CLASS 9th

Maths

EXERCISE NO:- 4.1

U#04)

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Basic Concepts:

* **Factor:** A number that divides the given number exactly without a remainder.

In case of numbers: $2 \times 3 = 6$

(2 and 3 are factors)

In case of expression:

$(x+3)(x+1) = x^2+4x+3$

($(x+3)$ and $(x+1)$ are factors)

* **Factorization:-**

(Factorization is the process of finding the factors.)

Example: $2y+6$

$= 2(y+3)$

(2 and $(y+3)$ are factors)

$ab+ac$

$ab+ac = a(b+c)$

(a and $(b+c)$ are factors)

Basic formulas:

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

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

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

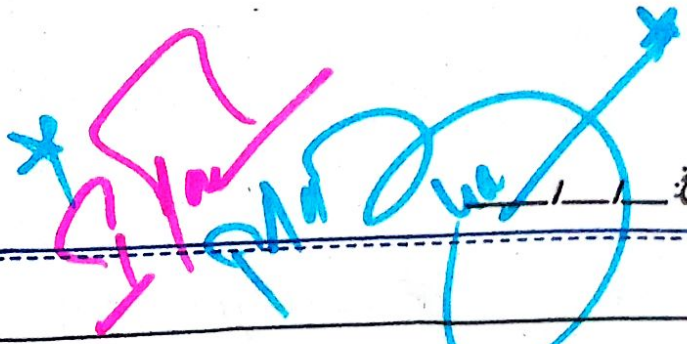
$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$

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

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

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

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



تاریخ: / /

How to find mid term:

1st term, Mid term, Last term

$x^2 + 7x + 10$

پہلے سے پہلے (1st term) کو آخری (Last term) سے (Multiply) کرتے ہیں

اس کے بعد LCM لیتے ہیں

پھر ایسے دو (pairs) بناتے ہیں جن کو (x) کرنے سے آخری ٹرم بنے اور (+) یا (-) کرنے سے درمیان والی

پھر دو (pairs) بنا کر (common) لیتے ہیں

$x^2 + 7x + 10$

Solve:

$x^2 + 7x + 10$

$= x^2 + 5x + 2x + 10$

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

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

$x^2 \times 10 = 10x^2$

LCM

2 | 10

5 | 5

1 | 1

$(+2x)(+5x) = 10x^2$

$+2x + 5x = +7x$

__/__/__ Date

$y^2 - 12y - 64$

factorization:

$= y^2 - 16y + 4y - 64$

$= y(y-16) + 4(y-16)$

$= (y-16)(y+4)$

$y^2 \times -64 = -64y^2$

LCM:

2	64
2	32
2	16
2	8
2	4
2	2
	1

16×4

$(-16y)(4y) = -12y$ ✓

$-16y \times 4y = -64y^2$ ✓

Date: Day:

Class 9th

Maths

Exercise # 4.1

Factorize the following polynomials.

Q NO: 1

$2x^2y^3 - 6x^2y^2 + 2xy^3$

Solve:

$2x^2y^3 - 6x^2y^2 + 2xy^3$

$= 2xy^2(1xy - 3x + 1y)$

Q NO: 2

$3nx - 3x - 3ny + 3y$

Solve:

$3nx - 3x - 3ny + 3y$

$= 3[nx - x - ny + y]$

$= 3[x(n-1) - y(n-1)]$

$= 3[(n-1)(x-y)]$

OR 2nd Method

$= 3nx - 3x - 3ny + 3y$

$= 3x(n-1) - 3y(n-1)$

$= (n-1)(3x-3y)$

$= (n-1)\,3(x-y)$

$= 3(n-1)(x-y)$

Date: Day.

