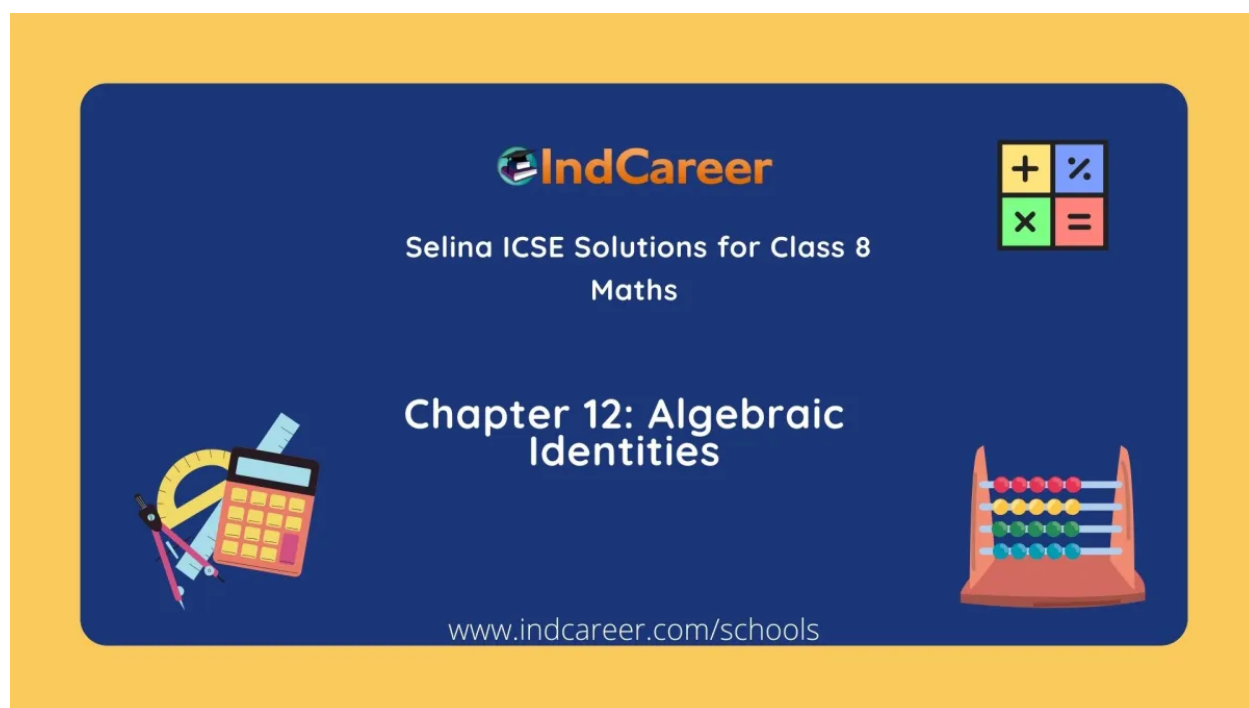


Selina Class 8 ICSE Solutions Mathematics :

Chapter 12- Algebraic Identities



For any clarifications or questions you can write to **info@indcareer.com**

Postal Address

IndCareer.com, 52, Shilpa Nagar, Somalwada Nagpur - 440015
Maharashtra, India

WhatsApp: +91 9561 204 888, **Website:** <https://www.indcareer.com>

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>



Selina Class 8 ICSE Solutions Mathematics :

Chapter 12- Algebraic Identities

Class 8: Maths Chapter 12 solutions. Complete Class 8 Maths Chapter 12 Notes.

Selina Class 8 ICSE Solutions Mathematics : Chapter 12- Algebraic Identities

Selina 8th Maths Chapter 12, Class 8 Maths Chapter 12 solutions

Exercise 12A

Question 1.

Use direct method to evaluate the following products :

(i) $(x + 8)(x + 3)$

(ii) $(y + 5)(y - 3)$

(iii) $(a - 8)(a + 2)$

(iv) $(b - 3)(b - 5)$

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

(vi) $(5a + 16)(3a - 7)$

(vii) $(8 - b)(3 + b)$

Solution:

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

$$\begin{aligned}(i) \quad (x+8)(x+3) &= (x \times x) + (x \times 3) + (8 \times x) + (8 \times 3) \\ &= x^2 + 3x + 8x + 24 \\ &= x^2 + 11x + 24 \\ (ii) \quad (y+5)(y-3) &= (y \times y) + (y \times -3) + (5 \times y) + (5 \times -3) \\ &= y^2 + (-3y) + (5y) - 15 \\ &= y^2 - 3y + 5y - 15 \\ &= y^2 + 2y - 15 \\ (iii) \quad (a-8)(a+2) &= (a \times a) + (a \times 2) + (-8) \times a + (-8)(2) \\ &= a^2 + 2a - 8a - 16 \\ &= a^2 - 6a - 16 \\ (iv) \quad (b-3)(b-5) &= (b \times b) + (b \times -5) \\ &\quad + (-3) \times b + (-3)(-5) \\ &= b^2 - 5b - 3b + 15 \\ &= b^2 - 8b + 15 \\ (v) \quad (3x-2y)(2x+y) &= (3x \times 2x) + (3x \times y) \\ &\quad + (-2y \times 2x) + (-2y \times y) \\ &= 6x^2 + 3xy - 4xy - 2y^2 \\ &= 6x^2 - xy - 2y^2 \\ (vi) \quad (5a+16)(3a-7) &= (5a \times 3a) + (5a \times -7) \\ &\quad + (16 \times 3a) + 16 \times -7 \\ &= 15a^2 + (-35a) + 48a + (-112) \\ &= 15a^2 - 35a + 48a - 112 \\ &= 15a^2 + 13a - 112 \\ (vii) \quad (8-b)(3+b) &= (8 \times 3) + (8 \times b) \\ &\quad + (-b \times 3) + (-b \times b) \\ &= 24 + 8b - 3b - b^2 \\ &= 24 + 5b - b^2\end{aligned}$$

Question 2.

Use direct method to evaluate :

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

- (i) $(x+1)(x-1)$ (ii) $(2+a)(2-a)$
(iii) $(3b-1)(3b+1)$ (iv) $(4+5x)(4-5x)$
(v) $(2a+3)(2a-3)$ (vi) $(xy+4)(xy-4)$
(vii) $(ab+x^2)(ab-x^2)$
(viii) $(3x^2+5y^2)(3x^2-5y^2)$
(ix) $\left(z - \frac{2}{3}\right)\left(z + \frac{2}{3}\right)$
(x) $\left(\frac{3}{5}a + \frac{1}{2}\right)\left(\frac{3}{5}a - \frac{1}{2}\right)$
(xi) $(0.5 - 2a)(0.5 + 2a)$
(xii) $\left(\frac{a}{2} - \frac{b}{3}\right)\left(\frac{a}{2} + \frac{b}{3}\right)$

Solution:

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

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

$$(i) \quad (x+1)(x-1) = (x)^2 - (1)^2 \\ = x^2 - 1$$

$$(ii) \quad (2+a)(2-a) = (2)^2 - (a)^2 \\ = 4 - a^2$$

$$(iii) \quad (3b-1)(3b+1) = (3b)^2 - (1)^2 \\ = 9b^2 - 1$$

$$(iv) \quad (4+5x)(4-5x) = (4)^2 - (5x)^2$$

$$(v) \quad (2a+3)(2a-3) = (2a)^2 - (3)^2 \\ = 4a^2 - 9$$

$$(vi) \quad (xy+4)(xy-4) = (xy)^2 - (4)^2 \\ = x^2y^2 - 16$$

$$(vii) \quad (ab+x^2)(ab-x^2) = (ab)^2 - (x^2)^2 \\ = a^2b^2 - x^4$$

$$(viii) \quad (3x^2+5y^2)(3x^2-5y^2) = (3x^2)^2 - (5y^2)^2 \\ = 9x^4 - 25y^4$$

$$(ix) \quad \left(z - \frac{2}{3}\right)\left(z + \frac{2}{3}\right) = (z)^2 - \left(\frac{2}{3}\right)^2 \\ = z^2 - \frac{4}{9}$$



$$(x) \quad \left(\frac{3}{5}a + \frac{1}{2}\right)\left(\frac{3}{5}a - \frac{1}{2}\right)$$

$$= \left(\frac{3}{5}a\right)^2 - \left(\frac{1}{2}\right)^2 = \frac{9}{25}a^2 - \frac{1}{4}$$

$$(xi) \quad (0.5 - 2a)(0.5 + 2a)$$

$$= (0.5)^2 - (2a)^2$$

$$= 0.25 - 4a^2$$

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

$$= \frac{a^2}{4} - \frac{b^2}{9}$$

Question 3.

