

1.4 DATA TYPES & STRUCTURES · 1.4.3

Simplifying Boolean & De Morgan's laws

The rules, De Morgan's laws, and step-by-step simplification. Spec 1.4.3(a)(c).

01 General rules

With 0/1 $A \cdot 0 = 0$ $A \cdot 1 = A$ $A + 0 = A$ $A + 1 = 1$

Self $A \cdot A = A$ $A + A = A$

Complement $A \cdot \neg A = 0$ $A + \neg A = 1$

Double neg $\neg \neg A = A$

Absorption $A + A \cdot B = A$ $A \cdot (A + B) = A$

02 De Morgan's laws

1st $\neg(A \cdot B) = \neg A + \neg B$

2nd $\neg(A + B) = \neg A \cdot \neg B$

Hook "Break the line, change the sign."

Use Clears a NOT off a whole bracket.

03 Method & worked example

Step 1 Use **De Morgan's** to remove a NOT from a bracket.

Step 2 **Factor** (distributive) and apply general/absorption rules.

Always **State the rule** at each line — method marks.

Example $\neg A \cdot B + A \cdot B = (\neg A + A) \cdot B = 1 \cdot B = B$

FINAL PASS BEFORE THE EXAM

Rapid exam tips

Six slips on simplification questions.

01

De Morgan's: $\neg(A \cdot B) = \neg A + \neg B$ — break the bar **and** swap the operator.

02

Cancel double bars: $\neg\neg B = B$.

03

State the rule at every step to earn method marks.

04

$A+1=1$ (not A!) · $A \cdot 0=0$ · $A \cdot 1=A$ · $A+0=A$.

05

Factoring with the distributive rule is usually the key step.

06

Unsure? Check the result against a **truth table** — must match all inputs.