AQA Computer Science AS-Level

3.4.1 Abstraction and automation

Past Paper Mark Schemes

Additional Specimen AS Paper 1

02	1		**All marks AO2 (apply)** **A** / **B** / **TEMP** / **OUTPUT** 100 / 60 / 60 / 40 / 60 / / 40 / 20 / 40 / / 20 / 0 / 20 / / / The value is 20 One mark - first bordered area of table completed correctly; One mark - second bordered area of table completed correctly; One mark - correct output in last row of table; **I**. Relative positions of variables in each bordered area	3

02	2		**All marks AO2 (apply)** greatest common divisor // GCD;	1

01	1		**Mark is for AO2 (apply)** D;	1

01	2		**Mark is for AO2 (apply)** A;	1

01	1		**Mark is for AO2 (apply)** D;	1

01	2		**Mark is for AO2 (apply)** A;	1

03	**1**		**Marks are for AO2 (analysis)** The values are being stored as string; the string 007 is (alphabetically) less than 06;	2

03	**2**		**Mark is for AO3 (programming)**
			
			`IF Value1 < Value2 THEN`
			`  OUTPUT "Value 2 is larger"`
			`ELSE IF Value1 = Value2 THEN`
			`  OUTPUT "Value1 and Value2 are the same"`
			`ELSE`
			`  OUTPUT "Value 1 is larger"`
			`ENDIF`
			
			One mark - addition of check for equality and output message;
			One mark - statement works correctly;
				2

02	3	**All marks AO2 (apply)**	6

Call number	S	E	M	List returned
1	1	5	3	
2	1	3	2	
3	1	2	1	
4	1	1		[6]
3	1	2	1	
5	2	2		[3]
3	1	2	1	[6, 3]
2	1	3	2	
6	3	3		[4]
2	1	3	2	[6, 4, 3]
1	1	5	3	
7	4	5	4	
8	4	4		[8]
7	4	5	4	
9	5	5		[5]
7	4	5	4	[8, 5]
1	1	5	3	[8, 6, 5, 4, 3]

Mark as follows:
1 mark: Correct list returned by call number 3;
1 mark: Correct lists returned by call number 6-9;
1 mark: Correct list returned by call number 1;
1 mark: `S`, `M`, `E` given correct values for call number 6;
1 mark: `S`, `M`, `E` given correct values for call number 7;
1 mark: `S`, `M`, `E` given correct values for call number 8-9;

Info for examiner: Ignore missing values for `S`, `E`, `M` after the first time a particular call number appears in the table.

June 2011 Comp 3

5 **(c)**

String Pos	Token	Integer Val	Op1	Op2	Result	Stack
0	-	-	-	-	-	⌐ ¬
1	6	6				⌐ 6 ¬
2	4	4				⌐ 4 6 ¬
3	+		**6**	**4**	10	⌐ 10 ¬
4	3	3				⌐ 3 10 ¬
5	2	2				⌐ 2 3 10 ¬
6	+		**3**	**2**	5	⌐ 5 10 ¬
7	*		**10**	**5**	50	⌐ 50 ¬

