2.2 Programming Fundamentals: 30-minute Pack

OCR J277 · Calculators not allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Given the variables x = 7, y = 3 and z = 10, state whether each expression evaluates to True or False.

(i) x > y AND z < y

(ii) NOT (x == y)

(iii) (x + y) ≥ z

(iv) x < y OR z > y

(Total for Question 1 is 4 marks)

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2 A program reads a user's age from the keyboard using INPUT, which always stores the value as a String.

(a) Write one line of pseudocode that converts the String stored in ageInput into an integer and stores the result in a variable called age. **(1)**

(b) Explain why this conversion is necessary before the program can use age in a calculation such as age + 1. **(2)**

(Total for Question 2 is 3 marks)

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3 A program classifies a percentage exam score using the following pseudocode.

```
INPUT score
IF score >= 90 THEN
  OUTPUT "Distinction"
ELSE IF score >= 70 THEN
  OUTPUT "Merit"
ELSE IF score >= 40 THEN
  OUTPUT "Pass"
ELSE
  OUTPUT "Fail"
ENDIF
```

(a) Complete the trace table below by stating the output produced for each input score: 95, 68, 40, 39. **(4)**

(b) State the term used for test data that lies exactly on one of the boundaries in this algorithm, and give one example value from the algorithm that is boundary data. **(2)**

(Total for Question 3 is 6 marks)

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4 Write an algorithm, using pseudocode, that repeatedly asks the user to input an integer age. The algorithm must use a WHILE loop to reject any value that is not between 0 and 120 inclusive, printing an error message and asking again, and must only continue once a valid age has been entered.

(Total for Question 4 is 5 marks)

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5 A procedure declares a variable called total that is used only inside that procedure.

(a) State what is meant by the term 'local variable'. **(1)**

(b) Identify whether total is a local or global variable, and explain the problem this could cause if another part of the program needs to use the value stored in total after the procedure has finished running. **(3)**

(Total for Question 5 is 4 marks)

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6 A programmer intended the following algorithm to sum only the even numbers from 1 to 10, but it contains a logic error.

```
total = 0
FOR num = 1 TO 10
  IF num MOD 2 == 1 THEN
    total = total + num
  ENDIF
NEXT num
OUTPUT total
```

(a) State what this algorithm actually calculates as it is currently written. **(1)**

(b) Identify the line of pseudocode that contains the logic error. **(1)**

(c) State the corrected line of pseudocode needed so the algorithm sums only the even numbers. **(1)**

(d) Using the corrected algorithm, state the value that would be output. **(2)**

(Total for Question 6 is 5 marks)

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Mark scheme · 2.2 Programming Fundamentals: 30-minute Pack

Question 1

(i) False cao **B1**

(ii) True cao **B1**

(iii) True cao **B1**

(iv) True cao **B1**

Answer: (i) False (ii) True (iii) True (iv) True

Question 2

(a) age = STRING_TO$_{INT}$(ageInput) or equivalent cast, any correct syntax **M1**

(a) Answer: age = STRING_TO$_{INT}$(ageInput)

(b) INPUT stores the value as a String / text data type **B1**

(b) arithmetic operators only work on numeric data types, so the String must be cast to an integer first oe **B1**

(b) Answer: Because INPUT always produces a String, and a String cannot be used with + in arithmetic; it must first be cast to an Integer.

Question 3

(a) score 95 -> Distinction cao **B1**

(a) score 68 -> Pass cao **B1**

(a) score 40 -> Pass cao **B1**

(a) score 39 -> Fail cao **B1**

(a) Answer: 95 -> Distinction, 68 -> Pass, 40 -> Pass, 39 -> Fail

(b) boundary data (accept borderline data) **B1**

(b) any one of 90, 70 or 40 given as an example **B1**

(b) Answer: Boundary data, for example 40.

Question 4

an initial INPUT of age before the loop condition is tested **M1**

WHILE condition correctly tests both bounds, e.g. age < 0 OR age > 120 **M1**

an error message is output inside the loop **M1**

age is re-input inside the loop **M1**

overall structure correctly repeats until a valid value is entered; any correct logic, ignore minor syntax **M1**

Answer:

```
INPUT age
WHILE age < 0 OR age > 120
  OUTPUT "Invalid age, try again"
  INPUT age
ENDWHILE
OUTPUT "Age accepted"
```

Question 5

(a) a variable that can only be accessed / used within the subprogram (procedure or function) in which it is declared **B1**

(a) Answer: A local variable is one that only exists and can be used inside the subprogram in which it was declared.

(b) identifies total as a local variable **B1**

(b) explains that total goes out of scope / is deleted once the procedure ends, so its value is lost **B1**

(b) states a valid fix, e.g. return the value from a function, pass it as a parameter, or make it global oe **B1**

(b) Answer: total is local. Once the procedure ends, total no longer exists, so its value cannot be read elsewhere. This could be fixed by using a function to RETURN the value, or by passing it out via a parameter.

Question 6

(a) the sum of the odd numbers from 1 to 10 (or equivalent description) **B1**

(a) Answer: It sums the odd numbers between 1 and 10.

(b) IF num MOD 2 == 1 THEN **B1**

(b) Answer: IF num MOD 2 == 1 THEN

(c) IF num MOD 2 == 0 THEN **B1**

(c) Answer: IF num MOD 2 == 0 THEN

(d) even numbers 2, 4, 6, 8, 10 identified / added **M1**

(d) 30 cao, ft from part (c) **A1**

(d) Answer: 30

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