

# LESSON PLAN 12

**TEACHER'S NAME :**

**SUBJECT: MATHEMATICS**

**CLASS: 8**

**UNIT : FACTORISATION**

**No.of Periods: 12+13=25**

## PERIOD ALLOTMENT

NAME OF THE UNIT	SUB-TOPICS	NO OF PERIODS REQUIRED			Time line for teaching	
		Teaching	Practice	TOTAL	From	To
<b>FACTORISATION</b>	12.1 PRE-REQUISITES & INTRODUCTION					
	12.1.1 FACTORS OF NATURAL NUMBERS	1	1	2		
	12.1.2 FACTORS OF ALGEBRAIC EXPRESSIONS					
	12.2 WHAT IS FACTORISATION?					
	12.2.1 METHOD OF COMMON FACTORS					
	12.2.2 FACTORISATION BY REGROUPING TERMS	5	6	11		
	12.2.3 FACTORISATION USING IDENTITIES					
	12.2.4 FACTORS OF THE FORM $(x+a)(x+b)$					
	12.3 DIVISION OF ALGEBRAIC EXPRESSIONS					
	12.3.1 DIVISION OF MONOMIAL BY ANOTHER MONOMIAL	6	6	12		
12.3.2 DIVISION OF A POLYNOMIAL BY A MONOMIAL						
12.3.3 DIVISION OF ALGEBRAIC EXPRESSIONS CONTINUED (POLYNOMIAL÷POLYNOMIAL)						
TOTAL	12	13	25			

### PRE-REQUISITES OF THE LESSON

Every Pupil is expected to have basic knowledge in

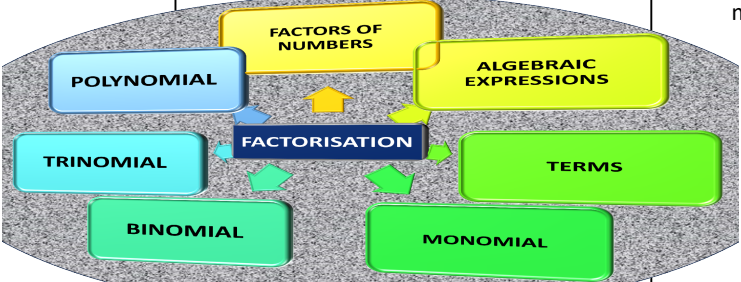
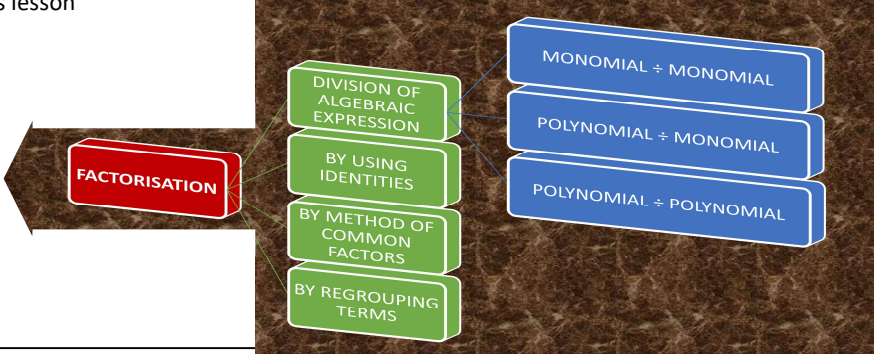
- # factorising natural numbers
- # terminology related to algebraic expressions like, term, expression, numerical expression, algebraic expression, variable, constant, etc.,
- # four basic operations  $+, -, \times, \div$
- # expressing terms with more numbers of variables and constants by splitting using product.
- # applying different properties like distributive property, commutative property etc., in treating algebraic expressions for simplification.

### LEARNING OUTCOMES

After Completion of this lesson every student will be able to

- # understand that factorisation of algebraic expression is similar to factorising natural numbers
- # find factors of a given algebraic expression using different methods like method of common factors & using identities
- # perform division of a polynomial with another polynomial.
- # Utilize the concept of Factorisation in real life sums
- # appreciate the utility of "Factorisation" in real life situations

**TEACHING PERIOD : 1 ( PRE - REQUISITES & INTRODUCTION - FACTORS OF NATURAL NUMBERS -FACTORS OF ALGEBRAIC EXPRESSIONS )**

