# FACTORISATION

# **DIVISION OF ALGEBRAIC EXPRESSIONS**

# **DIVISION OF POLYNOMIALS**

## 1. Division of a Monomial by Another Monomial

To divide a monomial by another monomial, follow the following steps :

**Step 1:** Find the quotient of the numeical coefficients.

**Step 2:** Find the quotient of the variables.

**Step 3:** Find the product of the results obtained in steps 1 and 2.

**Ex.1** Divide 
$$108x^3 y^3 z^7 by - 120x^2 y^2 z^2$$

Sol. 
$$\frac{108x^3y^3z^7}{-120x^2y^2z^2} = \frac{-9}{10}xyz^5$$

Thus,  $108x^3y^3z^7 \div (-120x^2y^2z^2) = \frac{-9}{10}xyz^5$ 

**Ex.2** Divide 
$$96x^3y^3z^2 - 36x^2y^2z^2 - 60xyz$$
 by  $- 12xyz$ 

**Sol.** 
$$(96x^3y^3z^2 - 36x^2y^2z^2 - 60xyz) \div (-12xyz)$$

$$=\frac{96x^3y^3z^2-36x^2y^2z^2-60xyz}{-12xyz}$$

$$=\frac{96x^{3}y^{3}z^{2}}{-12xyz}-\frac{36x^{2}y^{2}z^{2}}{-12xyz}-\frac{60xyz}{-12xyz}=-8x^{2}y^{2}z+3xyz+5$$

# 2. Division of a Polynomial by Another Polynomial

### A. Factorisation Method

Consider  $(3x^2 + 12x)$  divided by x + 4We can write the factors fo  $3x^2 + 12x$  as 3x(x + 4)

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Now 
$$\frac{3x^2 + 12x}{x+4} = \frac{3x(x+4)}{(x+4)} = 3x$$
  
Ex.3 Divide  $9x^2 - 16y^2$  by  $3x - 4y$   
Sol.  $\frac{9x^2 - 16y^2}{3x - 4y} = \frac{(3x^2) - (4y^2)}{3x - 4y}$   
[Applying the identity  $x^2 - y^2 = (x - y)(x + y)$ ]  
 $= \frac{(3x - 4y)(3x + 4y)}{3x - 4y} = 3x + 4y$   
Ex.4 Divide  $x^2 - 9x + 14$  by  $x - 2$   
Sol.  $\frac{x^2 - 9x + 14}{x-2} = \frac{x^2 - 7x - 2x + 14}{x-2} = \frac{x(x - 7) - 2(x - 7)}{x-2}$   
 $= \frac{(x - 7)(x - 2)}{x-2} = x - 7$ 

# B. Method of Long Division

x - 2

1. Divide the first term (x<sup>2</sup>) of the divident by the first term (x) of the divisor  $x^{2} x = x$ 

Thus, x is the first term of the quotient

- **2.** Multiply the divisor (x + 1) by the first term of the quotient obtained is step 1.
- 3. Write the like terms of the product  $x (x + 1) = x^2 + x$  below the terms of the dividend such that like terms are placed below each other and subtract.

 $(x^2 + 3x + 2) - (x^2 + x) = 2x + 2$ 

**4.** Now, divide the first term of the remainder (2x) by the first term (x) of the divisor 2x, x = 2

Thus, 2 is the next term of the quotient.

5. Multiply the divisor (x + 1) by the next term of the quotient (2) obtained in previous step.

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Write the terms of the product 2(x + 1) = 2x + 2 below terms of 2x + 2 (remainder 6. obtained in step 3) such that like terms are placed below each other and subtract (2x + 2) - (2x + 2) = 0Thus, the remainder is 0 and the quotient is x + 2To verify the result x + 2We know x+1 )  $x^2+3x+2($  $Dividend = Divisor \times Quotient + Remainder$  $x^2 \pm x$ R.H.S. = Divisor  $\times$  Quotient = Remainder 2x + 2 $= (x + 1) \times (x + 2) + 0$  $2x \pm 2$ = x (x + 2) + 1 (x + 2) + 00 = x(x) + x(2) + x + 2 $= x^{2} + 2x + x + 2$  $= x^{2} + 3x + 2$ 

L.H.S. = Dividend =  $x^2 + 3x + 2$ 

As L.H.S. = R.H.S. Hence, verified, that the answer is correct.