SpeedLabs

MATHS

CBSE 8th

TEEVRA EDUTECH PVT. LTD.

Q.1 Use a suitable identity to get each of the following products.

(i) $(x + 3)(x + 3)$

(ii) $(2y + 5)(2y + 5)$

(iii) $(2a - 7)(2a - 7)$

(iv) $(3a - \frac{1}{2})(3a - \frac{1}{2})$

(v) $(1.1m - 0.4)(1.1m + 0.4)$

(vi) $(a^2 + b^2)(-a^2 + b^2)$

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

(viii) $(-a + c)(-a + c)$

(IX) $\left(\frac{x}{2} + \frac{3y}{4}\right)\left(\frac{x}{2} + \frac{3y}{4}\right)$

(x) $(7a - 9b)(7a - 9b)$

Sol:

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

$= (x)^2 + 2 \times x \times 3 + (3)^2$

Using identity $(a + b)^2 = a^2 + 2ab + b^2$

$= x^2 + 6x + 9$

(ii) $(2y + 5)(2y + 5) = (2y + 5)^2$

$= (2y)^2 + 2 \times 2y \times 5 + (5)^2$

Using identity $(a + b)^2 = a^2 + 2ab + b^2$

$= 4y2 + 20y + 25$

(iii) $(2a - 7)(2a - 7) = (2a - 7)2$

$= (2a)^2 - 2 \times 2a \times 7 + (7)2$

Using identity $(a - b)^2 = a^2 - 2ab + b^2$

$= 4a^2 - 28a + 49$

$= 4a^2 - 28a + 49$

(iv) $\left(3a - \frac{1}{2}\right)\left(3a - \frac{1}{2}\right) = \left(3a - \frac{1}{2}\right)^2$

$= (3a)^2 - 2 \times 3a \times \frac{1}{2} + \left(\frac{1}{2}\right)^2$

Using identity $(a - b)^2 = a^2 - 2ab + b^2$

$= 9a^2 - 3a + \frac{1}{4}$

(v) $(1.1m - 0.4)(1.1m + 0.4)$

$= (1.1m - 0.4)(1.1m + 0.4) = (1.1m)^2 - (0.4)^2$

Using identity $(a - b)(a + b) = a^2 - b^2$

$= 1.21m^2 - 0.16$

(vi)$(a^2 + b^2)(-a^2 + b^2) = (b^2 + a^2)(b^2 - a^2)$

$= (b^2)^2 - (a^2)^2$ Using identity $(a + b)(a - b) = a^2 - b^2$

$= b^4 - a^4$

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

$= (6x)^2 - (7)^2$ Using identity $(a - b)(a + b) = a^2 - b^2$

$= 36x^2 - 49$

(viii) $(-a + c)(-a + c) = (-a + c)^2$

$= (-a)^2 + 2(-a) \times c + (C)^2$

Using identity $(a + b)^2 = a^2 + 2ab + b^2$

$= a^2 - 2ac + c^2$

Aliter. $(-a + c)(-a + c) = (-a + c)^2 = (c - a)^2$

$= (c)^2 - 2 \times c \times a + a^2$ Using identity $(a - b)^2$

$= a^2 - 2ab + b^2$

$= c^2 - 2ac + a^2$

(ix) $\left(\frac{x}{2}+\frac{3y}{4}\right)\left(\frac{x}{2}+\frac{3y}{4}\right)=\left(\frac{x}{2}+\frac{3y}{4}\right)^2$

$=\left(\frac{x}{2}\right)^2+2\times\frac{x}{2}\times\frac{3y}{4}+\left(\frac{3y}{4}\right)^2$

Using identity $(a+b)^2 = a^2 + 2ab + b^2$

$=\frac{x^2}{4}+\frac{3}{4}xy+\frac{9}{16}y^2$

(x) $(7a-9b)(7a-9b) = (7a-9b)^2$

$= (7a)^2 - 2\times 7a\times 9b + (9b)^2$

Using identity $(a-b)^2 = a^2 - 2ab + b^2$

$= 49a^2 - 126ab + 81b^2$.

Q.2 Use the identity $(x + a)(x + b) = x^2 + (a + b)x + ab$ to the following products.

