

2.2 Programming

Saturday, 19 December 2020 3:41 PM



2.2

Program...



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Topic: 2.2 Programming

May/June 2015.P21

- 2 Read this section of program code that should input 10 positive numbers and then output the smallest number input.

```
1 Small = 0  
2 Counter = 0  
3 REPEAT  
4     INPUT Num  
5     IF Num < Small THEN Num = Small  
6     Counter = Counter + 1  
7     PRINT Small  
8 UNTIL Counter < 10
```

There are **four** errors in this code.

Locate these errors and suggest a corrected piece of code for each error.

[4]

- 4 Five data types and five data samples are shown below. Draw a line to link each data type to the correct data sample.

Data type	Data sample
Integer	'a'
Real	2
Char	2.0
String	True
Boolean	"Twelve"

[4]



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Page 1 of 34

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Topic: 2.2 Programming

- 5 Explain the difference between a variable and a constant in a program.

[2]

- 6 Identify **three** different loop structures that you can use when writing pseudocode.

[3]

May/June 2015 P22

- 2 Read this section of program code that should input 30 positive numbers and then output the largest number input.

```
1 Large = 9999  
2 Counter = 0  
3 WHILE Counter > 30  
4 DO  
5     INPUT Num  
6     IF Num < Large THEN Large = Num  
7     Counter = Counter - 1  
8 ENDWHILE  
9 PRINT Large
```

There are **four** errors in this code.

Locate these errors and suggest a corrected piece of code for each error.

[4]



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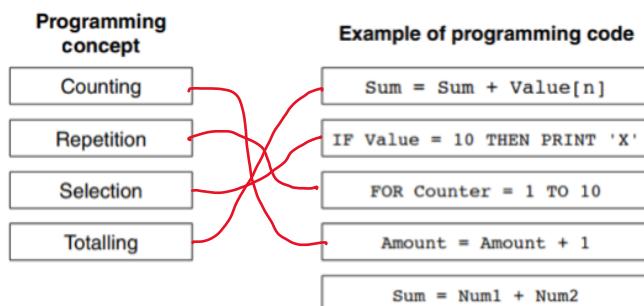


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- 4 Four programming concepts and four examples of programming code are shown below.

Draw a line to link each programming concept to the correct example of programming code.

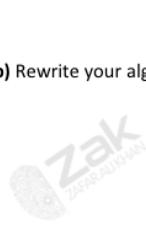


[4]

- 5 (a) Write an algorithm, using pseudocode and a FOR ... TO ... NEXT loop structure, to input 1000

(b) Rewrite your algorithm using another loop structure.

[4]



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Oct/Nov 2015 P22

- 2 Read this section of program code that should input 50 numbers and then output the average.

```

1 Total = 0
2 For Counter = 1 TO 50
3 INPUT Num
4 Total = Total + 1
5 Counter = Counter + 1
6 Average = Total/Counter
7 NEXT Counter
8 PRINT Average

```

There are **four** errors in this code.

Locate these errors and suggest code corrections to remove each error.

[4]

- 5 Identify **two** different conditional statements that you can use when writing pseudocode.

[2]

Oct/Nov 2015 P23

- 2 Read this section of program code that should input 50 numbers and then output the average of the positive numbers only.

```

1 Total = 0
2 PosCount = 0
3 FOR Counter = 1 TO 50
4     INPUT Num
5     IF Num < 0 THEN Total = Total + Num
6     IF Num > 0 THEN Counter = Counter + 1
7     Average = Total/PosCount
8 NEXT Counter

```



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9 PRINT Num

There are **four** errors in this code.

Locate these errors and suggest code corrections to remove each error.

[4]

- 3 (a) This pseudocode inputs an integer. The predefined function DIV gives the value of the division, e.g. $Y \leftarrow 10 \text{ DIV } 3$ gives the value $Y = 3$. The predefined function MOD gives the value of the remainder, e.g. $Y \leftarrow 10 \text{ MOD } 3$ gives the value $Y = 1$.

```
INPUT X
WHILE X > 15
    DO
        T1 ← X DIV 16
        T2 ← X MOD 16
        CASE T2 OF
            10:OUTPUT A
            11:OUTPUT B
            12:OUTPUT C
            13:OUTPUT D
            14:OUTPUT E
            15:OUTPUT F
        OTHERWISE OUTPUT T2
    ENDCASE
    X ← T1
ENDWHILE
CASE X OF
    10:OUTPUT A
    11:OUTPUT B
```



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12:OUTPUT C

13:OUTPUT D

14:OUTPUT E

15:OUTPUT F

OTHERWISE OUTPUT X

ENDCASE

Complete a trace table for each of the **two** input values 37 and 191.

