PRACTICE SET 5.1 PAGE NO: 24

1. Expand:

(1) $(a+2)(a-1)$ (2) $(m-4)(m+6)$ (3) $(p+8)(p-3)$

(4) $(13+x)(13-x)$ (5) $(3x+4y)(3x+5y)$ (6) $(9x-5t)(9x+3t)$

(7) $\left(m+\frac{2}{3}\right)\left(m-\frac{7}{3}\right)$ (8) $\left(x+\frac{1}{x}\right)\left(x-\frac{1}{x}\right)$ (9) $\left(\frac{1}{y}+4\right)\left(\frac{1}{y}-9\right)$

Solution:

(1) (a + 2) (a – 1)

Let us simplify the expression, we get

$(a + 2) (a – 1) = a^2 + [(2) + (-1)] a + [(2) \times (-1)]$

By using the logic,

$(x + p) (x + q) = x^2 + (p + q)x +(p \times q)$

Here, x = a, p = 2, q = -1

Now, substitute the value we get

$= a^2 + (2 – 1)a + (-2)$

$= a^2 + 2a – a – 2$

$= a^2 + a – 2$

$\therefore (a + 2) (a – 1) = a^2 + a – 2$

(2) (m – 4) (m + 6)

Let us simplify the expression, we get

$(m – 4) (m + 6) = m^2 + [(- 4) + (6)] m + [(- 4) \times (6)]$

By using the logic,

$(x + p) (x + q) = x^2 + (p + q)x + (p \times q)$

Here, x = m, p = -4, q = 6

Now, substitute the value we get

$= m^2 + (6 – 4)m + (- 24)$

$= m^2 + 6m – 4m – 24$

$= m^2 + 2m – 24$

$\therefore (m – 4) (m + 6) = m^2 + 2m – 24$

(3) (p + 8) (p – 3)

Let us simplify the expression, we get

$(p + 8) (p – 3) = p^2 + [(8) + (- 3)] p + [(8) \times (- 3)]$

By using the logic,

$(x + a)(x + b) = x^2 + (a + b)x + (a \times b)$
Here, x = p, a = 8, b = -3
Now, substitute the value we get
$= p^2 + (8 – 3)p + (- 24)$
$= p^2 + 8p – 3p – 24$
$= p^2 + 5p – 24$
$\therefore (p + 8)(p – 3) = p^2 + 5p – 24$

(4) (13 + x) (13 – x)
Let us simplify the expression, we get
$(13 + x)(13 – x) = (13)^2 – (x)^2$
{We know that $(a + b)(a – b) = (a)^2 – (b)^2$}
$= 169 + 0(13) – x^2$
$= 169 – x^2$
$\therefore (13 + x)(13 – x) = 169 – x^2$

(5) (3x + 4y) (3x + 5y)
Let us simplify the expression, we get
$(3x + 4y)(3x + 5y) = (3x)^2 + [(4y) + (5y)] 3x + [(4y) \times (5y)]$
By using the logic,
$(x + a)(x + b) = x^2 + (a + b)x + (a \times b)$
Here, x = 3x, a = 4y, b = 5y
Now, substitute the value we get
$= 9x^2 + [(9y) \times (3x)] + 20y^2$
$= 9x^2 + 27xy + 20y^2$
$\therefore (3x + 4y)(3x + 5y) = 9x^2 + 27xy + 20y^2$

(6) (9x – 5t) (9x + 3t)
Let us simplify the expression, we get
$(9x – 5t)(9x + 3t) = (9x)^2 + [(- 5t) + (3t)] 9x + [(- 5t) \times (3t)]$
By using the logic,
$(x + a)(x + b) = x^2 + (a + b)x + (a \times b)$
Here, x = 9x, a = -5t, b = 3t
Now, substitute the value we get
$= 81x^2 + [(- 2t) \times (9x)] + (- 15t^2)$
$= 81x^2 – 18xt – 15t^2$
$\therefore (9x – 5t)(9x + 3t) = 81x^2 – 18xt – 15t^2$

(7) $\left(m + \frac{2}{3}\right)\left(m - \frac{7}{3}\right)$

Let us simplify the expression, we get

$$\left(m + \frac{2}{3}\right)\left(m - \frac{7}{3}\right) = (m)^2 + \left(\frac{2}{3} + \left(-\frac{7}{3}\right)\right)m + \left(\frac{2}{3} \times \left(-\frac{7}{3}\right)\right)$$

