End of topic quiz - Topic 2.4 Boolean logic

1. Why do computers store data using binary? [1 mark]

2. Draw a logic diagram to represent the following expressions:

a. **P**=**A** AND **B** [2 marks]

b. **P**=**A** OR **B** [2 marks]

c. **P**=(**A** AND **B)** OR **C** [2 marks]

d. **P**=**(A** AND **B)** AND NOT **C** [2 marks]

3. Complete the Truth Tables for the following expressions:

a. **Q**=**(**NOT **A)** AND **B** [4 marks]

A	B	NOT A	Q

b. **Q**=(NOT **A**) OR **B** [4 marks]

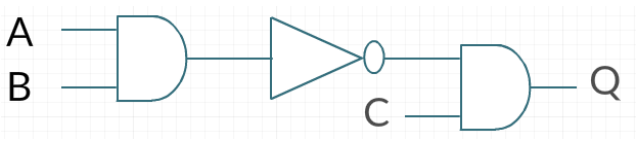
A	B	NOT A	Q

c. **Q**=(**A** AND **B**) OR **C** [8 marks]

A	B	C	A AND B	Q

4. Write out the Boolean expressions to represent each of the following circuits: [4 marks]

a.



5. Complete the truth table below for the Boolean statement p = NOT (A AND B). [2 marks]

A	B	P
FALSE	FALSE	TRUE
FALSE	TRUE	
TRUE	FALSE	

TRUE	TRUE	FALSE

6. A cinema uses the following criteria to decide if a customer is allowed to see a film that has a 15 rating:

Customers have to be 15 years of age or older to see the film. They also need to either have a ticket or have the money to buy a ticket.

The table shows the inputs to the system that will output whether the customer can watch the film.

Input	**Criteria (True / False)**
A	The customer is 15 or over
B	The customer has a ticket
C	The customer has the money to buy a ticket

Draw this system using logic gates. [2 marks]

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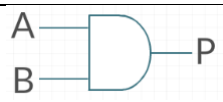
Answers

1. What do computers store data using Binary?

So that computers can be based on logic circuits.
… (each part of the circuit) can be in one of two states
... 0 and 1/true or false

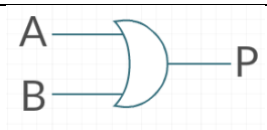
2. Draw a logic diagram to represent the following expressions:

a. **P**=**A** AND **B**



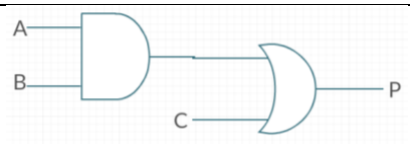
A, B and P correct.
Correct AND gate drawn.

b. **P**=**A** OR **B**



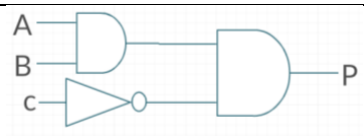
A, B and P correct.
Correct OR gate drawn.

c. **P**=(**A** AND **B)** OR **C**



A AND B correct.
Joined to OR C.

d. **P**=**(A** AND **B)** AND NOT **C**



A AND B correct, NOT C drawn correct.
Both (A AND B) and (NOT C) going into an AND gate.

3. Complete the Truth Tables for the following expressions:

a. **Q=(**NOT **A)** AND **B**

A	B	NOT A	Q
0	0	1	0
0	1	1	1
1	0	0	0
1	1	0	0

b. **Q**=(NOT **A**) OR **B**

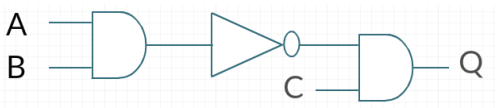
A	B	NOT A	Q
0	0	1	1
0	1	1	1
1	0	0	0
1	1	0	1

c. **Q**=(**A** AND **B**) OR **C**

A	B	C	A AND B	Q
0	0	0	0	0
0	0	1	0	1
0	1	0	0	0
0	1	1	0	1
1	0	0	0	0
1	0	1	0	1
1	1	0	1	1
1	1	1	1	1

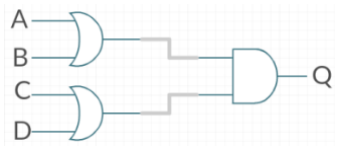
4. Write out the Boolean expressions to represent each of the following circuits:

a.



Q=NOT(A AND B)
AND C

b.



Q=(A OR B)
AND (C OR D)

5. Complete the truth table below for the Boolean statement p = NOT (A AND B).

A	B	P
FALSE	FALSE	TRUE
FALSE	TRUE	**TRUE**
TRUE	FALSE	**TRUE**
TRUE	TRUE	FALSE

TRUE TRUE – 1 mark each

[2 marks]

6. A cinema uses the following criteria to decide if a customer is allowed to see a film that has a 15 rating:

Customers have to be 15 years of age or older to see the film. They also need to either have a ticket or have the money to buy a ticket.

The table shows the inputs to the system that will output whether the customer can watch the film.

Input	Criteria (True / False)
A	The customer is 15 or over
B	The customer has a ticket
C	The customer has the money to buy a ticket

Draw this system using logic gates.

- OR gate with two inputs // AND gate with two inputs
- Diagram as shown in guidance with no additional gates

Marks: 2