FACTORIZATION OF ALGEBRAIC EXPRESSIONS

A COMMON FACTOR LAWS

A.1 FACTORIZING THE COMMON FACTOR: LEVEL 1

Ex 1: Factorize:

$$3x + 15 = \boxed{3(x + 5)}$$

Answer:

$$\begin{aligned} 3x + 15 &= 3 \times x + 3 \times 5 \\ &= 3(x + 5). \end{aligned}$$

Ex 2: Factorize:

$$4x + 2 = \boxed{2(2x + 1)}$$

Answer:

$$\begin{aligned} 4x + 2 &= 2 \times 2x + 2 \times 1 \\ &= 2(2x + 1). \end{aligned}$$

Ex 3: Factorize:

$$6x + 9 = \boxed{3(2x + 3)}$$

Answer:

$$\begin{aligned} 6x + 9 &= 3 \times 2x + 3 \times 3 \\ &= 3(2x + 3). \end{aligned}$$

Ex 4: Factorize:

$$2x - 4 = \boxed{2(x - 2)}$$

Answer:

$$\begin{aligned} 2x - 4 &= 2 \times x - 2 \times 2 \\ &= 2(x - 2). \end{aligned}$$

Ex 5: Factorize:

$$3 - 6x = \boxed{3(1 - 2x)}$$

Answer:

$$\begin{aligned} 3 - 6x &= 3 \times 1 - 3 \times 2x \\ &= 3(1 - 2x). \end{aligned}$$

A.2 FACTORIZING THE COMMON FACTOR: LEVEL 2

Ex 6: Factorize:

$$2x^2 + 4 = \boxed{2(x^2 + 2)}$$

Answer:

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

Ex 7: Factorize:

$$x^2 + 6x = \boxed{x(x + 6)}$$

Answer:

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

Ex 8: Factorize:

$$x^2 - 2x = \boxed{x(x - 2)}$$

Answer:

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

Ex 9: Factorize:

$$2x^2 - 2x = \boxed{2x(x - 1)}$$

Answer:

$$\begin{aligned} 2x^2 - 2x &= 2x \times x - 2x \times 1 \\ &= 2x(x - 1). \end{aligned}$$

B DIFFERENCE OF SQUARES

B.1 FACTORIZING THE DIFFERENCE OF SQUARES: LEVEL 1

Ex 10: Factorize:

$$x^2 - 1 = \boxed{(x - 1)(x + 1)}$$

Answer:

$$\begin{aligned} x^2 - 1 &= x^2 - 1^2 \\ &= (x - 1)(x + 1) \end{aligned}$$

Ex 11: Factorize:

$$x^2 - 4 = \boxed{(x - 2)(x + 2)}$$

Answer:

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

Ex 12: Factorize:

$$x^2 - 9 = \boxed{(x - 3)(x + 3)}$$

Answer:

$$\begin{aligned} x^2 - 9 &= x^2 - 3^2 \\ &= (x - 3)(x + 3) \end{aligned}$$

Ex 13: Factorize:

$$25 - x^2 = \boxed{(5 - x)(5 + x)}$$

Answer:

$$\begin{aligned} 25 - x^2 &= 5^2 - x^2 \\ &= (5 - x)(5 + x) \end{aligned}$$

B.2 FACTORIZING THE DIFFERENCE OF SQUARES: LEVEL 2

Ex 14: Factorize:

$$x^2 - 3 = \boxed{(x - \sqrt{3})(x + \sqrt{3})}$$

Answer:

$$\begin{aligned} x^2 - 3 &= x^2 - \left(\sqrt{3}\right)^2 \\ &= \left(x - \sqrt{3}\right)\left(x + \sqrt{3}\right) \end{aligned}$$

Ex 15: Factorize:

$$x^2 - 2 = \boxed{(x - \sqrt{2})(x + \sqrt{2})}$$

Answer:

$$\begin{aligned} x^2 - 2 &= x^2 - \left(\sqrt{2}\right)^2 \\ &= \left(x - \sqrt{2}\right)\left(x + \sqrt{2}\right) \end{aligned}$$

Ex 16: Factorize:

$$5 - x^2 = \boxed{(\sqrt{5} - x)(\sqrt{5} + x)}$$

Answer:

$$\begin{aligned} 5 - x^2 &= \left(\sqrt{5}\right)^2 - x^2 \\ &= \left(\sqrt{5} - x\right)\left(\sqrt{5} + x\right) \end{aligned}$$

Ex 17: Factorize:

$$7 - x^2 = \boxed{(\sqrt{7} - x)(\sqrt{7} + x)}$$

Answer:

$$\begin{aligned} 7 - x^2 &= \left(\sqrt{7}\right)^2 - x^2 \\ &= \left(\sqrt{7} - x\right)\left(\sqrt{7} + x\right) \end{aligned}$$

C PERFECT SQUARE TRINOMIALS

C.1 FACTORIZING PERFECT SQUARE TRINOMIALS

Ex 18: Factorize:

$$x^2 + 2x + 1 = \boxed{(x + 1)^2}$$

Answer:

$$\begin{aligned} x^2 + 2x + 1 &= x^2 + 2 \times x \times 1 + 1^2 \\ &= (x + 1)^2 \end{aligned}$$

Ex 19: Factorize:

$$x^2 + 4x + 4 = \boxed{(x + 2)^2}$$

Answer:

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

Ex 20: Factorize:

$$x^2 + 6x + 9 = \boxed{(x + 3)^2}$$

Answer:

$$\begin{aligned} x^2 + 6x + 9 &= x^2 + 2 \times x \times 3 + 3^2 \\ &= (x + 3)^2 \end{aligned}$$

Ex 21: Factorize:

$$x^2 + 10x + 25 = \boxed{(x + 5)^2}$$

Answer:

$$\begin{aligned} x^2 + 10x + 25 &= x^2 + 2 \times x \times 5 + 5^2 \\ &= (x + 5)^2 \end{aligned}$$