Evaluate :

$$(i) \quad (a+1)(a-1)(a^2+1)$$

$$(ii) \quad (a+b)(a-b)(a^2+b^2)$$

$$(iii) \quad (2a-b)(2a+b)(4a^2+b^2)$$

$$(iv) \quad (3-2x)(3+2x)(9+4x^2)$$

$$(v) \quad (3x-4y)(3x+4y)(9x^2+16y^2)$$

Solution:

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

$$\begin{aligned} \text{(i)} \quad & (a+1)(a-1)(a^2+1) \\ &= [(a)^2-(1)^2](a^2+1) \\ &= (a^2-1)(a^2+1) \\ &= (a^2)^2 - (1)^2 \\ &= a^4 - 1 \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad & (a+b)(a-b)(a^2+b^2) \\ &= (a^2-b^2)(a^2+b^2) \\ &= (a^2)^2 - (b^2)^2 \\ &= a^4 - b^4 \end{aligned}$$

$$\begin{aligned} \text{(iii)} \quad & (2a-b)(2a+b)(4a^2+b^2) \\ &= [(2a)^2-(b)^2](4a^2+b^2) \\ &= (4a^2-b^2)(4a^2+b^2) \\ &= (4a^2)^2 - (b^2)^2 \\ &= 16a^4 - b^4 \end{aligned}$$

$$\begin{aligned} \text{(iv)} \quad & (3-2x)(3+2x)(9+4x^2) \\ &= [(3)^2-(2x)^2](9+4x^2) \\ &= (9-4x^2)(9+4x^2) \\ &= (9)^2 - (4x^2)^2 \\ &= 81 - 16x^4 \end{aligned}$$

$$\begin{aligned} \text{(v)} \quad & (3x-4y)(3x+4y)(9x^2+16y^2) \\ &= [(3x)^2-(4y)^2](9x^2+16y^2) \\ &= (9x^2-16y^2)(9x^2+16y^2) \\ &= (9x^2)^2 - (16y^2)^2 \\ &= 81x^4 - 256y^4 \end{aligned}$$

Question 4.

Use the product $(a+b)(a-b) = a^2 - b^2$ to evaluate:

(i) 21×19

(ii) 33×27

(iii) 103×97

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

(iv) 9.8×10.2

(v) 7.7×8.3

(vi) 4.6×5.4

Solution:

(i) $21 \times 19 = (20 + 1)(20 - 1)$

$= (20)^2 - (1)^2 = 400 - 1 = 399$

(ii) $33 \times 27 = (30 + 3)(30 - 3)$

$= (30)^2 - (3)^2 = 900 - 9 = 891$

(iii) $103 \times 97 = (100 + 3)(100 - 3)$

$= (100)^2 - (3)^2 = 10000 - 9 = 9991$

(iv) $9.8 \times 10.2 = (10 - .2)(10 + .2)$

$= (10)^2 - (.2)^2 = 100 - .04 = 99.96$

(v) $7.7 \times 8.3 = (8 - .3)(8 + .3)$

$= (8)^2 - (.3)^2 = 64 - .09 = 63.91$

(vi) $4.6 \times 5.4 = (5 - .4)(5 + .4)$

$= (5)^2 - (.4)^2 = 25 - .16 = 24.84$

Question 5.

Evaluate :

(i) $(6 - xy)(6 + xy)$

$$(ii) \left(7x + \frac{2}{3}y\right) \left(7x - \frac{2}{3}y\right)$$

$$(iii) \left(\frac{a}{2b} + \frac{2b}{a}\right) \left(\frac{a}{2b} - \frac{2b}{a}\right)$$

$$(iv) \left(3x - \frac{1}{2y}\right) \left(3x + \frac{1}{2y}\right)$$

$$(v) (2a + 3)(2a - 3)(4a^2 + 9)$$

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

$$(vii) (5x + 8y)(3x + 5y)$$

$$(viii) (7x + 15y)(5x - 4y)$$

$$(ix) (2a - 3b)(3a + 4b)$$

$$(x) (9a - 7b)(3a - b)$$

Solution:

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

$$(6 - xy)(6 + xy) = 6(6 + xy) - xy(6 + xy) \\ = 36 + 6xy - 6xy + (xy)^2 = 36 - x^2 y^2$$

$$(ii) \left(7x + \frac{2}{3}y\right)\left(7x - \frac{2}{3}y\right)$$

$$= 7x\left(7x - \frac{2}{3}y\right) + \frac{2}{3}y\left(7x - \frac{2}{3}y\right)$$

$$= 49x^2 - \frac{14}{3}xy + \frac{14}{3}xy - \frac{4}{9}y^2 = 49x^2 - \frac{4}{9}y^2$$

$$(iii) \left(\frac{a}{2b} + \frac{2b}{a}\right)\left(\frac{a}{2b} - \frac{2b}{a}\right)$$

$$= \frac{a}{2b}\left(\frac{a}{2b} - \frac{2b}{a}\right) + \frac{2b}{a}\left(\frac{a}{2b} - \frac{2b}{a}\right)$$

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

$$(iv) \left(3x - \frac{1}{2y}\right) \left(3x + \frac{1}{2y}\right)$$

$$= 3x \left(3x + \frac{1}{2y}\right) - \frac{1}{2y} \left(3x + \frac{1}{2y}\right)$$

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

$$(v) (2a + 3) (2a - 3) (4a^2 + 9)$$

$$= [(2a)^2 - (3)^2] (4a^2 + 9)$$

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

$$= (4a^2 - 9) (4a^2 + 9)$$

$$= (4a^2)^2 - (9)^2 \quad [(a + b) (a - b) = a^2 - b^2]$$

$$= 16a^4 - 81$$

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

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

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

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

$$= (a^2)^2 - (b^2c^2)^2 \quad [\because (a + b) (c - b) = a^2 - b^2]$$

$$= a^4 - b^4c^4$$

$$\begin{aligned} \text{(vii)} \quad & (5x + 8y)(3x + 5y) \\ &= 5x(3x + 5y) + 8y(3x + 5y) \\ &= 15x^2 + 25xy + 24xy + 40y^2 \\ &= 15x^2 + 49xy + 40y^2 \end{aligned}$$

$$\begin{aligned} \text{(viii)} \quad & (7x + 15y)(5x - 4y) \\ &= 7x(5x - 4y) + 15y(5x - 4y) \\ &= 35x^2 - 28xy + 75xy - 60y^2 \\ &= 35x^2 + 47xy - 60y^2 \end{aligned}$$

$$\begin{aligned} \text{(ix)} \quad & (2a - 3b)(3a + 4b) \\ &= 2a(3a + 4b) - 3b(3a + 4b) \\ &= 6a^2 + 8ab - 9ab - 12b^2 \\ &= 6a^2 - ab - 12b^2 \end{aligned}$$

$$\begin{aligned} \text{(x)} \quad & (9a - 7b)(3a - b) \\ &= 9a(3a - b) - 7b(3a - b) \\ &= 27a^2 - 9ab - 21ab + 7b^2 \\ &= 27a^2 - 30ab + 7b^2 \end{aligned}$$

Exercise 12B

Question 1.