Trace table for input value 37

X	T1	T2	OUTPUT

Trace table for input value 191

X	T1	T2	OUTPUT

[4]

(b) State the purpose of the pseudocode in part (a). [2]



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- 3 A program will be written to store information about members of a swimming club.

The following membership details will be recorded:

- Name
- Gender
- Status:
 - Senior
 - Junior
- Fee
- Team member (Yes or No)

- (i) Choose a suitable data type for each of the membership details to be recorded.

Membership details	Data type
Name	STRING/TEXT
Gender	BOOLEAN
Status	STRING
Fee	CURRENCY
Team member	BOOLEAN

[5]

- (ii) The swimming club has 50 members.

State the data structure that would be most suitable to use and give a reason for your choice.

Data structure



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- 5 REPEAT . . . UNTIL is one type of loop structure.

Identify and describe **two** other types of loop structure that you could use when writing pseudocode.

Loop structure 1

Description

Loop structure 2

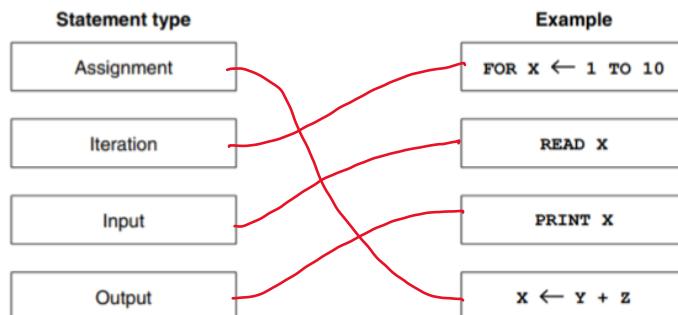
Description

[4]

May/June 2016 P22

- 4 Four statement types and four examples are shown below.

Draw a line to connect each statement type to the correct example.



[3]

- 5 A programmer writes a program to store a patient's temperature every hour for a day.

State the data structure that would be most suitable to use and give the reason for your choice.

Data structure

Reason

[2]



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Oct/Nov 2016 P22

- 2 Read this section of program code that inputs positive numbers, discards any negative numbers and then outputs the average. An input of zero ends the process.

```

1 Total = 0
2 Counter = 100
3 REPEAT
4     REPEAT
5         INPUT Num
6         UNTIL Num < 0
7     Total = Total + 1
8     Counter = Counter + Num
9 UNTIL Num = 0
10 Average = Total / (Counter - 1)
11 Print Average

```

There are four errors in this code.

Locate these errors and suggest a correction to remove each error.

Error 1

Correction

Error 2

Correction

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Error 3

Correction

Error 4

Correction

[8]

- 4 IF ... THEN ... ELSE ... ENDIF and CASE ... OF ... OTHERWISE ... ENDCASE are two different conditional statements that you can use when writing pseudocode.

Explain, using examples, why you would choose to use each conditional statement.

Example 1

Reason for choice

Example 2

Reason for choice

[6]

2 Read this section of program code that:

- inputs 10 numbers
- checks whether each number is within a specified range
- totals the numbers within the range and outside the range

```

1 InRange = 0
2 OutRange = 1000
3 FOR Count = 1 TO 10
4     INPUT Num
5     IF Num > 10 AND Num < 20 THEN InRange = InRange + 1

```



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```

6         ELSE OutRange = OutRange - 1
7 Count = Count + 1
8 NEXT X
9 PRINT InRange, OutRange

```

(a) There are four errors in this code.

Locate these errors and suggest a correction to remove each error.

Error 1

Correction

Error 2

Correction

Error 3

Correction

Error 4

Correction

[4]

(b) Decide, with reasons, whether the numbers 10 and 20 are within or outside the range.

Number	Within range (✓)	Outside range (✗)	Reason
10		
20		

[4]



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**Topic: 2.2 Programming**

- 5 REPEAT ... UNTIL and WHILE ... DO ... ENDWHILE are two different loop structures you can use when writing pseudocode.

Explain, using examples, why you would choose to use each type of loop.

Example 1

Reason for choice

Example 2

Reason for choice

[6]

May/June 2017 P21

- 2 This section of program code asks for 50 numbers to be entered. The total and average of the numbers are calculated.