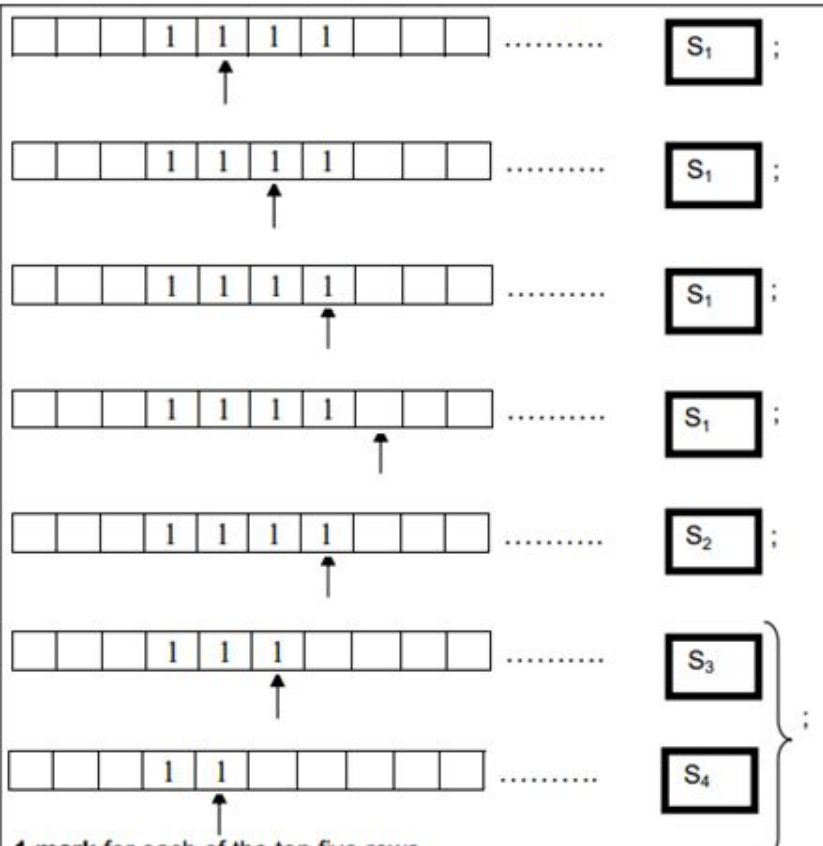
Output : **50**

1 mark for each of rows 1-3
1 mark for rows 4 and 5 together
1 mark for rows 6 and 7 together
1 mark for correct final output

Values of Op1 and Op2 MUST be assigned in rows 3, 6 and 7 to award the marks for these rows. They cannot be inferred from incorrectly entered previous values.

I values in empty cells, even if they are incorrect.

6

11	(a)		 **1 mark** for each of the top five rows **1 mark** for sixth and seventh row together **Must have correct tape contents and state for each mark** **A** the blank cell symbol ☐ in blank cells **A** answers in which the initial situation of the TM is repeated **A** If the read/write head is not drawn on some rows, this should result in the loss of the mark on the first occasion that it is missing only. Marks should be awarded for subsequent rows, even if the read/write head is not drawn.	6

June 2012 Comp 3

3	(b)	(i)		

N	Pos1	W1	Pos2	W2	Output	
3	1	Rope	1	Rope		
			2	Dagger		1 mark
			3	Rope	Duplicate: Rope	
	2	Dagger	1	Rope		
			2	Dagger		1 mark
			3	Rope		
	3	Rope	1	Rope	Duplicate: Rope	
			2	Dagger		1 mark
			3	Rope		

A answers which have correct values repeated in empty cells, but do not award a mark if there are any incorrect values within the block for which the mark is being awarded.

A additional rows in trace table, so long as the trace is correct.

DPT if just "Duplicate" or "Rope" are written in the Output column when it should be "Duplicate: Rope" or if the value of Pos1 is written in the output instead of W1 e.g. 1 instead of "Rope"

If candidate has not written in the value of N, only one mark should be lost (for the top rectangular area) for this mistake