By using the logic,

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

Here, $x = m$, $a = 2/3$, $b = -7/3$

Now, substitute the value we get

$$= m^2 + \left(\frac{2}{3} - \frac{7}{3}\right)m + \left(-\frac{14}{9}\right)$$

$$= m^2 + \left(-\frac{5}{3}\right)m - \frac{14}{9}$$

$$= m^2 - \frac{5}{3}m - \frac{14}{9}$$

$$\therefore \left(m + \frac{2}{3}\right)\left(m - \frac{7}{3}\right) = m^2 - \frac{5}{3}m - \frac{14}{9}$$

(8) $\left(x + \frac{1}{x}\right)\left(x - \frac{1}{x}\right)$

Let us simplify the expression, we get

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

By using the logic,

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

Here, $x = x$, $a = 1/x$, $b = -1/x$

Now, substitute the value we get

$$= x^2 + 0(x) - 1/x^2$$

$$= x^2 - \frac{1}{x^2}$$

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

(9) $\left(\frac{1}{y}+4\right)\left(\frac{1}{y}-9\right)$

Let us simplify the expression, we get

$$\left(\frac{1}{y}+4\right)\left(\frac{1}{y}-9\right)=\left(\frac{1}{y}\right)^2+[\{(4)+(-9)\}\times\left(\frac{1}{y}\right)]+[4\times(-9)]$$

By using the logic,

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

Here, $x = 1/y$, $a = 4$, $b = -9$

Now, substitute the value we get

$$=\left(\frac{1}{y}\right)^2+\left(-\frac{5}{y}\right)-36$$

$$=\frac{1}{y^2}-\frac{5}{y}-36$$

$$\therefore\left(\frac{1}{y}+4\right)\left(\frac{1}{y}-9\right)=\frac{1}{y^2}-\frac{5}{y}-36$$

PRACTICE SET 5.2 PAGE NO: 25

1. Expand:

(1) $(k+4)^3$ (2) $(7x+8y)^3$ (3) $(7+m)^3$ (4) $(52)^3$

(5) $(101)^3$ (6) $\left(x+\frac{1}{x}\right)^3$ (7) $\left(2m+\frac{1}{5}\right)^3$ (8) $\left(\frac{5x}{y}+\frac{y}{5x}\right)^3$

Solution:

(1) $(k + 4)^3$

Let us simplify the expression, we get

$(k + 4)^3 = (k)^3 + [\ 3 \times (k)^2 \times (4)] + [\ 3 \times (k) \times (4)^2\ ] + (4)^3$

By using the formula,

$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

Here a = k, b = 4

Now, substitute the value we get

$= k^3 + (3 \times 4)k^2 + (3 \times 16)k + 64$

$= k^3 + 12k^2 + 48k + 64$

$\therefore (k + 4)^3 = k^3 + 12k^2 + 48k + 64$

(2) $(7x + 8y)^3$

Let us simplify the expression, we get

$(7x + 8y)^3 = (7x)^3 + [\ 3 \times (7x)^2 \times (8y)] + [\ 3 \times (7x) \times (8y)^2\ ] + (8y)^3$

By using the formula,

$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

Here a = 7x, b = 8y

Now, substitute the value we get

$= 343x^3 + (3 \times 49 \times 8)x^2y + (3 \times 7 \times 64)xy^2 + 512y^3$

$= 343x^3 + 1176x^2y + 1344xy^2 + 512y^3$

$\therefore (7x + 8y)^3 = 343x^3 + 1176x^2y + 1344xy^2 + 512y^3$

(3) $(7 + m)^3$

Let us simplify the expression, we get

$(7 + m)^3 = (7)^3 + [\ 3 \times (7)^2 \times (m)] + [\ 3 \times (7) \times (m)^2] + (m)^3$

By using the formula,

$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

Here a = 7, b = m

Now, substitute the value we get

$= 343 + (3 \times 49)m + (3 \times 7)m^2 + m^3$

$= 343 + 147m + 21m^2 + m^3$

$\therefore (7 + m)^3 = 343 + 147m + 21m^2 + m^3$

(4) $(52)^3$

Let us simplify the expression, we get

$(52)^3 = (50 + 2)^3$

$(50 + 2)^3 = (50)^3 + [3 \times (50)^2 \times (2)] + [3 \times (50) \times (2)^2] + (2)^3$

