# NOTES

## CLASS 8
## MATHS

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# FACTORISATION

**IMPORTANT CONCEPTS:**

**1. Prime factor form :**A number written as a product of prime factors is said to be in the prime factor form. For example: The prime factor form of 30 = 2 x 3 x 5.

**2. Factors of algebraic expressions :**Like any natural number, an algebraic expression is also the product of its factors. In the case of algebraic expression, it is said to be an irreducible form instead of prime factor form. For example : 8ab = 8 x a x b ( irreducible form)

**3. Factorisation** : Factorisation of an algebraic expression is writing it as a product of factors.These factors may be numbers, algebraic variables or algebraic expressions.

4. **Methods of Factorisation** :

a) Methods of common factors.
b) Factorisation by regrouping terms
c) Factorisation using identities .

**Methods of common factors:**

Example : Factorise $12xy^2 - 24y$ .

Solution : Factors of $12xy^2 = 2\times 2\times 3\times x\times y\times y$

Factors of $24y = 2\times 2\times 2\times 3\times y$

common factors of two terms are 2 , 2 , y.

$12xy^2 - 24y = (2\times 2\times 3\times x\times y\times y)+(2\times 2\times 2\times 3\times y)$

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

$= 12y \times (xy + 2)$

$= 12y\ (xy + 2)$

**Factorisation by regrouping terms :**

Example : Factorise $8p - q + pq - 8$ by regrouping terms.

$8p + q - pq - 8 = 8p - 8 - pq + q$

$= 8(p - 1) - q(p - 1)$

$= (p - 1)(8 - q)$

Factorisation using Identities :

Algebraic Identities : $(a + b)^2 = a^2 + 2ab + b^2$

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

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

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

4.Division of Algebraic Expressions

Consider $7x^3 \div 14x$

$7x^3 \div 14x = \frac{7x^3}{14x}$

$$= \frac{7 \times x \times x \times x}{2 \times 7 \times x}$$

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

## SOME ILLUSTRATIONS:

1.The factorisation of $18a^2 b + 15ab^2$ is

a) 3ab (6a + 5b) b) $3a^2b$ (6a + 5b) c) $3ab^2$ (6a + 5b) d) $3a^2b^2$ (6a + 5b)

Ans: a) 3ab (6a + 5b)

2. The common factor of $x^2y^2z$ and $x^3y^3z^2$ is

a) $x^2y^2z$ b) $x^3y^3z$ c) $x^2y^3z$ d) $x^3y^2z$

Ans: a) $x^2y^2z$

3. The factorisation of 6xy – 4y + 6 – 9x is

a) (3x – 2)(2y – 3) b) (3x + 2)(2y – 3) c) (3x – 2)(2y + 3) d) (3x + 2)(2y + 3)

Ans: a) (3x – 2)(2y – 3)

4. The factors of $4y^2 - 12y + 9$ is:

a) $(2y+3)^2$ b) $(2y-3)^2$ c) (2y-3)(2y+3) d) None of the above

Ans: b) $(2y-3)^2$

## Case Study Based Questions:

1. Riddhi wants to make a garden in her house in the shape of a parallelogram ABCD, the area of which is $4x^2-9$ and side BC is of length 3m.

(i) If the height corresponding to side AB is 2x+3, then find the length of side CD.

(ii) she fenced the garden with wire which cost a total of rupees x. Find the rate of wire per unit length.

(iii) find the area of parallelogram shaped garden for x=4 units.

Ans: (i) $(2x-3)$ m

(ii) Rs4

(iii) 55 $m^2$

## Short Answer Questions:

1. Factorise $p^2 - 2p + 1$.

Ans: $p^2 - 2p + 1 = p^2 - p - p + 1$

$= p(p-1) - 1(p-1)$

$= (p-1)(p-1)$

$= (p-1)^2$

2. Factorise: 6ab + 12bc

Ans: : $6ab + 12bc = (2 \times 3 \times a \times b) + (2 \times 2 \times 3 \times b \times c)$

