

Algebraic Expressions and Identities: Exercise 9.4

Q.1 Multiply the binomials.

(i) $(2x + 5)$ and $(4x - 3)$

(ii) $(y - 8)$ and $(3y - 4)$

(iii) $(2.5l - 0.5m)$ and $(2.5l + 0.5m)$

(iv) $(a + 3b)$ and $(x + 5)$

(v) $(2pq + 3q^2)$ and $(3pq - q^2)$

(vi) $\left(\frac{3}{4}a^2 + 3b^2\right)$ and $4\left(a^2 - \frac{2}{3}b^2\right)$

Sol. Multiplication of binomials:

(i) **Given:** $(2x + 5) \times (4x - 3) = 2x(4x - 3) + 5(4x - 3)$
 $= 2x \times 4x - 2x \times 3 + 5 \times 4x - 5 \times 3$
 $= 8x^2 - 6x + 20x - 15$
 $= 8x^2 + 14x - 15$

(ii) **Given:** $(y - 8) \times (3y - 4) = y(3y - 4) - 8(3y - 4)$
 $= y \times 3y - y \times 4 - 8 \times 3y + 8 \times 4$
 $= 3y^2 - 4y - 24y + 32$
 $= 3y^2 - 28y + 32$

(iii) **Given:** $(2.5l - 0.5m) \times (2.5l + 0.5m) = 2.5l \times (2.5l + 0.5m) - 0.5m(2.5l + 0.5m)$
 $= 2.5l \times 2.5l + 2.5l \times 0.5m - 0.5m \times 2.5l - 0.5m \times 0.5m$
 $= 6.25l^2 + 1.25lm - 1.25lm - 0.25m^2$
 $= 6.25l^2 - 0.25m^2$

(iv) **Given:** $(a + 3b) \times (x + 5) = a \times (x + 5) + 3b \times (x + 5)$
 $= a \times x + a \times 5 + 3b \times x + 3b \times 5$
 $= ax + 5a + 3bx + 15b$

(v) **Given:** $(2pq + 3q^2) \times (3pq - q^2) = 2pq \times (3pq - q^2) + 3q^2 \times (3pq - q^2)$
 $= 6p^2q^2 - 4pq^3 + 9pq^3 - 6q^4$
 $= 6p^2q^2 + 5pq^3 - 6q^4$

(vi) **Given:** $\left(\frac{3}{4}a^2 + 3b^2\right) \times 4\left(a^2 - \frac{2}{3}b^2\right) = \left(\frac{3}{4}a^2 + 3b^2\right) \times \left(4a^2 - \frac{8}{3}b^2\right)$
 $= \frac{3}{4}a^2 \times \left(4a^2 - \frac{8}{3}b^2\right) + 3b^2 \times \left(4a^2 - \frac{8}{3}b^2\right)$
 $= 3a^4 - 2a^2b^2 + 12a^2b^2 - 8b^4$
 $= 3a^4 + 10a^2b^2 - 8b^4$

Q.2 Find the product.

(i) $(5 - 2x)(3 + x)$

(ii) $(x + 7y)(7x - y)$

(iii) $(a^2 + b)(a + b^2)$

(iv) $(p^2 - q^2)(2p + q)$

Sol. Product of given expressions:

(i) **Given:** $(5 - 2x)(3 + x) = 5 \times (3 + x) + -2x \times (3 + x)$
 $= 15 + 5x - 6x + 2x^2$
 $= 15 - x + 2x^2$

(ii) **Given:** $(x + 7y)(7x - y) = x(7x - y) + 7y(7x - y)$
 $= 7x^2 - xy + 49xy - 7y^2$

$$= 7x^2 + 48xy - 7y^2$$

$$\begin{aligned} \text{(iii) Given: } (a^2 + b)(a + b^2) &= a^2 \times (a + b^2) + b^2 \times (a + b^2) \\ &= a^3 + a^2b^2 + ab + b^3 \end{aligned}$$

$$\begin{aligned} \text{(iv) Given: } (p^2 - q^2)(2p + q) &= p^2 \times (2p + q) - q^2 \times (2p + q) \\ &= 2p^3 + p^2q - 2pq^2 - q^3 \end{aligned}$$

