## TESTING

Describe, identify, exemplify, and implement normal, extreme, and exceptional test data for a specific problem, using a test table

SQP Q21b

21. Arthur's Antiques sells old furniture. All staff receive a monthly bonus of £50, which is increased if they sell over 10 items of furniture. The bonus is increased further if they sell over 20 items of furniture.

A design for the program used to calculate the bonus payment for each of the four members of staff is shown below.
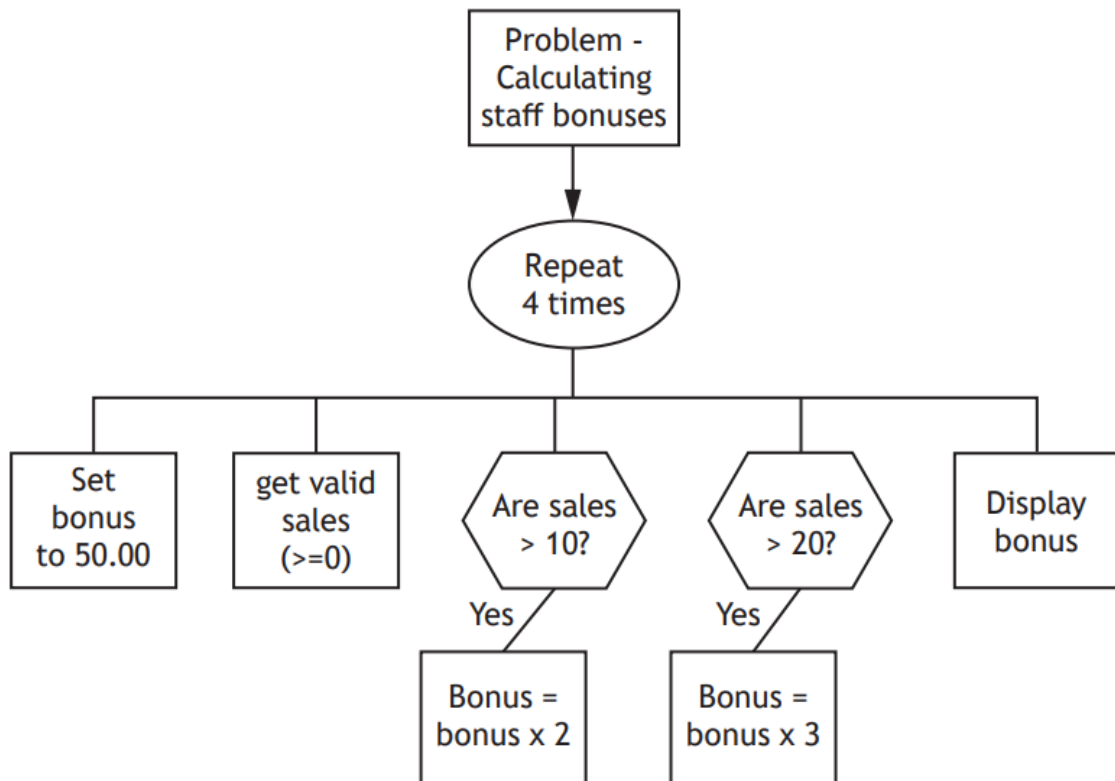
(b) The program is implemented to match the design.

State examples of exceptional and extreme test data that could be used when inputting staff sales.   **2**

Exceptional _____

Extreme _____

2019 Q7a

7. Part of a program requires a user to input the total score achieved when they roll a pair of six-sided dice.

   For example, if the user rolled a 4 and a 1 they would input 5.

   (a) State the extreme values required to test this part of the program. **2**

   Extreme 1 _____

   Extreme 2 _____

2018 19e

19. A program is being designed that will allow pupils to add money to their lunch money account. The user enters their name, an 8 character password and the amount of money they want to add. A button is then clicked and the updated balance of the account is displayed.

   (e) Test data will be used to ensure the validation of the password works correctly.