Q NO: 3

$18x^4 + 108x^2y^2 + 162y^4$

Solve

$18x^4 + 108x^2y^2 + 162y^4$

$= 18[x^4 + 6x^2y^2 + 9y^4]$

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

$= 18[(x^2)^2 + 2(x^2)(3y^2) + (3y^2)^2]$

$= 18[(x^2 + 3y^2)^2]$

Q NO: 4

$(k+2)^2 - 8(k+2) + 16$

Solve:

$(k+2)^2 - 8(k+2) + 16$

$= (k+2)^2 - 2(k+2)(4) + (4)^2$ $\because (a-b)^2 = a^2 - 2ab + b^2$

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

$= (k-2)^2$

Q NO: 5

$9x^2 + 4 - 169y^2 - 12x$

Solve:

$9x^2 + 4 - 169y^2 - 12x$

Re-arrange

$= 9x^2 + 4 - 12x - 169y^2$

$= [9x^2 - 12x + 4] - 169y^2$

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

$= [(3x)^2 - 2(3x)(2) + (2)^2] - (13y)^2$

$= [(3x-2)^2] - (13y)^2$

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

$= [(3x-2)+13y][(3x-2)-13y]$

$= [3x-2+13y][3x-2-13y]$

$= [3x+13y-2][3x-13y-2]$

Q NO 6

$(x^2-1)(y-1) - (y+3)(x^2-1)$

Solve

$(x^2-1)(y+1) - (y+3)(x^2-1)$

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

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

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

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

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

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

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

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

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

Day:

Date:

Q NO: 7

$x^2 - 6ax + 9a^2 - 16b^2$

Solve:

$x^2 - 6ax + 9a^2 - 16b^2$

$[x^2 - 6ax + 9a^2] - 16b^2$

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

$[(x)^2 - 2(x)(3a) + (3a)^2] - (4b)^2$

$[(x-3a)^2] - (4b)^2$

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

$[(x-3a) + 4b][(x-3a) - 4b]$

$[x - 3a + 4b][x - 3a - 4b]$

Q NO: 8

$1 - x^2 - 2xy - y^2$

Solve

$1 - x^2 - 2xy - y^2$

$1 - [x^2 + 2xy + y^2]$

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

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

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

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

$[1 + (x+y)][1 - (x+y)]$

$[1 + x + y][1 - x - y]$

Date: Day:

Q NO: 9

Solution:-

Given that

$(x+y-2c)(x+2c+y)$

$(x+y-2c)(x+y+2c)$

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

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

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

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

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

$= x^2+y^2+2xy-4c^2$

Q NO: -10

Solution:

Given expression:

$x^2+4y^2-z^2+4xy$

Re-arrange:

$x^2+4xy+4y^2-z^2$

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

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

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

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

Proved!

Date: Day.

Q NO:11

a) $(2y^2-3y-27)=(y+3)(\ )$

Solution:

$2y^2-3y-27$

factorization:

$=2y^2-9y+6y-27$

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

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

$(2y-9)$ is missing factor.

b) $(5x^2+12x-9)=(\ )(x+3)$

Solution:

$5x^2+12x-9$

factorization:

$=5x^2+15x-3x-9$

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

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

$(5x-3)$ is missing factor.

-45

3 | 45
3 | 15
5 | 5
1

$(+15x)(-3x)$

Q NO:12

x^4+4m^4

Solve:-

x^4+4m^4

Date: Day:

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

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

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

$= (x^2 + 2m^2)^2 - (2mx)^2$

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

$= [(x^2 + 2m^2) - 2mx][(x^2 + 2m^2) + 2mx]$

$= [x^2 + 2m^2 - 2mx][x^2 + 2m^2 + 2mx]$

Q NO: 13

Solution:

$m^4 + m^2 + 1$

Re-arrange

$m^4 + 1 + m^2$

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

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

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

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

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

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

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

$= [m^2 + 1 + m][m^2 + 1 - m]$

$= [m^2 + m + 1][m^2 - m + 1]$

Q NO: 14

Solution:

$-3x^4 - 21x^3 + 24x^2$

$= -3x^2[x^2 + 7x - 8]$ $\quad -8x^2$

$= -3x^2[x^2 + 8x - 1x - 8]$

$= -3x^2[x(x+8) - 1(x+8)]$

$= -3x^2[(x+8)(x-1)]$

$= -3x^2(x+8)(x-1)$

Q NO: 15

Solution:

