Your notes

GCSE Computer Science: revision notes

Boolean logic and logic gates

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Logic gates

- AND: the output is 1 only if both inputs are 1.
- OR: the output is 1 if at least one input is 1.
- NOT: the output is the opposite of the input.
- (AQA) XOR: the output is 1 if the two inputs are different.

Truth tables

- A **truth table** shows the output for every combination of inputs. 2 inputs give 4 rows; 3 inputs give 8 rows (2^n rows for n inputs).
- AND: 0 0 → 0, 0 1 → 0, 1 0 → 0, 1 1 → 1. OR: 0 0 → 0, 0 1 → 1, 1 0 → 1, 1 1 → 1. NOT: 0 → 1, 1 → 0.

Logic circuits and expressions

- Gates can be joined into circuits. P = NOT (A AND B) is 0 only when A and B are both 1.
- Work through a circuit one gate at a time, adding a column to the **truth table** for each gate's output.
- Expressions may use symbols. OCR writes AND as ∧, OR as ∨ and NOT as ¬. AQA writes A AND B as A·B, A OR B as A + B, and NOT A as A with a bar over it.

Using logic

- Logic is used in program conditions and in real systems. An alarm might sound if (a door is open OR a window is open) AND the alarm is set.

Key terms

Logic gate	An electronic component that carries out a Boolean operation on its inputs.

AND gate	Outputs 1 only when both inputs are 1.
OR gate	Outputs 1 when at least one input is 1.
NOT gate	Outputs the opposite of its single input.
XOR gate	Outputs 1 when the two inputs are different. (AQA)
Truth table	A table showing the output for every possible combination of inputs.
Boolean expression	A statement using AND, OR and NOT that is either true or false.

Your notes

Quick questions

Cover the answers and test yourself: remembering is what makes it stick.

1. What does an AND gate output when both inputs are 1?
2. What does an OR gate output when the inputs are 0 and 1?
3. What does a NOT gate do?
4. How many rows does a truth table for 3 inputs have?
5. Which gate outputs 1 only when both inputs are 1?
6. What is NOT (1 AND 1)?
7. What is (1 OR 0) AND 0?
8. An XOR gate has the inputs 1 and 1. What is the output? (AQA)

Answers

1. 1
2. 1
3. Outputs the opposite of its input
4. 8
5. AND
6. 0
7. 0
8. 0

What to do next

Practise 12 questions on this topic

Try 5 exam questions, with mark schemes

Read the lesson, one step at a time

Free revision for GCSE and KS3 at lycolearn.co.uk. Some notes are for one exam board only, and say so in brackets.