$= 2 \times 3 \times b(a + 2c)$

$= 6b(a + 2c)$

3. Expand using suitable identities : $(7x + 5)^2$

Ans: $(7x + 5)^2 = (7x)^2 + 2 \times 7x \times 5 + 5^2 \quad [(a + b)^2 = a^2 + 2ab + b^2]$

$= 49x^2 + 70x + 25$

## Long Answer Questions:

1. Factorise the following using the identity $(a + b)(a - b) = a^2 - b^2$

a) $4x^2 - 25y^2$ b) $\frac{4x^2}{9} - \frac{9y^2}{16}$

Ans:

a) $4x^2 - 25y^2 = (2x)^2 - (5y)^2$

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

b) $\frac{4x^2}{9} - \frac{9y^2}{16} = \frac{(2x)^2}{3^2} - \frac{(3y)^2}{4^2}$

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

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

2. Factorize $(x + y)^2 - 4xy$

Ans: $(x + y)^2 = x^2 + 2xy + y^2$

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

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

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

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

**PRACTICE**

**A) MCQ**

**1.** Which of the following is the common factor of $25a^2b$ and $55ab^2$?

(a) $5ab^2$ (b) $5a^2b$ (c) $5ab$ (d) $5a^2b^2$

2. The common factor of $6a^2b^4c^2$, $21a^2b$ and $15a^3$ is

(a) $3a^3$ (b) $6a^3$ (c) $6a^2$ (d) $3a^2$

3. The factorisation of $x^2yz + xy^2z + xyz^2$ is

(a) $xyz(x + y + z)$ (b) $x^2yz\ (x + y + z)$

(c) $xy^2z\ (x + y + z)$ (d) $xyz^2\ (x + y + z)$

4. If $x^2 - x - 42 = (x + k)(x + 6)$ then k =

(a) 6 (b) -6 (c) -7 (d) 7

5. The quotient of $12a^8b^8 \div (-4a^6b^6)$ is

(a) $3a^2b^2$ (b) $3a^2b$ (c) $3ab^2$ (d) $-3a^2b^2$

6. The factors of $6xy - 4y + 6 - 9x$ are:

a. $(3x + 2)(2y + 3)$ b. $(3x - 2)(2y - 3)$

c. $(3x - 2)(2y + 3)$ d. $(3x -+2)(2y - 3)$

7. The factors of $49p^2 - 36$ are:

a. $(7p+6)^2$ b. $(7p-6)^2$ c. $(7p - 6)(7p + 6)$ d. none of the above

8. The common factor of $24a^3b^4$, $36a^4c^4$ and $48a^3b^2c$ is:

a. $12a^3$ b. $24a^3$ c. $36a^3$ d. $48a^3$

9. The factors of xyz are:

a. x b. y c. z d. all of the above

10. The value of $3.5 \times 3.5 - 2.5 \times 2.5$ is

(a) -6 (b) 6 (c) 60 (d) 1

B) SHORT ANSWER QUESTIONS

1. Subtract : (i) $5a^2b^2c^2$ from $-7a^2b^2c^2$
2. Simplify $(ab - c)^2 + 2abc$
3. Expand using suitable identities : $\left(\frac{4a}{5} + \frac{5b}{4}\right)^2$
4. Carry out the following divisions: (ii) $76x^3yz^3$ $19x^2y^2$
5. Factorise the following : $x^2 - 8x + 16$
6. Factorise the expressions. $(lm + l) + m + 1$
7. Factorise $(a^2 - 2ab + b^2 - c^2)$
8. Factorise $m^4 - 256$
9. Obtain the factors of $z^2 - 4z - 12$.
10. Carry out the following divisions. $12a^8b^8 \div (-6a^6b^4)$

## LONG ANSWER TYPE :

1. Find the common factors of the following:
(i) $6xyz$, $24xy^2$ and $12x^2y$
(ii) $3x^2y^3$, $10x^3y^2$ and $6x^2y^2z$
2. Solve for $(4x^2 - 100) \div 6(x + 5)$
3. Factorize the expressions and divide them as directed. $(m^2 - 14m - 32) \div (m + 2)$
4. Factorize $9a(6a - 5b) - 12a^2(6a - 5b)$
5. The area of a square is given by $4x2 + 12xy + 9y2$. Find the side of the square.
6. The area of a circle is given by the expression $\pi x^2 + 6\pi x + 9\pi$. Find the radius of the circle.
7. Factorise the expressions and divide them as directed:
$(x^4 - 16) \div x^3 + 2x^2 + 4x + 8$
8. Factorize $(q2 - 10q + 21)$
9. Factorize $x^2 + \frac{1}{x^2} + 2 - 3x - \frac{3}{x}$
10. If $m - n = 16$ and $m^2 + n^2 = 400$, then find mn.

