MODULE Q BOOLEAN LOGIC · Q1

Logic gates: AND, OR and NOT

Original practice questions · 20 marks · ~25 minutes · OCR J277 spec 2.4.1

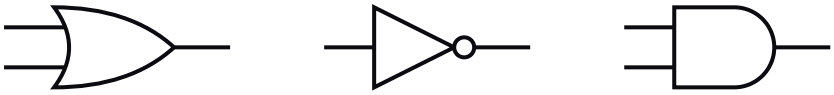
Name _____ Date _____

Instructions. Answer all questions in the spaces provided. The marks for each part are shown in brackets [ ]. The total for this worksheet is **20 marks**. In this worksheet 1 means true/on and 0 means false/off. Use the standard logic gate symbols when you draw. All scenarios are made up.

1

Total: 4 marks

Three logic gate symbols are shown, labelled X, Y and Z.



X Y Z

(a) Identify the logic gate shown by each symbol. **[3]**

X

Y

Z

(b) The AND operator is also called conjunction. State the Boolean operator that is also called **disjunction**. **[1]**

2

Total: 3 marks

(a) Tick (✓) **one** box in each row to show which logic gate each statement describes. **[3]**

Statement	AND	OR	NOT
The gate has only one input.			
The output is 1 when either input is 1 or both inputs are 1.			
The output is 0 if any of its inputs is 0.			

3 **Total: 4 marks**

(a) Complete the table to show the output P (0 or 1) of each expression for the input values given. **[4]**

Expression	Input values	Output P
`P = A AND B`	A = 1, B = 0	
`P = A OR B`	A = 0, B = 1	
`P = NOT A`	A = 1	
`P = A OR B`	A = 0, B = 0	

4 **Total: 3 marks**

A room heater is controlled by a temperature sensor, input **T**. T is 1 when the room is warm enough and 0 when it is not. The heater, output **H**, is on (H = 1) only when the room is **not** warm enough.

(a) Draw the logic diagram for the heater. Connect input T to output H. **[2]**



(b) Write a Boolean expression for H. **[1]**

H =

5 **Total: 6 marks**

A charging locker for electric bikes switches the charger on only when the locker door is closed **and** a bike is plugged in. The output is **P**: P = 1 means the charger is on.

Input	Input of 1 means	Input of 0 means
D	the locker door is closed	the locker door is open
B	a bike is plugged in	no bike is plugged in

(a) Identify the logic gate needed for this locker. **[1]**

(b) Draw the logic diagram for the locker. Connect inputs D and B to output P. **[2]**



(c) A technician suggests using an OR gate instead. Explain why an OR gate would **not** work for this locker. Use one combination of input values in your answer. **[3]**

Total for this worksheet: 20 marks