```
1 Total = 0
2 Counter = 50
3 PRINT 'When prompted, enter 50 numbers, one at a time'
4 REPEAT
5 PRINT 'Enter a number'
6 INPUT Number
7 Total + Number = Total
8 Number = Number + 1
9 UNTIL Counter = 50
10 Average = Number * Counter
11 PRINT 'The average of the numbers you entered is ', Average
```

There are four errors in this code.

State the line number for each error and write the correct code for that line.

Error 1

Line number



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Correct code

Error 2

Line number

Correct code

Error 3

Line number

Correct code

Error 4

Line number

Correct code

[4]

- 5 (a) Describe the purpose of each statement in this algorithm.

FOR I ← 1 TO 300

INPUT Name[I]

NEXT I

[2]

- (b) Identify, using pseudocode, another loop structure that the algorithm in part (a) could have used. [1]

- (c) Write an algorithm, using pseudocode, to input a number between 0 and 100 inclusive. The algorithm should prompt for the input and output an error message if the number is outside this range. [3]



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Topic: 2.2 Programming

May/June 2017 P22

- 2 (a) Write an algorithm to input three different numbers, and then output the largest number. Use either pseudocode or a flowchart. [4]

- 4 An algorithm has been written in pseudocode to input 100 numbers and print out the sum.

A REPEAT ... UNTIL loop has been used.

Count ← 0

Sum ← 0

REPEAT

 INPUT Number

 Sum ← Sum + Number

 Count ← Count + 1

UNTIL Count > 100

PRINT Sum

- (a) Find the error in the pseudocode and suggest a correction.

Error

Correction

[2]

- (b) Rewrite the correct algorithm using a more suitable loop structure. [3]

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Oct/Nov 2017.P22

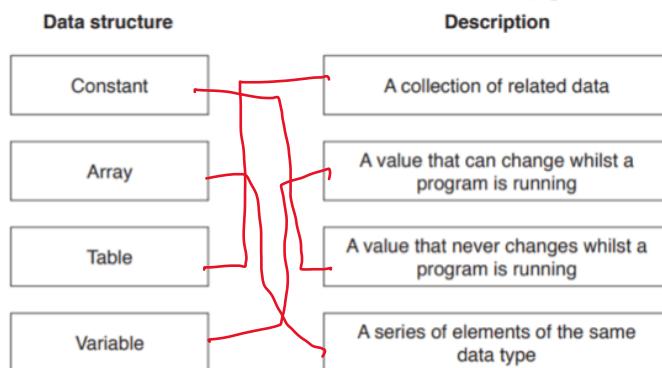
- 2 Write an algorithm using either pseudocode or a flowchart, to:

- input a positive integer
- use this value to set up how many other numbers are to be input
- input these numbers
- calculate and output the total and the average of these numbers.

[6]

- 3 The following diagram shows four data structures and four descriptions.

Draw a line to connect each data structure to the correct description.



[3]

- 4 IF ... THEN ... ELSE ... ENDIF is one type of conditional statement used when writing pseudocode.

Identify and describe another type of conditional statement that you could use when writing pseudocode.
Give a reason why you would use this type of conditional statement.

Conditional statement

Description

Reason

[4]

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Topic: 2.2 Programming

Oct/Nov 2017.P23

- 2 This section of program code asks for 80 numbers between 100 and 1000 to be entered. It checks that the numbers are in the correct range, and stores them in an array. It counts how many of the numbers are larger than 500 and then outputs the result when the program is finished.