By using the formula,

$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

Here a = 50, b = 2

Now, substitute the value we get

$= 125000 + (3 \times 2500 \times 2) + (3 \times 50 \times 4) + 8$

$= 125000 + 15000 + 600 + 8$

$= 140608$

$\therefore (52)^3 = (50 + 2)^3 = 140608$

(5) $(101)^3$

Let us simplify the expression, we get

$(101)^3 = (100 + 1)^3$

$(100 + 1)^3 = (100)^3 + [3 \times (100)^2 \times (1)] + [3 \times (100) \times (1)^2] + (1)^3$

By using the formula,

$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

Here a = 100, b = 1

Now, substitute the value we get

$= 1000000 + (3 \times 10000 \times 1) + (3 \times 100 \times 1) + 1$

$= 1000000 + 30000 + 300 + 1$

$= 1030301$

$\therefore (101)^3 = (100 + 1)^3 = 1030301$

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

Let us simplify the expression, we get

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

By using the formula,

$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

Here $a = x$, $b = 1/x$

Now, substitute the value we get

$$= x^3 + 3x + \frac{3}{x} + \frac{1}{x^3}$$

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

(7) $\left(2m+\frac{1}{5}\right)^3$

Let us simplify the expression, we get

$$\left(2m+\frac{1}{5}\right) = (2m)^3 + \left[3 \times (2m)^2 \times \left(\frac{1}{5}\right)\right] + \left[3 \times (2m) \times \left(\frac{1}{5}\right)^2\right] + \left(\frac{1}{5}\right)^3$$

By using the formula,

$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

Here $a = 2m$, $b = 1/5$

Now, substitute the value we get

$$= 8m^3 + \left[3 \times 4m^2 \times \left(\frac{1}{5}\right)\right] + \left[3 \times (2m) \times \frac{1}{25}\right] + \frac{1}{125}$$

$$= 8m^3 + \frac{12m^2}{5} + \frac{6m}{25} + \frac{1}{125}$$

$$\therefore \left(2m+\frac{1}{5}\right)^3 = 8m^3 + \frac{12m^2}{5} + \frac{6m}{25} + \frac{1}{125}$$

(8) $\left(\frac{5x}{y}+\frac{y}{5x}\right)^3$

Let us simplify the expression, we get

$$\left(\frac{5x}{y}+\frac{y}{5x}\right)=\left(\frac{5x}{y}\right)^3+\left[3\times\left(\frac{5x}{y}\right)^2\times\left(\frac{y}{5x}\right)\right]+\left[3\times\left(\frac{5x}{y}\right)\times\left(\frac{y}{5x}\right)^2\right]+\left(\frac{y}{5x}\right)^3$$

By using the formula,

$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

Here a = 5x/y, b = y/5x

Now, substitute the value we get

$$=\frac{125x^3}{y^3}+\left[3\times\frac{25x^2}{y^2}\times\left(\frac{y}{5x}\right)\right]+\left[3\times\left(\frac{5x}{y}\right)\times\frac{y^2}{25x^2}\right]+\frac{y^3}{125x^3}$$

$$=\frac{125x^3}{y^3}+\frac{15x}{y}+\frac{3y}{5x}+\frac{y^3}{125x^3}$$

$$\therefore\left(\frac{5x}{y}+\frac{y}{5x}\right)^3=\frac{125x^3}{y^3}+\frac{15x}{y}+\frac{3y}{5x}+\frac{y^3}{125x^3}$$

PRACTICE SET 5.3 PAGE NO: 27

1. Expand:

(1) $(2m-5)^3$ (2) $(4-p)^3$ (3) $(7x-9y)^3$ (4) $(58)^3$

(5) $(198)^3$ (6) $\left(2p-\frac{1}{2p}\right)^3$ (7) $\left(1-\frac{1}{a}\right)^3$ (8) $\left(\frac{x}{3}-\frac{3}{x}\right)^3$

Solution:

(1) $(2m – 5)^3$

Let us simplify the expression, we get

$(2m – 5)^3 = (2m)^3 – [3 \times (2m)^2 \times 5] + [3 \times (2m) \times (5)^2] – (5)^3$