CONCEPTS/STEPS	TEACHER ACTIVITY ( I DO )	GROUP ACTIVITY ( WE DO )	INDIVIDUAL ACTIVITY ( YOU DO )
PRE REQUISITES	Brain storming session involving children with pre-requisites vocabulary and concepts related to previous knowledge. Introduction of new vocabulary and key words associated with the concept through questioning # Factors of Numbers & Algebraic expression # terms # Monomial # Binomial # Trinomial # Polynomial	* Students read the pre-requisites and answer the questions to the teacher (whole class activity)	Every Pupil will read and write the key words in their note books
MIND MAPPING	Teacher writes the key word " FACTORISATION" on the black board and will elicit its other related words through questioning  	Hetrogeneous groups are created. One group will read the words and other will explain the meaning	Pupils individually read the keywords associated with the lesson
RELEVANCE OF THE LESSON	Teacher conducts a discussion on the importance of the lesson through questioning 1) How will you factorize 36 ? 2) What an expression consisting of unknown variables called? 3) How can you express the term $27x^2y$ as a product of different irreducible terms?	Students participate in the discussion and ask questions	Pupils individually write their responses to the questions asked
CONCEPT MAP	Teacher displays the concept map depicting various concepts that pupil are going to learn in this lesson  	Whole class read the concept map	
ASSESSMENT	Teacher poses some questions to test their knowledge on prerequisites.	every group will do the task by discussion among each other	every individual solves the task on their own

**PRACTICE PERIOD: 1**

CONCEPTS/STEPS	TEACHER ACTIVITY (I DO)	GROUP ACTIVITY (WE DO)	INDIVIDUAL ACTIVITY (YOU DO)
KEY WORDS READING	Teacher writes the key words from previous class's teaching period and asks children to read and write them in note books # Factors of Numbers & Algebraic expression # terms # Monomial # Binomial # Trinomial # Polynomial	Students read these key words in groups and will try to give examples to each key word	Every child comes to the board and reads the key words and notes them down in their note books
SIMILAR LINES READING	Teacher writes some algebraic expressions as product of irreducible terms and asks children to write some more by watching similar lines	Each group will observe the similar lines and will frame some more by discussion	Every Individual will frame some more using similar lines
<p><i><b><math>7x^2y</math> can be written as a product of irreducible factors as <math>7 \cdot x \cdot x \cdot y</math></b></i></p> <p><i><b><math>24y^3zm</math> can be expressed as a product of irreducible factors as <math>2 \cdot 2 \cdot 2 \cdot 3 \cdot y \cdot y \cdot y \cdot z \cdot m</math></b></i></p>			
SUMMARY/ SYNOPSIS	Teacher writes synopsis on the board and asks children to read, note down and practice.	pupils will note down and read the summary in groups	every individual spells and reads the summary and notes it down
WRITING/ EDITING	Teacher conducts a dictation on key words ,pre-requisites and similar lines and asks children to exchange books for editing after writing is finished.	One group will check the writings of the other and vice versa	Slow learners are focused and teacher will ascertain that every individual learns the

