9, 14 Multiplication, Division and Factorisation of Algebraic Expressions

**Objectives:**

* + Review the various terms related to algebraic expressions
	+ Review addition and subtraction of algebraic expressions
	+ Multiply two or more polynomials
	+ Learn and use standard identities to help simplify algebraic multiplication
	+ Review factors of an integer
	+ Understand how the Distributive Property (multiplication) and Factorisation are inverse operations and where each is used
	+ Factorise algebraic expressions by grouping terms and using standard identities
	+ Divide a polynomial by another polynomial by factorising and simplifying the algebraic expressions

**Before We Begin:**

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| --- | --- |
| Terms | Methods |
| * + Algebraic Expressions
	+ Like and unlike terms
	+ Factors
	+ Coefficients
	+ Mono, Bi, Tri, Polynomials
 | * + Add given algebraic expressions
	+ Subtract given algebraic expressions
	+ Distributive property for integers:

e.g. 5(4 - 3) = 5x4 - 5x3 |

**Lesson Plan: (Chapters 10, 14: NCERT Textbook for Class VIII)**

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| --- | --- | --- | --- |
| Content | Teacher's Activity  | Student's Activity | Assignments |
| 9.1 - 9.5 Revision of Algebraic Expressions  | * + Encourage students to read 9.1 - 9.5 on their own and attempt the questions from Ex 9.1
	+ Write down addition and subtraction problems on the board and invite students to solve it
 | * + Read and understand 9.1 - 9.5 from the textbook
	+ Complete Ex 9.1
 | * + Ex 9.1
	+ Classroom problems
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| 9.6 - 9.9 Multiplication of Algebraic Expressions  | * + Ask students to give examples of monomials, binomials, trinomials and polynomials
	+ Ask students to make algebraic expressions for given statements
	+ Prompt students for examples of cases where algebraic expressions need to be multiplied
 | * + Differentiate between an algebraic expression and a polynomial
	+ Differentiate between mono, bi, tri and polynomials
	+ Create an algebraic expression from a given problem statement
	+ Explain situations where we need to multiply algebraic expressions
 |    |
|   | * + Through examples show how monomials are multiplied with monomials
	+ Revisit the Distributive Property for integers and extend it to algebraic expressions
	+ Through examples show how monomials can be multiplied with polynomials
	+ Through examples show how polynomials can be multiplied with polynomials
 | * + Multiply a monomial with a monomial
	+ Multiply a monomial with a polynomial
	+ Multiply a polynomial with a polynomial
 | * + Ex 9.2
	+ Ex 9.3
	+ Ex 9.4
 |
| 9.10 - 9.12 Identities | * + Explain how Identities serve as shortcuts for common polynomial multiplication
	+ With students' help, derive the following identities: (a+b)2; (a-b)2; (a+b)(a-b); (x+a)(x+b)
	+ Explain through examples, how identities can be used to simplify calculations
 | * + Understand what Identities are and where they are used
	+ Learn to use Identities to simply numerical and algebraic calculations
 | * + Textbook Examples
	+ Ex 9.5
 |
| 14.1, 14.2: Factorisation | * + Revisit factors for natural numbers
	+ Explain how factors of simple monomials can be found
	+ Point out how multiplication and factorisation are reverse operations using examples of monomials multiplied with binomials
	+ Explain factorisation of simply polynomials by the method of common factors
 | * + Understand and explain what a factor means, both for numbers as well as monomials
	+ Recognise that multiplication and factorisation are reverse processes
	+ Factorise a given polynomial when all terms have one or more common factors
 | * + Textbook Examples
	+ Try These
 |
| 14.2 Factorise by regrouping terms; Factorise using identities | * + Introduce polynomials where all terms do not have common factors. Point out how some terms may still have common factors and can be regrouped to yield the factors of the entire polynomial
	+ Write down the four identities learnt earlier as part of multiplication and encourage students to match the given examples against the appropriate identity
	+ Once matched, explain how the identities can now be used as a shortcut to factorisation, much as they were used as a shortcut for multiplication
 | * + Factorise polynomials by regrouping terms
	+ Factorise polynomials by using identities
 | * + Ex 14.1
	+ Textbook Examples
	+ Ex 14.2