(i) $(x+3)(x+7)$

(ii) $(4x+5)(4x+1)$

(iii) $(4x-5)(4x-1)$

(iv) $(4x+5)(4x-1)$

(v) $(2x+5y)(2x+3y)$

(vi) $(2a^2+9)(2a^2+5)$

(vii) $(xyz-4)(xyz-2)$

Sol: (i) $(x+3)(x+7) = x^2 + (3+7)\times x + 3\times 7$

By using the above identity $(x+a)(x+b) = x^2 + (a+b)x + ab$

$= x^2 + 10x + 21$

(ii) $(4x+5)(4x+1)$

$(4x+5)(4x+1) = (4x)^2 + (5+1)\times 4x + 5\times 1$

By using above identity $(x+a)(x+b) = x^2 + (a+b)x + ab$

$= 16x^2 + 6\times 4x + 5$

$= 16x^2 + 24x + 5$

(iii) $(4x - 5)(4x - 1)$

$(4x - 5)(4x - 1) = (4x)^2 + (-5 - 1) \times 4x + (-5)(-1)$

By using the above identity $(x + a)(x + b) = x^2 + (a + b)x + ab$

$= 16x^2 + (-5 - 1) \times 4x + 5$

$= 16x^2 + (-6) \times 4x + 5$

$= 16x^2 - 24x + 5$

(iv) $(4x + 5)(4x - 1)$

$(4x + 5)(4x - 1) = (4x)^2 + [5 + (-1)] \times 4x + (5) \times (-1)$

By using the above identity $(x + a)(x + b) = x^2 + (a + b)x + ab$

$= 16x^2 + (5 - 1) \times 4x - 5$

$= 16x^2 + 4 \times 4x - 5 = 16x^2 + 16x - 5$

(v) $(2x + 5y)(2x + 3y)$

$(2x + 5y)(2x + 3y) = (2x)^2 + (5y + 3y) \times 2x + 5y \times 3y$

By using the above identity $(x + a)(x + b) = x^2 + (a + b)x + a \times b$

$= 4x^2 + 8y \times 2x + 15y^2$

$= 4x^2 + 16xy + 15y^2$

(vi) $(2a^2 + 9)(2a^2 + 5)$

$(2a^2 + 9)(2a^2 + 5) = (2a^2)^2 + (9 + 5) \times 2a^2 + 9 \times 5$

By using the above identity $(x + a)(x + b) = x^2 + (a + b)x + ab$

$= 4a^4 + 14 \times 2a^2 + 45 = 4a^4 + 28a^2 + 45$

(vii) $(xyz - 4)(xyz - 2)$

$(xyz - 4)(xyz - 2) = (xyz)^2 + (-4 - 2) \times xyz + (-4) \times (-2)$

By using the above identity $(x + a)(x + b) = x^2 + (a + b)x + ab$

$= x^2y^2z^2 + (-4 - 2) \times xyz + 8$

$= x^2y^2z^2 + (-6)xyz + 8$

$= x^2y^2z^2 - 6xyz + 8.$

Q.3 Find the following squares by using the identities.

(i) $(b - 7)^2$

(ii) $(xy + 3z)^2$

(iii) $(6x^2 - 5y)^2$

(iv) $\left(\frac{2}{3}m + \frac{3}{2}n\right)^2$

(v) $(0.4p - 0.5q)^2$

(vi) $(2xy + 5y)^2$

Sol: (i) $(b - 7)^2$

Using identity $(a - b)^2 = a^2 - 2ab + b^2$

$(b - 7)^2 = (b)^2 - 2 \times b \times 7 + (7)^2$

$= b^2 - 14b + 49.$

(ii) $(xy + 3z)^2$

Using identity $(a + b)^2 = a^2 + 2ab + b^2$

$(xy + 3Z)^2 = (xy)^2 + 2 \times xy \times 3z + (3z)^2$

$= x^2y^2 + 6xyz + 9z^2.$

(iii) $(6x^2 - 5y)^2$

Using identity $(a - b)^2 = a^2 - 2ab + b^2$

$(6x^2 - 5y)^2 = (6x^2)^2 - 2 \times 6x^2 \times 5y + (5y)^2$

$= 36x^4 - 60x^2y + 25y^2.$

(iv) $\left(\frac{2}{3}m + \frac{3}{2}n\right)^2$

Using identity $(a + b)^2 = a^2 + 2ab + b^2$

$\left(\frac{2}{3}m + \frac{3}{2}n\right)^2 = \left(\frac{2}{3}m\right)^2 + 2 \times \frac{2}{3}m \times \frac{3}{2}n + \left(\frac{3}{2}n\right)^2$

$= \frac{4}{9}m^2 + 2mn + \frac{9}{4}n^2.$

(v) $(0.4p - 0.5q)^2$

Using identity $(a - b)^2 = a^2 - 2ab + b^2$

$(0.4p - 0.5q)^2 = (0.4p)^2 - 2 \times 0.4p \times 0.5q + (0.5q)^2$

$= 0.16p^2 - 0.40pq + 0.25q^2$.