$x^8 + x^4 + 1$

Re-arrange

$= x^8 + 1 + x^4$

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

$\because a^2 + 2ab + b^2$

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

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

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

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

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

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

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

$[x^4 + 1 - x^2]$

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

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

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

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

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

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

Q NO: 16

Solve:-

$4x^4 + 256y^4$

$= 4[x^4 + 64y^4]$

$= 4[(x^2)^2 + (8y^2)^2 + 2(x^2)(8y^2) - 2(x^2)(8y^2)]$

$= 4[(x^2 + 8y^2)^2 - 16x^2y^2]$

$= 4[(x^2 + 8y^2)^2 - (4xy)^2]$

$= 4[(x^2 + 8y^2) + 4xy][(x^2 + 8y^2) - 4xy]$

$= 4[x^2 + 8y^2 + 4xy][x^2 + 8y^2 - 4xy]$

Q NO: 17

Solve:

$12 - 7x + x^2$

Re-arrange

$= x^2 - 7x + 12$

factorization

$= x^2 - 4x - 3x + 12$

$= x(x-4) - 3(x-4)$

$= (x-4)(x-3)$

Q NO: 18

Solve:

$x^2 - 9x + 8$

factorization:-

$x^2 - 8x - 1x + 8$

$x(x-8) - 1(x-8)$

$(x-8)(x-1)$

Q NO: 19

Solve:

$10z^2 - 29z + 10$

factorization:

$= 10z^2 - 25z - 4z + 10$

$= 5z(2z-5) - 2(2z-5)$

$= (2z-5)(5z-2)$

Q NO: 20

Solve:

$-3y^2 + 13y - 4$

$= -[3y^2 - 13y + 4]$

$= -[3y^2 - 12y - 1y + 4]$

$= -[3y(y-4) - 1(y-4)]$

$= -[(y-4)(3y-1)]$

Q NO: 21

Solve:

$x^2 - 21x + 90$

factorization

$= x^2 - 6x - 15x + 90$

$= x(x-6) - 15(x-6)$

$= (x-6)(x-15)$

Q NO: 22

Solve:

$x^2 + x - 2$

factorization

$= x^2 + 2x - x - 2$

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

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

Q NO: 23

Solve:

$3x^2 + 11x + 6$

factorization

$= 3x^2 + 9x + 2x + 6$

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

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

Q NO: 24

Solve:

$2x^2 - 5xy - 3y^2$

factorization

$= 2x^2 - 6xy + xy - 3y^2$

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

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

Q NO: 25

Solve:

$8+6x-5x^2$

factorization:-

$= 8-4x+10x-5x^2$

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

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

Q NO: 26

Solve:-

$6-7x-5x^2$

factorization:-

$= 6+3x-10x-5x^2$

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

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

OR Second Method:

$6-7x-5x^2$

$-5x^2-7x+6$

$-5x^2-10x+3x+6$

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

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

Q NO: 27

Solve:

$2a^2 - 4a - 6$

factorization:

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

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

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

$= (a-3)\,2(a+1)$

$= 2(a-3)(a+1)$

$2a^2 \times -6$

$-12a^2$

2 | 12

2 | 6

3 | 3

1

$(-6a) + (2a) = -4a$

Method:

$2a^2 - 4a - 6$

$= 2[a^2 - 2a - 3]$

$= 2[a^2 - 3a + a - 3]$

$= 2[a(a-3) + 1(a-3)]$

$= 2[(a-3)(a+1)]$

$= 2(a-3)(a+1)$

Q NO: 28

Solve:-

$u^4 - 13u^2 + 36$

factorization:

$u^4 - 9u^2 - 4u^2 + 36$

$u^2(u^2-9)-4(u^2-9)$

$=(u^2-9)(u^2-4)$

$=[(u)^2-(3)^2]\ [(u)^2-(2)^2]$

$=[(u+3)(u-3)]\ [(u-2)(u+2)]$

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

Q NO:- 27

Solve

y^4-12y^2-64

factorization

$y^4-16y^2+4y^2-64$

$=y^2(y^2-16)+4(y^2-16)$

$=(y^2-16)(y^2+4)$

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

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

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