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**COMPUTER SCIENCE**

**9608/43**

Paper 4 Written Paper

**October/November 2017**

MARK SCHEME

Maximum Mark: 75

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**Published**

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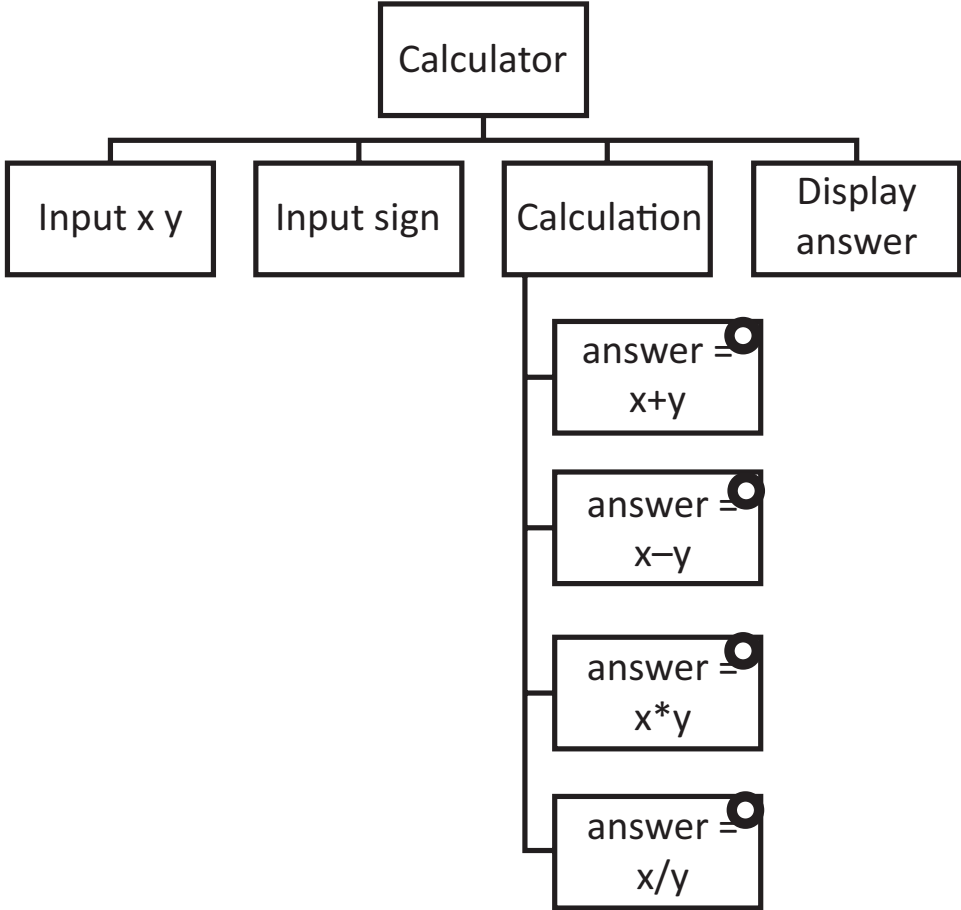
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**Cambridge Assessment**  
International Education

Question	Answer	Marks
1	<p>1 mark for each completed statement</p> <pre> graph TD     A((Window closed)) -- "Temperature &gt; 20° C" --&gt; B((Window half open))     B -- "Temperature &lt; 15 °C" --&gt; A     B -- "Temperature &gt; 30°C" --&gt; C((Window fully open))     C -- "Temperature &lt; 25° C" --&gt; B </pre>	7

Question	Answer	Marks
2(a)(i)	<ul style="list-style-type: none"> <li>Asterisk (*) in the corner/top of the box(es)</li> </ul>	1
2(a)(ii)	<ul style="list-style-type: none"> <li>Circle (o) in the corner/top of box(es)</li> </ul>	1

Question	Answer	Marks
2(b)	<p>1 mark per bullet</p> <ul style="list-style-type: none"> <li>• Inputting 2 numbers, stored in x and y</li> <li>• Inputting sign Selection used for all four calculations</li> <li>• .. underneath an appropriate box at level 1</li> <li>• Displaying the answer</li> </ul> <p>For example:</p>  <pre> graph TD     Calculator[Calculator] --&gt; InputXY[Input x y]     Calculator --&gt; InputSign[Input sign]     Calculator --&gt; Calculation[Calculation]     Calculator --&gt; DisplayAnswer[Display answer]     Calculation --&gt; Answer1["answer = x+y"]     Calculation --&gt; Answer2["answer = x-y"]     Calculation --&gt; Answer3["answer = x*y"]     Calculation --&gt; Answer4["answer = x/y"]   </pre>	5