   Complete the test table below. **3**

Type of test	Input	Expected result
Normal		Program continues
	Jaj8up	

12. A complex condition is used to decide if hotel customers qualify for a free night's stay. Part of the program is shown below.

```
. . .
Line 21    IF nightsBooked >= 6  AND (NOT (cardType = Bronze)) THEN
Line 22        SEND custName TO DISPLAY
Line 23    END IF
. . .
```

State all possible outputs when the following test data is used in this program.   **2**

custName	cardType	nightsBooked
J Kerr	Gold	3
P Singh	Silver	8
R Kroon	Bronze	7
H Smith	Gold	6

17. An online pet supply retailer is offering a special deal to customers buying at least **two**, but not more than **six**, bags of pet food. If customers try to buy any other quantity, a message is displayed.

For example:

Input

> Special Deal
> Please enter the number of bags of pet food you would like to buy:
>
> 8

Output

> Quantity not valid.
> Please try again.

(b) The data in the table below will be used to test the program.

Complete the table.   **2**

Type of Test Data	Test Data	Expected Results
Extreme		Proceed to next section of code
Exceptional	Three	Program cannot run! Invalid data type
	4	Proceed to next section of code

16. A Maths game is designed for primary school pupils to test number ordering. In the game the pupil is asked to enter two integer numbers. A third integer number is then randomly generated and shown to the pupil.

The pupil must then state if the random number is:

> lower (l) than the two entered numbers
> higher (h) than the two entered numbers
> in the middle (m) of the two entered numbers.

A design for the code is shown below.

```
Line 1    <enter the first number and assign to numOne>
Line 2    <enter the second number and assign to numTwo>
Line 3    <generate random number and assign to randNum>
Line 4    SEND randNum TO DISPLAY
Line 5    RECEIVE guess FROM (CHARACTER) KEYBOARD
Line 6    IF guess = "l" AND randNum < numOne THEN
Line 7        SEND "Correct it is lower" TO DISPLAY
Line 8        SET score TO score + 1
Line 9    END IF
Line 10   IF guess = "m" AND randNum >= numOne AND randNum <= numTwo
Line 11       SEND "Correct it is in the middle" TO DISPLAY
Line 12       SET score TO score + 1
Line 13   END IF
Line 14   IF guess = "h" AND randNum > numTwo
Line 15       SEND "Correct it is higher" TO DISPLAY
Line 16       SET score TO score + 1
Line 17   END IF
Line 18   <display incorrect message>
```

(c) The program is run with the following data.

Variables	Values
numOne	7
numTwo	15
randNum	10
guess	m

State the output from the program. 1

_____

_____

_____

_____

5

21. A software developer is creating an online booking system for a bowling alley. Customers can book a bowling lane for a maximum of 4 people playing a maximum of 3 games.

The developer has used a flow chart to produce the program design. Part of the design is shown below.
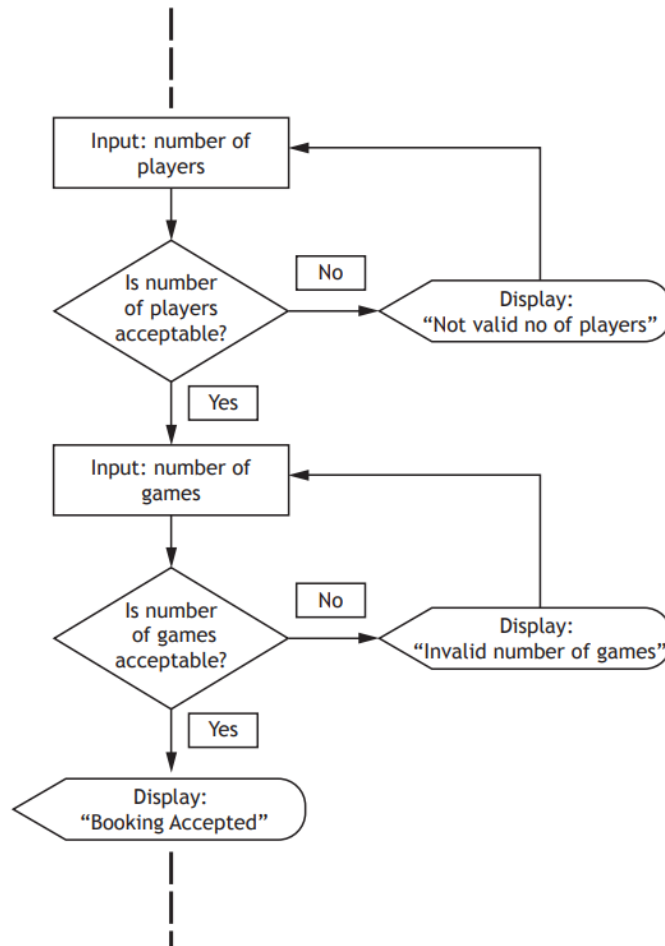
(c) The program is tested using a set of test data.