3

10	(e)						Discovered							Completely Explored							
				Call	V	U	EndV	1	2	3	4	5	6	7	1	2	3	4	5	6	7	F
					-	-	7	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
				DFS(1,7)	1	2	7	**T**	F	F	F	F	F	F	F	F	F	F	F	F	F	F
				DFS(2,7)	2	1	7	T	**T**	F	F	F	F	F	F	F	F	F	F	F	F	F
						3	7	T	T	F	F	F	F	F	F	F	F	F	F	F	F	F
				DFS(3,7)	3	2	7	T	T	**T**	F	F	F	F	F	F	**T**	F	F	F	F	F
				DFS(2,7)	2	4	7	T	T	T	F	F	F	F	F	F	T	F	F	F	F	F
				DFS(4,7)	4	2	7	T	T	T	**T**	F	F	F	F	F	T	F	F	F	F	F
						5	7	T	T	T	T	F	F	F	F	F	T	F	F	F	F	F
				DFS(5,7)	5	4	7	T	T	T	T	**T**	F	F	F	F	T	F	F	F	F	F
						6	7	T	T	T	T	T	F	F	F	F	T	F	F	F	F	F
				DFS(6,7)	6	5	7	T	T	T	T	T	**T**	F	F	F	T	F	F	**T**	F	F
				DFS(5,7)	5	7	7	T	T	T	T	T	T	F	F	F	T	F	F	T	F	F
				DFS(7,7)	7	5	7	T	T	T	T	T	T	**T**	F	F	T	F	F	T	**T**	**T**
				DFS(5,7)	5	-	7	T	T	T	T	T	T	T	F	F	T	F	**T**	T	T	T
				DFS(4,7)	4	-	7	T	T	T	T	T	T	T	F	F	T	**T**	T	T	T	T
				DFS(2,7)	2	-	7	T	T	T	T	T	T	T	F	**T**	T	T	T	T	T	T
				DFS(1,7)	1	-	7	T	T	T	T	T	T	T	**T**	T	T	T	T	T	T	T
				1 mark for having the correct values changes in each region highlighted by a rectangle and no incorrect changes in the region. Ignore the contents of any cells that are not changed. **A** alternative indicators that clearly mean True and False. **A** it is not necessary to repeat values that are already set (shown lighter in table)																	5

June 2016 AS Paper 1

01	1	**Mark is for AO2 (apply)** B;	1
01	2	**Mark is for AO2 (apply)** C;	1

04	1	**All marks AO2 (apply)**	5

ItemsCount	NewItemsCount	LoopA	Done	LoopB	NewItems			
					[0]	[1]	[2]	[3]
4	1				12	0	0	0
	2	1	False	0		25		
		2	False	0				
			True	1				
		3	False	0				
	3			1			53	

1. `LoopA` running over the values `1, 2, 3` and stops at 3;
2. `LoopB` is set to 0 then changes to 1 then changes to 0 then changes to 1 and no further changes;
3. `NewItems` becoming `12, 25, 0, 0` at the end of `LoopA` value `1`;
4. `NewItems` not changing during `LoopA` value `2`;
   R. if `NewItems` has not changed previously
5. `NewItems` having value `12, 25, 53, 0` at end of table;

A. `NewItems` without trailing zeroes
A. `NewItems` without repeated values for `12` and `25`

Note: 12 might not be seen in `NewItems[0]` as does not need to be copied across into EAD in which case column should be blank

I. columns `NewItemsCount` and `Done` (first and third columns in EAD)

04	2	**Mark is for AO2 (apply)** `NewItems` contains an array/list of the unique items from the `Items` array/list; Remove duplicate items from an array/list; **Max 1**	1

June 2017 AS Paper 1

Qu			Marks
02	1	**All marks AO2 (apply)** **Mark as follows:** 1. `Count` running over the values `1, 2` with correct sequence of values for `HexString` (`"A2", "1G"`); 2. The correct sequence of values in `Number` column (`0, 10, 162, 0, 1, 15`); 3. The correct sequence of values in `HexDigit` column (`"A", "2", "1", "G"`); 4. The correct sequence of values in `Value` column (`10, 2, 1, -1`); 5. The correct sequence of values in `Output` column (`162, 15`); **A.** repeating values in first two columns **A.** `"1G"` before `"A2"` **A.** string values without quotes	5

Count	HexString	Number	HexDigit	Value	Output
1	"A2"	0	"A"	10	
		10	"2"	2	
		162			162
2	"1G"	0	"1"	1	
		1	"G"	-1	
		15			15

02	2	**All marks for AO2 (analyse)** 1. invalid character produces value -1 from subroutine; 2. -1 should not be used to calculate // deal with -1 seperately // using -1 gives a misleading result; 3. final output should be -1 / error message; **MAX 2**	2