(vi)$(2xy + 5y)^2$

Using identity $(a + b)^2 = a^2 + 2ab + b^2$

$(2xy + 5y)^2 = (2xy)^2 + 2 \times 2xy \times 5y + (5y)^2$

$= 4x^2y^2 + 20xy^2 + 25y^2$

Q. 4 Simplify.

(i)$(a^2 - b^2)^2$

(ii)$(2x + 5)^2 - (2x - 5)^2$

(iii)$(7m - 8n)^2 + (7m + 8n)^2$

(iv)$(4m + 5n)^2 + (5m + 4n)^2$

(v)$(2.5p - 1.5q)^2 - (1.5p - 2.5q)^2$

(vi)$(ab + bc)^2 - 2ab^2c$

(vii)$(m^2 - n^2m)^2 + 2m^3n^2$.

Sol: (i)$(a^2 - b^2)^2$

Using identity $(a - b)^2 = a^2 - 2ab + b^2$

$(a^2 - b^2)^2 = (a^2)^2 - 2 \times a^2 \times b^2 + (b^2)^2$

$= a^4 - 2a^2b^2 + b^4$

(ii)$(2x + 5)^2 - (2x - 5)^2$

Using identities $(a + b)^2 = a^2 + 2ab + b^2$ and $(a - b)^2 = a^2 - 2ab + b^2$

$(2x + 5)^2 - (2x - 5)^2 = (2x)^2 + 2 \times 2x \times 5 + (5)^2 - [(2x)^2 - 2 \times 2x \times 5 + (5)^2]$

$= 4x^2 + 20x + 25 - (4x^2 - 20x + 25)$

$= 4x^2 + 20x + 25 - 4x^2 + 20x - 25$

$= 40x$ ($\because$ Like terms with equal coefficient having opposite sign will be cancelled.)

(iii)$(7m - 8n)^2 + (7m + 8n)^2$

Using identities $(a - b)^2 = a^2 - 2ab + b^2$

and $(a + b)^2 = a^2 + 2ab + b^2$

$$(7m - 8n)^2 + (7m + 8n)^2$$
$$= (7m)^2 - 2 \times 7m \times 8n + (8n)^2 + (7m)^2 + 2 \times 7m \times 8n + (8n)^2$$

$= 49m^2 - 112mn + 64n^2 + 49m^2 + 112mn + 64n^2$

$= 98m^2 + 128n^2$

($\because$ Having equal coefficients of like terms with opposite sign will be cancelled.)

(iv)$(4m + 5n)^2 + (5m + 4n)^2$

Using identity $(a + b)^2 = a^2 + 2ab + b^2$

$(4m + 5n)^2 + (5m + 4n)^2$

$= [(4m)^2 + 2 \times 4m \times 5n + (5n)^2] + [(5m)^2 + 2 x 5m x 4n + (4n)^2]$

$= 16m^2 + 40mn + 25n^2 + 25m^2 + 40mn + 16n^2$

$= 41m^2 + 80mn + 41n^2$

(v)$(2.5p - 1.5q)^2 - (1.5p - 2.5q)^2$

Using identity $(a - b)^2 = a^2 - 2ab + b^2$

$(2.5p - 1.5q)^2 - (1.5p - 2.5q)^2 = (2.5p)^2 - 2 \times 2.5p \times 1.5q$

$+ (1.5q)^2 - [(1.5p)^2 - 2 \times 1.5p \times 2.5q + (2.5q)^2]$

$= 6.25p^2 - 7.50pq + 2.25q^2 - (2.25p^2 - 7.50pq + 625q^2)$

$= 6.25p^2 - 7.50pq + 2.25q^2 - 2.25p^2 + 7.50pq - 6.25q^2$

($\because$ Equal like variables with opposite signs Will be cancelled.)

$= 4p^2 - 4q^2$.

(vi)$(ab + bc)^2 - 2ab^2c$

Using identity $(a + b)^2 = a^2 + 2ab + b^2$

$(ab + bc)^2 - 2ab^2c = (ab)^2 + 2 \times ab \times bc + (bc)^2 - 2ab^2c$

$= a^2b^2 + 2ab^2c + b^2c^2 2ab^2c$

$= a^2b^2 + b^2c^2.$

(vii)$(m^2 - n^2m)^2 + 2m^3n^2$

Using identity $(a - b)^2 = a^2 - 2ab + b^2$

$(m^2n^2m)^2 + 2m^3n^2 = (m^2)^2 - 2 \times m^2 \times n^2m + (n^2m)^2 + 2m^3n^2$