Expand :

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

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

$$(iii) \left(a + \frac{1}{2a}\right)^2 \quad (iv) \left(2a - \frac{1}{a}\right)^2$$

$$(v) (a+b-c)^2 \quad (vi) (a-b+c)^2$$

$$(vii) \left(3x + \frac{1}{3x}\right)^2 \quad (viii) \left(2x - \frac{1}{2x}\right)^2$$

Solution:

$$\begin{aligned} (i) (2a+b)^2 &= (2a)^2 + (b)^2 + 2 \times 2a \times b \\ &= 4a^2 + b^2 + 4ab \end{aligned}$$

$$\begin{aligned} (ii) (a-2b)^2 &= (a)^2 + (2b)^2 - 2 \times a \times 2b \\ &= a^2 + 4b^2 - 4ab \end{aligned}$$

$$\begin{aligned} (iii) \left(a + \frac{1}{2a}\right)^2 &= (a)^2 + \left(\frac{1}{2a}\right)^2 + 2 \times a \times \frac{1}{2a} \\ &= a^2 + \frac{1}{4a^2} + \frac{2a}{2a} \\ &= a^2 + \frac{1}{4a^2} + 1 \end{aligned}$$

$$\begin{aligned} (iv) \left(2a - \frac{1}{a}\right)^2 &= (2a)^2 + \left(\frac{1}{a}\right)^2 - 2 \times 2a \times \frac{1}{a} \\ &= 4a^2 + \frac{1}{a^2} - 4 \end{aligned}$$

$$\begin{aligned} (v) (a+b-c)^2 &= (a)^2 + (b)^2 + (-c)^2 \\ &\quad + 2 \times a \times b + 2 \times b \times (-c) + 2 \times (-c) \times (a) \\ &= a^2 + b^2 + c^2 + 2ab - 2bc - 2ca \end{aligned}$$

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

(Note : $(a+b+c)^2 = a^2+b^2+c^2+2ab-2bc-2ca$)

$$\begin{aligned} \text{(vi)} \quad (a-b+c)^2 &= (a)^2+(-b)^2+(c)^2+2 \times a \times -b \\ &\quad +2(-b)(c) + 2 \times c \times a \\ &= a^2+b^2+c^2-2ab-2bc+2ca \end{aligned}$$

$$\begin{aligned} \text{(vii)} \quad \left(3x + \frac{1}{3x}\right)^2 &= (3x)^2 + \left(\frac{1}{3x}\right)^2 + 2 \times 3x \times \frac{1}{3x} \\ &= 9x^2 + \frac{1}{9x^2} + 2 \end{aligned}$$

$$\begin{aligned} \text{(viii)} \quad \left(2x - \frac{1}{2x}\right)^2 &= (2x)^2 + \left(\frac{1}{2x}\right)^2 - 2 \times 2x \times \frac{1}{2x} \\ &= 4x^2 + \frac{1}{4x^2} - 2 \end{aligned}$$

Question 2.

Find the square of :

(i) $x+3y$

(ii) $2x-5y$

(iii) $a + \frac{1}{5a}$

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

(v) $x-2y+1$

(vi) $3a-2b-5c$

(vii) $2x + \frac{1}{x} + 1$

(viii) $5-x + \frac{2}{x}$

(ix) $2x-3y+z$

(x) $x + \frac{1}{x} - 1$

Solution:

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

$$(i) \quad (x+3y)^2 = (x)^2 + (3y)^2 + 2 \times x \times 3y \\ = x^2 + 9y^2 + 6xy$$

$$(ii) \quad (2x-5y)^2 = (2x)^2 + (5y)^2 - 2 \times 2x \times 5y \\ = 4x^2 + 25y^2 - 20xy$$

$$(iii) \quad \left(a + \frac{1}{5a}\right)^2 = (a)^2 + \left(\frac{1}{5a}\right)^2 + 2 \times a \times \frac{1}{5a} \\ = a^2 + \frac{1}{25a^2} + \frac{2}{5}$$

$$(iv) \quad \left(2a - \frac{1}{a}\right)^2 = (2a)^2 + \left(\frac{1}{a}\right)^2 - 2 \times 2a \times \frac{1}{a} \\ = 4a^2 + \frac{1}{a^2} - 4$$

$$(v) \quad (x-2y+1)^2 = (x)^2 + (-2y)^2 + (1)^2 + 2 \times x \\ \times -2y + 2 \times (-2y) \times 1 + 2 \times 1 \times x \\ = x^2 + 4y^2 + 1 - 4xy - 4y + 2x$$

$$(vi) \quad (3a-2b-5c)^2 = (3a)^2 + (-2b)^2 + (-5c)^2 \\ + 2 \times 3a \times -2b + 2 \times (-2b) \times (-5c) \\ + 2 \times -5c \times 3a \\ = 9a^2 + 4b^2 + 25c^2 - 12ab \\ + 20bc - 30ca$$

$$\begin{aligned}
 \text{(vii)} \quad \left(2x + \frac{1}{x} + 1\right)^2 &= (2x)^2 + \left(\frac{1}{x}\right)^2 + (1)^2 + 2 \times \\
 &\quad 2x \times \frac{1}{x} + 2 \times \frac{1}{x} \times 1 + 2 \times 1 \times 2x \\
 &= 4x^2 + \frac{1}{x^2} + 1 + 4 + \frac{2}{x} + 4x \\
 &= 4x^2 + \frac{1}{x^2} + 5 + \frac{2}{x} + 4x
 \end{aligned}$$

$$\begin{aligned}
 \text{(viii)} \quad \left(5 - x + \frac{2}{x}\right)^2 &= (5)^2 + (-x)^2 + \left(\frac{2}{x}\right)^2 \\
 &\quad + 2 \times 5 \times (-x) + 2(-x) \times \frac{2}{x} + 2 \times \frac{2}{x} \times 5 \\
 &= 25 + x^2 + \frac{4}{x^2} - 10x - 4 + \frac{20}{x} \\
 &= 21 + x^2 + \frac{4}{x^2} - 10x + \frac{20}{x}
 \end{aligned}$$

$$\begin{aligned}
 \text{(ix)} \quad (2x - 3y + z)^2 &= (2x)^2 + (-3y)^2 + (z)^2 + 2 \times 2x \times \\
 &\quad -3y + 2(-3y) \times z + 2 \times z \times 2x \\
 &= 4x^2 + 9y^2 + z^2 - 12xy - 6yz + 4zx
 \end{aligned}$$

$$\begin{aligned}
 \text{(x)} \quad \left(x + \frac{1}{x} - 1\right)^2 &= (x)^2 + \left(\frac{1}{x}\right)^2 + (-1)^2 \\
 &\quad + 2 \times x \times \frac{1}{x} + 2 \times \frac{1}{x} \times (-1) + 2(-1) \times x \\
 &= x^2 + \frac{1}{x^2} + 1 + 2 - \frac{2}{x} - 2x \\
 &= x^2 + \frac{1}{x^2} + 3 - \frac{2}{x} - 2x
 \end{aligned}$$

Question 3.

Evaluate:

Using expansion of $(a + b)^2$ or $(a - b)^2$

(i) $(208)^2$

(ii) $(92)^2$

(iii) $(415)^2$

(iv) $(188)^2$

(v) $(9.4)^2$

(vi) $(20.7)^2$

Solution:

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

$$\begin{aligned} \text{(i)} \quad (208)^2 &= (200 + 8)^2 \\ &= (200)^2 + (8)^2 + 2(200)(8) = 40000 + 64 + 3200 = 43264 \end{aligned}$$

$$\text{(ii)} \quad (92)^2 = (100 - 8)^2 = (100)^2 + (8)^2 - 2(100)(8)$$

$$= 10000 + 64 - 1600 = 10064 - 1600 = 8464$$

$$\begin{aligned} \text{(iii)} \quad (415)^2 &= (400 + 15)^2 \\ &= (400)^2 + (15)^2 + 2(400)(15) = 160000 + 225 + 12000 = 172225 \end{aligned}$$

$$\begin{aligned} \text{(iv)} \quad (188)^2 &= (200 - 12)^2 \\ &= (200)^2 + (12)^2 - 2(200)(12) = 40000 + 144 - 4800 \end{aligned}$$

$$= 40144 - 4800 = 35344$$

$$\begin{aligned} \text{(v)} \quad (9.4)^2 &= (10 - .6)^2 \\ &= (10)^2 + (.6)^2 - 2(10)(.6) = 100 + .36 - 12 \\ &= 88 + .36 = 88.36 \end{aligned}$$

$$\begin{aligned} \text{(vi)} \quad (20.7)^2 &= (20 + .7)^2 = (20)^2 + (.7)^2 + 2(20)(.7) \\ &= 400 + .49 + 28 = 428 + .49 = 428.49 \end{aligned}$$

Question 4.