By using the formula,

$(a – b)^3 = a^3 – 3a^2b + 3ab^2 – b^3$

Here, a = 2m, b = -5

Now, substitute the value we get

$= 8m^3– [3 \times 4m^2 \times 5] + [3 \times 2m \times 25] – 125$

$= 8m^3 – 60m^2 + 150m – 125$

$\therefore (2m – 5)^3 = 8m^3 – 60m^2 + 150m – 125$

(2) $(4 – p)^3$

Let us simplify the expression, we get

$(4 – p)^3 = (4)^3 – [3 \times (4)^2 \times p] + [3 \times (4) \times (p)^2] – (p)^3$

By using the formula,

$(a – b)^3 = a^3 – 3a^2b + 3ab^2 – b^3$

Here, a = 4, b = -p

Now, substitute the value we get

$= 64 – [3 \times 6 \times p] + [3 \times 4 \times p^2] – p^3$

$= 64 – 48p + 12p^2 – p^3$

$\therefore (4 – p)^3 = 64 – 48p + 12p^2 – p^3$

(3) $(7x – 9y)^3$

Let us simplify the expression, we get

$(7x – 9y)^3 = (7x)^3 – [3 \times (7x)^2 \times 9y] + [3 \times (7x) \times (9y)^2] – (9y)^3$

By using the formula,

$(a – b)^3 = a^3 – 3a^2b + 3ab^2 – b^3$

Here, a = 7x, b = -9y

Now, substitute the value we get

$= 343x^3 – [3 \times 49x^2 \times 9y] + [3 \times 7x \times 81y^2] – 729y^3$

$= 343x^3 – 1323x^2y + 1701xy^2 – 729y^3$

$\therefore (7x – 9y)^3 = 343x^3 – 1323x^2y + 1701xy^2 – 729y^3$

(4) $(58)^3$

Let us simplify the expression, we get

$(58)^3 = (60 – 2)^3$

$(60 – 2)^3 = (60)^3 – [3 \times (60)^2 \times 2] + [3 \times (60) \times (2)^2] – (2)^3$

By using the formula,

$(a – b)^3 = a^3 – 3a^2b + 3ab^2 – b^3$

Here, a = 60, b = -2

Now, substitute the value we get

$= 216000 – [3 \times 3600 \times 2] + [3 \times 60 \times 4] – 8$

$= 216000 – 21600 + 720 – 8$

$= 195112$

$\therefore (58)^3 = (60 – 2)^3 = 195112$

(5) $(198)^3$

Let us simplify the expression, we get

$(198)^3 = (200 – 2)^3$

$(200 – 2)^3 = (200)^3 – [3 \times (200)^2 \times 2] + [3 \times (200) \times (2)^2] – (2)^3$

By using the formula,

$(a – b)^3 = a^3 – 3a^2b + 3ab^2 – b^3$

Here, a = 200, b = -2

Now, substitute the value we get

$= 8000000 – 240000 + 2400 – 8$

$= 7762392$

$\therefore (198)^3 = (200 – 2)^3 = 7762392$

(6) $\left(2p - \frac{1}{2p}\right)^3$

Let us simplify the expression, we get

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

By using the formula,

$(a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$

Here, $a = 2p$, $b = -1/2p$

Now, substitute the value we get

$$= 8p^3 - 6p + \frac{3}{2p} - \frac{1}{8p^3}$$

$$\therefore \left(2p - \frac{1}{2p}\right)^3 = 8p^3 - 6p + \frac{3}{2p} - \frac{1}{8p^3}$$

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

Let us simplify the expression, we get

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

By using the formula,

$(a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$

Here, $a = 1$, $b = -1/a$

Now, substitute the value we get

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

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

(8) $\left(\frac{x}{3}-\frac{3}{x}\right)^3$

Let us simplify the expression, we get

$$\left(\frac{x}{3}-\frac{3}{x}\right)^3 = \left(\frac{x}{3}\right)^3 - \left[3 \times \left(\frac{x}{3}\right)^2 \times \left(\frac{3}{x}\right)\right] + \left[3 \times \left(\frac{x}{3}\right) \times \left(\frac{3}{x}\right)^2\right] - \left(\frac{3}{x}\right)^3$$

By using the formula,

$(a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$

Here, a = x/3, b = -3/x

Now, substitute the value we get

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

$$\therefore \left(\frac{x}{3}-\frac{3}{x}\right)^3 = \frac{x^3}{27} - x + \frac{9}{x} - \frac{27}{x^3}$$