$= m^4 - 2m^3 n^2 + n^4 m^2 + 2m^3 n^2$

$= m^4 + n^4m^2$

Q. 5 Show that.

(i)$(3x + 7)^2 - 84x = (3x - 7)^2$

(ii)$(9p - 5q)^2 + 180pq = (9p + 5q)^2$

(iii) $\left(\frac{4}{3}m - \frac{3}{4}n\right)^2 + 2mn = \frac{16}{9}m^2 + \frac{9}{16}n^2$

(iv)$(4pq + 3q)^2 - (4pq - 3q)^2 = 48pq^2$

(v) $(a - b)(a + b) + (b - c)(b + c) + (c - a)(c + a) = 0$

Sol: (i)$(3x + 7)^2 - 84x = (3x - 7)^2$

Using identity $(a + b)^2 = a^2 + 2ab + b^2$

L. H. S. = $(3x + 7)^2 - 84x$

$= (3x)^2 + 2 \times 3x \times 7 + (7)^2 - 84x$

$= 9x^2 + 42x + 49 - 84x$

$= 9x^2 - 42x + 49$

$= (3x)^2 - 2 \times 3x \times 7 + (7)^2$ $[\because a^2 - 2ab + b^2 = (a - b)^2]$

$= (3x - 7)^2$

L. H. S. = RH. S.

(ii)$(9p - 5q)^2 + 180pq = (9p + 5q)^2$

Using identity $(a - b)^2 = a^2 - 2ab + b^2$

L. H. S. = $(9p - 5q)^2 + 180pq$

$= (9p)^2 - 2 \times 9p \times 5q + (5q)^2 + 180pq$

$= 81p^2 - 90pq + 25q^2 + 180pq$

$= 81p^2 + 90pq + 25q^2$

$= (9p)^2 + 2 \times 9p \times 5q + (5q)^2$

$= (9p + 5q)^2$ [$\because a^2 + 2ab + b^2 = (a + b)^2$]

$\therefore$ L. H. S. = R. H. S.

(iii) $\left(\frac{4}{3} m - \frac{3}{4} n\right)^2 + 2mn = \frac{16}{9} m^2 + \frac{9}{16} n^2$

Using identity $(a - b)^2 = a^2 - 2ab + b^2$

L. H. S. $= \left(\frac{4}{3}m - \frac{3}{4}n\right)^2 + 2mn$

$= \left(\frac{4}{3}m\right)^2 - 2 \times \frac{4}{3}m \times \frac{3}{4}n + \left(\frac{3}{4}n\right)^2 + 2mn$

$= \frac{16}{9} m^2 - 2mn + \frac{9}{16} n^2 + 2mn$

$= \frac{16}{9} m^2 + \frac{9}{16} n^2$

$\therefore$ L. H. S. = RH. S.

(iv) $(4pq + 3q)^2 - (4pq - 3q)^2 = 48pq^2$

Using identities $(a + b)^2 = a^2 + 2ab + b^2$

and $(a - b)^2 = a^2 - 2ab + b^2$

L. H. S. $= (4pq + 3q)^2 - (4pq - 3q)^2$

$= (4pq)^2 + 2 \times 4pq \times 3q + (3q)^2 - [(4pq)^2 - 2 \times 4pq \times 3q + (3q)^2]$

$= 16p^2q^2 + 24pq^2 + 9q^2 - [16p^2q^2 - 4pq^2 + 9q^2]$

$= 16p^2q^2 + 24pq^2 + 9q^2 - 16p^2q^2 + 24pq^2 - q^2$

$= 48pq^2$

$\therefore$ L. H. S. = RH. S.

(V) $(a - b)(a + b) + (b - c)(b + c) + (c - a)(c + a) = 0$

Using identity $(a - b)(a + b) = (a^2 - b^2)$

$L.H.S. = (a - b)(a + b) + (b - c)(b + c) + (c - a)(c + a)$

$= (a^2 - b^2) + (b^2 - c^2) + (c^2 - a^2)$

$= a^2 - b^2 + b^2 - c^2 + c^2 - a^2$

$= 0$

$\therefore$ L.H.S. = R.H.S.