<b>WHAT IS FACTORISATION?, METHOD OF COMMON FACTORS, FACTORISATION BY REGROUPING TERMS, FACTORISATION USING IDENTITIES, FACTORS OF THE FORM (x+a)(x+b)</b>			
TEACHING PERIODS : 2 to 5			
CONCEPTS/STEPS	TEACHER ACTIVITY (I DO)	GROUP ACTIVITY (WE DO)	INDIVIDUAL ACTIVITY (YOU DO)
KEY WORDS	Brain storming session involving children with key words # factorisation # Method of common factors # Regrouping terms # Identities	* Students read the keywords answer the questions to the teacher (whole class)	Every Pupil will read and write the key words in their note books
CONCEPTUAL UNDERSTANDING	Teacher demonstrates the concept of different factorisation methods like 1) factorisation by the method of common factors 2) factorisation by regrouping terms 3) factorisation by using identities 4) factorisation of expressions of the form (x+a)(x+b) through some exemplary illustrations and activities using factor tiles	Each group will understand the concepts by participation in the activity	every child learns the concept through the learning activity
LEARNING ACTIVITY	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 5px; background-color: #f0f0f0;"> <p style="text-align: center;"><b>FACTORIZATION BY REGROUPING TERMS</b></p> <p style="text-align: center;">To Factorise <math>6xy - 4y + 6 - 9x</math></p> <p>Step 1: Check if there is a common factor among all terms. There is none.</p> <p>Step 2: Think of grouping. Notice that first two terms have a common factor 2y: <math>6xy - 4y = 2y(3x - 2)</math> → (a) What about the last two terms? Observe them. If you change their order to <math>-9x + 6</math>, the factor <math>(3x - 2)</math> will come out: <math>-9x + 6 = -3(3x - 2)</math> → (b)</p> <p>Step 3: Putting (a) and (b) together, <math>6xy - 4y + 6 - 9x = 6xy - 4y - 9x + 6</math> <math>= 2y(3x - 2) - 3(3x - 2)</math> <math>= (3x - 2)(2y - 3)</math> Therefore the factors of <math>(6xy - 4y + 6 - 9x)</math> are <math>(3x - 2)</math> and <math>(2y - 3)</math></p> </div> <div style="border: 1px solid black; padding: 5px; background-color: #e0ffe0;"> <p style="text-align: center;"><b>FACTORIZATION BY THE METHOD OF COMMON FACTORS</b></p> <p style="text-align: center;">To factorise <math>5xy + 10x</math></p> <p>The irreducible factor forms of <math>5xy</math> and <math>10x</math> are respectively, <math>5xy = 5 \times x \times y</math> <math>10x = 2 \times 5 \times x</math></p> <p>Observe that the two terms have 5 and x as common factors. Now, <math>5xy + 10x = (5 \times x \times y) + (5 \times x \times 2)</math> <math>= (5x \times y) + (5x \times 2)</math> We combine the two terms using the distributive law, <math>(5x \times y) + (5x \times 2) = 5x \times (y + 2)</math> Therefore, <math>5xy + 10x = 5x \times (y + 2)</math>. (This is the desired factor form.)</p> </div> <div style="border: 1px solid black; padding: 5px; background-color: #e0e0ff;"> <p style="text-align: center;"><b>FACTORIZATION USING IDENTITIES</b></p> <p style="text-align: center;">Factorise <math>x^2 + 8x + 16</math></p> <p>Observe the expression; it has three terms. Its first and third terms are perfect squares with a positive sign before the middle term.</p> <p>So, it is of the form <math>a^2 + 2ab + b^2</math> where <math>a = x</math> and <math>b = 4</math></p> <p>such that <math>a^2 + 2ab + b^2 = x^2 + 2(x)(4) + 4^2 = x^2 + 8x + 16</math> Since <math>a^2 + 2ab + b^2 = (a + b)^2</math>, by comparison <math>x^2 + 8x + 16 = (x + 4)^2</math> (the required factorisation)</p> </div> <div style="border: 1px solid black; padding: 5px; background-color: #ffffe0;"> <p style="text-align: center;"><b>FACTORS OF THE FORM (x+a)(x+b)</b></p> <p style="text-align: center;">Factorise <math>x^2 + 5x + 6</math></p> <p>If we compare the R.H.S. of Identity <math>(x+a)(x+b) = x^2 + (a+b)x + ab</math> with <math>x^2 + 5x + 6</math>, we find <math>ab = 6</math>, and <math>a + b = 5</math>.</p> <p>From this, we must obtain a and b. The factors then will be <math>(x + a)</math> and <math>(x + b)</math>.</p> <p>If <math>a = 6</math>, it means that a and b are factors of 6. Let us try <math>a = 6</math>, <math>b = 1</math>. For these values <math>a + b = 7</math>, and not 5, So this choice is not right.</p> <p>Let us try <math>a = 2</math>, <math>b = 3</math>. For this <math>a + b = 5</math> exactly as required. The factorised form of this given expression is then <math>(x + 2)(x + 3)</math></p> </div> </div>		
SUMMARY	Teacher once again writes important key words and procedures and asks children to note down and adopt.	Pupils will note down and read the summary in groups	Every individual reads the summary and notes it down and adopts the procedure
ASSESSMENT	Teacher gives some questions from Try These sections as well as some examples and asks children to solve those sums	Every group will do the sums by discussion among each other	Every individual solves the sums on their own

