INITIALLY allTimes [0]
```

```
Line 3      FOR EACH time FROM allTimes DO
Line 4      IF fastestTime > time THEN
Line 5            SET fastestTime TO time
Line 6      END IF
Line 7      END FOR EACH
Line 8      SEND "The winner's time was: " & numberToString(fastestTime) TO DISPLAY
```

While testing this code, the programmer uses a debugging technique which will force the program to stop running each time the loop reaches line 5.

a. State the name of this technique. 1
   breakpoint
b. Explain the purpose of doing this in this code. 1
   This would allow the programmer to check that the value of the fastest time variable updates correctly.

Question 5

The administrator of a computer games website wants to find out which game sold the most copies in the previous year. The names of all the games and their sales figures are stored in the text file. The text file, containing 250 games, is formatted as shown below.

```
Dark Star,1158
World Cricket, 1176
Breath of Life, 2282
Wrestlemania, 2324
Splinter Cell, 2746
Devil's Revenge, 3004
Gedi Wars - V, 3054
```

Before coding the program, an algorithm is written outlining the main steps that will be required to solve the problem.

1. Initialise variables and data structures	
2. Read data from text file into two arrays	IN: OUT: gamesList(), salesList()
3. Using one of the arrays calculate the position of the highest sales figure	IN: salesList() OUT: foundAt
4. Display the name of the game with the most sales.	IN: foundAt, gamesList() OUT:

a. Using a programming language of your choice, write a single line of code that could be used to open the text file, called “Games” before its contents are copied into the two arrays in step 2. 2
   Open(“games.txt”, “r”)
b. Using a programming language of your choice, write the function required to implement step 3. 4

```
FUNCTION findmax(salesList) RETURNS INTEGER
    DECLARE foundAt INITIALLY 0
    DECLARE maxValue INITIALLY salesList[0]
```

```
    FOR index FROM 0 TO len(SalesList) DO
        IF maxValue <= salesList[index] THEN
            SET foundAt TO index
        END IF
    END FOR
    RETURN foundAT
END FUNCTION
```

1 mark for declaration and parameters
1 mark for return of foundAT
1 mark for loop
1 mark for IF to locate highest

c. Using a programming language of your choice, write the procedure required to implement step 4. 2

```
PROCEDURE displayDetails(gamesList, foundAt)
SEND gamesList[foundAt] & "has the most sales" TO DISPLAY
END PROCEDURE
```

Question 6

An interactive touch screen application is developed to enable EasyJet's passengers to reserve their preferred seats.

Each flight has 156 seats.

A typical plane seat layout is shown here.

When a reservation is made, the following information is stored for each seat:

- Flight Number eg EZY394
- Date eg 05/06/18
- Passenger ID eg FraserA324
- Seat Number eg 12F
- Seat Cost eg £0.00

a. The application uses a record data structure to store each passenger's reservation details.

i. Using a programming language of your choice, define a record structure for the data for each reservation. 3

RECORD Reservation IS {STRING flightno, STRING date, STRING passengerID, STRING seatnumber, REAL seatcost}

1 mark for Record Declaration

1 mark for 5 variables

1 mark for correct data types

ii. The system is designed for a maximum of one hundred thousand reservations. Using a programming language of your choice, declare a variable based on the record structure to store these reservations. 2

DECLARE BookingList AS ARRAY OF Reservation INITIALLY [] * 10000

1 mark for array and data type

1 mark for 10000 records

b. A data file is to be created containing the Flight Number, Passenger ID and Seat Number of all passengers travelling on a particular date.

i. Write an algorithm, using detailed pseudocode, that asks for the date and then creates a data file containing this information for these passengers. Your answer should refer to the variable defined in a.ii. 5

1. Get requireddate
2. Open new file
3. Loop 10000 times
4. if BookingList().date = requireddate then
5. Write BookingList().flightno, BookingList().passengerID, BookingList().seatnumber
6. End if
7. End loop
8. Close file

1 mark for open file and close file

1 mark for loop 10000 times, or length of array

1 mark for comparison of date field of array element with input value at step 1

1 mark for Write statement

1 mark for correct variables written to file

ii. State one example of an execution error that may occur when creating this data file. 1

Any 1 from:

Insufficient space

Insufficient access rights

Incorrect pathname

file path does not exist

attempting to open an already open file

file with that name already exists

c. Some of the sub-programs used in the application are shown below.

Gets_Seat(seat, passengerdetails)

Confirm_Payment(passengerdetails)

Add_To_Journeyfile(seat, passengerdetails)

Each sub-program has been tested separately and no errors were found. However, when the sub-programs were integrated, errors were identified.

Give one example of an error that may have caused the program not to run. 1

Wrong number of arguments OR

mismatch of data types when parameter passing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