Ncert solutions for class 8 maths chapter 9

Question 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 – 12) (3a – 12)

(v) (1.1m – 0.4) (1.1m + 0.4)

(vi) (a2 + b2) (-a2 + b2)

(vii) (6x – 7) (6x + 7)

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

(ix) (x2 + 3y4) (x2 + 3y4)

(x) (7a – 9b) (7a – 9b)

Solution:

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

$= (x + 3)^2$

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

$= x^2 + 6x + 9 \qquad [(a + b)^2 = a^2 + 2ab + b^2]$

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

$= (2y + 5)^2$

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

$[(a + b)^2 = a^2 + 2ab + b^2]$

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

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

$= (2a - 7)^2$

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

$[(a - b)^2 = a^2 - 2ab + b^2]$

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

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

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

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

$[(a-b)^2 = a^2 - 2ab + b^2]$

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

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

$= (1.1\,m)^2 - (0.4)^2$

$[(a+b)(a-b) = a^2 - b^2]$

$= 1.21m^2 - 0.16$

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

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

$= (b^2)^2 - (a^2)^2$ $[(a+b)(a-b) = a^2 - b^2]$

$= b^4 - a^4$

$= -a^4 + b^4$

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

$= (6x)^2 - (7)^2$ $[(a+b)(a-b) = a^2 - b^2]$

$= 36x^2 - 49$

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

$= [(-a) + c]^2$

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

$= a^2 - 2ac + c^2$ $[(a-b)^2 = a^2 - 2ab + b^2]$

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

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

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

$[(a+b)^2 = a^2 + 2ab + b^2]$

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

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

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

$[(a-b)^2 = a^2 - 2ab + b^2]$

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

Question 2. Use the identity (x + a)(x + b) = x2 + (a + b)x + ab to find 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) (2a2 + 9) (2a2 + 5)

(vii) (xyz – 4) (xyz – 2)

Solution:

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

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

$= x^2 + 10x + 21$

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

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

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

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

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

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

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

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

(iv) $(4x + 5)(4x - 1)^2$

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

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

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

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

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

$= 4x^2 + (8y)(2x) + 15y^2$

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

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

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

$= 4a^4 + (14)(2a^2) + 45$

$= 4a^4 + 28a^2 + 45$

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

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

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

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

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

(i) (b – 7)2

(ii) (xy + 3z)2

(iii) (6x2 – 5y)2

(iv) (23 m + 32 n)2

(v) (0.4p – 0.5q)2

(vi) (2xy + 5y)2

Solution:

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

$= b^2 - 14b + 49$

[using $(a-b)^2 = a^2 - 2ab + b^2$]

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

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

[using $(a+b)^2 = a^2 + 2ab + b^2$]

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

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

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

[using $(a-b)^2 = a^2 - 2ab + b^2$]

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

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

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

[using $(a+b)^2 = a^2 + 2ab + b^2$]

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

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

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

[using $(a-b)^2 = a^2 - 2ab + b^2$]

$= 0.16p^2 - 0.4pq + 0.25q^2$

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

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

[using $(a+b)^2 = a^2 + 2ab + b^2$]

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

Question 4. Simplify:

(i) (a2 – b2)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 – 2ab2c

(vii) (m2 – n2m)2 + 2m3n2

Solution:

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

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

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

[using $(a - b)^2 = a^2 - 2ab + b^2$]

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

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

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

$= \cancel{4x^2} + 20x + \cancel{25} - \cancel{4x^2} + 20x - \cancel{25}$

$= 20x + 20x = 40x$

Alternately:

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

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

[using $a^2 - b^2 = (a + b)(a - b)$]

$= (2x + \cancel{5} + 2x - \cancel{5})(\cancel{2x} + 5 - \cancel{2x} + 5)$

$= (2x + 2x)(5 + 5)$

$= 4x \times 10 = 40x$

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

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

$= 49m^2 - \cancel{112mn} + 64n^2 + 49m^2 + \cancel{112mn} + 64n^2$

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

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

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

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

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

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

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

$= (6.25p^2 - 7.5pq + 2.25q^2)$
$- (2.25p^2 - 7.5pq + 6.25q^2)$

$= 6.25p^2 - \cancel{7.5pq} + 2.25q^2$
$- 2.25p^2 + \cancel{7.5pq} - 6.25q^2$

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

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

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

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

$= a^2b^2 + \cancel{2ab^2c} + b^2c^2 - \cancel{2ab^2c}$

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

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

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

$= m^4 - \cancel{2m^3n^2} + n^4m^2 + \cancel{2m^3n^2}$

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

Question 5. Show that:

(i) (3x + 7)2 – 84x = (3x – 7)2

(ii) (9p – 5q)2 + 180pq = (9p + 5q)2

(iii) (43 m – 34 n)2 + 2mn = 169 m2 + 916 n2

(iv) (4pq + 3q)2 – (4pq – 3q)2 = 48pq2

(v) (a – b)(a + b) + (b – c) (b + c) + (c – a) (c + a) = 0

Solution:

(*i*) To Show that:

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

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

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

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

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

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

$= (3x - 7)^2 =$ RHS

LHS = RHS

Hence, proved.

(*ii*) To show that:

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

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

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

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

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

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

$= (9p + 5q)^2 =$ RHS

LHS = RHS

Hence, proved.

(*iii*) To show that:

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

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

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

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

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

LHS = RHS

Hence, proved.

(*iv*) To show that:

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

$\text{LHS} = (4pq + 3q)^2 - (4pq - 3q)^2$

$= [(4pq + 3q) + (4pq - 3q)]$
$[(4pq + 3q) - (4pq - 3q)]$

$= (4pq + \cancel{3q} + 4pq - \cancel{3q})$
$(\cancel{4pq} + 3q - \cancel{4pq} + 3q)$

$= (8pq)(6q)$

$= 48pq^2 = \text{RHS}$

LHS = RHS

Hence, proved.

(*v*) To show that:

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

$\text{LHS} = (a^2 - b^2) + (b^2 - c^2) + (c^2 - a^2)$

$[\because (x + y)(x - y) = x^2 - y^2]$

$= \cancel{a^2} - \cancel{b^2} + \cancel{b^2} - \cancel{c^2} + \cancel{c^2} - \cancel{a^2}$

$= 0 = \text{RHS}$

LHS = RHS

Hence, proved.

Question 6. Using identities, evaluate:

(i) 712 (ii) 992 (iii) 1022 (iv) 9982 (v) 5.22

(vi) 297 × 303 (vii) 78 × 82 (viii) 8.92 (ix) 1.05 × 9.5

Solution:

(*i*) $71^2 = (70 + 1)^2$

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

$[(a + b)^2 = a^2 + 2ab + b^2]$

$= 4900 + 140 + 1$

$= 5041$

Hence, $71^2 = 5041$

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

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

$[(a - b)^2 = a^2 - 2ab + b^2]$

$= 10000 - 200 + 1$

$= 10001 - 200$

$= 9801$

Hence, $99^2 = 9801$

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

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

$[(a + b)^2 = a^2 + 2ab + b^2]$

$= 10000 + 400 + 4$

$= 10404$

Hence, $102^2 = 10404$

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

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

$[(a - b)^2 = a^2 - 2ab + b^2]$

$= 1000000 - 4000 + 4$

$= 1000004 - 4000$

$= 996004$

Hence, $998^2 = 996004$

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

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

$[(a + b)^2 = a^2 + 2ab + b^2]$

$= 25 + 2 + 0.04$

$= 27 + 0.04$

$= 27.04$

Hence, $(5.2)^2 = 27.04$

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

$= (300)^2 - (3)^2$ $[(a + b)(a - b) = a^2 - b^2]$

$= 90000 - 9$

$= 89991$

Hence, $297 \times 303 = 89991$

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

$= (80)^2 - (2)^2$ $[(a + b)(a - b) = a^2 - b^2]$

$= 6400 - 4$

$= 6396$

Hence, $78 \times 82 = 6396$

(*viii*) $8.9^2 = (9 - 0.1)^2$

$= (9)^2 - 2(9)(0.1) + (0.1)^2$

$[(a - b)^2 = a^2 - 2ab + b^2]$

$= 81 - 1.8 + 0.01$

$= 81.01 - 1.8$

$= 79.21$

Hence, $8.9^2 = 79.21$

(*ix*) $1.05 \times 9.5 = (1 + 0.5)(10 - 0.5)$

$= 1(10 - 0.5) + 0.05(10 - 0.5)$

$= 10 - 0.5 + 0.05 \times 10 - 0.05 \times 0.5$

$= 10 - 0.5 + 0.5 - 0.025$

$= 10.5 - 0.525$

$= 9.975$

Hence, $1.05 \times 9.5 = 9.975$

Question 7. Using a2 – b2 = (a + b) (a – b), find

(i) 512 – 492

(ii) (1.02)2 – (0.98)2

(iii) 1532 – 1472

(iv) 12.12 – 7.92

Solution:

(i) 512 – 492 = (51 + 49) (51 – 49) = 100 × 2 = 200

(ii) (1.02)2 – (0.98)2 = (1.02 + 0.98) (1.02 – 0.98) = 2.00 × 0.04 = 0.08

(iii) 1532 – 1472 = (153 + 147) (153 – 147) = 300 × 6 = 1800

(iv) 12.12 – 7.92 = (12.1 + 7.9) (12.1 – 7.9) = 20.0 × 4.2 = 84

Question 8. Using (x + a) (x + b) = x2 + (a + b)x + ab, find

(i) 103 × 104

(ii) 5.1 × 5.2

(iii) 103 × 98

(iv) 9.7 × 9.8

Solution:

(i) 103 × 104 = (100 + 3)(100 + 4) = (100)2 + (3 + 4) (100) + 3 × 4 = 10000 + 700 + 12 = 10712

(ii) 5.1 × 5.2 = (5 + 0.1) (5 + 0.2) = (5)2 + (0.1 + 0.2) (5) + 0.1 × 0.2 = 25 + 1.5 + 0.02 = 26.5 + 0.02 = 26.52

(iii) 103 × 98 = (100 + 3) (100 – 2) = (100)2 + (3 – 2) (100) + 3 × (-2) = 10000 + 100 – 6 = 10100 – 6 = 10094

(iv) 9.7 × 9.8 = (10 – 0.3) (10 – 0.2) = (10)2 – (0.3 + 0.2) (10) + (-0.3) (-0.2) = 100 – 5 + 0.06 = 95 + 0.06 = 95.06

Q1 : 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) $\left(3a-\frac{1}{2}\right)\left(3a-\frac{1}{2}\right)$

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

Answer :

The products will be as follows.

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

$= (x)^2 + 2(x)(3) + (3)^2$ $[(a + b)^2 = a^2 + 2ab + b^2]$

$= x^2 + 6x + 9$

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

$= (2y)^2 + 2(2y)(5) + (5)^2$ $[(a + b)^2 = a^2 + 2ab + b^2]$

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

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

$= (2a)^2 - 2(2a)(7) + (7)^2$ $[(a - b)^2 = a^2 - 2ab + b^2]$

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

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

$= (1.1m)^2 - (0.4)^2$ $[(a + b)(a - b) = a^2 - b^2]$

$= 1.21m^2 - 0.16$

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

$= (b^2)^2 - (a^2)^2$ $[(a + b)(a - b) = a^2 - b^2]$

$= b^4 - a^4$

(vii) $(6x - 7)(6x + 7) = (6x)^2 - (7)^2$ $[(a + b)(a - b) = a^2 - b^2]$

$= 36x^2 - 49$

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

$= (-a)^2 + 2(-a)(c) + (c)^2$ $[(a + b)^2 = a^2 + 2ab + b^2]$

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

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

$= \left(\frac{x}{2}\right)^2 + 2\left(\frac{x}{2}\right)\left(\frac{3y}{4}\right) + \left(\frac{3y}{4}\right)^2$ $[(a + b)^2 = a^2 + 2ab + b^2]$

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

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

$= (7a)^2 - 2(7a)(9b) + (9b)^2$ $[(a - b)^2 = a^2 - 2ab + b^2]$

(v) $(2x + 5y)(2x + 3y)$ (vi) $(2a^2 + 9)(2a^2 + 5)$

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

Answer :

The products will be as follows.

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

$= x^2 + 10x + 21$

(ii) $(4x + 5)(4x + 1) = (4x)^2 + (5 + 1)(4x) + (5)(1)$

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

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

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

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

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

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

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

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

$= 4a^4 + 28a^2 + 45$

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

$= (xyz)^2 + [(-4) + (-2)](xyz) + (-4)(-2)$

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

Answer :

(i) $(b - 7)^2 = (b)^2 - 2(b)(7) + (7)^2$ $[(a - b)^2 = a^2 - 2ab + b^2]$

$= b^2 - 14b + 49$

(ii) $(xy + 3z)^2 = (xy)^2 + 2(xy)(3z) + (3z)^2$ $[(a + b)^2 = a^2 + 2ab + b^2]$

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

(iii) $(6x^2 - 5y)^2 = (6x^2)^2 - 2(6x^2)(5y) + (5y)^2$ $[(a - b)^2 = a^2 - 2ab + b^2]$

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

(iv) $\left(\frac{2}{3}m + \frac{3}{2}n\right)^2 = \left(\frac{2}{3}m\right)^2 + 2\left(\frac{2}{3}m\right)\left(\frac{3}{2}n\right) + \left(\frac{3}{2}n\right)^2$ $[(a + b)^2 = a^2 + 2ab + b^2]$

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

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

$[(a - b)^2 = a^2 - 2ab + b^2]$

$= 0.16p^2 - 0.4pq + 0.25q^2$

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

$[(a + b)^2 = a^2 + 2ab + b^2]$

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

Q4 : Simplify.