Expand :

$$\text{(i)} \quad (2a+b)^3$$

$$\text{(ii)} \quad (a-2b)^3$$

$$\text{(iii)} \quad (3x-2y)^3$$

$$\text{(iv)} \quad (x+5y)^3$$

$$\text{(v)} \quad \left(a + \frac{1}{a}\right)^3$$

$$\text{(vi)} \quad \left(2a - \frac{1}{2a}\right)^3$$

Solution:

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

$$\begin{aligned} \text{(i) } (2a+b)^3 &= (2a)^3 + (b)^3 + 3 \times 2a \times b(2a+b) \\ &\quad [(a+b)^3 = a^3 + b^3 + 3ab(a+b)] \\ &= 8a^3 + b^3 + 6ab(2a+b) \\ &= 8a^3 + b^3 + 12a^2b + 6ab^2 \\ \text{(ii) } (a-2b)^3 &= (a)^3 - (2b)^3 - 3 \times a \times 2b(a-2b) \\ &\quad [(a-b)^3 = a^3 - b^3 - 3ab(a-b)] \\ &= a^3 - 8b^3 - 6ab(a-2b) \\ &= a^3 - 8b^3 - 6a^2b + 12ab^2 \\ \text{(iii) } (3x-2y)^3 &= (3x)^3 - (2y)^3 - 3 \times 3x \times 2y(3x-2y) \\ &= 27x^3 - 8y^3 - 18xy(3x-2y) \\ &= 27x^3 - 8y^3 - 54x^2y + 36xy^2 \\ \text{(iv) } (x+5y)^3 &= (x)^3 + (5y)^3 + 3 \times x \times 5y(x+5y) \\ &= x^3 + 125y^3 + 15xy(x+5y) \\ &= x^3 + 125y^3 + 15x^2y + 75y^2 \end{aligned}$$

$$\begin{aligned}
 \text{(v)} \quad \left(a + \frac{1}{a}\right)^3 &= a^3 + \left(\frac{1}{a}\right)^3 + 3 \times a \times \frac{1}{a} \times \left(a + \frac{1}{a}\right) \\
 &= a^3 + \frac{1}{a^3} + 3 \left(a + \frac{1}{a}\right) \\
 &= a^3 + \frac{1}{a^3} + 3a + \frac{3}{a}
 \end{aligned}$$

$$\begin{aligned}
 \text{(vi)} \quad \left(2a - \frac{1}{2a}\right)^3 &= (2a)^3 - \left(\frac{1}{2a}\right)^3 - 3 \times 2a \\
 &\quad \times \frac{1}{2a} \left(2a - \frac{1}{2a}\right) \\
 &= 8a^3 - \frac{1}{8a^3} - 3 \left(2a - \frac{1}{2a}\right) \\
 &= 8a^3 - \frac{1}{8a^3} - 6a + \frac{3}{2a}
 \end{aligned}$$

Question 5.

Find the cube of :

- | | |
|----------------------|---------------------|
| (i) $a+2$ | (ii) $2a-1$ |
| (iii) $2a+3b$ | (iv) $3b-2a$ |
| (v) $2x+\frac{1}{x}$ | (v) $x-\frac{1}{2}$ |

Solution:

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

$$\begin{aligned} \text{(i)} \quad (a+2)^3 &= (a)^3 + (2)^3 + 3 \times a \times 2(a+2) \\ &= a^3 + 8 + 6a(a+2) \\ &= a^3 + 8 + 6a^2 + 12a \\ &= a^3 + 6a^2 + 12a + 8 \\ \text{(ii)} \quad (2a-1)^3 &= (2a)^3 - (1)^3 - 3 \times 2a \times 1(2a-1) \\ &= 8a^3 - 1 - 6a(2a-1) \\ &= 8a^3 - 1 - 12a^2 + 6a \\ &= 8a^3 - 12a^2 + 6a - 1 \\ \text{(iii)} \quad (2a+3b)^3 &= (2a)^3 + (3b)^3 + 3 \times 2a \times 3b \\ &\quad (2a+3b) \\ &= 8a^3 + 27b^3 + 18ab(2a+3b) \\ &= 8a^3 + 27b^3 + 36a^2b + 54ab^2 \\ &= 8a^3 + 36a^2b + 54ab^2 + 27b^3 \\ \text{(iv)} \quad (3b-2a)^3 &= (3b)^3 - (2a)^3 - 3 \times 3b \times 2a(3b-2a) \\ &= 27b^3 - 8a^3 - 18ab(3b-2a) \\ &= 27b^3 - 8a^3 - 54ab^2 + 36a^2b \\ &= 27b^3 - 54b^2a + 36ba^2 - 8a^3 \end{aligned}$$

$$\begin{aligned} \text{(v)} \quad & \left(2x + \frac{1}{x}\right)^3 \\ &= (2x)^3 + \left(\frac{1}{x}\right)^3 + 3 \times 2x \times \frac{1}{x} \left(2x + \frac{1}{x}\right) \\ &= 8x^3 + \frac{1}{x^3} + 6 \left(2x + \frac{1}{x}\right) \\ &= 8x^3 + \frac{1}{x^3} + 12x + \frac{6}{x} \\ &= 8x^3 + 12x + \frac{6}{x} + \frac{1}{x^3} \end{aligned}$$

$$\begin{aligned} \text{(vi)} \quad & \left(x - \frac{1}{2}\right)^3 \\ &= (x)^3 - \left(\frac{1}{2}\right)^3 - 3 \times x \times \frac{1}{2} \left(x - \frac{1}{2}\right) \\ &= x^3 - \frac{1}{8} - \frac{3x}{2} \left(x - \frac{1}{2}\right) \\ &= x^3 - \frac{1}{8} - \frac{3x^2}{2} + \frac{3x}{4} \\ &= x^3 - \frac{3x^2}{2} + \frac{3x}{4} - \frac{1}{8} \end{aligned}$$

Exercise 12C

Question 1.

If $a + b = 5$ and $ab = 6$; find $a^2 + b^2$

Solution:

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

$$\begin{aligned}(a+b)^2 &= a^2+b^2+2ab \\ \Rightarrow (5)^2 &= a^2+b^2+2 \times 6 \\ \Rightarrow 25 &= a^2+b^2+12 \\ \Rightarrow 25-12 &= a^2+b^2 \\ \Rightarrow 13 &= a^2+b^2 \\ \therefore a^2+b^2 &= 13\end{aligned}$$

Question 2.

If $a - b = 6$ and $ab = 16$; find $a^2 + b^2$

Solution:

$$\begin{aligned}(a-b)^2 &= a^2+b^2-2ab \\ \Rightarrow (6)^2 &= a^2+b^2-2 \times 16 \\ \Rightarrow 36 &= a^2+b^2-32 \\ \Rightarrow 36+32 &= a^2+b^2 \\ \Rightarrow 68 &= a^2+b^2 \\ \therefore a^2+b^2 &= 68\end{aligned}$$

Question 3.

If $a^2 + b^2 = 29$ and $ab = 10$; find :

(i) $a + b$

(ii) $a - b$

Solution:

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

$$\begin{aligned}(i) \quad & (a+b)^2 = a^2 + b^2 + 2ab \\ \Rightarrow & (a+b)^2 = 29 + 2 \times 10 \\ \Rightarrow & (a+b)^2 = 29 + 20 \\ \Rightarrow & (a+b)^2 = 49 \\ \Rightarrow & a+b = \sqrt{49} \\ \Rightarrow & a+b = 7 \\ (ii) \quad & (a-b)^2 = a^2 + b^2 - 2ab \\ \Rightarrow & (a-b)^2 = 29 - 2 \times 10 \\ \Rightarrow & (a-b)^2 = 29 - 20 \\ \Rightarrow & (a-b)^2 = 9 \\ \Rightarrow & a-b = \sqrt{9} \\ \Rightarrow & a-b = 3\end{aligned}$$

Question 4.

If $a^2 + b^2 = 10$ and $ab = 3$; find :

(i) $a - b$

(ii) $a + b$

Solution:

$$\begin{aligned} & \text{(i) } (a-b)^2 = a^2 + b^2 - 2ab \\ \Rightarrow & (a-b)^2 = 10 - 2 \times 3 \\ \Rightarrow & (a-b)^2 = 10 - 6 \\ \Rightarrow & (a-b)^2 = 4 \\ \Rightarrow & (a-b) = \sqrt{4} \\ \Rightarrow & a-b = 2 \\ & \text{(ii) } (a+b)^2 = a^2 + b^2 + 2ab \\ \Rightarrow & (a+b)^2 = 10 + 2 \times 3 \\ \Rightarrow & (a+b)^2 = 10 + 6 \\ \Rightarrow & (a+b)^2 = 16 \\ \Rightarrow & (a+b) = \sqrt{16} \\ \Rightarrow & (a+b) = 4 \end{aligned}$$

Question 5.