2. Simplify:

(1) $(2a + b)^3 - (2a - b)^3$

(2) $(3r - 2k)^3 + (3r + 2k)^3$

(3) $(4a - 3)^3 - (4a + 3)^3$

(4) $(5x - 7y)^3 + (5x + 7y)^3$

Solution:

(1) $(2a + b)^3 - (2a - b)^3$

Let us expand the given expression:

$(2a + b)^3 - (2a - b)^3 = [(2a)^3 + \{3 \times (2a)^2 \times b\} + \{3 \times (2a) \times (b)^2\} + (b)^3] - [(2a)^3 - \{3 \times (2a)^2 \times b\} + \{3 \times (2a) \times (b)^2\} - (b)^3]$

By using the formula,

$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$ and $(a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$

$= [8a^3 + \{3 \times 4a^2 \times b\} + \{3 \times 2a \times b\} + b^3] - [8a^3 - \{3 \times 4a^2 \times b\} + \{3 \times 2a \times b^2\} - b^3]$

$= [8a^3 + 12a^2b + 6ab^2 + b^3] - [8a^3 - 12a^2b + 6ab^2 - b^3]$

$= 8a^3 + 12a^2b + 6ab^2 + b^3 - 8a^3 + 12a^2b - 6ab^2 + b^3$

$= 24a^2b + 2b^3$

$\therefore (2a + b)^3 - (2a - b)^3 = 24a^2b + 2b^3$

(2) $(3r - 2k)^3 + (3r + 2k)^3$

Let us expand the given expression:

$(3r - 2k)^3 + (3r + 2k)^3 = [(3r)^3 - \{3 \times (3r)^2 \times (2k)\} + \{3 \times (3r) \times (2k)^2\} - (2k)^3] + [(3r)^3 + \{3 \times (3r)^2 \times (2k)\} + \{3 \times (3r) \times (2k)^2\} + (2k)^3]$

By using the formula,
$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$ and $(a – b)^3 = a^3 – 3a^2b + 3ab^2 – b^3$
$= [27r^3 – \{3 \times 9r^2 \times 2k\} + \{3 \times 3r \times 4k^2\} – 8k^3] + [27r^3 + \{3 \times 9r^2 \times 2k\} + \{3 \times 3r \times (4k^2)\} + 8k^3]$
$= [27r^3 – 54r^2k + 36rk^2 – 8k^3] + [27r^3 + 54r^2k + 36rk^2 + 8k^3]$
$= 27r^3 - 54r^2k + 36rk^2 – 8k^3 + 27r^3 + 54r^2k + 36rk^2 + 8k^3$
$= 54r^3 + 72rk^2$
$\therefore (3r – 2k)^3 + (3r + 2k)^3 = 54r^3 + 72rk^2$

(3) $(4a – 3)^3 – (4a + 3)^3$
Let us expand the given expression:
$(4a – 3)^3 – (4a + 3)^3 = [(4a)^3 - \{3 \times (4a)^2 \times 3\} + \{3 \times (4a) \times (3)^2\} - (3)^3] - [(4a)^3 + \{3 \times (4a)^2 \times 3\} + \{3 \times (4a) \times (3)^2\} + (3)^3]$
By using the formula,
$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$ and $(a – b)^3 = a^3 – 3a^2b + 3ab^2 – b^3$
$= [64a^3 - \{3 \times 16a^2 \times 3\} + \{3 \times 4a \times 9\} - 27] – [64a^3 + \{3 \times 16a^2 \times 3\} + \{3 \times 4a \times 9\} + 27]$
$= [64a^3 - 144a^2 + 108a - 27] – [64a^3 + 144a^2 + 108a + 27]$
$= 64a^3 - 144a^2 + 108a – 27 – 64a^3 - 144a^2 - 108a - 27$
$= - 288a^2 – 54$
$\therefore (4a – 3)^3 – (4a + 3)^3 = -288a^2 – 54$

