EDULiTO

Computational Logic

Topic Tests

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Topic Test - Computational Logic

1 (a) Explain what is meant by **binary**? [1]

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1 (b) Why is data represented in computer systems in binary form? [1]

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2 (a) A NOT gate has just one input. The output of the circuit will be the opposite of the input. Complete the table below to show what happens to the inputs. [2]

| Input	Output
1	
0	

2(b) An **AND** gate can be used on a gate with two inputs. Complete the truth table below to show the output from an AND Gate. [4]

Input A	Input B	Output
0	0	
0	1	
1	0	
1	1	

2(c) The **OR** gate has two inputs. Complete the truth table below to show the output from an AND Gate. [4]

Input A	Input B	Output
0	0	
0	1	
1	0	
1	1	

3 (a) Look at this Venn diagram, which shows the number of children who take part in two sports in year 7 and then fill in the gaps below. [3]
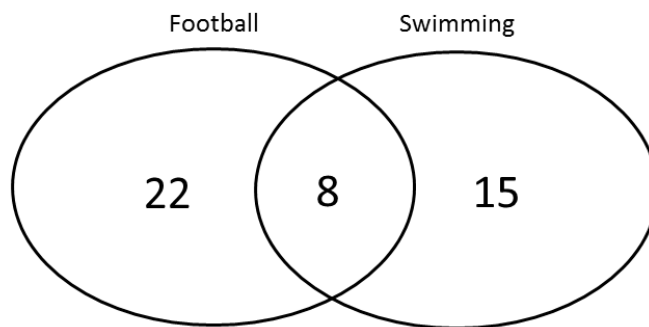
(i) There were ……… children who took part in football **AND** swimming.

(ii) There were ……… children who took part in football but **NOT** swimming.

(iii) There were 15 children who took part in swimming ……………………. football.

(iv) There were ……… children who took part in football OR swimming.

3 (b)   Determine the output for each of the examples below, by assigning the following values to the variables.

x=10 y=20 z=15

Question	Pseudocode	Output

(i)	if x>y AND z>y then
	
	print("true")
	
	else
	
	print("false")
	
	endif	

(ii)	if x==y OR z<y then
	
	print("true")
	
	else
	
	print("false")
	
	endif	

(iii)	if NOT(x>y) OR x==y/2 then
	
	print("true")
	
	else
	
	print("false")
	
	endif	

4(a) A jewellery shop has an alarm system that they are turn on at night that has a sensor on the door and a sensor on the window. The alarm will go off if someone tries to enter the shop via the door OR the window.

Complete the truth table below to show how Boolean logic is used. [4]

Door opened	Window opened	Alarm sounds
T		
T		
F		
F		

4(b) Create a truth table for the following pseudocode. [4]

if NOT (X == 6 OR Y == 12) then

print ("true")

endif

X	Y	NOT(X OR Y)
T	T	
F	T	
T	F	
F	F	

5 (a) A farmer grows her tomatoes in poly-tunnels. She has decided to set up an automatic watering system.

At the entrance to the poly-tunnels there is a light sensor, and inside the poly-tunnel within the soil there is a moisture sensor. The farmer only wants the watering system to turn on at night and only when the soil is dry. The farmer chooses to use two **NOT** gates and one **AND** gate.

Draw a diagram to show the logic gate structure used in the poly-tunnel. [2]

5 (b) (i) A logic circuit can be written as **Q = (NOT A) OR B**:

Draw the logic gate in the space below. [3]

5(b)(ii) Complete the truth table for the logic gate structure shown in 5(b)(i). [4]

Input		Output
A	**B**	**Q**
0	0	
0	1	
1	0	
1	1	

6 (a) MOD and DIV are arithmetic operators. Explain the difference between them. [2]

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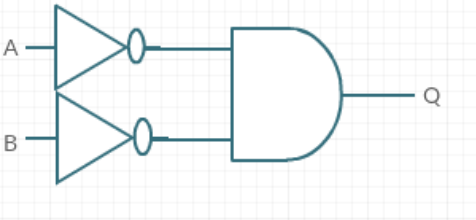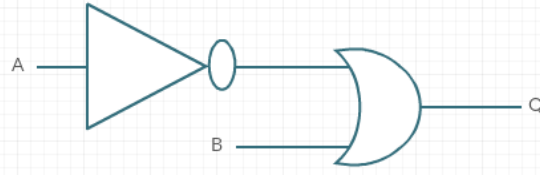
6(b) What would be the output produced in each of the examples of pseudocode shown below? [8]

	Pseudocode	Output
(i)	a=7 b=14 c=12 print(a*b) +(c*a)	
(ii)	a=7 b=20 c=12 print(a+c+(a^4)) +(b*a)	

(iii)	a=6
	b=14
	c=12
	if a<=b then
	print(a*b) +(c/a)
	else
	print(a+b)-c^6
	endif	

(iv)	a=5
	b=14
	c=12
	if a>=b OR c/2>=7 then
	print(cMODa)
	else
	print(cDIVa)	

Question Number	Answer	Additional Guidance	Mark
1 a	Binary is the base 2 number system – it consists of the two numbers 1 and 0 [1]		**2**
1 b	Binary numbers are required for computer logic to work as the number 1 can be represented as a high-voltage signal and the 0 can be represented as a low voltage signal. [1] Patterns of high and low voltage produce binary code [1]		**2**
2 a	Output 0 [1] 1 [1]		**2**
2 b	Output 0 [1] 0 [1] 0 [1] 1 [1]		**4**
2 c	Output 0 [1] 1 [1] 1 [1] 1 [1]		**4**
3 a	(i) 8 [1] (ii) 22 [1] (iii) but NOT [1] (iv) 45 [1]		**4**
3 b	(i) false [1] (ii) true[1] (iii) true [1]		**3**
4 a	<table><tr><td>**Door opened**</td><td>**Window opened**</td><td>**Alarm sounds**</td></tr><tr><td>T</td><td>T</td><td>T [1]</td></tr><tr><td>T</td><td>F</td><td>T [1]</td></tr><tr><td>F</td><td>T</td><td>T [1]</td></tr><tr><td>F</td><td>F</td><td>F [1]</td></tr></table>		**4**
4 b	<table><tr><td>**X**</td><td>**Y**</td><td>**NOT(X OR Y)**</td></tr><tr><td>T</td><td>T</td><td>F [1]</td></tr><tr><td>F</td><td>T</td><td>F [1]</td></tr><tr><td>T</td><td>F</td><td>F [1]</td></tr></table>		**4**

		F	F		T [1]				

5 a	 Correct use of NOT gates [1] Correct use of AND gate [1]		**2**

5 b i	 Correct use of NOT gate for A. [1] No NOT gate for B. [1] OR gate in correct location. [1]		**3**

5 b ii

Input		Output		**4**
A	**B**	**Q**		
0	0	1 [1]		
0	1	1 [1]		
1	0	0 [1]		
1	1	1 [1]		

6 a	The DIV operator is used for finding the "quotient" [1] The MOD operator is used for finding "remainder" [1]		**2**

6 b	(i) 182 [2] (ii) 2200 [2] (iii) 86 [2] (iv) 2 [2]	One mark if workings out are generally correct but final answer is incorrect.	**8** **/88**