Question	Answer	Marks
3(a)	1 mark per clause <ul style="list-style-type: none"> <li>• <code>person(mimi).</code></li> <li>• <code>food(lettuce).</code></li> <li>• <code>likes(mimi, chocolate).</code></li> <li>• <code>dislikes(mimi, sushi).</code></li> <li>• <code>dislikes(mimi, lettuce).</code></li> </ul>	5
3(b)	1 mark per answer <code>chocolate, pizza</code>	2
3(c)	1 mark per bullet <ul style="list-style-type: none"> <li>• <code>might_like(B,A)</code></li> <li>• <code>Person(B)</code></li> <li>• <code>Food(A)</code></li> <li>• <code>AND</code></li> <li>• <code>AND NOT</code></li> <li>• <code>Dislikes</code> predicate</li> </ul> <p>For example:</p> <pre> might_like(B, A).            { IF person(B) AND food(A)    {      { AND NOT(dislikes(B, A)).  {      { </pre>	6

Question	Answer					Marks
4(a)	Label	Op code	Operand	Comment	Marks	11
	START:	LDM	#63	// load ASCII value for '?'		
		OUT		// OUTPUT '?'	1	
		IN		// input GUESS	1	
		CMP	LETTERTOGEUSS	// compare with stored letter	1	
		JPE	GUESSED	// if correct guess, go to GUESSED	1	
		LDD	ATTEMPTS	// increment ATTEMPTS	1	
		INC	ACC		1	
		STO	ATTEMPTS		1	
		CMP	#9	// is ATTEMPTS = 9 ?	1	
		JPE	ENDP	// if out of guesses, go to ENDP	1	
		JMP	START	// go back to beginning of loop	1	
	GUESSED:	LDM	#42	// load ASCII for '*'		
		OUT		// OUTPUT '*'	1	
	ENDP:	END		// end program		
	ATTEMPTS:	0				
	LETTERTOGEUSS:	'a'				

Question	Answer					Marks
4(b)	<b>Label</b>	<b>Opcode</b>	<b>Operand</b>	<b>Comment</b>	<b>Mark</b>	10
	START:	LDR	#0	// initialise the Index Register	1	
	LOOP:	LDX	NUMBERS	// load the value from NUMBERS	1 (LOOP) + 1(LDX NUMBERS)	
		LSL	#2	// multiply by 4	1 (LSL) + 1 (#2)	
		STX	NUMBERS	// store the new value in NUMBERS	1	
		INC	IX	// increment the Index Register	1	
		LDD	COUNT	// increment COUNT	1	
		INC	ACC			
		STO	COUNT			
		CMP	#5	// is COUNT = 5 ?	1	
		JPN	LOOP	// repeat for next number	1	
	ENDP:	END				
	COUNT:	0				
	NUMBERS:	22				
		13				
		5				
		46				
		12				

Question	Answer	Marks
5(a)(i)	PERT / GANTT	1
5(a)(ii)	1 mark per bullet to max 3 For example: <ul style="list-style-type: none"> <li>• Calculate total minimum time required for project</li> <li>• Identify milestones</li> <li>• Task dependencies</li> <li>• Provides the critical path analysis</li> <li>• Identify which tasks need to be prioritised</li> <li>• Determine when to begin specific tasks/stages</li> <li>• Identify slack time</li> <li>• Identify when resources need allocating</li> <li>• Identify tasks that can be completed in parallel</li> </ul>	3
5(b)(i)	Integration	1
5(b)(ii)	Beta / acceptance	1

Question	Answer	Marks
6(a)	1 mark per bullet to max 6 <ul style="list-style-type: none"> <li>• Declaring a class with the name animal</li> <li>• Declaring variables for across, down and score (all Integers)</li> <li>• ...as private/protected</li> <li>• Correct constructor header and ending</li> <li>• Randomly generating an across between 0–39 inc. in constructor</li> <li>• Randomly generating a down between 0–39 inc. in constructor</li> <li>• Initialising Score to zero in constructor</li> <li>• Correct get for Across</li> <li>• Correct set for Across</li> </ul>	6

Question	Answer	Marks
6(a)	<pre>Example: VB Class Animal     Private Across As Integer     Private Down As Integer     Private Score As Integer      Function GetAcross()         Return Across     End Function     Sub SetAcross(Value As Integer)         Across = Value     End Sub      Sub New()         Randomize()         Across = randomnumber.Next(0, 40)         Down = randomnumber.Next(0, 40)         Score = 0     End Sub End Class</pre>	



Question	Answer	Marks
6(a)	<p>or</p> <pre> Class Animal   Private Across As Integer   Property _Across As Integer     Get       Return _Across     End Get   Set(Value As Integer)     Across = Value   End Set End Property Private Down As Integer Private _Score As Integer Sub New()   Randomize()   Across = randomnumber.Next(0, 40)   Down = randomnumber.Next(0, 40)   _Score = 0 End Sub End Class  Example: Python class Animal :     def __init__ (self) :         x = random.randint(0,39)         y = random.randint(0,39)         self.Across = x         self.Down = y         self.Score = 0      def SetAcross(A) :         self.Across = A      def GetAcross() :         return self.Across </pre>	

Question	Answer	Marks
6(a)	<pre> Example: Pascal type Animal = class   private     Across: integer;     Down: integer;     score: integer;   public     constructor init;      procedure SetAcross(AcrossV: integer);     function GetAcross(): integer; end;  constructor Animal.init();   SetAcross(random(40));   SetDown (random(40));   SetScore (0); end;  procedure Animal.SetAcross(AcrossV: integer); begin   Across := AcrossV; end;  function Animal.GetAcross(): integer; begin   GetAcross := Across; end; </pre>	