<b>PRACTICE PERIODS : 2 to 6</b> <b>WHAT IS FACTORISATION?, METHOD OF COMMON FACTORS, FACTORISATION BY REGROUPING TERMS, FACTORISATION USING IDENTITIES, FACTORS OF THE FORM (x+a)(x+b)</b>			
CONCEPTS/STEPS	TEACHER ACTIVITY (I DO)	GROUP ACTIVITY (WE DO)	INDIVIDUAL ACTIVITY (YOU DO)
KEY WORDS READING	Teacher writes the key words from previous class's teaching period and asks children to read and write them in note books # factorisation # Method of common factors # Regrouping terms # Identities	Whole class activity : one child comes to the board and reads the key words loudly and the remaining class follows.	Every child comes to the board and reads the key words and notes them down in their note books
SIMILAR LINES READING	Teacher factorises some expressions using the methods learnt in the previous teaching period and asks children to factorise some more in the worksheet by watching similar lines	Each group will read the similar lines and will frame some more by discussion	Every Individual will do a few more by watching similar lines
<div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="border: 2px solid magenta; padding: 10px; width: 45%;"> <p style="text-align: center;"><b>Factorize</b></p> <div style="display: flex; justify-content: space-around; align-items: center;"> <math>x^2 + 4x</math> <math>x(x + 4)</math> </div> <p style="text-align: center;"><b>Multiply the factors to get the original expression</b></p> </div> <div style="border: 2px solid green; padding: 10px; width: 45%;"> <math display="block">a^2 + 2ab + b^2 = (a + b)^2</math> <p style="text-align: center;"><i>Example:</i></p> <math display="block">4x^2 + 8xy + 4y^2 = 4x^2 + (2 \times 2 \times 2)xy + 4y^2 = (2x + 2y)^2</math> </div> </div>			
<div style="display: flex; justify-content: space-between;"> <div style="border: 2px solid blue; padding: 10px; width: 48%;"> <p><b>2. Factorize the expressions:</b></p> <p>(i) <math>4x^2 - 12xy + 9y^2</math></p> <p>(ii) <math>36x^2 - 84xy + 49y^2</math></p> <p>(iii) <math>9a^2 + 42ab + 49b^2</math></p> <p>(iv) <math>(3a - 5b)^2 + 2(3a - 5b)(2b - a) + (2b - a)^2</math></p> <p>(v) <math>36x^2 + 36x + 8</math></p> <p>(vi) <math>4a^4 + b^4</math></p> </div> <div style="border: 2px solid red; padding: 10px; width: 48%;"> <p><b>3. Factor the identities:</b></p> <p>(i) <math>4x^2 + 12xy + 9y^2</math></p> <p>(ii) <math>x^2 + 22x + 121</math></p> <p>(iii) <math>9x^2 - 24xy + 16y^2</math></p> <p>(iv) <math>36x^2 - 36x + 9</math></p> <p>(v) <math>16x^4 - 72x^2y^2 + 81y^4</math></p> <p>(vi) <math>(a^2 + c^2 + 2ac) - b^2</math></p> </div> </div>			
SUMMARY/ SYNOPSIS	Teacher once again writes important key words and definitions and asks children to note down and adopt.	Pupil groups will read and adopt the procedure	Teacher focuses on every individual so that every child is able to learn the concept in successive upcoming practice sessions
WRITING/ EDITING	Teacher gives some questions from Exercise 12.1& 12.2 and asks children to solve those sums and teacher checks the writings of children	One group will check the writings of the other and vice versa	

**DIVISION OF ALGEBRAIC EXPRESSIONS, DIVISION OF MONOMIAL BY ANOTHER MONOMIAL, DIVISION OF A POLYNOMIAL BY A MONOMIAL, DIVISION OF ALGEBRAIC EXPRESSIONS CONTINUED (POLYNOMIAL÷POLYNOMIAL)**

CONCEPTS/STEPS	TEACHER ACTIVITY (I DO)	GROUP ACTIVITY (WE DO)	INDIVIDUAL ACTIVITY (YOU DO)
KEY WORDS	Brain storming session involving children with key words # Division # Monomial # Binomial # Trinomial # Polynomial	* Students read the keywords answer the questions to the teacher (whole class activity)	Every Pupil will read and write the key words in their note books
CONCEPTUAL UNDERSTANDING	Teacher demonstrates the concept of division of polynomials first a monomial by another monomial, next a polynomial by a monomial and finally a polynomial by another polynomial using some exemplary illustrations.	Each group will understand the concepts by participation in the activity	every child learns the concept through the learning activity and observation of TLM
<div style="border: 2px solid red; padding: 5px; display: inline-block; margin-bottom: 10px;"> <p style="background-color: blue; color: white; padding: 2px; display: inline-block;"><b>DIVISION OF MONOMIAL BY A MONOMIAL</b></p> <math display="block">7x^2y^2z^2 \div 14xyz = \frac{7 \cdot x \cdot x \cdot y \cdot y \cdot z \cdot z}{7 \cdot 2 \cdot x \cdot y \cdot z}</math> <math display="block">= \frac{x \cdot y \cdot z}{2}</math> <math display="block">= \frac{xyz}{2}</math> </div> <div style="border: 2px solid cyan; padding: 5px; display: inline-block; margin-bottom: 10px;"> <p>Simplify: <math>\frac{36x^9 - 12x^5}{4x^4}</math></p> <p>Break apart: <math>\frac{36x^9}{4x^4} - \frac{12x^5}{4x^4}</math></p> <p>Rewrite: <math>\frac{36}{4}x^{9-4} - \frac{12}{4}x^{5-4}</math></p> <p>Simplify: <math>9x^5 - 3x^1 \rightarrow 9x^5 - 3x</math></p> </div> <div style="border: 2px solid green; border-radius: 15px; padding: 10px; text-align: center;"> <p><b>Simplify</b></p> <math display="block">\frac{2x^2 - x - 15}{x^2 - 2x - 3}</math> <hr style="border-top: 1px dashed black;"/> <p><b>Factor</b></p> <math display="block">2x^2 - x - 15 = (2x+5)(x-3)</math> <math display="block">x^2 - 2x - 3 = (x+1)(x-3)</math> <hr style="border-top: 1px dashed black;"/> <p><b>Cancel Common Factors</b></p> <math display="block">\frac{2x^2 - x - 15}{x^2 - 2x - 3} = \frac{(2x+5)\cancel{(x-3)}}{(x+1)\cancel{(x-3)}} = \frac{(2x+5)}{(x+1)} \quad x \neq 3</math> </div>			
SUMMARY	Teacher once again writes important key words and procedures and asks children to note down and adopt.	Pupils will note down and read the summary in groups	Every individual reads the summary and notes it down and adopts the
ASSESSMENT	Teacher gives some questions from Try These sections as well as some examples and asks children to solve those sums	Every group will do the sums by discussion among each other	Every individual solves the sums on their own

