

2 Unit Bridging Course - Day 3

Factorisation and Expansion

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Factorisation is the process of writing an expression as a product of its factors.

For example, to factorise the expression $4x^2 + 8x$, look for a common factor in both terms.

$$4x \times x = 4x^2$$

and

$$4x \times 2 = 8x$$

Then divide

$$4x^2 + 8x = 4x(x + 2).$$

Example

Factorise $4pq + pq^2$

$$pq \times 4 = 4pq$$

and

$$pq \times q = pq^2$$

Then divide

$$4pq + pq^2 = pq(4 + q).$$

Practice Questions

Factorise the following:

1. $3x^2 - 6x$

2. $-ab - 3b^2$

3. $4x^3 + 2x^2$

4. $4p^2q - 8pq$

5. $xy + x^2$

6. $2x + 4y$

7. $x^2 - 3xy^2$

8. $5mn + 10m^2n^3$

9. $-pqr - pq^2$

10. $2abc - ab^2c$

Answers to practice questions:

1. $3x(x - 2)$

2. $-b(a + 3b)$

3. $2x^2(2x + 1)$

4. $4pq(p - 2)$

5. $x(y + x)$

6. $2(x + 2y)$

7. $x(x - 3y^2)$

8. $5mn(1 + 2mn^2)$

9. $-pq(r + q)$

10. $abc(2 - b)$

Expansion is the reverse of factorisation. That is, multiply the factors out to obtain an expression.

For example, to expand the expression $5x(x - 2)$, both terms inside the brackets are multiplied by $5x$.

$$\begin{aligned} 5x(x - 2) &= 5x \times x - 5x \times 2 \\ &= 5x^2 - 10x, \end{aligned}$$

Example

Consider expanding $(2x - 2)(x + 4)$.

$$\begin{aligned}(2x - 2)(x + 4) &= (2x - 2) \times x + (2x - 2) \times 4 \\&= 2x \times x - 2 \times x + 2x \times 4 - 2 \times 4 \\&= 2x^2 - 2x + 8x - 8 \\&= 2x^2 + 6x - 8\end{aligned}$$

Example

Expand $(4n + 1)(2n + 2)$.

$$\begin{aligned}(4n + 1)(2n + 2) &= (4n + 1) \times 2n + (4n + 1) \times 2 \\ &= 4n \times 2n + 1 \times 2n + 4n \times 2 + 1 \times 2 \\ &= 8n^2 + 2n + 8n + 2 \\ &= 8n^2 + 10n + 2\end{aligned}$$

Practice Questions

Expand the following:

1. $3x(x + 2)$

2. $(n - 1)(n + 2)$

3. $(2n - 5)(n - 1)$

4. $(x + 3)(5 - x)$

5. $(x + 2)^2$

6. $(3 - x)(2x + 1)$

7. $(x + 6)(x - 6)$

8. $(p - 2)(p + 2)$

9. $(2n - 2)^2$

10. $(x - a)(x + 2a)$

Answers to practice questions:

1. $3x^2 + 6x$

2. $n^2 + n - 2$

3. $2n^2 - 7n + 5$

4. $-x^2 + 2x + 15$

5. $x^2 + 4x + 4$

6. $-2x^2 + 5x + 3$

7. $x^2 - 36$

8. $p^2 - 4$

9. $4n^2 - 8n + 4$

10. $x^2 + ax - 2a^2$

You can check if your factorisation is correct by expanding your answer. If you get the original expression then you factorised correctly.

Your expansions can be checked similarly by factorising the expanded expression.

Factorise \rightarrow

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

\leftarrow Expand