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CLASS 9th

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Maths:-

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EXERCISE

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NO:- 4.2

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

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

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

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

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omitted
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Class 9th;

Maths

EXERCISE NO: 4.2

Basic Concept:

Formula:

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

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

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

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

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

Q. NO: 1

Solve:

$$x^3 - 125$$

$$= (x)^3 - (5)^3$$

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

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

$$= (x-5) [x^2 + 5x + 25]$$

$$= (x-5) (x^2 + 5x + 25)$$

5		125
5		25
5		5
		1

Q No: 2

Solve:

$$8x^3 + 1$$

$$= (2x)^3 + (1)^3$$

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

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

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

$$= (2x+1) (4x^2 - 2x + 1)$$

Q No: 3

Solve:

$$3p^3q^3 - 81x^3$$

$$= 3[p^3q^3 - 27x^3]$$

$$= 3 \cdot [(pq)^3 - (3x)^3]$$

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

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

$$= 3(pq - 3x) [p^2q^2 + 3pqx + 9x^2]$$

$$= 3(pq - 3x)(p^2q^2 + 3pqx + 9x^2)$$

3	27
3	9
3	3
	1

Q No: 4

Solve:

$$27 + 512x^3$$

$$= (3)^3 + (8x)^3$$

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

$$= (3+8x) [(3)^2 - (3)(8x) + (8)^2]$$

$$= (3+8x) [9 - 24x + 64]$$

$$= (3+8x) (9 - 24x + 64)$$

Q NO: 5

Solve:

$$t^6 - 64$$

$$= (t^3)^2 - (8)^2$$

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

$$= (t^3 + 8) (t^3 - 8)$$

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

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

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

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

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

QNO:6

Solve:

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

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

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

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

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

QNO:7

Solve:

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

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

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

$$= (y-x) [(2)^2 + (x)^2 - 2(2)(x) - (2y-4-xy+2x) + (y)^2 + (2)^2 - 2(y)(2)]$$

$$= (y-x) [4 + x^2 - 4x - 2y + 4 + xy - 2x + y^2 + 4 - 4y]$$

$$= (y-x) [4 + 4 + 4 + x^2 - 4x - 2x - 2y - 4y + xy + y^2]$$

$$= (y-x) [12 + x^2 - 6x - 6y + y^2 + xy]$$

$$= (y-x) (x^2 + y^2 - 6x - 6y + xy + 12)$$

Q No: 8

Solve:

$$64(x+y)^3 - z^3$$

$$(4 \times 4 \times 4)(x+y)^3 - z^3$$

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

$$[4(x+y)]^3 - (z)^3$$

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

$$= [4(x+y) - z] \left[(4(x+y))^2 + 4(x+y)(z) + (z)^2 \right]$$

$$= [4x + 4y - z] \left[(4)^2(x+y)^2 + 4z(x+y) + z^2 \right]$$

$$= (4x + 4y - z) \left[16(x^2 + y^2 + 2xy) + 4xz + 4y^2 + z^2 \right]$$

$$= (4x + 4y - z) \left[16x^2 + 16y^2 + 32xy + 4xz + 4yz + z^2 \right]$$

$$= (4x + 4y - z) \left(16x^2 + 16y^2 + 32xy + 4xz + 4yz + z^2 \right)$$

Q NO: 9

Solve:-

$$27p^3 + 144pq^2 - 108p^2q - 64q^3$$

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

$$= 27p^3 - 108p^2q + 144pq - 64q^3$$

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

$$= (3p - 4q)^3$$

Q NO: 10

Solve:-

$$8p^3 + q^3 + 12p^2q + 6pq^2$$

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

$$= 8p^3 + q^3 + 12p^2q + 6pq^2$$

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

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

Q NO: 11

Solve

$$125x^3 - y^3 - 75x^2y + 15xy^2$$

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

$$= 125x^3 - y^3 - 75x^2y + 15xy^2$$

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

$$= (5x - y)^3$$

Q No: 12

Solve:

$$p^3 - 9p^2q + 27pq^2 - 27q^3$$

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

$$= p^3 - 27q^3 - 9p^2q + 27pq^2$$

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

$$= (p - 3q)^3$$

_ _ | _ _ | _ 6A

Q NO: -13

Solve:

$$(2x^2 - 3x + 6)(2x^2 - 3x) - 55$$

Let

$$2x^2 - 3x = a$$

$$= (a + 6)(a) - 55$$

$$= a^2 + 6a - 55$$

factorization:

$$= a^2 + 11a - 5a - 55$$

$$= a(a + 11) - 5(a + 11)$$

$$= (a + 11)(a - 5)$$

Put value of a

in above equation

$$= (2x^2 - 3x + 11)(2x^2 - 3x - 5)$$

$$= (2x^2 - 3x + 11)[2x^2 + 2x - 5x - 5]$$

$$= (2x^2 - 3x + 11)[2x(x + 1) - 5(x + 1)]$$

$$= (2x^2 - 3x + 11)[(x + 1)(2x - 5)]$$

$$= (2x^2 - 3x + 11)(x + 1)(2x - 5)$$

Q. NO: 14

Solve:-

$$(y^2 + 2y - 3)(y^2 + 2y + 11) + 48$$

Let

$$y^2 + 2y = a$$

$$= (a - 3)(a + 11) + 48$$

$$= a(a + 11) - 3(a + 11) + 48$$

$$= a^2 + 11a - 3a - 33 + 48$$

$$= a^2 + 8a + 15$$

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

$$= a(a + 3) + 5(a + 3)$$

$$= (a + 3)(a + 5)$$

put value of a in

above equation.

