Factorisation Of Algebraic Expressions

Practice set 6.1

Q. 1. A. Factorise.

$x^2 + 9x + 18$

Answer : On comparing with standard quadratic equation that is $ax^2 + bx + c$

We have,

a = 1, b = 9 and c = 18

Now here,

Product a × c = 1 × 18 = 18

Factors of 18; 2 × 9 and 6 × 3

Sum should be b = + 9

From above factors (+ 6x + 3x)

Will give + 9x sum

Therefore + 9x is replaced by (+ 6x + 3x)

Now above eq. becomes

$x^2 + 6x + 3x + 18$

⇒ $x(x + 6) + 3(x + 6)$; taking x common

⇒ (x + 3)(x + 6)

Q. 1. B. Factorise.

$x^2 – 10x + 9$

Answer : On comparing with standard quadratic equation that is $ax^2 + bx + c$

We have, 0

a = 1, b = – 10 and c = 9

Now here,

Product a × c = 1 × 9 = 9

Factors of 9; 1 × 9 and 3 × 3

Sum should be b = – 10

From above factors (– 1x – 9x)

Will give – 10x sum

Therefore – 10x is replaced by (– 1x – 9x)

Now above eq. becomes

$x^2 - x - 9x + 9$

$x(x-1) - 9(x-1)$; taking x and – 9 common

(x – 1)(x – 9)

Q. 1. C. Factorise.

y^2 + 24y + 144

Answer : On comparing with standard quadratic equation that is $ax^2 + bx + c$

We have,

a = 1, b = + 24 and c = + 144

Now here,

Product a × c = 1 × 144 = 144

Factors of 144; 12 × 12; 24 × 6;144 × 1;

48 × 3; 72 × 2

Sum should be b = 24

From above factors (12y + 12y)

Will give + 24y sum

therefore + 24 is replaced by (+ 12y + 12y)

Now above eq. becomes

$y^2 + 12y + 12y + 144$

$y(y + 12) + 12(y + 12)$

; taking y and + 12 common

(y + 1)(y + 12)

Note: Try to find all factors of “c”, then choose from it that combination whose sum or difference give “b”

Q. 1. D. Factorise.

$5y^2 + 5y – 10$

Answer : On comparing with standard quadratic equation that is $ax^2 + bx + c$

we have,

a = 5, b = + 5 and c = – 10

Now here,

Product a × c = 5 × – 10 = – 50

Factors of 50; 5 × 10; 25 × 2;50 × 1

Sum should be b = + 5

From above factors (– 5y + 10y)

Will give + 5y sum

Therefore + 5y is replaced by (– 5y + 10y)

Now above eq. becomes

$5y^2 – 5y + 10y – 10$

$5y(y-1)\ +\ 10(y-1)$; taking 5y and + 10 common

(y – 1)(5y + 10)

5(y – 1)(y + 2); 5 common

Note: if given equation’s constant a, b, c have common multiple take it out and then factorize.

Q. 1. E. Factorise.

p^2 – 2p – 35

Answer : On comparing with standard quadratic equation that is $ax^2\ +\ bx\ +\ c$

We have,

a = 1, b = – 2 and c = – 35

Now here,

Product a × c = 1 × – 35 = – 35

Factors of 35; 1 × 35 and 7 × 5

Sum should be b = – 2

From above factors (– 7p + 5p)

Will give – 2p sum

Therefore – 2p is replaced by (– 7p + 5p)

Now above eq. becomes

$p^2-7p\ +\ 5p-35$

$(p-7)\ +\ 5(p-7)$; taking p and + 5 common

(p – 7)(p + 5)

Q. 1. F. Factorise.

p^2 – 7p – 44

Answer : On comparing with standard quadratic equation that is $ax^2 + bx + c$

We have,

a = 1, b = – 7 and c = – 44

Now here,

Product a × c = 1 × – 44 = – 44

Factors of 44; 1 × 44; 2 × 22 ; 4 × 11

Sum should be b = – 7

From above factors (– 11p + 4p)

Will give – 7p sum

Therefore – 7p is replaced by (– 11p + 4p)

Now above eq. becomes

$p^2 - 11p + 4p - 44$

$p(p - 11) + 4(p - 11)$; taking p and + 4 common

(p + 4)(p – 11)

