# Activity 1 - Commutative Law expressions

## Exercise 1

Given the expression:

*X⋅Y⋅Z*

…apply the Commutative Law to rearrange the terms.

## Exercise 2

Simplify the expression:

*A+B+C*

…using the Commutative Law.

## Exercise 3

Apply the Commutative Law to the expression:

P⋅Q⋅R

…to show an equivalent expression.

## Exercise 4:

Given the expression:

*(X+Y)⋅Z*

use the Commutative Law to rewrite the expression.

## Exercise 5:

Rearrange the terms in the expression:

*A⋅B+C*

using the Commutative Law.

## Exercise 6:

Apply the Commutative Law to the expression:

*(P⋅Q)+R*

…to demonstrate its equivalence to another expression.

# Activity 2 – the other laws

## Question 1 – associative law

1. Show that *A+(B+C)* is equivalent to *(A+B)+C*
2. Show that *P⋅ (Q⋅ R)* is equivalent to *(P⋅ Q)⋅ R*

## Question 2 – Distibutative law

1. Apply the distributive law to simplify the expression:

*A⋅ (B+C)*

1. Apply the distributive law to simplify the expression:

*(P+Q)⋅ R*

## Question 3 - Tautology/Idempotent Law

1. Simplify the expression:

*X+X*

1. Simplify the expression:

*Y⋅ Y*

## Question 4 - Tautology/Identity Law

1. Simplify the expression:

*A+0*

1. Simplify the expression:

*B⋅ 1*

## Question 5 - Tautology/null Law

1. Simplify the expression:

*X+0*

1. Simplify the expression:

*B⋅ 1*

## Question 4 - Tautology/inverse Law

1. Simplify the expression:

$$A+\overline{A}$$

1. Simplify the expression:

$B⋅\overline{B}$

## Question 4 - Absorbtion

1. Simplify the expression:

*A+(A⋅ B)*

1. Simplify the expression:

*P⋅ (P* +*Q)*

# Activity 3 – De Morgan’s Laws

## Exercise 1 – application of De Morgan’s

Use De Morgan’s Laws to simplify the expression:

$$\overbar{\left(A+B\right)}$$

## Exercise 2 - APPLICATION OF DE MORGAN’S

Apply De Morgan's Laws to simplify the expression:

$$\overbar{\left(P⋅Q\right)}$$

## Exercise 3 – De Morgan’s Laws in a complex expression

Simplify the expression:

$$\overbar{\left(X+Y⋅Z\right)}$$

## Exercise 4 - De Morgan’s Laws with OR operation

Use De Morgan's Laws to simplify the expression:

$$\overline{(A⋅B +C)}$$

## Exercise 5 - De Morgan’s Laws with multiple operations

Simplify the expression:

$$\overline{(P+Q)⋅(R+S)}$$