(4) $(5x – 7y)^3 + (5x + 7y)^3$
Let us expand the given expression:
$(5x – 7y)^3 + (5x + 7y)^3 = [(5x)^3 - \{3 \times (5x)^2 \times (7y)\} + \{3 \times (5x) \times (7y)^2\} - (7y)^3] + [(5x)^3 + \{3 \times (5x)^2 \times (7y)\} + \{3 \times (5x) \times (7y)^2\} + (7y)^3]$
By using the formula,
$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$ and $(a – b)^3 = a^3 – 3a^2b + 3ab^2 – b^3$
$= [125x^3 – \{3 \times 25x^2 \times 7y\} + \{3 \times 5x \times 49y^2\} – 343y^3] + [125x^3 + \{3 \times 25x^2 \times 7y\} + \{3 \times 5x \times 49y^2\} + 343y^3]$
$= [125x^3 – 525x^2y + 735xy^2 – 343y^3] + [125x^3 + 525x^2y + 735xy^2 + 343y^3]$
$= 125x^3 – 525x^2y + 735xy^2 – 343y^3 + 125x^3 + 525x^2y + 735xy^2 + 343y^3$
$= 250x^3 + 1470xy^2$
$\therefore (5x – 7y)^3 + (5x + 7y)^3 = 250x^3 + 1470xy^2$

PRACTICE SET 5.4 PAGE NO: 28

1. Expand:
(1) $(2p + q + 5)^2$
(2) $(m + 2n + 3r)^2$
(3) $(3x + 4y - 5p)^2$
(4) $(7m - 3n - 4k)^2$
Solution:
(1) $(2p + q + 5)^2$
Let us expand the given expression:
$(2p + q + 5)^2 = (2p)^2 +(q)^2 +(5)^2 + [2 \times(2p)\times(q)] + [2 \times(q)\times(5)] + [2 \times(2p)\times(5)]$
By using the formula,
$(a + b +c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ac$
Here, a = 2p, b = q, c = 5
Now, substitute the value we get
$= 4p^2 + q^2 + 25 + [4pq] + [10q] + [20p]$
$= 4p^2 + q^2 + 25 + 4pq + 10q + 20p$
$\therefore (2p + q + 5)^2 = 4p^2 + q^2 + 25 + 4pq + 10q + 20p$

(2) $(m + 2n + 3r)^2$
Let us expand the given expression:
$(m + 2n + 3r)^2 = (m)^2 +(2n)^2 +(3r)^2 + [2 \times(m)\times (2n)] + [2 \times(2n)\times(3r)] + [2 \times(m)\times(3r)]$
By using the formula,
$(a + b +c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ac$
Here, a = m, b = 2n, c = 3r
Now, substitute the value we get
$= m^2 + 4n^2 + 9r^2 + [4mn] + [12nr] + [6mr]$
$= m^2 + 4n^2 + 9r^2 + 4mn + 12nr + 6mr$
$\therefore (m + 2n + 3r)^2 = m^2 + 4n^2 + 9r^2 + 4mn + 12nr + 6mr$

(3) $(3x + 4y - 5p)^2$
Let us expand the given expression:
$(3x + 4y - 5p)^2 = (3x)^2 +(4y)^2 +(-5p)^2 + [2 \times(3x) \times(4y)] + [2 \times(4y)\times(- 5p)] + [2 \times(3x)\times(-5p)]$
By using the formula,
$(a + b +c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ac$
Here, a = 3x, b = 4y, c = 5p
Now, substitute the value we get
$= 9x^2 + 16y^2 + 25p^2 + [24xy] + [- 40yp] + [- 30xp]$

$= 9x^2 + 16y^2 + 25p^2 + 24xy – 40yp – 30xp$

$\therefore (3x + 4y – 5p)^2 = 9x^2 + 16y^2 + 25p^2 + 24xy – 40yp – 30xp$

(4) $(7m – 3n – 4k)^2$

Let us expand the given expression:

$(7m – 3n – 4k)^2 = (7m)^2 +(- 3n)^2 +(- 4k)^2 + [2 \times(7m)\times(-3n)] + [2 \times(-3n)\times(-4k)] + [2 \times (7m)\times(-4k)]$

By using the formula,

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

Here, a = 7m, b = -3n, c = -4k

Now, substitute the value we get

$= 49m^2 + 9n^2 + 16k^2 + [– 42mn] + [24nk] + [– 56mk]$

$= 49m^2 + 9n^2 + 16k^2 – 42mn + 24nk – 56mk$

$\therefore (7m – 3n – 4k)^2 = 49m^2 + 9n^2 + 16k^2 – 42mn + 24nk – 56mk$

2. Simplify:

(1) $(x – 2y + 3)^2 + (x + 2y – 3)^2$

(2) $(3k – 4r – 2m)^2 - (3k + 4r – 2m)^2$

(3) $(7a – 6b + 5c)^2 + (7a + 6b – 5c)^2$

Solution:

(1) $(x – 2y + 3)^2 + (x + 2y – 3)^2$

Let us expand the given expression:

$(x – 2y + 3)^2 + (x + 2y – 3)^2 = [(x)^2 +(-2y)^2 + (3)^2 +\{2 \times(x)\times(- 2y)\} +\{2 \times(- 2y)\times (3)\} + \{2 \times(x)\times(3)\}] + [(x)^2 + (2y)^2 + (-3)^2 + \{2\times(x)\times(2y)\} +\{2\times(2y)\times(- 3)\} +\{2 \times(x)\times(-3)\}]$

By using the formula,

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

$= [x^2 + 4y^2 + 9 + \{– 4xy\} + \{– 12y\} + \{6x\}] + [x^2 + 4y^2 + 9 + \{4xy\} + \{– 12y\} + \{– 6x\}]$

$= [x^2 + 4y^2 + 9 – 4xy – 12y + 6x] + [x^2 + 4y^2 + 9 + 4xy – 12y – 6x]$

$= x^2 + 4y^2 + 9 – 4xy – 12y + 6x + x^2 + 4y^2 + 9 + 4xy – 12y – 6x$

$= 2x^2 + 8y^2 + 18 – 24y$

$\therefore (x – 2y + 3)^2 + (x + 2y – 3)^2 = 2x^2 + 8y^2 + 18 – 24y$

(2) $(3k – 4r – 2m)^2 - (3k + 4r – 2m)^2$

Let us expand the given expression:

$(3k – 4r – 2m)^2 - (3k + 4r – 2m)^2 = [(3k)^2 +(- 4r)^2 + (- 2m)^2 +\{2 \times(3k)\times(- 4r)\} + \{2 \times(- 4r)\times (-2m)\} +\{2 \times(3k)\times(- 2m)\}] - [(3k)^2 + (4r)^2 +(- 2m)^2 +\{2 \times(3k)\times(4r)\} +\{2 \times (4r)\times(-$

2m)} +{2 ×(3k)×(-2m)}]

By using the formula,

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

$= [9k^2 + 16r^2 + 4m^2 + \{-24kr\} + \{16rm\} + \{-12km\}] - [9k^2 + 16r^2 + 4m^2 + \{24kr\} + \{-16rm\} + \{-12km\}]$

$= [9k^2 + 16r^2 + 4m^2 - 24kr + 16rm - 12km] - [9k^2 + 16r^2 + 4m^2 + 24kr - 16rm - 12km]$

$= 9k^2 + 16r^2 + 4m^2 - 24kr + 16rm - 12km - 9k^2 - 16r^2 - 4m^2 - 24kr + 16rm + 12km$

$= -48kr + 32rm$

$= 32rm - 48kr$

$\therefore (3k - 4r - 2m)^2 - (3k + 4r - 2m)^2 = 32rm - 48kr$

(3) $(7a - 6b + 5c)^2 + (7a + 6b - 5c)^2$

Let us expand the given expression:

$(7a - 6b + 5c)^2 + (7a + 6b - 5c)^2 = [(7a)^2 + (-6b)^2 + (5c)^2 + \{2 \times (7a) \times (-6b)\} + \{2 \times (-6b) \times (5c)\} + \{2 \times (7a) \times (5c)\}] + [(7a)^2 + (6b)^2 + (-5c)^2 + \{2 \times (7a) \times (6b)\} + \{2 \times (6b) \times (-5c)\} + \{2 \times (7a) \times (-5c)\}]$

By using the formula,

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

$= [49a^2 + 36b^2 + 25c^2 + \{-84ab\} + \{-60bc\} + \{70ac\}] + [49a^2 + 36b^2 + 25c^2 + \{84ab\} + \{-60bc\} + \{-70ac\}]$

$= [49a^2 + 36b^2 + 25c^2 - 84ab - 60bc + 70ac] + [49a^2 + 36b^2 + 25c^2 + 84ab - 60bc - 70ac]$

$= 49a^2 + 36b^2 + 25c^2 - 84ab - 60bc + 70ac + 49a^2 + 36b^2 + 25c^2 + 84ab - 60bc - 70ac$

$= 98a^2 + 72b^2 + 50c^2 - 120bc$

$\therefore (7a - 6b + 5c)^2 + (7a + 6b - 5c)^2 = 98a^2 + 72b^2 + 50c^2 - 120bc$