Q.3 Simplify.

$$\text{(i) } (x^2 - 5)(x + 5) + 25$$

$$\text{(ii) } (a^2 + 5)(b^3 + 3) + 5$$

$$\text{(iii) } (t + s^2)(t^2 - s)$$

$$\text{(iv) } (a + b)(c - d) + (a - b)(c + d) + 2(ac + bd)$$

$$\text{(v) } (x + y)(2x + y) + (x + 2y)(x - y)$$

$$\text{(vi) } (x + y)(x^2 - xy + y^2)$$

$$\text{(vii) } (1.5x - 4y)(1.5x + 4y + 3) - 4.5x + 12y$$

$$\text{(viii) } (a + b + c)(a + b - c)$$

Sol. Simplification:

$$\begin{aligned} \text{(i) Given: } (x^2 - 5)(x + 5) + 25 &= x^2 \times (x + 5) - 5 \times (x + 5) + 25 \\ &= x^3 + 5x^2 - 5x - 25 + 25 \\ &= x^3 + 5x^2 - 5x \end{aligned}$$

$$\begin{aligned} \text{(ii) Given: } (a^2 + 5)(b^3 + 3) + 5 &= a^2 \times (b^3 + 3) + 5 \times (b^3 + 3) \\ &= a^2b^3 + 3a^2 + 5b^3 + 15 + 5 \\ &= a^2b^3 + 3a^2 + 5b^3 + 20 \end{aligned}$$

$$\begin{aligned} \text{(iii) Given: } (t + s^2)(t^2 - s) &= t \times t^2 - t \times s + s^2 \times t^2 - s^2 \times s \\ &= t^3 - st + s^2t^2 - s^3 \end{aligned}$$

$$\begin{aligned} \text{(iv) Given: } (a + b)(c - d) + (a - b)(c + d) + 2(ac + bd) \\ &= a(c - d) + b(c - d) + a(c + d) - b(c + d) + 2ac + 2bd \\ &= ac - ad + bc - bd + ac + ad - bc - bd + 2ac + 2bd \\ &= 2ac - 2bd + 2ac + 2bd \\ &= 4ac \end{aligned}$$

$$\begin{aligned} \text{(v) Given: } (x + y)(2x + y) + (x + 2y)(x - y) \\ &= x(2x + y) + y(2x + y) + x(x - y) + 2y(x - y) \\ &= 2x^2 + xy + 2xy + y^2 + x^2 - xy + 2xy - 2y^2 \\ &= 3x^2 + 4xy - y^2 \end{aligned}$$

$$\begin{aligned} \text{(vi) Given: } (x + y)(x^2 - xy + y^2) &= x(x^2 - xy + y^2) + y(x^2 - xy + y^2) \\ &= x^3 - x^2y + xy^2 + x^2y - xy^2 + y^3 \\ &= x^3 + y^3 \end{aligned}$$

$$\begin{aligned} \text{(vii) Given: } (1.5x - 4y)(1.5x + 4y + 3) - 4.5x + 12y \\ &= 1.5x(1.5x + 4y + 3) - 4y(1.5x + 4y + 3) - 4.5x + 12y \\ &= 2.25x^2 + 6xy + 4.5 - 6xy - 16y^2 - 12y - 4.5x + 12y \\ &= 2.25x^2 - 16y^2 \end{aligned}$$

$$\begin{aligned} \text{(viii) Given: } (a + b + c)(a + b - c) &= a(a + b - c) + b(a + b - c) + c(a + b - c) \\ &= a^2 + ab - ac + ab + b^2 - bc + ac + bc - c^2 \\ &= a^2 + 2ab + b^2 - c^2 \end{aligned}$$