Q. 1. G. Factorise.

m^2 – 23m + 120

Answer : On comparing with standard quadratic equation that is

a$x^2 + bx + c$

We have,

a = 1, b = – 23 and c = + 120

Now here,

Product a × c = 1 × + 120 = + 120

Factors of + 120; 1 × 120; 2 × 60; 4 × 30; 8 × 15; 24 × 5; 40 × 3

Sum should be b = – 23

From above factors (– 15m – 8m)

Will give – 23m sum

Therefore – 23m is replaced by (– 15m – 8m)

Now above eq. becomes

$m^2 - 15m - 8m + 120$

$(m - 15) - 8(m - 15)$; taking m and – 8 common

(m – 15)(m – 8)

Q. 1. H. Factorise.

m^2 – 25m + 100

Answer : On comparing with standard quadratic equation that is $ax^2 + bx + c$

We have,

a = 1, b = – 25 and c = 100

Now here,

Product a × c = 1 × 100 = 100

Factors of 100; 1 × 100; 2 × 50; 4 × 25 ; 20 × 5

Sum should be b = – 25

From above factors (– 20m – 5m)

Will give – 25m sum

Therefore – 25m is replaced by (– 20m – 5m)

Now above eq. becomes

$m^2 - 20m - 5m + 100$

$m(m - 20) - 5(m - 20)$; taking m and – 5 common (m – 5)(m – 20)

Q. 1. I. Factorise.

$3x^2$ + 14x + 15

Answer : On comparing with standard quadratic equation that is $ax^2 + bx + c$

We have,

a = 3, b = + 14 and c = + 15

Now here,

Product a × c = 3 × 15 = + 45

Factors of 45; 1 × 45; 5 × 9;15 × 3

Sum should be b = + 14

From above factors (+ 9x + 5x)

Will give + 14x sum

Therefore + 14x is replaced by (+ 9x + 5x)

Now above eq. becomes

$x^2 + 9x + 5x + 15$

$(x + 9) + 5(x + 3)$; taking x and + 5 common

(x + 9)(x + 3)

Q. 1. J. Factorise.

$2x^2$ + x – 45

Answer : On comparing with standard quadratic equation that is $ax^2 + bx + c$

We have,

a = 2, b = 1 and c = – 45

Now here,

Product a × c = 2 × – 45 = 90

Factors of 90; 1 × 90; 2 × 45; 10 × 9; 30 × 3

Sum should be b = 1

From above factors (+ 10x – 9x)

Will give + x sum

Therefore + x is replaced by (+ 10x – 9x)

Now above eq. becomes

$2x^2 + 10x - 9x - 45$

$2x(x + 5) - 9(x + 5)$; taking 2x and – 9 common

(x + 5)(2x – 9)

Q. 1. K. Factorise.

$20x^2 - 26x + 8$

Answer : On comparing with standard quadratic equation that is $ax^2 + bx + c$

We have,

a = 20, b = – 26 and c = 8

Now here,

Product a × c = 20 × 8 = 160

Factors of 160; 2 × 80; 4 × 40; 8 × 20; 16 × 10; 32 × 5

Sum should be b = – 26x

From above factors (– 16x – 10x)

Will give – 26x sum

Therefore – 26x is replaced by (– 16x – 10x)

Now above eq. becomes

$20x^2 - 16x - 10x + 8$

$4x(5x - 4) - 2(5x - 4)$; taking 4x and – 2 common

2(2x – 1)(5x – 4)

Q. 1. L. Factorise.

$44x^2 - x - 3$

Answer : On comparing with standard quadratic equation that is $ax^2 + bx + c$

We have,

a = 44, b = – 1 and c = – 3

Now here,

Product a × c = – 132 = 44 × – 3

Factors of 132; 1 × 132; 2 × 66; 4 × 33;12 × 11

Sum should be b = – 1

From above factors (– 12x – 11x)

Will give – 1x sum

Therefore – 1x is replaced by (– 12x – 11x)

Now above eq. becomes

$44x^2 - 12x - 11x - 3$

$4x(11x - 3) - 1(11x + 3)$; taking x and – 9 common

(11x – 3)(4x – 1)