June 2017 Paper 1

<table>
<tr><td>04</td><td>1</td><td>Mark is for AO1 (knowledge)

A subroutine that calls itself;</td><td>1</td></tr>
<tr><td>04</td><td>2</td><td>Mark is for AO1 (understanding)

When target equals node // (When target does not equal node and) node is a leaf //
<code>node = target;</code></td><td>1</td></tr>
<tr><td>04</td><td>3</td><td>Marks are for AO2 (apply)

<table>
<tr><th>Function Call</th><th>Output</th></tr>
<tr><td><code>TreeSearch(Olivia, Norbert)</code></td><td>(Visited) Norbert;</td></tr>
<tr><td><code>TreeSearch(Olivia, Phil);</code></td><td>(Visited) Phil;</td></tr>
<tr><td></td><td></td></tr>
</table>
MAX 2 if any errors eg additional outputs / function calls after output of Phil

I. minor spelling and punctuation errors</td><td>3</td></tr>
</table>

June 2011 Comp 1

<table>
<tr><td>18</td><td>18, 23, 21, 36, 40, 45, 58, 59

Mark as follows:
18 in the first place;
23 and 21 in correct order and in the second and third places;
21 and 36 in the correct order and in the third and fourth places;
40, 45, 58 and 59 in the correct order and in the last four places;

A. Table 3 instead of Table 2 as long as the bottom cell of each of the scores column is correct (I. any working out)</td><td>4</td></tr>
<tr><td>19</td><td>Bubble sort;
NE. sort</td><td>1</td></tr>
</table>

June 2013 Comp 3

4	(d)		One mark for each area outlined with a dark rectangle. Lines that are not outlined can be missed out. Alternative 1 | Pos	Output
---	---
1	
2	4
1	
3	
4	9
3	
5	6
3	*
1	+	 Alternative 2 	Pos	Output
---	---
1	4
2	9
1	6
3	*
4	+
3	
5	
3	
1		 Mark against whichever alternative gives the highest mark. **Stop marking as soon as incorrect output is given.**	4

4	**(e)**		Post-order; **A.** Depth-first **A.** Depth-first search as BOD **TO.** Depth-first pre/in-order	**1**

4	**(f)**		(4 + 9 * 6 in) Reverse Polish (Notation) // Postfix (Notation) // RPN;	**1**

Specimen Paper 1

01	1	**Mark is for AO2 (apply)** **1 mark**: B;	1

01	2	**All marks AO2 (analyse)** Nathan was not killed with poison (rule a); therefore Peter was not in the kitchen (rule c); therefore Martin was not in the dining room (rule e); therefore Suzanne was in the dining room (rule b); therefore Steve murdered Nathan (rule d). **Mark as follows:** **1 mark:** Any correct point from the list above; **1 mark:** Any two further correct points from the list above;	2

03	4	**All marks AO2 (apply)** **Mark as follows:** **1 mark:** `A` is set the sequence indicated in the table; **1 mark:** `B` is set the sequence indicated in the table; **1 mark:** `C` is set the sequence indicated in the table; **1 mark:** `NoOfCats` is set to 5, `Cat[1]` is set to 1; **1 mark:** `Cat[2]` is set to 2 and `Cat[3]` is set to 3; **1 mark:** `Cat[4]` is set to 1 and `Cat[5]` is set to 1; **Info for examiner:** Ignore the empty cells in the sequences - values do not need to be set in the rows indicated in the table.	6

				Cat					
NoOfCats	**A**	**B**	**C**	**1**	**2**	**3**	**4**	**5**
5				1				
	2	1	1					
		1	2					
		2			2			
	3	1	1					
		1	2					
		2						
		1	3					
		2						
		3				3		
	4	1	1					
		2						
		3						
		4					1	
	5	1	1					
		2						
		3						
		4						
		5						1

03	5	**Mark is for AO2 (analyse)** To work out which cats will travel together to the show // To plan which cats will be in the van on which journey to the cat show // To colour the vertices of a graph // To create a decomposition of a graph; **Max 1**	1