isaac computer science



# Simplifying Boolean expressions

When using the Boolean laws to simplify expressions, you are doing a pattern matching activity to look for parts of the expression that you can replace with a simpler version. To do this easily, you need to know all the Boolean laws; if it's possible to apply several laws, you need to consider which one will help most for the next step of the simplifcation.

GCSE **Example simplification**

An expression may often need to be simplified by using multiple steps. Simplification requires identifying a pattern of variables that match one of the identities and replacing it, what those variables are called is irrelevent. For instance, the structure of $A \vee A = A$ is the same as $X \vee X = X$.

Watch the following video demonstration simplifying a Boolean expression:

Embedded YouTube video: https://www.youtube.com/watch?v=FWYCM4hlMXQ.
It is important to remember that there is not always one single way to simplify an expression. An expression can be simplified in different ways depending on the steps you choose at any given stage. Ultimately, the outcome will be the same.

Now watch the following video demonstrating an alternative simplification of the same Boolean expression:

Embedded YouTube video: https://www.youtube.com/watch?v=GGgwBPgzcuU.
Now attempt the question below and simplify the expression.

Simplify the Boolean expression $\neg A \vee \neg B \vee B$

**Click a button to show the answer**

What is your level of confidence that your own answer is correct?

Low Medium High

GCSE **Worked example 1**

Simplify $(A \wedge \neg B) \vee B$

Try it yourself, then click to see the working.

**Click a button to show the answer**

What is your level of confidence that your own answer is correct?

Low Medium High

GCSE **Worked example 2**

Simplify $(A \wedge B) \vee (A \wedge A)$

Try it yourself, then click to see the working.

**Click a button to show the answer**

What is your level of confidence that your own answer is correct?

Low Medium High

A Level **Worked example 3**

Simplify $\neg(A \wedge B) \vee B$

*Enter exposition here*

**Click a button to show the answer**

What is your level of confidence that your own answer is correct?

Low Medium High

A Level **Worked example 4**

Simplify $\neg(\neg(A \wedge B) \wedge B)$

Try it yourself, then click to see the working.

**Click a button to show the answer**



What is your level of confidence that your own answer is correct?

Low Medium High