(i) Complete the table below to show three examples of test data types and the expected result for each type. **3**

| Test data	Test data type	Expected Result
numPlayers = 3 numGames = 2	Normal	Booking accepted
numPlayers = 4 numGames = 3		Booking accepted
numPlayers = 6 numGames = 3		

Describe and identify syntax, execution, and logic errors

SQP Q21c(ii) – c(i) included for reference

21. Arthur's Antiques sells old furniture. All staff receive a monthly bonus of £50, which is increased if they sell over 10 items of furniture. The bonus is increased further if they sell over 20 items of furniture.

A design for the program used to calculate the bonus payment for each of the four members of staff is shown below.

(c) The program is further tested with normal test data. The results are shown below.
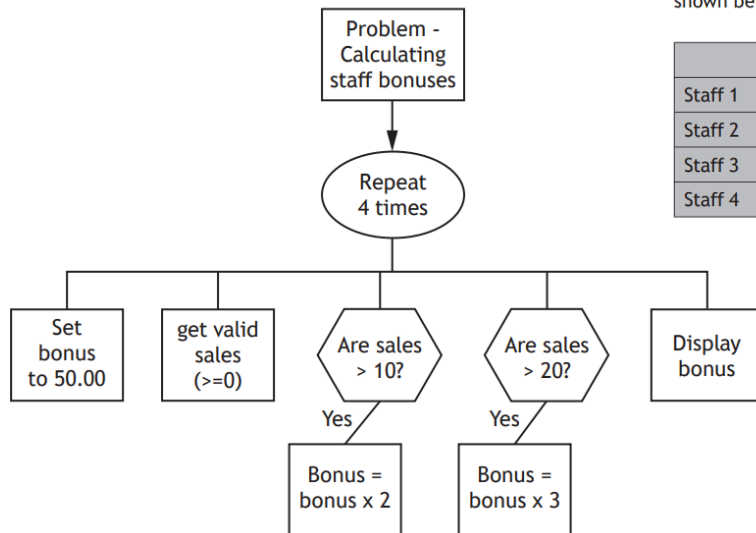
	Sales input	Expected output	Actual output
Staff 1	6	Bonus is 50	Bonus is 50
Staff 2	10	Bonus is 50	Bonus is 50
Staff 3	15	Bonus is 100	Bonus is 100
Staff 4	22	Bonus is 150	**Bonus is 300**

The test data for Staff 4 shows there is an error in the design.

(i) State the type of error. **1**

_____

(ii) Describe how this design error could be corrected. You may wish to write a description or re-draw part of the design. **2**

2019 Q11

11. The programming language below uses & to concatenate two strings.

```
SET message TO "hello" & "world"
```

When coding, a programmer types £ instead of & leading to an error.

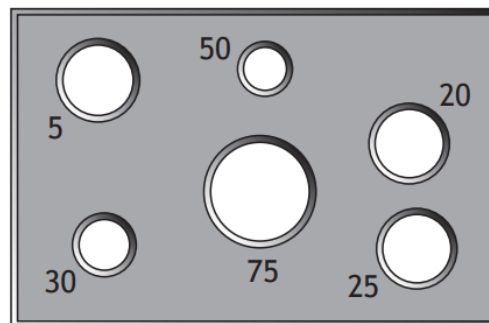State the type of programming error and describe its effect. **2**

Type _____

Effect _____

_____

2019 Q19b(i)

19. A fairground game involves throwing balls through holes in a large wooden board. Each hole scores different points.

The game is played using the following four rules.