If $a + \frac{1}{a} = 3$; find $a^2 + \frac{1}{a^2}$

Solution:

$$\begin{aligned}\left(a + \frac{1}{a}\right)^2 &= a^2 + \frac{1}{a^2} + 2 \\ \Rightarrow (3)^2 &= a^2 + \frac{1}{a^2} + 2 \\ \Rightarrow 9 &= a^2 + \frac{1}{a^2} + 2 \\ \Rightarrow 9 - 2 &= a^2 + \frac{1}{a^2} \\ \Rightarrow 7 &= a^2 + \frac{1}{a^2} \\ \therefore a^2 + \frac{1}{a^2} &= 7\end{aligned}$$

Alternative Method :

$$\begin{aligned}a + \frac{1}{a} &= 3 \\ \Rightarrow \left(a + \frac{1}{a}\right)^2 &= (3)^2 \\ \Rightarrow a^2 + \frac{1}{a^2} + 2 &= 9 \\ \Rightarrow a^2 + \frac{1}{a^2} &= 9 - 2 \\ \Rightarrow a^2 + \frac{1}{a^2} &= 7\end{aligned}$$

Question 6.

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

If $a - \frac{1}{a} = 4$; find $a^2 + \frac{1}{a^2}$

Solution:

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

$$\Rightarrow (4)^2 = a^2 + \frac{1}{a^2} - 2$$

$$\Rightarrow 16 = a^2 + \frac{1}{a^2} - 2$$

$$\Rightarrow 16 + 2 = a^2 + \frac{1}{a^2}$$

$$\Rightarrow 18 = a^2 + \frac{1}{a^2}$$

$$\therefore a^2 + \frac{1}{a^2} = 18$$

Alternative Method :

$$a - \frac{1}{a} = 4$$

$$\Rightarrow \left(a - \frac{1}{a}\right)^2 = (4)^2$$

$$\Rightarrow a^2 + \frac{1}{a^2} - 2 = 16$$

$$\Rightarrow a^2 + \frac{1}{a^2} = 16 + 2$$

$$\Rightarrow a^2 + \frac{1}{a^2} = 18$$

Question 7.

If $a^2 + \frac{1}{a^2} = 23$; find $a + \frac{1}{a}$

Solution:

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

$$\Rightarrow \left(a + \frac{1}{a}\right)^2 = 23 + 2$$

$$\Rightarrow \left(a + \frac{1}{a}\right)^2 = 25$$

$$\Rightarrow a + \frac{1}{a} = \sqrt{25}$$

$$\Rightarrow a + \frac{1}{a} = 5$$

Question 8.

If $a^2 + \frac{1}{a^2} = 11$; find $a - \frac{1}{a}$

Solution:

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

$$\Rightarrow \left(a - \frac{1}{a}\right)^2 = 11 - 2$$

$$\Rightarrow \left(a - \frac{1}{a}\right)^2 = 9$$

$$\Rightarrow a - \frac{1}{a} = \sqrt{9}$$

$$\Rightarrow a - \frac{1}{a} = 3$$

Question 9.

If $a + b + c = 10$ and $a^2 + b^2 + c^2 = 38$; find $ab + bc + ca$

Solution:

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

$$\begin{aligned}a+b+c &= 10 \\ \Rightarrow (a+b+c)^2 &= (10)^2 \\ \Rightarrow a^2+b^2+c^2+2ab+2bc+2ca &= 100 \\ \Rightarrow 38+2(ab+bc+ca) &= 100 \\ \Rightarrow 2(ab+bc+ca) &= 100-38 \\ \Rightarrow 2(ab+bc+ca) &= 62\end{aligned}$$

$$\Rightarrow (ab+bc+ca) = \frac{62}{2}$$

$$\Rightarrow ab+bc+ca = 31$$

Alternative Method :

$$\begin{aligned}(a+b+c)^2 &= a^2+b^2+c^2+2ab+2bc+2ca \\ \Rightarrow (10)^2 &= 38+2(ab+bc+ca) \\ \Rightarrow 100 &= 38+2(ab+bc+ca) \\ \Rightarrow 100-38 &= 2(ab+bc+ca) \\ \Rightarrow 62 &= 2(ab+bc+ca) \\ \Rightarrow \frac{62}{2} &= ab+bc+ca \\ \Rightarrow 31 &= ab+bc+ca \\ \therefore ab+bc+ca &= 31\end{aligned}$$

Question 10.

Find $a^2 + b^2 + c^2$; if $a + b + c = 9$ and $ab + bc + ca = 24$

Solution:

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

$$\begin{aligned}a+b+c &= 9 \\ \Rightarrow (a+b+c)^2 &= (9)^2 \\ \Rightarrow a^2+b^2+c^2+2ab+2bc+2ca &= 81 \\ \Rightarrow a^2+b^2+c^2+2(ab+bc+ca) &= 81 \\ \Rightarrow a^2+b^2+c^2+2 \times 24 &= 81 \\ \Rightarrow a^2+b^2+c^2+48 &= 81 \\ \Rightarrow a^2+b^2+c^2 &= 81-48 \\ \Rightarrow a^2+b^2+c^2 &= 33\end{aligned}$$

Question 11.

Find $a + b + c$; if $a^2 + b^2 + c^2 = 83$ and $ab + bc + ca = 71$

Solution:

$$\begin{aligned}(a+b+c)^2 &= a^2+b^2+c^2+2ab+2bc+2ca \\ \Rightarrow (a+b+c)^2 &= 83+2(ab+bc+ca) \\ \Rightarrow (a+b+c)^2 &= 83+2 \times 71 \\ \Rightarrow (a+b+c)^2 &= 83+142 \\ \Rightarrow (a+b+c)^2 &= 225 \\ \Rightarrow a+b+c &= \sqrt{225} \\ \Rightarrow a+b+c &= 15\end{aligned}$$

Question 12.

If $a + b = 6$ and $ab=8$; find $a^3 + b^3$

Solution:

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

$$\begin{aligned}a + b &= 6 \\ \Rightarrow (a + b)^3 &= (6)^3 \\ \Rightarrow a^3 + b^3 + 3ab(a + b) &= 216 \\ \Rightarrow a^3 + b^3 + 3 \times 8(6) &= 216 \\ \Rightarrow a^3 + b^3 + 144 &= 216 \\ \Rightarrow a^3 + b^3 &= 216 - 144 \\ \Rightarrow a^3 + b^3 &= 72\end{aligned}$$

Alternative Method :

$$\begin{aligned}(a + b)^3 &= a^3 + b^3 + 3ab(a + b) \\ \Rightarrow (6)^3 &= a^3 + b^3 + 3 \times 8(6) \\ \Rightarrow 216 &= a^3 + b^3 + 144 \\ \Rightarrow 216 - 144 &= a^3 + b^3 \\ \Rightarrow 72 &= a^3 + b^3 \\ \Rightarrow a^3 + b^3 &= 72\end{aligned}$$

Question 13.

If $a - b = 3$ and $ab = 10$; find $a^3 - b^3$

Solution:

$$a-b = 3$$

$$\Rightarrow (a-b)^3 = (3)^3$$

$$\Rightarrow a^3 - b^3 - 3ab(a-b) = 27$$

$$\Rightarrow a^3 - b^3 - 3 \times 10(3) = 27$$

$$\Rightarrow a^3 - b^3 - 90 = 27$$

$$\Rightarrow a^3 - b^3 = 27 + 90$$

$$\Rightarrow a^3 - b^3 = 117$$

Alternative Method :

$$(a-b)^3 = a^3 - b^3 - 3ab(a-b)$$

$$\Rightarrow (3)^3 = a^3 - b^3 - 3 \times 10(3)$$

$$\Rightarrow 27 = a^3 - b^3 - 90$$

$$\Rightarrow 27 + 90 = a^3 - b^3$$

$$\Rightarrow 117 = a^3 - b^3$$

$$\Rightarrow a^3 - b^3 = 117$$

Question 14.

Find $a^3 + \frac{1}{a^3}$ if $a + \frac{1}{a} = 5$

Solution:

$$a + \frac{1}{a} = 5$$

$$\Rightarrow \left(a + \frac{1}{a}\right)^3 = (5)^3$$

$$\Rightarrow a^3 + \frac{1}{a^3} + 3a \times \frac{1}{a} \left(a + \frac{1}{a}\right) = 125$$

$$\Rightarrow a^3 + \frac{1}{a^3} + 3(5) = 125 \quad \left[a + \frac{1}{a} = 5\right]$$

$$\Rightarrow a^3 + \frac{1}{a^3} + 15 = 125$$

$$\Rightarrow a^3 + \frac{1}{a^3} = 125 - 15$$

$$\Rightarrow a^3 + \frac{1}{a^3} = 110$$

Question 15.