```
1 Count = 0
2 FOR Index = 1 TO 80
3     INPUT 'Enter a number between 100 and 1000', Number
4     WHILE Number = 99 AND Number = 1001
5         INPUT 'This is incorrect, please try again', Number
6     ENDWHILE
7     Num[80] = Number
8     IF Number > 500 THEN Count = Count + 1
9 UNTIL Index = 80
10 PRINT Index
11 PRINT ' numbers were larger than 500'
```

There are **four** lines of code that contain errors.

State the line number for each error and write the correct code for that line.

Error 1 Line Number

Correct Code

Error 2 Line Number

Correct Code

Error 3 Line Number

Correct Code

Error 4 Line Number

Correct Code

[4]



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Topic: 2.2 Programming

- 4 (a) **Four** pseudocode descriptions and **five** pseudocode statements are shown. Draw one line to link each pseudocode description to the correct pseudocode statement. Not all pseudocode statements will be used.

Pseudocode description

Pseudocode statement

A loop that will iterate at least once.

FOR...TO...NEXT

A conditional statement to deal with many possible outcomes.

IF...THEN...ELSE...ENDIF

A loop that will iterate a set number of times.

WHILE...DO...ENDWHILE

A conditional statement with different outcomes for true and false.

CASE...OF...OTHERWISE...ENDCASE

REPEAT...UNTIL

[4]

- (b) Write an algorithm in pseudocode, using a single loop, to print 50 names that have been stored in an array.

[3]

2 (a) Write an algorithm to input 1000 numbers. Count how many numbers are positive and how many numbers are zero. Then output the results. Use either pseudocode or a flowchart. [6]

(b) Give one change you could make to your algorithm to ensure initial testing is more manageable. [1]

3 The global trade item number (GTIN-8) barcode has seven digits and a check digit.

This pseudocode algorithm inputs seven digits and calculates the eighth digit, then outputs the GTIN-8.

DIV (X, Y), finds the number of divides in division for example **DIV (23, 10)** is 2.

MOD (X, Y), finds the remainder in division for example **MOD (23, 10)** is 3.



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```
FOR Count ← 1 TO 7
    INPUT Number
    Digit(Count) ← Number
NEXT
Sum ← (Digit(1)+Digit(3)+Digit(5)+Digit(7))*3+Digit(2)+Digit(4)+Digit(6)
IF MOD(Sum,10) <> 0
    THEN Digit(8) ← DIV(Sum,10)*10 + 10 - Sum
    ELSE Digit(8) ← 0
ENDIF
OUTPUT "GTIN-8"
FOR Count ← 1 TO 8
    OUTPUT Digit(Count)
NEXT
```

(a) Complete the trace table for the input data: 5, 7, 0, 1, 2, 3, 4

Digit(1)	Digit(2)	Digit(3)	Digit(4)	Digit(5)	Digit(6)	Digit(7)	Digit(8)	Sum	OUTPUT

Complete the trace table for the input data: 4, 3, 1, 0, 2, 3, 1

Digit(1)	Digit(2)	Digit(3)	Digit(4)	Digit(5)	Digit(6)	Digit(7)	Digit(8)	Sum	OUTPUT

[5]



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Page 18 of 34

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(b) Explain how you would change the algorithm to input eight digits (seven digits and the check digit) and output if the check digit entered is correct or not. [3]

- 5 Explain the difference between the programming concepts of **counting** and **totalling**.

Include an example of a programming statement for each concept in your explanation.

[4]

May/June 2018 P22

- 3 This pseudocode algorithm inputs two non-zero numbers and a sign, and then performs the calculation shown by the sign. An input of zero for the first number terminates the process.

```
INPUT Number1, Number2, Sign
WHILE Number1 <> 0
    IF Sign = '+' THEN Answer Number1 + Number2 ENDIF
    IF Sign = '-' THEN Answer Number1 - Number2 ENDIF
    IF Sign = '*' THEN Answer Number1 * Number2 ENDIF
    IF Sign = '/' THEN Answer Number1 / Number2 ENDIF
    IF Sign <> '/' AND Sign <> '*' AND Sign <> '-' AND Sign <> '+' THEN
        Answer 0 ENDIF
    IF Answer <> 0 THEN OUTPUT Answer ENDIF
    INPUT Number1, Number2, Sign
ENDWHILE
```

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**Topic: 2.2 Programming**

- (a) Complete the trace table for the input data:

5, 7, +, 6, 2, -, 4, 3, *, 7, 8, ?, 0, 0, /

Number1	Number2	Sign	Answer	OUTPUT

(b) Show how you could improve the algorithm written in pseudocode by writing an alternative type of conditional statement in pseudocode.

[3]

Oct/Nov 2018 P22

- 2 (a) Write an algorithm, using pseudocode, to input three different numbers, multiply the two larger numbers together and output the result. Use the variables: Number1, Number2 and Number3 for your numbers and Answer for your result. [5]

- 3 Four programming concepts and four descriptions are shown. Draw a line to connect each programming concept to the most appropriate description.

Programming concept	Description
Library routine	A subroutine that does not have to return a value.
Structure diagram	A standard subroutine that is available for immediate use.
Procedure	A subroutine that always returns a value.
Function	An overview of a program or subroutine.

[3]

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Topic: 2.2 Programming

- 4 A programmer wants to test that the readings from 2000 electricity meters are greater than 400 units and less than 900 units. The programmer uses selection and repetition statements as part of the program.

