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Cambridge International Advanced Subsidiary and Advanced Level

COMPUTER SCIENCE 9608/22

Paper 2 Written Paper

October/November 2017

MARK SCHEME
Maximum Mark: 75

Published

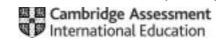
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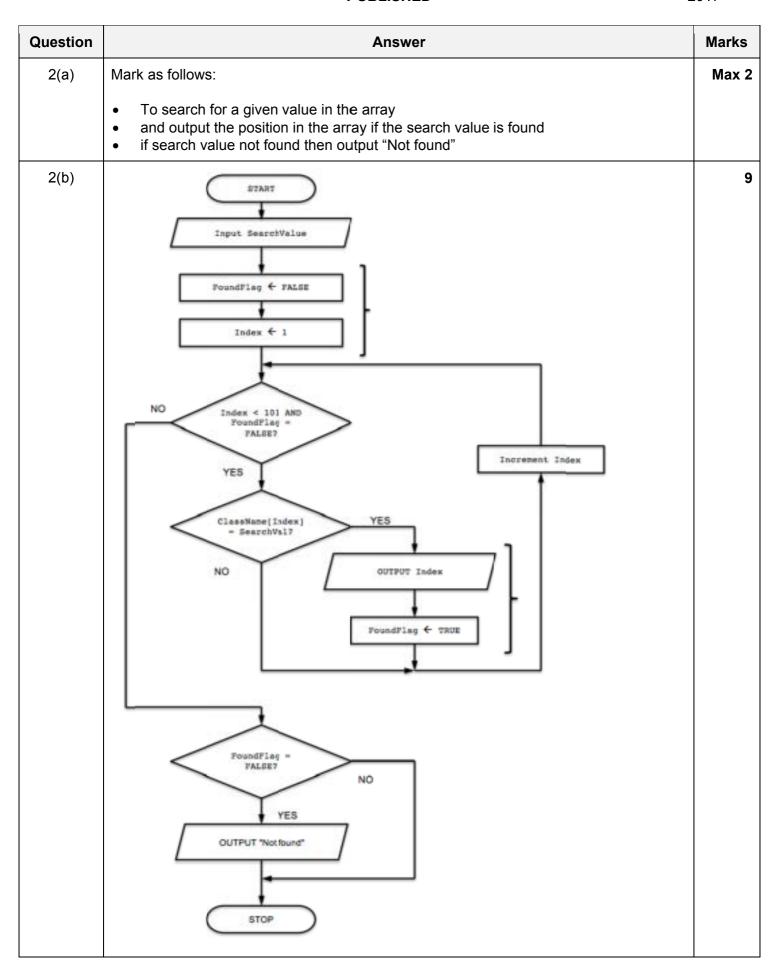
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Question		Answer	Marks
1(a)(i)			6
	Data value	Data type	
	FALSE	BOOLEAN	
	03/03/2013	DATE // DATETIME	
	35	INTEGER	
	"INTEGER"	STRING	
	3.5	REAL	
	"35"	STRING	
	One mark for each data ty Mark first data type given i		
1(a)(ii)	1D Array // 1D List		1
	 selection statement iteration statement assignment statements data declarations / structures / data types / use of variables or objects modular structure / functions / procedures / subroutines subroutine parameters Specific types of statement e.g. Input, Output, File operations Code format Operators Mark as follows: Any two from above, or valid alternative Accept by example 		ets
1(b)(i)	Data 67 // 0100 0011 // 65 // 0100 0001 // 71 // 0100 0111 // 69 // 0100 0101 // One mark for 67 and 65 One mark for 71 and 69	/ 041h / 047h	2

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Question	Answer	Marks
1(b)(ii)	 A value representing the number of characters stored at beginning of string OR Terminator / special character stored to indicate the end of string 	2
	One mark for each phrase or equivalent.	
1(c)	Explanation includes:	Max 3
1(d)(i)	27: MyGrade assigned the value "Fail"	2
	101: Output the text "Invalid Value Entered"	
	Ignore minor spelling mistakes	
1(d)(ii)	<pre>IF MyMark >= 75 AND MyMark <=100 THEN MyGrade ← "Distinction" ELSE IF MyMark >= 35 AND MyMark <=74 THEN MyGrade ← "Pass" ELSE IF MyMark >= 0 AND MyMark <=34 THEN MyGrade ← "Fail" ELSE OUTPUT "Invalid value entered" ENDIF ENDIF</pre>	5
	One mark for each of:	
	 One correct range test 'IF' equivalent (nested or not) to three CASE range tests with three corresponding assignments Equivalent of CASE OTHERWISE with corresponding OUTPUT statement Matching (three) ENDIFS (Or one if ELSIFS used) Max 4 if solution doesn't work under all circumstances // is not functionally equivalent to CASE	