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

Q No: 15

Solve:

$$\begin{aligned} & y(y-1)(y-3)(y-4) + 2 \\ &= y(y-4)(y-1)(y-3) + 2 \\ &= (y^2 - 4y)(y^2 - 3y - y + 3) + 2 \\ &= (y^2 - 4y)(y^2 - 4y + 3) + 2 \end{aligned}$$

Let

$$\begin{aligned} & y^2 - 4y = a \\ &= (a)(a+3) + 2 \\ &= a^2 + 3a + 2 \\ &= a^2 + 2a + 1 + a + 2 \\ &= a(a+2) + 1(a+2) \\ &= (a+2)(a+1) \end{aligned}$$

put value of a in above equ.

$$= (y^2 - 4y + 2)(y^2 - 4y + 1)$$

Q No :- 16

Solve :-

$$(k+2)(k-3)(k+5)(k+10) + 375$$

$$\text{pairs :- } \begin{aligned} 2+5 &= 7 \\ -3+10 &= 7 \end{aligned}$$

So re-arrange term

$$= (k+2)(k+5)(k-3)(k+10) + 375$$

$$= [(k+2)(k+5)] [(k-3)(k+10)] + 375$$

$$= [k(k+5) + 2(k+5)] [k(k+10) - 3(k+10)] + 375$$

$$= [k^2 + 5k + 2k + 10] [k^2 + 10k - 3k - 30] + 375$$

$$= [k^2 + 7k + 10] [k^2 + 7k - 30] + 375$$

$$= (k^2 + 7k + 10)(k^2 + 7k - 30) + 375$$

Let

$$k^2 + 7k = a$$

$$= (a+10)(a-30) + 375$$

$$= a(a-30) + 10(a-30) + 375$$

$$= a^2 - 30a + 10a - 300 + 375$$

$$= a^2 - 20a + 75$$

factorization:

$$= a^2 - 15a - 5a + 75$$

$$= a(a-15) - 5(a-15)$$

$$= (a-15)(a-5)$$

put value of a
in above equation

$$= (k^2 + 7k - 5)(k^2 + 7k - 15)$$

Q NOS: 17

Solve:-

$$(x-5)(x-6)(x+3)(x+2) + 12$$

$$\text{Pair: } -6+3 = -3$$

$$-5+2 = -3$$

Rearrange

$$= (x-5)(x+2)(x-6)(x+3) + 12$$

$$= [(x-5)(x+2)][(x-6)(x+3)] + 12$$

$$= [x(x+2) - 5(x+2)][x(x+3) - 6(x+3)] + 12$$

$$= [x^2 + 2x - 5x - 10][x^2 + 3x - 6x - 18] + 12$$

$$= [x^2 - 3x - 10][x^2 - 3x - 18] + 12$$

Let

$$x^2 - 3x = a$$

$$= (a-10)(a-18) + 12$$

$$= a(a-18) - 10(a-18) + 12$$

$$= a^2 - 18a - 10a + 180 + 12$$

$$= a^2 - 28a + 192$$

Factorization

$$= a^2 - 16a - 12a + 192$$

$$= a(a-16) - 12(a-16)$$

$$= (a-12)(a-16)$$

put value of a in
above equation

$$= (x^2-3x-12)(x^2-3x-16)$$

Q NO:- 18

Solve:-

$$(x+1)(x+2)(x-3)(x-6) - 21x^2$$

Pairs-

$$(x-6) = -6$$

$$(+2)(-3) = -6$$

Rearrange

$$(x+1)(x-6)(x+2)(x-3) - 21x^2$$

$$= [(x+1)(x-6)] [(x+2)(x-3)] - 21x^2$$

$$= [x(x-6) + 1(x-6)] [x(x-3) + 2(x-3)] - 21x^2$$

$$= [x^2 - 6x + 1x - 6] [x^2 - 3x + 2x - 6] - 21x^2$$

$$= [x^2 - 5x - 6] [x^2 - x - 6] - 21x^2$$

$$= (x^2 - 6 - 5x)(x^2 - 6 - x) - 21x^2$$

Let

$$x^2 - 6 = a$$

$$= (a - 5x)(a - x) - 21x^2$$

$$= a(a - x) - 5x(a - x) - 21x^2$$

$$= a^2 - ax - 5ax + 5x^2 - 21x^2$$

$$= a^2 - 6ax - 16x^2$$

factorizations:-

$$= a^2 - 8ax + 2ax - 16x^2$$

$$= a(a - 8x) + 2x(a - 8x)$$

$$= (a - 8x)(a + 2x)$$

Put value of a in
above equation:-

$$= (x^2 - 6 - 8x)(x^2 - 6 + 2x)$$

$$= (x^2 - 8x - 6)(x^2 + 2x - 6)$$

QNO:- 19

Solve:-

$$(x-2)(x-6)(x-3)(x-4) - 2x^2$$

Pair:-

$$(2)(-6) = +12$$

$$(-3)(-4) = +12$$

$$= (x-2)(x-6)(x-3)(x-4) - 2x^2$$

$$= [(x-2)(x-6)][(x-3)(x-4)] - 2x^2$$

$$= [x(x-6) - 2(x-6)][x(x-4) - 3(x-4)] - 2x^2$$

$$= [x^2 - 6x - 2x + 12][x^2 - 4x - 3x + 12] - 2x^2$$

$$= (x^2 - 8x + 12)(x^2 - 7x + 12) - 2x^2$$

$$= (x^2 + 12 - 8x) (x^2 + 12 - 7x) - 2x^2$$

Let

$$x^2 + 12 = a$$

$$= (a - 8x) (a - 7x) - 2x^2$$

$$= a(a - 7x) - 8x(a - 7x) - 2x^2$$

$$= a^2 - 7ax - 8xa + 56x^2 - 2x^2$$

$$= a^2 - 15ax + 54x^2$$

Factorizations:-

$$= a^2 - 9ax - 6ax + 54x^2$$

$$= a(a - 9x) - 6x(a - 9x)$$

$$= (a - 9x) (a - 6x)$$

Put value of a in

above equation:-

$$= (x^2 + 12 - 9x) (x^2 + 12 - 6x)$$

$$= (x^2 - 9x + 12) (x^2 - 6x + 12)$$

Q # 20):-

Solve:-

$$(5-x)(2+x)(10-x)(1+x) - 7x^2$$

Factor:-

$$5 \times 2 = 10$$

$$10 \times 1 = 10$$

$$(5-x)(2+x)(10-x)(1+x) - 7x^2$$

$$= \left[(5-x)(2+x) \right] \left[(10-x)(1+x) \right] - 7x^2$$

$$= \left[5(2+x) - x(2+x) \right] \left[10(1+x) - x(1+x) \right] - 7x^2$$

$$= \left[10 + 5x - 2x - x^2 \right] \left[10 + 10x - x - x^2 \right] - 7x^2$$

$$= \left[10 + 3x - x^2 \right] \left[10 + 9x - x^2 \right] - 7x^2$$

$$= (10 - x^2 + 3x)(10 - x^2 + 9x) - 7x^2$$

Let

$$10 - x^2 = a$$

$$= (a + 3x)(a + 9x) - 7x^2$$

$$= a(a + 9x) + 3x(a + 9x) - 7x^2$$

$$= a^2 + 9ax + 3ax + 27x^2 - 7x^2$$

$$= a^2 + 12ax + 20x^2$$

Factorization:-

$$= a^2 + 10ax + 2ax + 20x^2$$

$$= a(a + 10x) + 2x(a + 10x)$$

$$= (a + 10x)(a + 2x)$$

Put value of a in

above equation:-

$$= (10 - x^2 + 10x)(10 - x^2 + 2x)$$

$$= (10 + 10x - x^2)(10 + 2x - x^2)$$

Q #21)

Solve:

Given expression:

$$a^6 + 729$$

a) Sum of two squares.

$$a^6 + 729$$

$$(a^3)^2 + (27)^2$$

b) Sum of two cubes.

$$a^6 + 729$$

$$= (a^2)^3 + (9)^3$$

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

Sum of two cubes because of
positive sign b/w the term
OR

We cannot factorize part (a)
because there is no
formula for it.
But

We can factorize part (b)
by using formula.

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

$$a^6 + 729$$

$$= (a^2)^3 + (9)^3$$

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

$$= (a^2 + 9) [a^4 - 9a^2 + 81]$$

$$= (a^2 + 9) (a^4 - 9a^2 + 81) \text{ Ans!}$$

Q. NO: - 22) :-

Solve:

Bi means 2 term

Basic concept

Binomial A binomial is a polynomial with two unlike terms.

Example
 $t+2$

Trinomial A trinomial is an expression with three unlike terms.

Tri means 3 term

Example
 $x+y+z$

Solution :-

Given expression

$$8 + 12t + 6t^2 + t^3$$

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

$$= (2)^3 + 3(2)^2(t) + 3(2)(t)^2 + (t)^3$$

$$= (2+t)^3$$

$$= (t+2)^3$$

$$= (t+2)(t+2)(t+2)$$

Each factor is a binomial.