**PRACTICE PERIODS : 7 to 11**      **ANOTHER MONOMIAL, DIVISION OF A POLYNOMIAL BY A MONOMIAL, DIVISION OF ALGEBRAIC EXPRESSIONS CONTINUED (POLYNOMIAL÷POLYNOMIAL)**

CONCEPTS/STEPS	TEACHER ACTIVITY (I DO)	GROUP ACTIVITY (WE DO)	INDIVIDUAL ACTIVITY (YOU DO)
KEY WORDS READING	Teacher writes the key words from previous class's teaching period and asks children to read and write them in note books # Division # Monomial # Binomial # Trinomial # Polynomial	Whole class activity : one child comes to the board and reads the key words loudly and the remaining class follows.	Every child comes to the board and reads the key words and notes them down in their note books
SIMILAR LINES READING	Teacher performs some divisions of polynomials and asks children to do some more by watching similar lines	Each group will read the similar lines and will frame some more by discussion	Every Individual will do a few more by watching similar lines
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 2px solid magenta; border-radius: 15px; padding: 10px; width: 30%;"> <p>Dividing Monomials</p> <math display="block">15mn \div 5m = \left(\frac{15}{5}\right)\left(\frac{m}{m}\right)(n)</math> <math display="block">= (3)(1)(n)</math> <math display="block">= 3n</math> </div> <div style="border: 2px solid cyan; border-radius: 15px; padding: 10px; width: 60%;"> <math display="block">\frac{18x^4 - 10x^2 + 6x^7}{2x^2} = \frac{18x^4}{2x^2} - \frac{10x^2}{2x^2} + \frac{6x^7}{2x^2}</math> <p style="text-align: center;">Now, we just reduce each term!</p> <math display="block">= 9x^2 - 5 + 3x^5</math> </div> </div>			
<p style="text-align: center;"><b>Simplify:</b></p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <math>\sqrt{1}=1</math>  <math>\sqrt{x^2}=x</math>  <math>(1-x)=-1(x-1)</math>  <math>=-(x-1)</math> </div> <div style="text-align: center;"> <math>\frac{x^2+4x-5}{1-x^2}</math>  <math>(x+5)(x-1)</math>  <math>(1+x)(1-x)</math> </div> <div style="text-align: center;"> <math>-5 \cdot 1 = -5</math>  <math>-5 + 1 = -4</math>  <math>5 \cdot -1 = -5</math>  <math>5 - 1 = 4</math> </div> </div> $\frac{(x+5)(x-1)}{(1+x)(1-x)} = \frac{(x+5)\cancel{(x-1)}}{-(1+x)\cancel{(x-1)}}$			
SUMMARY/ SYNOPSIS	Teacher once again writes important key words and definitions and asks children to note down and adopt.	Pupil groups will read and adopt the procedure	Teacher focuses on every individual so that every child is able to learn the concept in successive upcoming practice sessions
WRITING/ EDITING	Teacher gives some questions from Exercise 12.3 and asks children to solve those sums and teacher checks the writings of children	One group will check the writings of the other and vice versa	