Practice set 6.2

Q. 1. A. Factorise.

$x^3 + 64y^3$

Answer : We know that

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

$$a^3 + b^3 = (a + b)^3 - 3a^2b - 3ab^2 \text{ - - - - - (i)}$$

Here a = 1x, b = 4y; putting values in eq.i

$$x^3 + (4y)^3 = (x + 4y)^3 - 3x^2(4y) - 3x(4y)^2$$

$$x^3 + (4y)^3 = (x + 4y)^3 - 3x^2(4y) - 3x(4y)^2$$

$$\Rightarrow x^3 + (4y)^3 = (x + 4y)^3 - 12xy(x + 4y)$$

$$\Rightarrow x^3 + (4y)^3 = (x + 4y)\{(x + 4y)^2 - 12xy$$

$$x^3 + (4y)^3 = (x + 4y)\{x^2 + 16y^2 + 8xy - 12xy$$

$$x^3 + (4y)^3 = (x + 4y)\{x^2 + 16y^2 - 4xy\}$$

Note: Must memorize cubes upto 12

Q. 1. B. Factorise.

$125p^3 + q^3$

Answer : We know that

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

$$a^3 + b^3 = (a + b)^3 - 3a^2b - 3ab^2 \text{ - - - - - (i)}$$

Here a = 5p, b = q; putting values in eq.i

$$(5p)^3 + q^3 = (5p + q)^3 - 3(5p)^2q - 3(5p)q^2$$

$$\Rightarrow (5p)^3 + q^3 = (5p + q)^3 - 15pq(5p + q)$$

$$\Rightarrow (5p)^3 + q^3 = (5p + q)\{(5p + q)^2 - 15pq$$

$$(5p)^3 + q^3 = (5p + q)\{25p^2 + q^2 + 10pq - 15pq$$

$(5p)^3 + q^3 = (5p + q)\{25p^2 + q^2 - 5pq\}$

Note: Must memorize cubes upto 12

Q. 1. C. Factorise.

125k³ + 27m³

Answer : We know that

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

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

Here a = 5k, b = 3m; putting values in eq.i

$\Rightarrow (5k)^3 + (3m)^3 = (5k + 3m)^3 - 3(5k)^2(3m) - 3(5k)(3m)^2$

$\Rightarrow (5k)^3 + (3m)^3 = (5k + 3m)^3 - 45km(5k + 3m)$

$\Rightarrow (5p)^3 + (3m)^3 = (5k + 3m)\{(5k + 3m)^2 - 45km\}$

$(5k)^3 + (3m)^3 = (5k + 3m)\{25k^2 + 9m^2 + 30km - 45km\}$

$(5k)^3 + (3m)^3 = (5k + 3m)\{25k^2 + 9m^2 - 15km\}$

Note: Must memorize cubes upto 12

Q. 1. D. Factorise.

2l³ + 432m³

Answer : We know that

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

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

Taking 2 common, we get

$2(l^3 + 216m^3)$

Here a = l, b = 6m; putting values in eq.i

$\Rightarrow 2 \times [l^3 + (6m)^3] = 2[(l + 6m)^3 - 3l^2(6m) - 3l(6m)^2]$

$\Rightarrow 2 \times [l^3 + (6m)^3] = 2[(l + 6m)^3 - 18lm(l + 6m)]$

$\Rightarrow 2 \times [l^3 + (6m)^3] = 2[(l + 6m)\{(l + 6m)^2 - 18lm\}]$

$2 \times [l^3 + (6m)^3] = 2(l + 6m)\{l^2 + 36m^2 + 12lm - 18lm\}$

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

$2 \times [l^3 + (6m)^3] = 2(l + 6m)\{l^2 + 36m^2 - 6lm\}$

Note: Must memorize cubes upto 12

Q. 1. E. Factorise.

$24a^3 + 81b^3$

Answer : We know that

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

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

Taking 3 as common, we get

$3 \times [8a^3 + 27b^3]$; solving only bracket term first,

Here a = 2a, b = 3b; putting values in eq.i

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

$(2a)^3 + (3b)^3 = (2a + 3b)^3 - 18ab(2a + 3b)$

$(2a)^3 + (3b)^3 = (2a + 3b)\{(2a + 3b)^2 - 18ab\}$

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

$(2a)^3 + (3b)^3 = (2a + 3b)\{4a^2 + 9b^2 + 12ab - 18ab\}$

$(2a)^3 + (3b)^3 = (2a + 3b)\{4a^2 + 9b^2 - 6ab\}$

Ans: - 3$(2a + 3b)\{4a^2 + 9b^2 - 6ab\}$

Note: Must memorize cubes upto 12

Q. 1. F. Factorise.

$$y^3 + \frac{1}{8y^3}$$

Answer : We know that

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

$$a^3 + b^3 = (a + b)^3 - 3a^2b - 3ab^2 \text{ - - - - - (i)}$$

Here a = y, b = $\frac{1}{2y}$; putting values in eq.i

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

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

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

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

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

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

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

Note: Must memorize cubes upto 12

Q. 1. G. Factorise.

$$a^3 + \frac{8}{a^3}$$

Answer : We know that

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

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

Here a = a, b = $\frac{2}{a}$; putting values in eq.i

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

$$a^3 + \left(\frac{2}{a}\right)^3 = \left(a + \frac{2}{a}\right)^3 - \frac{6a}{1} - \frac{12}{a}$$