Q. 6 Using identities, evaluate.

(i)71^2

(ii)998^2

(iii)102^2

(iv)998^2

(v)5.2^2

(vi)297×303

(vii)78×82

(viii)8.9^2

(ix)1.05×9.5

Sol: (i)$71^2 = (70 + 1)^2$

Using identity $(a + b)^2 = a^2 + 2ab + b^2$

$= (70)^2 + 2 \times 70 \times 1 + (1)^2$

$= 4900 + 140 + 1 = 5041$

(ii)$99^2 = (100 - 1)^2$

Using identity $(a - b)^2 = a^2 - 2ab + b^2$

$= (100)^2 - 2 \times 100 \times 1 + (1)^2$

$= 10000 - 200 + 1 = 9801$

(iii)$102^2 = (100 + 2)^2$

Using identity $(a + b)^2 = a^2 + 2ab + b^2$

$= (100)^2 + 2 \times 100 \times 2 + (2)^2$

$= 10000 + 400 + 4 = 10404$

(iv)$998^2 = (1000 - 2)^2$

Using identity $(a - b)^2 = a^2 - 2ab + b^2$

$= (1000)^2 - 2 \times 1000 \times 2 + (2)^2$

$= 1000000 - 4000 + 4 = 996004$

(v)$5.2^2 = (5 + 0.2)^2$

Using identity $(a + b)^2 = a^2 + 2ab + b^2$

$= (5)^2 + 2 \times 5 \times 0.2 + (0.2)^2$

$= 25 + 2.0 + 0.04 = 27.04$

(vi)$297 \times 303 = (300 - 3) \times (300 + 3)$

Using identity $(a + b)(a - b) = a^2 - b^2$

$= (300)^2 - (3)^2 = 90000 - 9 = 89991$

(vii)$78 \times 82 = (80 - 2)(80 + 2)$

Using identity $(a + b)(a - b) = a^2 - b^2$

$= (80)^2 - (2)^2$

$= 6400 - 4 = 6396$

(viii)$8.9^2 = (8 + 0.9)^2$

Using identity $(a + b)^2 = a^2 + 2ab + b^2$

$= (8)^2 + 2 \times 8 \times 0.9 + (0.9)^2$

$= 64 + 14.4 + 0.81 = 79.21$

(ix)$1.05 \times 9.5 = (10 + 0.5)(10 - 0.5)$

Using identity $(a + b)(a - b) = a^2 - b^2$

$= (10)^2 - (0.5)^2 = 100 - 0.25$

$=99.75$

Q. 7 Using $a^2 - b^2 = (a + b)(a - b)$, find

(i) $51^2 - 49^2$

(ii) $(1.02)^2 - (0.98)^2$

(iii) $153^2 - 147^2$

(iv) $12.1^2 - 7.9^2$

Sol: (i) $51^2 - 49^2$

By using above identity

$= (51 + 49)(51 - 49)$

$= 100 \times 2 = 200$

(ii) $(1.02)^2 - (0.98)^2$

By using above identity

$= (1.02 + (0.98)(1.02 - 0.98)$

$= 2.00 \text{ x } 0.04 = 0.08$

(iii) $153^2 - 147^2$

By using above identity

$= (153 + 147)(153 - 147)$

$= 300 \text{ x } 6 = 1800$

(iv) $12.1^2 - 7.9^2$

By using above identity

$= (12.1 + 7.9)(12.1 - 7.9)$

$= 20.0 \times 4.2 = 84.0 = 84.$

Q. 8 Using $(x + a)(x + b) = x^2 + (a + b)x + ab$, find

(i) 103×104 (ii) 5.1×5.2 (iii) 103×98 (iv) $9.7 \text{ x } 9.8$

Sol: (i) $103 \times 104 = (100 + 3) \times (100 + 4)$

By using above identity

$= (100)^2 + (3 + 4) \times 100 + 3 \times 4$

$= 10000 + 7 \times 100 + 12$

$= 10000 + 700 + 12 = 10712$

(ii) $5.1 \times 5.2 = (5 + 0.1) \times (5 + 0.2)$

By using above identity

$= (5)^2 + (0.1 + 0.2) \times 5 + 0.1 \text{ x } 0.2$

$= 25 + 0.3 \times 5 + 0.02$

$= 25 + 1.5 + 0.02 = 26.52$

(iii) $103 \times 98 = (100 + 3) \times (100 - 2)$

By using above identity

$= (100)^2 + [3 + (-2)] \times 100 + 3 \times (-2)$

$= 10000 + (3 - 2) \times 100 - 6$

$= 10000 + 1 \times 100 - 6$

$= 10000 + 100 - 6 = 10094$

(iv) $9.7 \times 9.8 = (10 - 0.3) \times (10 - 0.2)$

By using above identity

$= (10)2 + \{(-0.3) + (-0.2)\} \times 10 + (-0.3) \times (-0.2)$

$= 100 + \{-0.3 - 0.2\} \times 10 + 0.06$

$= 100 - (0.5) \times 10 + 0.06$

$= 100 - 5 + 0.06$

$= 95.06.$