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Question	Answer	Marks
2(b)	 Mark as follows: One mark for START and STOP / END One mark for each bracketed pair One mark for each of other labelled symbol (decision box shape must be correct) Allow F/T from incorrect decision symbol Full marks should be awarded for functionally equivalent solutions. 	

Question	Answer			Marks
3				Max 8
	Line number	Error	Correction	
	01	Wrong procedure name – "SortArray"	PROCEDURE ArraySort	
	02	Wrong data type - CHAR	DECLARE Temp: STRING	
	03	Variables undefined	DECLARE FirstID, SecondID, I, J: INTEGER	
	04	Wrong 'Value2' of 100	FOR I ← 1 TO 99	
	05	Wrong range	FOR J ← 1 TO (100 - I)	
	06/07	Wrong function - MODULUS	Replace MODULUS with TONUM: FirstID ← TONUM(LEFT(Product[J],	
	06/07	Wrong value of 6	Should be 4: FirstID ← TONUM(LEFT(Product[J],	
	10	Assigning wrong value to Temp	Temp ← Product[J]	
	11	Assigning wrong value to Product[I]	Product[J] ← Product[J + 1]	
	13/14	Lines reversed	13 ENDIF 14 ENDFOR	
	One mark	for each correct row		

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Question	Answer	Marks
4(a)	Pseudocode solution included here for development and clarification of mark scheme. Programming language solutions appear in the Appendix.	16
	PROCEDURE TestRandom (Repetitions : INTEGER) DECLARE Frequency : ARRAY [1 : 10] OF INTEGER DECLARE Expected : REAL / INTEGER //allow either DECLARE NextRandom : INTEGER DECLARE N : INTEGER	
	<pre>FOR N ← 1 TO 10 Frequency[N] ← 0 ENDFOR</pre>	
	Expected ← INT(Repetitions / 10)	
	CALL RANDOMIZE() //Set random seed	
	<pre>FOR N ← 1 TO Repetitions NextRandom ← INT(RND() * 10) + 1 Frequency[NextRandom] ← Frequency[NextRandom] + 1 ENDFOR</pre>	
	OUTPUT "The expected frequency is " & Expected	
	OUTPUT "Number Frequency Difference"	
	FOR N ← 1 TO 10 OUTPUT N & "	
	ENDFOR ENDPROCEDURE	
	 Mark as follows: 1. Procedure heading (including parameter) 2. Array declaration – 10 or 11 elements 3. Array declaration – data type 4. Variable declaration for a loop counter (integer) or expected frequency (integer or real) 	
	5. Variable declaration for next random value	
	(For Python solutions, mark points 1 to 4 may be gained by suitable comments)	
	6. Initialise all elements of array7. To set all elements to zero8. Calculate expected frequency	

Question	Answer	Marks
4(a)	 9. Loop to generate required number of random values 10. Use of relevant RANDOM() function in a loop 11. Generate random integer value in the range 1 to 10 in a loop 12. Increment (array) element in a loop 	
	 13. Output expected frequency message not in any loop 14. Output column header text 15. (Loop to) output each row 16 including three correct values (spaces optional) 	
4(b)	 Single-stepping to allow program statements to be executed one at a time Breakpoints to pause / stop the program at a specific line / statement Variable / expression watch window to monitor the value of variables / expressions as the program is run One mark for each Feature (text as above or equivalent) + 1 for meaningful explanation of use in context. 	6
4(c)	Program is probably working correctly if: Header is present giving frequency as 20 Column headers are present All rows are present (1 to 10) The difference is calculated correctly Output is formatted correctly Total differences should be zero Sum of Frequencies should be 200	Max 2