## CASE BASED QUESTIONS:-

1. Ramesh has a cuboidal box, the volume of which is $x^3+3x^2+2x$.



(i) write an expression for it's length, breadth and height in terms of x.
(ii) find the dimensions of box if its height 6m is the largest dimension.
(iii) how many rectangular sheets will be used to cover the base of box i of dimension $(1 \times x)$?

2. The total amount paid by Neha for purchasing some books at the rate of Rs. x is $x^3-x$ . The number of books is 1 more than the cost of each book.
(i) How many books she can purchase with the amount she has?
(ii) How many sets of books she can purchase from $x^3-x$ rupees if number of books in each set is x-1?
(iii) If the cost of each book is Rs. 10, total how much money was spent in purchasing 4 sets of books?



## ANSWERS:

Solution of MCQs

| | | | | | |
|---|---|---|---|---|---|
| 1. c | 2. d | 3. a | 4. c | 5. d | 6. b |
| 7. c | 8. a | 9. d | 10. b | | |

Solution Short Answer Questions:

1. $-2a^2b^2c^2$. 2. $a^2b^2 + c^2$ 3. $\frac{16a^2}{25} + \frac{25b^2}{16} + 2ab$ 4. $\frac{4xz^3}{y}$

5. $(x-4)^2$ 6. $(l+1)(m+1)$ 7.(a-b-c)(a-b+c) 8. $(m-2)(m+2)(m^2+4)$

9. (z-6)(z+12) 10. $-2a^2b^4$

Solutions of Long Answers Questions:

1.(i) 6xy (ii) $x^2y^2$ 2. $\frac{(x+5)}{3}$ 3. (m-16) 4. $(2x+3y)^2$

5. (2x +3y) units 6. (x+3) units 7. (x-2) 8. (x-7)(x-3)

9. $\left(x+\frac{1}{x}\right)\left(x+\frac{1}{x}-3\right)$ 10. mn = 72

Solutions Of Case Studt Based Questions :

| | | |
|---|---|---|
| 1.(i)x units , (x+2) units ,(x+1)units | (ii) 5 units ,4 units | (iii) (x+1) |
| 2.(i) $(x^2-1)$ | (ii)x(x+1) | (iii) Rs 440 |

**TEST-1( 20 marks)**

1. Factorise
(i) $(16x^5 - 144x^3)$
(ii) $x^2 + 9x + 20$ .
2. Find the common factors of the given terms.
(i) $20x^3$, $-4x^2$, 32x
(ii) 12 pq, 20pqr, 30rp
3.Factorise (z – 7 + 7 x y – x y z)
4. The area of a rectangle is $(x^2 + 7x + 12)$. If its breadth is (x + 3), then find its length
5. Perform the following divisions: $(x^3y^3 + x^2y^3 - xy^4 + xy) \div xy$

TEST-2 ( 30 marks)

1. Factorise the following expressions.
(i) $3pqr - 6p^2q^2r^2 - 15r^2$
(ii) –xy – ay
2. Expand the following, using suitable identities

$(x^2y - xy^2)^2$

3. Simplify $(1.5p + 1.2q)^2 - (1.5p - 1.2q)^2$

4. Factorise the expressions.

(i) $5y^2 - 20y - 8z + 2yz$

(ii) $10ab + 4a + 5b + 2$

5. Factorise the expressions and divide them as directed.

$39y^3 (50y^2 - 98) \div 26y^2 (5y + 7)$

6. The area of a square is given by $4x^2 + 12xy + 9y^2$. Find the side of the square.

7. Find the factors of $3m^2 + 9m + 6$.

8. Factorise

(ii) $p^4 - 81$

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

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