Find $a^3 - \frac{1}{a^3}$ if $a - \frac{1}{a} = 4$.

Solution:

$$\begin{aligned}a - \frac{1}{a} &= 4 \\ \Rightarrow \left(a - \frac{1}{a}\right)^3 &= (4)^3 \\ \Rightarrow a^3 - \frac{1}{a^3} - 3a \times \frac{1}{a} \left(a - \frac{1}{a}\right) &= 64 \\ \Rightarrow a^3 - \frac{1}{a^3} - 3(4) &= 64 \quad [\because a - \frac{1}{a} = 4] \\ \Rightarrow a^3 - \frac{1}{a^3} - 12 &= 64 \\ \Rightarrow a^3 - \frac{1}{a^3} &= 64 + 12 \\ \Rightarrow a^3 - \frac{1}{a^3} &= 76\end{aligned}$$

Question 16.

$$\text{If } 2x - \frac{1}{2x} = 4; \text{ find : (i) } 4x^2 + \frac{1}{4x^2}$$

$$(ii) 8x^3 - \frac{1}{8x^3}$$

Solution:

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

$$(i) \quad 2x - \frac{1}{2x} = 4$$

$$\Rightarrow \left(2x - \frac{1}{2x}\right)^2 = (4)^2$$

$$\Rightarrow (2x)^2 + \left(\frac{1}{2x}\right)^2 - 2 \times 2x \times \frac{1}{2x} = 16$$

$$\Rightarrow 4x^2 + \frac{1}{4x^2} - 2 = 16$$

$$\Rightarrow 4x^2 + \frac{1}{4x^2} = 16 + 2$$

$$\Rightarrow 4x^2 + \frac{1}{4x^2} = 18$$

$$(ii) \quad 2x - \frac{1}{2x} = 4$$

$$\Rightarrow \left(2x - \frac{1}{2x}\right)^3 = (4)^3$$

$$\Rightarrow (2x)^3 - \left(\frac{1}{2x}\right)^3 - 3 \times 2x \times \frac{1}{2x} \left(2x - \frac{1}{2x}\right) = 64$$

$$\Rightarrow 8x^3 - \frac{1}{8x^3} - 3(4) = 64$$

$$\Rightarrow 8x^3 - \frac{1}{8x^3} - 12 = 64$$

$$\Rightarrow 8x^3 - \frac{1}{8x^3} = 64 + 12 \Rightarrow 8x^3 - \frac{1}{8x^3} = 76$$

Question 17.

$$\text{If } 3x + \frac{1}{3x} = 3; \text{ find : (i) } 9x^2 + \frac{1}{9x^2}$$

$$(ii) \quad 27x^3 + \frac{1}{27x^3}$$

Solution:

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

$$(i) \quad 3x + \frac{1}{3x} = 3$$

$$\Rightarrow \left(3x + \frac{1}{3x}\right)^2 = (3)^2$$

$$\Rightarrow (3x)^2 + \left(\frac{1}{3x}\right)^2 + 2 \times 3x \times \frac{1}{3x} = 9$$

$$\Rightarrow 9x^2 + \frac{1}{9x^2} + 2 = 9 \Rightarrow 9x^2 + \frac{1}{9x^2} = 9 - 2$$

$$\Rightarrow 9x^2 + \frac{1}{9x^2} = 7$$

$$(ii) \quad 3x + \frac{1}{3x} = 3$$

$$\Rightarrow \left(3x + \frac{1}{3x}\right)^3 = (3)^3$$

$$\Rightarrow (3x)^3 + \left(\frac{1}{3x}\right)^3 + 3 \times 3x \times \frac{1}{3x} \left(3x + \frac{1}{3x}\right) = 27$$

$$\Rightarrow 27x^3 + \frac{1}{27x^3} + 3 \left(3x + \frac{1}{3x}\right) = 27$$

$$\Rightarrow 27x^3 + \frac{1}{27x^3} + 3(3) = 27$$

$$\Rightarrow 27x^3 + \frac{1}{27x^3} + 9 = 27$$

$$\Rightarrow 27x^3 + \frac{1}{27x^3} = 27 - 9$$

$$\Rightarrow 27x^3 + \frac{1}{27x^3} = 18$$

Question 18.

The sum of the squares of two numbers is 13 and their product is 6. Find:

(i) the sum of the two numbers.

(ii) the difference between them.

Solution:

Let x and y be the two numbers, then

$$x^2 + y^2 = 13 \text{ and } xy = 6$$

$$(i) (x + y)^2 = x^2 + y^2 + 2xy \\ = 13 + 2 \times 6 = 13 + 12 = 25$$

$$\therefore x + y = \pm\sqrt{25} = \pm 5$$

$$(ii) (x - y)^2 = x^2 + y^2 - 2xy = 13 - 12 = 1$$

$$\therefore x - y = \pm 1$$

Exercise 12D

Question 1.

Evaluate:

$$(i) \left(3x + \frac{1}{2}\right)\left(2x + \frac{1}{3}\right)$$

$$(ii) (2a + 0.5)(7a - 0.3)$$

$$(iii) (9 - y)(7 + y) \quad (iv) (2 - z)(15 - z)$$

$$(v) (a^2 + 5)(a^2 - 3) \quad (vi) (4 - ab)(8 + ab)$$

$$(vii) (5xy - 7)(7xy + 9) \quad (viii) (3a^2 - 4b^2)(8a^2 - 3b^2)$$

Solution:

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

$$(i) \left(3x + \frac{1}{2}\right) \left(2x + \frac{1}{3}\right)$$

$$= 3x \left(2x + \frac{1}{3}\right) + \frac{1}{2} \left(2x + \frac{1}{3}\right)$$

$$= 6x^2 + x + x + \frac{1}{6} = 6x^2 + 2x + \frac{1}{6}$$

$$(ii) (2a + 0.5) (7a - 0.3)$$

$$= 2a (7a - 0.3) + 0.5 (7a - 0.3)$$

$$= 14a^2 - 0.6a + 3.5a - 0.15$$

$$= 14a^2 + 2.9a - 0.15$$

$$(iii) (9 - y) (7 + y) = 9(7 + y) - y(7 + y)$$

$$= 63 + 9y - 7y - y^2 = 63 + 2y - y^2$$

$$(iv) (2 - z) (15 - z) = 2(15 - z) - z(15 - z)$$

$$= 30 - 2z - 15z + z^2 = 30 - 17z + z^2$$

$$(v) (a^2 + 5) (a^2 - 3) = a^2 (a^2 - 3) + 5 (a^2 - 3)$$

$$= a^4 - 3a^2 + 5a^2 - 15 = a^4 + 2a^2 - 15$$

$$(vi) (4 - ab) (8 + ab) = 4(8 + ab) - ab(8 + ab)$$

$$= 32 + 4ab - 8ab - a^2b^2 = 32 - 4ab - a^2b^2$$

$$(vii) (5xy - 7) (7xy + 9) = 5xy (7xy + 9) - 7 (7xy + 9)$$

$$= 35x^2y^2 + 45xy - 49xy - 63$$

$$= 35x^2y^2 - 4xy - 63$$

$$(viii) (3a^2 - 4b^2) (8a^2 - 3b^2)$$

$$= 3a^2 (8a^2 - 3b^2) - 4b^2 (8a^2 - 3b^2)$$

$$= 24a^4 - 9a^2b^2 - 32a^2b^2 + 12b^4$$

$$= 24a^4 - 41a^2b^2 + 12b^4$$

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

Question 2.