Explain, using programming statements, how selection and repetition could be used in this program.

Selection

Repetition

[4]

Oct/Nov 2018 P23

- 2 Describe, giving an example for each, the following data types used in programming.

Integer

Description

Example

String

Description

Example

[4]

- 3 Give an example of a pseudocode statement or statements to perform each of the following functions.

A condition controlled loop

A conditional statement

Totalling

[3]

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Topic: 2.2 Programming

- 4 This is a section of program code.

```
1 Total = 100.00
2 PRINT 'Enter the height of each member of your class, one at a time,
when prompted'
3 FOR Count = 1 TO 30
4     PRINT 'Enter a height in metres'
5     INPUT Height
6     Total = Total + Height
7     PRINT Total / 30
8     Count = Count + 1
9 NEXT Count
```

- (a) There are **three** errors in this code.

State the line numbers that contain the errors and describe how to correct each error.

Error 1

Error 2

Error 3

[3]

- (b) State the purpose of this program

[1]

- 5 The algorithm allows a number to be entered. It then calculates and outputs the next number in the mathematical series.

```
Fib ← 1
Prev2 ← 0
Prev1 ← 1
INPUT Number
```

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IF Number = 0

THEN Fib ← 0

END IF

```

ENIF
WHILE Number > 2
    Fib ← Prev2 + Prev1
    Prev2 ← Prev1
    Prev1 ← Fib
    Number ← Number - 1
ENDWHILE
OUTPUT Fib

```

(a) Complete the trace table for the input data: 7

Fib	Prev2	Prev1	Number	OUTPUT

[4]



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(b) Complete the trace table for the input data: 2

Fib	Prev2	Prev1	Number	OUTPUT

[2]

May/June 2019.P21

- 2 Describe each of the following data types used in programming. In each case, give an example of a piece of data to illustrate your answer. Each example must be different.

Char as single character which ASCII. Grade = 'A' , Gender ← 'M'

String as collection of characters . Name = "Azhar Khan"

Boolean where there are only two possibilities , isExamPassed = #True#

Boolean where there are only two possibilities , isExamPassed = #True#

- 3 (a) Give an example of a conditional statement using pseudocode. [2]

- (b) Describe the purpose of a conditional statement. [2]



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- 2 (a) An algorithm has been written in pseudocode to input 100 numbers, select and print the largest number and smallest number.

```

Count ← 1
INPUT Number
High ← Number
Low ← Count
REPEAT
    INPUT Number
    IF Number > High
        THEN
            High ← Number
    ENDIF
    IF Number < Low
        THEN
            Low ← Number
    ENDIF
    Count ← Count + 1
UNTIL Count = 99
PRINT "Largest Number is ", Number
PRINT "Smallest Number is ", Low

```

Find the four errors in the pseudocode and suggest a correction for each error.

Error 1

Correction

Error 2

Correction



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Page 25 of 34

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Error 3

Correction

Error 4

Correction

[4]

(b) Show how you would change the corrected algorithm to total the numbers and print the total. Use a variable Total.

- 4 For each of the **four** groups of statements in the table, place a tick in the correct column to show whether it is an example of **Selection** or **Repetition**.

Statements	Selection	Repetition
FOR A \leftarrow 1 TO 100 B \leftarrow B + 1 NEXT A		✓
CASE A OF 100: B \leftarrow A 200: C \leftarrow A ENDCASE	✓	
IF A > 100 THEN B \leftarrow A ENDIF	✓	
REPEAT A \leftarrow B * 10 UNTIL A > 100		✓

[4]



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- 2 An algorithm has been written in pseudocode to select a random number using the function RandInt (n), which returns a whole number between 1 and the argument n. The algorithm then allows the user to guess the number.

```
Number  $\leftarrow$  RandInt(100)
TotalTry  $\leftarrow$  1
REPEAT
    PRINT "Enter your guess now, it must be a whole number"
    INPUT Guess
    IF TotalTry > Number
        THEN
```

```

PRINT "Too large try again"
ENDIF
IF Guess > Number
THEN
PRINT "Too small try again"
ENDIF
TotalTry ← Guess + 1
UNTIL Guess <> Number
TotalTry ← TotalTry - 1
PRINT "Number of guesses ", TotalTry

```

Find the **four** errors in the pseudocode and suggest a correction to remove each error.

Error 1

Correction

Error 2

Correction

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Error 3

Correction

Error 4

Correction

[4]

- 5 A programmer writes a program to weigh baskets of fruit in grams, keeping a total of the weight and counting the number of baskets. The total weight is stored in a variable **Total** and the number of baskets is stored in a variable **BasketCount**.