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| 14.3, 14.4 Division of Polynomials | * + Similar to multiplication, point out that polynomials may also need to be divided in certain situations (discuss examples)
	+ Explain how factorisation can be used to simplify division of polynomials in cases where the numerator and denominator have common factors (use fraction simplification examples)
	+ Work out examples of monomials ÷ monomials, polynomials ÷ monomials and polynomials ÷ polynomials
 | * + Simplify and solve division problems using factorisation: monomials ÷ monomials, polynomials ÷ monomials and polynomials ÷ polynomials
 | * + Ex 14.3
 |
| 14.5 Error Analysis | * + Guide the students through catching common errors in algebraic arithmetic
 | * + Catch and correct common errors in algebraic arithmetic
 | * + Textbook Examples
	+ Ex 14.4
 |
| Self-Assessment and Test |   |   |   |

**Why do we need to learn Algebraic Arithmetic?**

An interesting read: <http://www.mathgoodies.com/articles/why_learn_algebra.html>

e.g. Mariam and Sandeep started moving from the same point in North and East directions respectively. Mariam got tired after some time. She talked to Sandeep on the phone and came to know that he has travelled 2 km more than her. If the distance between them at that very moment is 10km, then find the distances travelled by them separately.

 **Self-Assessment:**

|  |  |  |  |
| --- | --- | --- | --- |
| Topic | Understanding of the topic | Working with simple cases | High comfort-level and confidence with the topic |
| Algebraic Expressions | * + I know what algebraic expressions and polynomials are
	+ I know what terms, factors and coefficients mean
	+ I can identify like and unlike terms

  | * I can add simple algebraic expressions. E.g. Add $x+2y$ and $3y+5x$
* I can subtract simple algebraic expressions involving whole number subtraction. E.g. Subtract $3x+4y$ from $7x+5y$
 | * I can add and subtract complex algebraic expressions using integer and fraction arithmetic
* I can solve multi-step addition/subtraction problems. E.g. From the sum of $2y^{2}+3yz$, $-y^{2}-yz-z^{2}$ and $yz+2z^{2}$, subtract the sum of $3y^{2}-z^{2}$ and $-y^{2}+yz+z^{2}$
 |
| Multiplication of polynomials | * + I know what the Distributive Property means and understand the following statement:

5(4-2) = 5 x 4 - 5 x 2* + I can multiply two simple monomials e.g. $3x $x $4y$

  | * + I can multiply any two monomials

C:\054A90C5\2F2412D5-532C-4D31-A988-5B96462A33BE_files\image005.png* + I can multiply a monomial and a binomial using the distributive property

C:\054A90C5\2F2412D5-532C-4D31-A988-5B96462A33BE_files\image006.png | * + I can multiply any two polynomials having integer or fraction coefficients

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| Identities | * + I know what multiplication identities are and know the expanded form of the following four identities:

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e.g. 582 = (60 - 2)2 | * + I can choose the appropriate identity and use it to simplify numerical and algebraic multiplication

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| Factorisation | * + I know how to find the factors of a given number
	+ I know how to find the factors of a given monomial
 | * + I can find the factors of a given polynomial where all terms have one or more common factors

e.g. $2xy -4x^{2}y+8xy^{2}$  | * + I can find the factors of a polynomial by regrouping the terms

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| Division of Polynomials | * I can simplify a given fraction to its simplest form. e.g. $\frac{21}{35}$
* I can simply an algebraic fraction with monomials in the numerator and denominator e.g. $\frac{4xy}{16x^{2}}$
 | * + I can divide a binomial by a monomial by using factorisation

C:\054A90C5\2F2412D5-532C-4D31-A988-5B96462A33BE_files\image015.png | * + I can divide a polynomial by a polynomial by using factorisation

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**Additional Comments:** (Please write a few lines about your experience with the topic, whether you need to put in additional time or require teacher’s help, etc. Be as specific as possible)