Evaluate:

(i) $\left(2x - \frac{3}{5}\right)\left(2x + \frac{3}{5}\right)$ (ii) $\left(\frac{4}{7}a + \frac{3}{4}b\right)\left(\frac{4}{7}a - \frac{3}{4}b\right)$

(iii) $(6 - 5xy)(6 + 5xy)$

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

(v) $(4x^2 - 5y^2)(4x^2 + 5y^2)$

(vi) $(1.6x + 0.7y)(1.6x - 0.7y)$

(vii) $(m + 3)(m - 3)(m^2 + 9)$

(viii) $(3x + 4y)(3x - 4y)(9x^2 + 16y^2)$

(ix) $(a + bc)(a - bc)(a^2 + b^2c^2)$

(x) 203×197

(xi) 20.8×19.2

Solution:

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

$$(i) \left(2x - \frac{3}{5}\right) \left(2x + \frac{3}{5}\right)$$

$$= (2x)^2 - \left(\frac{3}{5}\right)^2 \quad [\because (a - b)(a + b) = a^2 - b^2]$$

$$= 4x^2 - \frac{9}{25}$$

$$(ii) \left(\frac{4}{7}a + \frac{3}{4}b\right) \left(\frac{4}{7}a - \frac{3}{4}b\right)$$

$$= \left(\frac{4}{7}a\right)^2 - \left(\frac{3}{4}b\right)^2 \quad [\because (a - b)(a + b) = a^2 - b^2]$$

$$= \frac{16}{49}a^2 - \frac{9}{16}b^2$$

$$(iii) (6 - 5xy)(6 + 5xy)$$

$$= (6)^2 - (5xy)^2$$

$$= 36 - 25x^2y^2 \quad [\because (a - b)(a + b) = a^2 - b^2]$$

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

$$= (2a)^2 - \left(\frac{1}{2a}\right)^2 \quad [\because (a - b)(a + b) = a^2 - b^2]$$

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

$$(v) (4x^2 - 5y^2) (4x^2 + 5y^2)$$

$$= (4x^2)^2 - (5y^2)^2$$

$$= 16x^4 - 25y^4 \quad [\because (a - b)(a + b) = a^2 - b^2]$$

$$(vi) (1.6x + 0.7y) (1.6x - 0.7y)$$

$$= (1.6x)^2 - (0.7y)^2 \quad [\because (a - b)(a + b) = a^2 - b^2]$$

$$= 2.56x^2 - 0.49y^2$$

$$(vii) (m + 3) (m - 3) (m^2 + 9)$$

$$= (m)^2 - (3)^2 (m^2 + 9) \quad [\because (a - b)(a + b) = a^2 - b^2]$$

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

$$= (m^2)^2 - 9^2 = m^4 - 81$$

$$(viii) (3x + 4y) (3x - 4y) (9x^2 + 16y^2)$$

$$= [(3x)^2 - (4y)^2] (9x^2 + 16y^2)$$

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

$$= (9x^2 - 16y^2) (9x^2 + 16y^2)$$

$$= (9x^2)^2 - (16y^2)^2 \quad [\because (a - b)(a + b) = a^2 - b^2]$$

$$= 81x^4 - 256y^4$$

$$(ix) (a + bc) (a - bc) (a^2 + b^2c^2)$$

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

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

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

$$= (a^2)^2 - (b^2c^2)^2 \quad [\because (a - b)(a + b) = a^2 - b^2]$$

$$= a^4 - b^4c^4$$

$$\begin{aligned} \text{(x)} \quad & 203 \times 197 \\ &= (200 + 3) (200 - 3) \\ &= (200)^2 - (3)^2 = 40000 - 9 \\ &\quad [\because (a - b) (a + b) = a^2 - b^2] \\ &= 39991 \\ \text{(xi)} \quad & 20.8 \times 19.2 = (20 + .8) (20 - .8) \\ &= (20)^2 - (.8)^2 \quad [\because (a - b) (a + b) = a^2 - b^2] \\ &= 400 - .64 = 399.36 \end{aligned}$$

Question 3.

Find the square of :

$$\begin{array}{ll} \text{(i)} \quad 3x + \frac{2}{y} & \text{(ii)} \quad \frac{5a}{6b} - \frac{6b}{5a} \\ \text{(iii)} \quad 2m^2 - \frac{2}{3}n^2 & \text{(iv)} \quad 5x + \frac{1}{5x} \\ \text{(v)} \quad 8x + \frac{3}{2}y & \text{(vi)} \quad 607 \\ \text{(vii)} \quad 391 & \text{(viii)} \quad 9.7 \end{array}$$

Solution:

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

$$(i) 3x + \frac{2}{y}$$

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

$$= 9x^2 + \frac{4}{y^2} + \frac{12x}{y}$$

$$(ii) \left(\frac{5a}{6b} - \frac{6b}{5a}\right)^2 = \left(\frac{5a}{6b}\right)^2 + \left(\frac{6b}{5a}\right)^2 - 2 \times \frac{5a}{6b} \times \frac{6b}{5a}$$

$$= \frac{25a^2}{36b^2} - 2 + \frac{36b^2}{25a^2}$$

$$(iii) 2m^2 - \frac{2}{3}n^2$$

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

$$= 4m^4 + \frac{4}{9}n^4 - \frac{8}{3}m^2n^2$$

$$= 4m^4 - \frac{8}{3}m^2n^2 + \frac{4}{9}n^4$$

$$(iv) \left(5x + \frac{1}{5x}\right)^2 = (5x)^2 + \frac{1}{(5x)^2} + 2 \times 5x \times \frac{1}{5x}$$

$$= 25x^2 + \frac{1}{25x^2} + 2 = 25x^2 + 2 + \frac{1}{25x^2}$$

$$(v) \left(8x + \frac{3}{2}y\right)^2 = (8x)^2 + \left(\frac{3}{2}y\right)^2 + 2 \times 8x \times \frac{3}{2}y$$

$$= 64x^2 + \frac{9}{4}y^2 + 24xy = 64x^2 + 24xy + \frac{9}{4}y^2$$

$$(vi) (607)^2 = (600 + 7)^2 = (600)^2 + (7)^2 + 2(600)(7)$$

$$= 360000 + 49 + 8400 = 368449$$

$$(vii) (391)^2 = (400 - 9)^2 = (400)^2 + 9^2 - 2(400)(9)$$

$$= 160000 + 81 - 7200 = 152881$$

$$(viii) (9.7)^2 = (10 - .3)^2 = (10)^2 + (.3)^2 - 2(10)(.3)$$

$$= 100 + .09 - 6 = 100.09 - 6.00 = 94.09$$

Question 4.

If $a + \frac{1}{a} = 2$, find :

$$(i) a^2 + \frac{1}{a^2} \quad (ii) a^4 + \frac{1}{a^4}$$

Solution:

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

$$\begin{aligned}\text{(i)} \quad a^2 + \frac{1}{a^2} &= \left(a + \frac{1}{a}\right)^2 - 2 \\ &= (2)^2 - 2 = 4 - 2 = 2\end{aligned}$$

$$\begin{aligned}\text{(ii)} \quad a^4 + \frac{1}{a^4} &= \left(a^2 + \frac{1}{a^2}\right)^2 - 2 \\ &= (2)^2 - 2 = 4 - 2 = 2\end{aligned}$$

Question 5.

If $m - \frac{1}{m} = 5$, find :

$$\text{(i)} \quad m^2 + \frac{1}{m^2} \qquad \text{(ii)} \quad m^4 + \frac{1}{m^4}$$

$$\text{(iii)} \quad m^2 - \frac{1}{m^2}$$

Solution:

$$\begin{aligned}\text{(i) } m^2 + \frac{1}{m^2} &= \left(m - \frac{1}{m}\right)^2 + 2 \\ &= (5)^2 + 2 = 25 + 2 = 27\end{aligned}$$

$$\begin{aligned}\text{(ii) } m^4 + \frac{1}{m^4} &= \left(m^2 + \frac{1}{m^2}\right)^2 - 2 \\ &= (27)^2 - 2 = 729 - 2 = 727\end{aligned}$$

$$\begin{aligned}\text{(iii) } m^2 - \frac{1}{m^2} &= \left(m + \frac{1}{m}\right)\left(m - \frac{1}{m}\right) \\ &= 5\left(m + \frac{1}{m}\right)\end{aligned}$$

$$\begin{aligned}\text{Now } \left(m + \frac{1}{m}\right)^2 &= \left(m - \frac{1}{m}\right)^2 + 4 \\ &= (5)^2 + 4 = 25 + 4 = 29\end{aligned}$$

$$\therefore m + \frac{1}{m} = \sqrt{29}$$

$$\therefore m^2 - \frac{1}{m^2} = (5)(\sqrt{29})5\sqrt{29}$$

Question 6.