$$a^3 + \left(\frac{2}{a}\right)^3 = \left(a + \frac{2}{a}\right)^3 - 6\left(a + \frac{2}{a}\right)$$

$$a^3 + \left(\frac{2}{a}\right)^3 = \left(a + \frac{2}{a}\right)\left\{\left(a + \frac{2}{a}\right)^2 - 6\right\}$$

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

$$a^3 + \left(\frac{2}{a}\right)^3 = \left(a + \frac{2}{a}\right)\left\{a^2 + \frac{4}{a^2} + 4 - 6\right\}$$

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

Note: Must memorize cubes upto 12

Q. 1. H. Factorise.

$$1 + \frac{q^3}{125}$$

Answer : We know that

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

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

Here a = 1, b = $\frac{q}{5}$; putting values in eq.i

$1^3 + (\frac{q}{5})^3 = \left(1 + \frac{q}{5}\right)^3 - 3(\frac{q}{5}) - 3(\frac{q}{5})^2$

$1 + (\frac{q}{5})^3 = \left(1 + \frac{q}{5}\right)^3 - \frac{3q}{5} - \frac{3q^2}{25}$

$1 + (\frac{q}{5})^3 = \left(1 + \frac{q}{5}\right)^3 - \frac{3q}{5}\left(1 + \frac{q}{5}\right)$

$1 + (\frac{q}{5})^3 = \left(1 + \frac{q}{5}\right)\{\left(1 + \frac{q}{5}\right)^2 - \frac{3q}{5}\}$

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

$1 + (\frac{q}{5})^3 = \left(1 + \frac{q}{5}\right)\{1 + \frac{q^2}{25} + \frac{2q}{5} - \frac{3q}{5}$

$1 + (\frac{q}{5})^3 = \left(1 + \frac{q}{5}\right)\{1 + \frac{q^2}{25} - \frac{q}{5}\}$

Note: Must memorize cubes upto 12

Practice set 6.3

Q. 1. A. Factorise :

$y^3 - 27$

Answer : We know that

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

On comparison with above, we get

a = y, b = 3

$$y^3 - 27 = (y - 3)(y^2 + 3y + 9)$$

Note: Must memorize cubes upto 12

Q. 1. B. Factorise :

$x^3 - 64y^3$

Answer : We know that

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

On comparison with above, we get

a = y, b = 3

$$x^3 - 64y^3 = (x - 4)(x^2 + 4x + y^2)$$

Note: Must memorize cubes upto 12

Q. 1. C. Factorise :

$27m^3 - 216n^3$

Answer : We know that

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

On comparison with above, we get

a = 3m, b = 6n

$$27m^3 - 216n^3 = (3m - 6n)(9m^2 + 18mn + 36n^2)$$

Note: Must memorize cubes upto 12

Q. 1. D. Factorise :

$125y^3 - 1$

Answer : We know that

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

On comparison with above, we get

a = 5y, b = 1

$$125y^3 - 1 = (5y - 1)(25y^2 + 5y + 1)$$

Note: Must memorize cubes upto 12

Q. 1. E. Factorise :

$8p^3 – 27/p^3$

Answer : We know that

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

On comparison with above, we get

a = 2p, b = 3/p

$$8p^3 - 27/p^3 = (2p - 3/p)(4p^2 + 6 + \frac{9}{p^2})$$

Note: Must memorize cubes upto 12

Q. 1. F. Factorise :

$343a^3 – 512b^3$

Answer : We know that

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

On comparison with above, we get

a = 7a, b = 8b

$$343a^3 - 512b^3 = (7a - 8b)(49a^2 + 56ab + 64b^2)$$

Note: Must memorize cubes upto 12

Q. 1. G. Factorise :

$64x^2 – 729y^2$

Answer : We know that

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

On comparison with above, we get

a = 4x, b = 9y

$$64x^3 - 729y^3 = (4x - 9y)(16x^2 + 36xy + 81y^2)$$

Note: Must memorize cubes upto 12

Q. 1. H. Factorise :

16 a^3 – 128/b^3

Answer : We know that

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

Taking 2 common from above given equation;

$$2(8a^3 - \frac{64}{b^3})$$

On comparison with above, we get

a = 2a, b = 4/b

$$8a^3 - \frac{64}{b^3} = 2(2a - \frac{4}{b})(4a^2 + \frac{8a}{b} + \frac{16}{b^2})$$

$$8a^3 - \frac{64}{b^3} = 16(a - \frac{2}{b})(a^2 + \frac{2\,a}{b} + \frac{4}{b^2}$$