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Question	Answer	Marks	
5	PROCEDURE RemoveDetails DECLARE FileLine: STRING DECLARE MemberToDelete: STRING	Max 9	
	OPENFILE "EmailDetails.txt" FOR READ OPENFILE "NewEmailDetails.txt" FOR WRITE		
	<pre>INPUT MembershipNumber WHILE NOT EOF("EmailDetails.txt") READFILE "EmailDetails.txt", FileLine IF LEFT(FileLine, 4) <> MembershipNumber THEN WRITEFILE "NewEmailDetails.txt", FileLine ENDIF ENDWHILE CLOSEFILE "EmailDetails.txt"</pre>		
	CLOSEFILE "NewEmailDetails.txt"		
	ENDPROCEDURE		
	Mark as follows: 1. Procedure declaration and end. No parameters.		
	2. Variable declaration of STRING for variable FileLine (or similar)		
	3. Input the MembershipNumber of the person who has left		
	4. Open EmailDetails for READ		
	5. Open NewEmailDetails for WRITE		
	6. Correct loop checking for EOF (EmailDetails)		
	7. Reading a line from EmailDetails.txt in a loop		
	8. Correct check for MemberToDelete in a loop		
	9. Writing a line to NewEmailDetails.txt in a loop		
	10. Closing both files (not in a loop)		

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Appendix - Program Code Example Solutions

Q4 (a): Visual Basic

```
Dim random As New Random()
Sub TestRandom(ByVal repetitions As Integer)
  Dim randinrange As Integer
  Dim i As Integer
  Dim num(1 To 10) As Integer
  Dim freq As Integer
  Dim difference As Integer
  For i = 1 To 10
                          'initialise array to store total frequencies
    num(i) = 0
  Next i
  For i = 1 To repetitions 'generate random numbers & increment
appropriate freq
     randinrange = random.Next(1, 11)
     num(randinrange) = num(randinrange) + 1
  Next i
  Console.WriteLine("The expected frequency is " & freq) 'report header 'column headers'
  For i = 1 To 10 'calc & display difference between expected and actual
freq
     difference = num(i) - freq
                                Console.WriteLine(i & "
  Next i
End Sub
```

Other possible ways of calculating a random number in VB include:

```
randinrange = CInt(Math.Floor((upperbound - lowerbound + 1) * Rnd())) +
lowerbound
   randinrange = math.round((Rnd()*9)+1)
   randinrange = CInt(Math.Ceiling(Rnd() * 9
```

Q4 (a): Pascal

```
procedure TestRandom(var Repetitions : integer);
      Frequency : array[1..10] : integer;
     Expected, NextRandom, N : integer;
  begin
     Expected := Round(Repetitions/10);
      for N := 1 to 10 do
        Frequency[N] := 0;
      for N := 1 to Repetitions do
     begin
        NextRandom := random (10) + 1;
        Frequency[NextRandom] := Frequency[NextRandom]+1;
      end;
      writeln ('The expected frequency is ', Expected);
     writeln ('Number Frequency Difference');
      for N := 1 to 10 do
        writeln (' ',N,'
                            ',Frequency[N],' ',Frequency[N]-
Expected);
  end;
```

Q4 (a): Python

```
# frequency is an array from 1 to 10 of type integer;
# nextNumber is an integer which stores the created random number
# expected is an integer which stores the expected frequency of each number
def TestRandom (repetitions):
  import random
   frequency = [0 \text{ for i in range}(1,11)] # initialise each frequency count
to 0
  expected = repetitions / 10
   for i in range(1, repetitions + 1):
      nextNumber = random.randint(1,10)
      frequency[nextNumber] = frequency[nextNumber] + 1
  print ("The expected frequency is ", expected)
  print(" Number Frequency Difference")
   for i in range (1,11):
     print (" ", i, " ", frequency[i]," ", frequency[i] -
expected)
Alternative:
def TestRandom (repetitions):
  expected = repetitions / 10
                                  ## initialised as real/integer
                                   ## NextRandom and N defined as integers
   frequency = [0,0,0,0,0,0,0,0,0,0] ## defined as an array and
initialised to zero
   for n in range (0, repetitions):
     nextNumber = randint(1, 10)
      frequency[nextNumber] += 1
  print ('The expected frequency is ', expected)
  print ('Number Frequency Difference')
   for n in range (1, 11):
                     ', frequency[n],' ', frequency[n] - expected)
     print (n,'
Alternative:
```

```
frequency =[0]*11
                    ## alternate way to initialise array to zero
frequency =[]
                     ## empty array/list
```

Alternative:

```
for n in range (1,11):
  frequency[n-1] = 0 ##alternate way to initialise array to zero
```

Alternative:

for n in range (0,11): ##alternate way to initialise array to zero frequency.append(0)

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