If $a^2 + b^2 = 41$ and $ab = 4$, find :

(i) $a - b$

(ii) $a + b$

Solution:

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

$$(i) (a - b)^2 = a^2 + b^2 - 2ab = 41 - 2(4) = 41 - 8 = 33$$

$$\therefore a - b = \sqrt{33}$$

$$(ii) (a + b)^2 = a^2 + b^2 + 2ab = 41 + 2(4) = 41 + 8 = 49 \Rightarrow (a + b)^2 = 49$$

$$\therefore a + b = 7$$

Question 7.

$$\text{If } 2a + \frac{1}{2a} = 8, \text{ find :}$$

$$(i) 4a^2 + \frac{1}{4a^2} \quad (ii) 16a^4 + \frac{1}{16a^4}$$

Solution:

$$(i) 4a^2 + \frac{1}{4a^2} = \left(2a + \frac{1}{2a}\right)^2 - 2 \cdot 2a \cdot \frac{1}{2a}$$

$$\left(2a + \frac{1}{2a}\right)^2 - 2 = (8)^2 - 2 = 64 - 2 = 62$$

$$(ii) 16a^4 + \frac{1}{16a^4} = \left(4a^2 + \frac{1}{4a^2}\right)^2 - 2 \cdot 4a^2 \cdot \frac{1}{4a^2}$$

$$= (62)^2 - 2 = 3844 - 2 = 3842$$

Question 8.

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

If $3x - \frac{1}{3x} = 5$, find :

(i) $9x^2 + \frac{1}{9x^2}$

(ii) $81x^4 + \frac{1}{81x^4}$

Solution:

$$\begin{aligned} \text{(i) } 9x^2 + \frac{1}{9x^2} &= \left(3x - \frac{1}{3x}\right)^2 + 2 \\ &= (5)^2 + 2 = 25 + 2 = 27 \end{aligned}$$

$$\begin{aligned} \text{(ii) } 81x^4 + \frac{1}{81x^4} &= \left(9x^2 + \frac{1}{9x^2}\right)^2 - 2 \\ &= (27)^2 - 2 = 729 - 2 = 727 \end{aligned}$$

Question 9.

Expand :

(i) $(3x - 4y + 5z)^2$

(ii) $(2a - 5b - 4c)^2$

(iii) $(5x + 3y)^3$

(iv) $(6a - 7b)^3$

Solution:

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

(i) $(3x - 4y + 5z)^2$

$$(3x)^2 + (-4y)^2 + (5z)^2 + 2(3x)(-4y) + 2(-4y)(5z) + 2(5z)(3x)$$

$$= 9x^2 + 16y^2 + 25z^2 - 24xy - 40yz + 30zx$$

(ii) $(2a - 5b - 4c)^2 = (2a)^2 + (-5b)^2 + (-4c)^2$

$$+ 2(2a)(-5b) + 2(-5b)(-4c) + 2(-4c)(2a)$$

$$= 4a^2 + 25b^2 + 16c^2 - 20ab + 40bc - 16ca$$

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

$$= 125x^3 + 27y^3 + 45xy(5x + 3y)$$

$$= 125x^3 + 27y^3 + 225x^2y + 135xy^2$$

(iv) $(6a - 7b)^3 = (6a)^3 - (7b)^3 - 3(6a)(7b)(6a - 7b)$

$$= 216a^3 - 343b^3 - 126ab(6a - 7b)$$

$$= 216a^3 - 343b^3 - 756a^2b + 882ab^2$$

$$= 216a^3 - 756a^2b + 882ab^2 - 343b^3$$

Question 10.

If $a + b + c = 9$ and $ab + bc + ca = 15$, find: $a^2 + b^2 + c^2$.

Solution:

$$\text{Since } (a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$$

$$\therefore (9)^2 = a^2 + b^2 + c^2 + 2(15)$$

$$81 = a^2 + b^2 + c^2 + 30$$

$$\therefore a^2 + b^2 + c^2 = 81 - 30 = 51$$

Question 11.

If $a + b + c = 11$ and $a^2 + b^2 + c^2 = 81$, find $ab + bc + ca$.

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>



Solution:

Since $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$$\therefore (11)^2 = 81 + 2(ab + bc + ca)$$

$$\therefore 2(ab + bc + ca) = 121 - 81 = 40$$

$$ab + bc + ca = \frac{40}{2}$$

$$\Rightarrow ab + bc + ca = 20$$

Question 12.

If $3x - 4y = 5$ and $xy = 3$, find : $27x^3 - 64y^3$.

Solution:

$$\begin{aligned} 27x^3 - 64y^3 &= (3x)^3 - (4y)^3 \\ &= (3x - 4y)^3 + 3(3x)(4y)(3x - 4y) \\ &\quad [\because a^3 - b^3 = (a - b)^3 + 3ab(a - b)] \\ &= (5)^3 + 36(xy)(3x - 4y) = 125 + 36(3)(5) \\ &= 125 + 540 = 665 \end{aligned}$$

Question 13.

If $a + b = 8$ and $ab = 15$, find : $a^3 + b^3$.

Solution:

$$\begin{aligned} a^3 + b^3 &= (a + b)^3 - 3ab(a + b) \\ &= (8)^3 - 3(15)(8) = 512 - 360 = 152 \end{aligned}$$

Question 14.

If $3x + 2y = 9$ and $xy = 3$, find : $27x^3 + 8y^3$

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

Solution:

$$\begin{aligned}27x^3 + 8y^3 &= (3x)^3 + (2y)^3 = (3x + 2y)^3 - \\ &3 \cdot 3x \cdot 2y (3x + 2y) \\ &= (3x + 2y)^3 - 18xy (3x + 2y) \\ &= (9)^3 - 18(3)(9) = 729 - 486 = 243\end{aligned}$$

Question 15.

If $5x - 4y = 7$ and $xy = 8$, find : $125x^3 - 64y^3$

Solution:

$$\begin{aligned}125x^3 - 64y^3 &= (5x)^3 - (4y)^3 = (5x - 4y)^3 + 3(5x) \\ &(4y) (5x - 4y) \\ &= (5x - 4y)^3 + 60xy (5x - 4y) \\ &= (7)^3 + 60 (8) (7) = 343 + 3360 = 3703\end{aligned}$$

Question 16.

The difference between two numbers is 5 and their products is 14. Find the difference between their cubes.

Solution:

Let x and y be two numbers, then $x - y = 5$ and $xy = 14$

$$\begin{aligned}\therefore x^3 - y^3 &= (x - y)^3 + 3xy(x - y) \\ &= (5)^3 + 3 \times 14 \times 5 \\ &= 125 + 210 = 335\end{aligned}$$

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>



Selina Publishers ICSE Solutions

Class 8 Maths

- Chapter 1- Rational Numbers
- Chapter 2- Exponents (Powers)
- Chapter 3- Squares and Square Roots
- Chapter 4- Cubes and Cube-Roots
- Chapter 5- Playing with Number
- Chapter 6- Sets
- Chapter 7- Percent and Percentage
- Chapter 8- Profit, Loss and Discount
- Chapter 9- Simple and Compound Interest
- Chapter 10- Direct and Inverse Variations
- Chapter 11- Algebraic Expressions
- Chapter 12- Algebraic Identities
- Chapter 13- Factorisation
- Chapter 14- Linear Equations in one Variable
- Chapter 15- Linear Inequations
- Chapter 16- Understanding Shapes
- Chapter 17- Special Types of Quadrilaterals
- Chapter 18- Constructions
- Chapter 19- Representing 3-D in 2-D
- Chapter 20- Area of Trapezium and a Polygon
- Chapter 21- Surface Area, Volume and Capacity
- Chapter 22- Data Handling
- Chapter 23- Probability

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

About About Selina Publishers ICSE

Selina Publishers has been serving the students since 1976 and is one of the quality ICSE school textbooks publication houses. Mathematics and Science books for classes 6-10 form the core of our business, apart from certain English and Hindi literature as well as a few primary books. All these books are based upon the syllabus published by the Council for the I.C.S.E. Examinations, New Delhi. The textbooks are composed by a panel of subject experts and vetted by teachers practising in ICSE schools all over the country. Continuous efforts are made in complying with the standards and ensuring lucidity and clarity in content, which makes them stand tall in the industry.

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>

About IndCareer

IndCareer.com is a leading developer of online career guidance resources for the Indian marketplace. Established in 2007, IndCareer.com is currently used by over thousands of institutions across India, including schools, employment agencies, libraries, colleges and universities.

IndCareer.com is designed to assist you in making the right career decision - a decision that meets your unique interests and personality.

For any clarifications or questions you can write to **info@indcareer.com**

Postal Address

IndCareer.com
52, Shilpa Nagar,
Somalwada
Nagpur - 440015
Maharashtra, India

WhatsApp: +91 9561 204 888

Website: <https://www.indcareer.com>

<https://www.indcareer.com/schools/selina-class-8-icse-solutions-mathematics-chapter-12-algebraic-identities/>