Note: Must memorize cubes upto 12

Q. 2. A. Simplify :

$(x + y)^3 – (x – y)^3$

Answer : We know that

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

On comparing with given equation we get, a = (3a + 5b), b = (3a – 5b)

$$(x+y)^3 - (x-y)^3 = (x+y-x+y)\{(x+y)^2 + (x+y)(x-y) + (x-y)^2\}$$

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

$$(x+y)^3 - (x-y)^3 = (2y)\{x^2 + 2xy + y^2 + x^2 - xy + xy - y^2 + x^2 - 2xy + y^2\}$$

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

$$(x+y)^3 - (x-y)^3 = 6x^2y + 2y^3$$

Q. 2. B. Simplify :

$(3a + 5b)^3 - (3a - 5b)^3$

Answer : We know that

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

On comparing with given equation we get,

a = (3a + 5b), b = (3a – 5b)

$$\begin{aligned}(3a+5b)^3 - (3a-5b)^3 \\ &= (3a+5b-3a+5b)\{(3a+5b)^2 + (3a+5b)(3a-5b) \\ &+ (3a-5b)^2\}\end{aligned}$$

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

$$\begin{aligned}(3a+5b)^3 - (3a-5b)^3 \\ &= (10b)\{9a^2 + 30ab + 25b^2 + 9a^2 - 15ab + 15ab25b^2 + 9a^2 - 30ab \\ &+ 25b^2\}\end{aligned}$$

$$(3a+5b)^3 - (3a-5b)^3 = (10b)(27a^2 + 25b^2)$$

$$(3a+5b)^3 - (3a-5b)^3 = 270a^2b + 250b^3$$

Q. 2. C. Simplify :

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

Answer : We know that

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

On comparing with given equation we get

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

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

Q. 2. D. Simplify :

$p^3 - (p + 1)^3$

Answer : We know that

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

On comparing with given equation we get

a = p, b = 1

$$p^3 - (p + 1)^3 = p^3 - (p^3 + 3p^2 + 3p + 1)$$

$$p^3 - (p + 1)^3 = -3p^2 - 3p - 1$$

Q. 2. E. Simplify :

$(3xy - 2ab)^3 - (3xy + 2ab)^3$

Answer : We know that

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

On comparing with given equation we get,

a = (3xy – 2ab), b = (3xy + 2ab)

$$(3xy - 2ab)^3 - (3xy + 2ab)^3 = (3xy - 2ab - 3xy - 2ab)$$

$$\{(3xy - 2ab)^2 + (3xy - 2ab)(3xy + 2ab) + (3xy + 2ab)^2\}$$

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

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

$(3xy - 2ab)^3 - (3xy + 2ab)^3$
$= (-4ab)\{9x^2y^2 - 12xyab + 4a^2b^2 + 9x^2y^2 + 6xyab - 6xyab - 4a^2b^2 + 9x^2y^2 + 12xyab + 4a^2b^2\}$

$(3xy - 2ab)^3 - (3xy + 2ab)^3 = (-4ab)(27a^2b^2 + 4a^2b^2)$

$(3xy - 2ab)^3 - (3xy + 2ab)^3 = -108a^3b^3 - 16a^3b^3$

Practice set 6.4

Q. 1. A. Simplify:

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

Answer : We know that

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

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

Applying these equation in above expression, we get

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

= 1

Note: - Try to factorize that term which help in reducing expression.

Q. 1. B. Simplify:

$$\frac{a^2 + 10a + 21}{a^2 + 6a - 7} \times \frac{a^2 - 1}{a + 3}$$

Answer : We know that

$a^2 - 1 = (a - 1)(a + 1)$ and factorization of numerator and denominator

$$= \frac{a^2 + 7a + 3a + 21}{a^2 + 7a - a - 7} \times \frac{(a-1)(a+1)}{a+3}$$

$$= \frac{a(a+7) + 3(a+7)}{a(a+7) - 1(a+7)} \times \frac{(a-1)(a+1)}{a+3}$$

$$= \frac{(a+3)(a+7)}{(a+7)(a-1)} \times \frac{(a-1)(a+1)}{a+3}$$

= a + 1

Note: - Try to factorize that term which help in reducing expression.