1. A player starts with 3 balls and throws them one at a time.
2. If a ball is successfully thrown through a hole the points are added onto the player's score.
3. The game ends immediately if a player's score is greater than or equal to 50.
4. If the score reaches exactly 50 points the player is told they have won a prize.

A program is written to keep the score for a player.

```
...
Line 3    DECLARE total INITIALLY 0
Line 4    DECLARE balls INITIALLY 3
Line 5    WHILE total < 50 AND balls > 0 DO
Line 6       RECEIVE ballScoreOne FROM KEYBOARD
Line 7       SET total TO total + ballScoreOne
Line 8       SET balls TO balls - 1
Line 9       RECEIVE ballScoreTwo FROM KEYBOARD
Line 10      SET total TO total + ballScoreTwo
Line 11      SET balls TO balls - 1
Line 12      RECEIVE ballScoreThree FROM KEYBOARD
Line 13      SET total TO total + ballScoreThree
Line 14      SET balls TO balls - 1
Line 15   END WHILE
Line 16   SEND "Well done! You have won a prize." TO DISPLAY
```

(b) (continued)

(ii) The program has been edited as shown, but still breaks rule 3 and rule 4 of the game.

```
...
Line 3    DECLARE total INITIALLY 0
Line 4    DECLARE balls INITIALLY 3
Line 5    WHILE total < 50 AND balls > 0 DO
Line 6       RECEIVE ballScore FROM KEYBOARD
Line 7        SET total TO total + ballScore
Line 8        SET balls TO balls - 1
Line 9    END WHILE
Line 10   SEND "Well done! You have won a prize." TO
          DISPLAY
```

Using a design technique of your choice, design a solution that meets the requirements of all four game rules. **4**

2018 Q14a

14. The program code below calculates the delivery cost of orders.

. . .

```
Line 13   IF orderTotal < 50.00 AND NOT(cardType = "Platinum") THEN
Line 14          SET deliveryCost TO 5.00
Line 15   ELSE
Line 16          SET delivery TO 1.50
Line 17   END IF
Line 18   SEND deliveryCost TO DISPLAY
```

. . .

(a) Explain why the program may not display the expected output at line 18.　　**1**

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_____

_____

2017 Q17c & Q17d(i) – 17b is included for reference

17. An online pet supply retailer is offering a special deal to customers buying at least **two**, but not more than **six**, bags of pet food. If customers try to buy any other quantity, a message is displayed.

For example:

Input

> Special Deal
> Please enter the number of bags of pet food you would like to buy:
>
> 8

Output

> Quantity not valid.
> Please try again.

(b) The data in the table below will be used to test the program. Complete the table.

Type of Test Data	Test Data	Expected Results
Extreme		Proceed to next section of code
Exceptional	Three	Program cannot run! Invalid data type
	4	Proceed to next section of code

(c) When testing the program using the data from the table, "Three" is entered. As expected, an error message appears.

```
Program cannot run!
Invalid data type
```

    (i) Name this type of error. **1**

    _____

   (ii) Explain why this error occurred when testing the program. **1**

    _____

    _____

(d) A syntax error can occur when writing code.

    (i) Explain what is meant by a syntax error. **1**

    _____

    _____

21. A software developer is creating an online booking system for a bowling alley. Customers can book a bowling lane for a maximum of 4 people playing a maximum of 3 games.