Explain, including examples of programming statements, how totalling and counting could be used in this program.

Totalling

Counting

[4]

- 6 Explain why constants, variables and arrays are used in programming.

Constants

Variables

Arrays

[6]

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- 3 Name the **three** types of loop structure used in pseudocode.

[3]

- 4 The following pseudocode algorithm uses nested IF statements.

IF Response = 1

THEN

X ← X + Y

ELSE

IF Response = 2

THEN

X ← X - Y

ELSE

IF Response = 3

THEN

X ← X * Y

ELSE

IF Response = 4

THEN

X ← X / Y

ELSE OUTPUT "No response"

ENDIF

ENDIF

ENDIF

ENDIF

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- (a) Name the type of statement demonstrated by the use of IF ... THEN ... ELSE ... ENDIF

[1]

- (b) Re-write the pseudocode algorithm using a CASE statement.

[4]

5 The algorithm performs an operation on the array named MyData

DIV means integer division, so only the whole number part of the result is returned

e.g. 7 DIV 2 returns a value of 3

First \leftarrow 0

Last \leftarrow 16

Found \leftarrow FALSE

INPUT UserIn

WHILE (First \leq Last) AND (Found = FALSE) DO

 Middle \leftarrow (First + Last) DIV 2

 IF MyData[Middle] = UserIn

 THEN

 Found \leftarrow TRUE

 ELSE

 IF UserIn < MyData[Middle]

 THEN

 Last \leftarrow Middle - 1

 ELSE

 First \leftarrow Middle + 1

 ENDIF

 ENDIF

ENDWHILE



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Page 30 of 34

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OUTPUT Found

This table shows the contents of the array: MyData e.g. MyData[2] stores the value 5

	MyData																
Index	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]
Value	2	3	5	6	8	10	12	13	14	16	18	20	25	27	29	34	36

(a) Complete the trace table for the input data: 10

First	Last	UserIn	Middle	Found	OUTPUT

[6]

(b) Describe the function being performed by the algorithm.

[2]

REPEAT

 INPUT Values[Count]

 Count ← Count + 1

UNTIL Count = 0

(a) Explain why the algorithm will never end.

[2]

(b) Re-write the original pseudocode so that it terminates correctly **and** also prevents numbers below 100 from being stored in the array Values []

[4]



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Page 31 of 34



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Topic: 2.2 Programming

May/June 2020 P22

- 2 Most programming languages include basic data types. Ahmad is describing the basic data types he has used.

State the data type that Ahmad is describing in each sentence.

Choose the data type from this list of programming terms.

Array Boolean Char Constant Function Integer
Iteration Procedure Real String Variable

A number with a fractional part that can be positive or negative and used in calculations

Data type

A whole number that can be positive, negative or zero and used in calculations

Data type

A single number, symbol or letter

Data type

A sequence of characters

Data type

A data type with two values, True or False

Data type

[5]



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Page 32 of 34



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Topic: 2.2 Programming

- 3 (a) An algorithm has been written in pseudocode to input the names and marks of 35 students. The algorithm stores the names and marks in two arrays Name [] and Mark []. The highest mark awarded is found and the number of students with that mark is counted. Both of these values are output.

```
01 HighestMark ← 100
02 HighestMarkStudents ← 0
03 FOR Count ← 1 TO 35
04   OUTPUT "Please enter student name"
05   INPUT Name[Count]
06   OUTPUT "Please enter student mark"
07   INPUT Mark[Counter]
08   IF Mark[Count] = HighestMark
09     THEN
10       HighestMarkStudents ← HighestMarkStudents + 1
11   ENDIF
12   IF Mark[Count] > HighestMark
13     THEN
14       Mark[Count] ← HighestMark
15       HighestMarkStudents ← 1
16   ENDIF
17 NEXT Count
18 OUTPUT "There are ", HighestMarkStudents, " with the highest mark of ", HighestMark
```

Give line numbers where the **four** errors are to be found in the pseudocode. Suggest a correction for each error.

[4]

- (b) Explain how you could extend the algorithm to also find the lowest mark awarded, count the number of students with that mark, and output both these values.

[6]



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Page 33 of 34

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Topic: 2.2 Programming

- 5 Arrays are data structures used in programming.

Explain what is meant by the terms dimension and index in an array. Use examples of arrays in your explanations.

Dimension

Index

[3]