Q. 1. C. Simplify:

$$\frac{8x^3 - 27y^3}{4x^2 - 9y^2}$$

Answer : We know that

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

$$= \frac{(2x-3y)(4x^2 + 6xy + 9y^2)}{(2x-3y)(2x+3y)}$$

$$= \frac{4x^2 + 6xy + 9y^2}{2x + 3y}$$

Note: - Try to factorize that term which help in reducing expression.

Q. 1. D. Simplify:

$$\frac{x^2 - 5x - 24}{(x+3)(x+8)} \times \frac{x^2 - 64}{(x-8)^2}$$

Answer : Applying $a^2 - b^2 = (a+b)(a-b)$ and factorization, we get

$$= \frac{x^2 - 8x + 3x - 24}{(x+3)(x+8)} \times \frac{(x-8)(x+8)}{(x-8)^2}$$

$$= \frac{x(x-8) + 3(x-8)}{(x+3)(x+8)} \times \frac{(x-8)(x+8)}{(x+8)^2}$$

= 1

Note: - Try to factorize that term which help in reducing expression.

Q. 1. E. Simplify:

$$\frac{3x^2 - x - 2}{x^2 - 7x + 12} \div \frac{3x^2 - 7x - 6}{x^2 - 4}$$

Answer : Applying

$a^2 - b^2 = (a+b)(a-b)$ and factorization, we get, also changing $\div$ into $\times$ by reversing N and D

$$= \frac{3x^2 - 3x + 2x - 2}{x^2 - 4x - 3x + 12} \times \frac{(x+4)(x-4)}{3x^2 - 9x + 2x - 6}$$

$$= \frac{3x(x-1) + 2(x-1)}{x(x-4) - 3(x-4)} \times \frac{(x+4)(x-4)}{3x(x-3) + 2(x-3)}$$

$$= \frac{(3x+2)(x-1)}{(x-3)(x-4)} \times \frac{(x+4)(x-4)}{(x-3)(3x+2)}$$

$$= \frac{(x-1)(x+4)}{(x-3)^2}$$

Note: - Try to factorize that term which help in reducing expression.

Q. 1. F. Simplify:

$$\frac{4x^2 - 11x + 6}{16x^2 - 9}$$

Answer : Applying

$a^2 - b^2 = (a+b)(a-b)$ and factorization, we get

$$= \frac{4x^2 - 8x - 3x + 6}{(4x - 3)(4x + 3)}$$

$$= \frac{4x(x - 2) - 3(x - 2)}{(4x - 3)(4x + 3)}$$

$$= \frac{(4x - 3)(x - 2)}{(4x - 3)(4x + 3)}$$

= x – 2

Note: - Try to factorize that term which help in reducing expression.

Q. 1. G. Simplify:

$$\frac{a^3 - 27}{5a^2 - 16a + 3} \div \frac{a^2 + 3a + 9}{25a^2 - 1}$$

Answer : Applying

$a^2 - b^2 = (a + b)(a - b)$, factorization and $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$ we get, also changing $\div$ into $\times$ by reversing N and D

$$= \frac{(a - 3)(a^2 + 3a + 9)}{5a^2 - 15a - a + 3} \times \frac{(5a + 1)(5a - 1)}{a^2 + 3a + 9}$$

$$= \frac{(a - 3)(a^2 + 3a + 9)}{5a(a - 3) - 1(a - 1)} \times \frac{(5a + 1)(5a - 1)}{a^2 + 3a + 9}$$

$$= \frac{(a - 3)(a^2 + 3a + 9)}{(5a - 1)(a - 3)} \times \frac{(5a + 1)(5a - 1)}{a^2 + 3a + 9}$$

= 5a + 1

Note: - Try to factorize that term which help in reducing expression.

Q. 1. H. Simplify:

$$\frac{1 - 2x + x^2}{1 - x^3} \times \frac{1 + x + x^2}{1 + x}$$

Answer : Applying

$a^3 - b^3 = (a-b)(a^2 + ab + b^2), (a-b)^2 = a^2 - 2ab + b^2$ and factorization, we get

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

$$= \frac{1-x}{1+x}$$

Note: - Try to factorize that term which help in reducing expression.