The developer has used a flow chart to produce the program design. Part of the design is shown below.
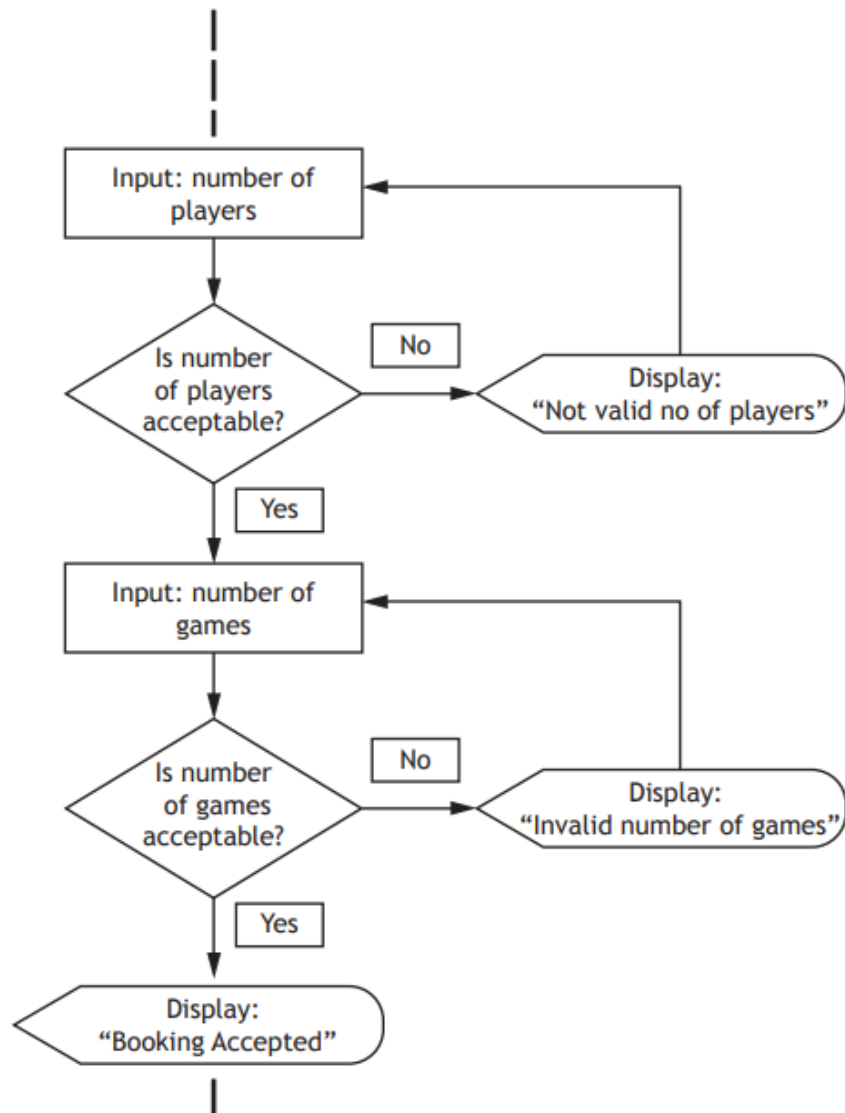
(ii) The character "£" is entered as a test value for the number of players. This causes the program to crash.

State the **type** of error that would cause this crash. **1**

_____

_____

EVALUATION

Describe, identify, and exemplify the evaluation of a solution in terms of:

- *Fitness for purpose*
- *Efficient use of coding constructs*
- *Robustness*
- *Readability:*
    - *Internal commentary*
    - *Meaningful identifiers*
    - *Indentation*
    - *White space*

2017 Q19c

19. Louise is conducting a survey at her school to find out how many hours per week her class mates spend playing computer games. Louise will survey 100 pupils.

The program assigns 100 names to a 1-D array as shown below.

```
Line 1      DECLARE name AS ARRAY OF STRING INITIALLY []
Line 2      RECEIVE name[0] FROM KEYBOARD
Line 3      RECEIVE name[1] FROM KEYBOARD
Line 4      RECEIVE name[2] FROM KEYBOARD
. . .
. . .
Line 101   RECEIVE name[99] FROM KEYBOARD
```

(c) Louise gives a copy of her finished program to her friend who tells her that the program code is difficult to read.

    (i) Explain how indentation can help readability in the program.   **1**

_____

_____

_____

    (ii) State one other programming technique used to improve readability of programs.   **1**

_____

2016 Q2

2. Explain why it is important that program code is readable.   1

_____

_____

2016 Q21d

(d) Error detection and correction in a program is easier if the code is readable.

State **one** technique that can be used to ensure _readability_ of code.   1

_____

_____