Question	Answer	Marks
6(b)	<p>1 mark per bullet to max 5</p> <ul style="list-style-type: none"> <li>• constructor method heading and ending</li> <li>• Initialise all 40 by 40 elements of Grid as " or equivalent</li> <li>• Loop 5 times...</li> <li>• ...Creates a new instance of animal inside loop...</li> <li>• ...and adds it to array <code>AnimalList</code></li> </ul> <p>• Call generate food <b>and</b> initialise <code>StepCounter</code> to 0</p> <p>Example Python</p> <pre>def __init__ (self) :     self.grid = [[' ' for i in range(40)] for j in range(40)]     self.AnimalList = []     self.StepCounter = 0     for i in range(5) :         newAnimal = Animal ()         self.AnimalList.append(newAnimal)         self.GenerateFood()</pre> <p>Example VB</p> <pre>Sub New()     For x = 0 To 39         For y = 0 To 39             grid(x, y) = " "         Next     Next      For z = 0 To 4         AnimalList(z) = New Animal     Next      Call GenerateFood() End Sub</pre>	5

Question	Answer	Marks
6(b)	<p>Example Pascal</p> <pre> constructor Desert.init();   for x := 0 to 39 do     begin       for y := 0 to 39 do         begin           grid(x,y) = "";         end       end     end      for x := 0 to 4 do       begin         AnimalList(x) = object (Animal);       end        GenerateFood();     end; </pre>	
6(c)(i)	<p>1 mark per bullet:</p> <ul style="list-style-type: none"> <li>• Function header and ending taking one value as parameter</li> <li>• Check if coordinate = 0 (on lower bound)</li> <li>• ...generate random number (0 or 1)</li> <li>• Check if coordinate = 39 (on upper bound)</li> <li>• ...generate random number (–1 or 0)</li> <li>• Generate random number (e.g. –1, 0, 1)</li> <li>• Return the generated value</li> </ul>	<b>max 4</b>

Question	Answer	Marks
6(c)(i)	<p><b>Example VB</b></p> <pre> Function GenerateDirection(ByRef coord As Integer)     Dim lowerbound As Integer = -1     Dim upperbound As Integer = 1      If coord = 0 Then         lowerbound = 0     ElseIf coord = 39 Then         upperbound = 0     End If      GenerateDirection = randomnumber.Next(lowerbound, upperbound)  End Function </pre> <p><b>Example Python</b></p> <pre> def GenerateDirection(Coord) :     lowerBound = -1     upperBound = 1     if Coord == 0 :         lowerBound = 0     elif Coord == 39 :         upperBound = 0     return random.randint(lowerBound, upperBound) </pre>	

Question	Answer	Marks
6(c)(i)	<p>Example Pascal</p> <pre>function GenerateDirection(coord : Integer): Integer; begin     lowerbound = -1;     upperbound = 1;     if coord = 0 then         lowerbound = 0;     else if coord = 39 then         upperbound = 0;     GenerateDirection = random(39); end;</pre>	
6(c)(ii)	<p>1 mark per bullet to max 4</p> <ul style="list-style-type: none"> <li>• Procedure move header, no parameters</li> <li>• Calling GenerateDirection <b>twice</b> sending across and down as separate parameters</li> <li>• Add return value to Across</li> <li>• Add return value to Down</li> <li>• Check if the grid, at the (new) coordinates == "F"</li> <li>• ..if true, Call EatFood</li> </ul> <p>Example python</p> <pre>def Move(self) :     self.Across += GenerateChangeInCoordinate(self.Across)     self.Down += GenerateChangeInCoordinate(self.Down)     if grid[self.Across][self.Down] == 'F' :         self.EatFood()     return</pre>	4

Question	Answer	Marks
6(c)(ii)	<p>Example VB</p> <pre> Sub Move(ByRef thisAnimal As Animal)     thisAnimal.across += GenerateChangeInCoordinate (thisAnimal.across)     thisAnimal.down += GenerateChangeInCoordinate (thisAnimal.down)     If thegrid._grid(thisAnimal.across, thisAnimal.down) = "F"     Then         Call EatFood()     End If End Sub </pre> <p>Example Pascal</p> <pre> procedure Move(thisAnimal : Animal); begin     thisAnimal.across = this.Animal.across + GenerateChangeInCoordinate (thisAnimal.across);     thisAnimal.down = thisAnimal.down + GenerateChangeInCoordinate (thisAnimal.down);     if (thisgrid.grid(thisAnimal.across, thisAnimal.down) = "F") then         EatFood();     End; </pre>	
6(d)	<p>1 mark per bullet to max 3</p> <ul style="list-style-type: none"> <li>• Pre-compiled</li> <li>• Collection of Code/modules/routines</li> <li>• Each module performs a specific purpose/task</li> <li>• Each module can be linked/imported into the program</li> </ul>	<b>2</b>