Answer :

(i) $(a^2 - b^2)^2 = (a^2)^2 - 2(a^2)(b^2) + (b^2)^2$ $[(a - b)^2 = a^2 - 2ab + b^2]$

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

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

$[(a - b)^2 = a^2 - 2ab + b^2]$

$[(a + b)^2 = a^2 + 2ab + b^2]$

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

$= 4x^2 + 20x + 25 - 4x^2 + 20x - 25 = 40x$

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

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

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

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

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

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

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

$[(a + b)^2 = a^2 + 2ab + b^2]$

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

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

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

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

$= (ab)^2 + 2(ab)(bc) + (bc)^2 - 2ab^2c$ $[(a + b)^2 = a^2 + 2ab + b^2]$

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

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

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

$= (m^2)^2 - 2(m^2)(n^2m) + (n^2m)^2 + 2m^3n^2$ $[(a - b)^2 = a^2 - 2ab + b^2]$

Q5 : 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) $(a - b)(a + b) + (b - c)(b + c) + (c - a)(c + a) = 0$

Answer :

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

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

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

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

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

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

L.H.S = R.H.S

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

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

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

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

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

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

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

$= \frac{16}{9}m^2 + \frac{9}{16}n^2 =$ R.H.S.

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

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

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

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

$= 48pq^2 =$ R.H.S

Q6 : Using identities, evaluate.

(i) 71^2 (ii) 99^2 (iii) 102^2 (iv) 998^2

(v) $(5.2)^2$ (vi) 297 x 303 (vii) 78 x 82

(viii) 8.9^2 (ix) 1.05 x 9.5

Answer :

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

$= (70)^2 + 2(70)(1) + (1)^2$ $[(a + b)^2 = a^2 + 2ab$

= 4900 + 140 + 1 = 5041

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

$= (100)^2 - 2(100)(1) + (1)^2$ $[(a - b)^2 = a^2 - 2a$

= 10000 - 200 + 1 = 9801

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

$= (100)^2 + 2(100)(2) + (2)^2$ $[(a + b)^2 = a^2 + 2$

= 10000 + 400 + 4 = 10404

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

$= (1000)^2 - 2(1000)(2) + (2)^2$ $[(a - b)^2 = a^2 - 2$

(vi) 297 x 303 = (300 - 3) x (300 + 3)

= $(300)^2 - (3)^2$ [$(a + b)(a - b) = a^2 - b^2$]

= 90000 - 9 = 89991

(vii) 78 x 82 = (80 - 2) (80 + 2)

= $(80)^2 - (2)^2$ [$(a + b)(a - b) = a^2 - b^2$]

= 6400 - 4 = 6396

(viii) $8.9^2 = (9.0 - 0.1)^2$

= $(9.0)^2 - 2(9.0)(0.1) + (0.1)^2$ [$(a - b)^2 = a^2 - 2ab + b^2$]

= 81 - 1.8 + 0.01 = 79.21

(ix) 1.05 x 9.5 = 1.05 x 0.95 x 10

= (1 + 0.05) (1- 0.05) x 10

Q7 : 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

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

Answer :

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

= (100) (2) = 200

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

= (2) (0.04) = 0.08

(iii) $153^2 - 147^2$ = (153 + 147) (153 - 14

= (300) (6) = 1800

Q8 : Using $(x + a)(x + b) = x^2 + (a + b)x + ab$, find

(i) 103 x 104 (ii) 5.1 x 5.2 (iii) 103 x 98 (iv) 9.7 x 9.8

Answer :

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

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

$= 10000 + 700 + 12 = 10712$

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

$= (5)^2 + (0.1 + 0.2)(5) + (0.1)(0.2)$

$= 25 + 1.5 + 0.02 = 26.52$

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

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

$= 10000 + 100 - 6$

$= 10094$