

Class 7	Subject: Math	Topic: Algebraic Expressions
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SUMMARY SHEET

Learner Previous Knowledge

Recognize, describe, and extend patterns and determine a next term in linear patterns (e.g., 4, 8, 12, ...)

Visualize of different patterns like matchstick pattern, block patterns and other such different patterns and generalizing a rule for the same.

Use letters, boxes, or other symbols to stand for any number in simple expressions or equations (e.g., demonstrate an understanding and the use of the concept of a variable, constant and co-efficient, Like and Unlike terms)

Use a letter to represent an unknown number; write and evaluate simple algebraic expressions in one variable by substitution.

Know and use the distributive property in equations and expressions with variables.

Target Knowledge for this Topic

Know what Polynomials are (types of algebraic expression on the basis of number of terms)

- Single Terms: Monomial
- Two terms: Binomial
- Three terms: Trinomial
- Four terms: Quadrinomials/Tetranomials.
- Degree of Polynomials

(demonstrate an understanding and the use of the concept of a variable, constant and co-efficient).

Like and Unlike terms.

Operation on Algebraic Expressions

- Addition and Subtraction of Algebraic Expressions
- Addition Method (Horizontal method, Column method)
- Subtraction Method (Horizontal method, Column method).

Simplification of Algebraic Expressions

- Clear the Brackets.
- Combine the like terms.
- Combine the constants.

Finding the value of an expression

Class 7	Subject: Math	Topic: Algebraic Expressions
----------------	----------------------	-------------------------------------

	Using Algebraic Expressions- Formulas and Rules	
Learning Goals		Taxonomy Level
<i>More Complex Learning Goal- Students will be able to identify and rectify the errors in algebraic expressions with logical explanations.</i>		Analyzing
<i>Target Learning Goal- Students will be able to add, subtract, simplify algebraic expressions using different methods and by applying associate, distributive and commutative properties.</i>		Executing
<i>Simpler Learning Goal- Students will be able to describe different terms with examples like monomial, trinomial, binomial, quadranomials, coefficients, algebraic expressions, constants, variables, like terms and unlike terms.</i>		Recalling
Period No.	Lesson Objectives	Teaching Learning Materials Required
1 and 2 <i>Note: This lesson requires 2 days</i>	- Know what Polynomials are (types of algebraic Expression on the basis of number of terms) -Single Terms: Monomial -Two terms: Binomial -Three terms: Trinomial -Four terms: Quadranomials/Tetranomials - Degree of Polynomials - Demonstrate an understanding and the use of the concept of a variable, constant and co-efficient. - Like and unlike terms.	- Recapitulation: Worksheet-1(1 per student); Projector (1 per class) Terminologies: Worksheet-2 (1 per class), Worksheet-3 (1 per person)
3	- Add and subtract Algebraic Expression horizontally and vertically - Simplification of Algebraic Expression. -Clear the Brackets -Combine the like terms. -Combine the Constants.	Brainstorm: Math Notebooks (1 per student) Home assignment: Worksheet-4 (1 per student)

Class 7	Subject: Math	Topic: Algebraic Expressions
----------------	----------------------	-------------------------------------

4	• Simplification of Algebraic Expression. -Clear the Brackets -Combine the like terms. -Combine the Constants. • Finding the value of an expression.	• <u>Brainstorm:</u> Math Notebook (1 per student) • Worksheet-5_(1 per student)
5	• Using Algebraic Expressions- Formulas and Rules	

Period 1 and 2

Lesson Objectives

At the end of this lesson students will be able to:

Class 7	Subject: Math	Topic: Algebraic Expressions
----------------	----------------------	-------------------------------------



- Know what Polynomials are (types of algebraic expressions on the basis of number of terms)
 - Single terms: Monomial
 - Two terms: Binomial
 - Three terms: Trinomial
 - Four terms: Quadrinomials/Tetranomials
- Degree of Polynomials
- Demonstrate an understanding and the use of the concept of a variable, constant and co-efficient.
- Like and unlike terms.

Teaching Learning Materials required

- **Recapitulation: Worksheet-1**(1 per student); Projector (1 per class)
- **Terminologies: Worksheet- 2**; (1 per class), **Worksheet-3** (1 per class)

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4 to 6

Lesson Beginning <u>Time</u> : 20mins <u>Purpose</u> : Activate prior knowledge	<u>Recapitulation/Whole class</u> • Begin the session by informing students about the class. • Tell them this class is related to algebraic expressions, in which they will recall the sub concepts of algebraic expressions, which they have covered in grade 6. • Provide Worksheet-1 to each student of the group. • Give them 5 to 7 mins to complete the task. <i>Note: The intent here is to allow students to identify expressions and equations and differentiate in between them.</i> <u>Whole class-discussion</u> • Project Worksheet-1. • Ask a few students at random to share the answers of all the questions. • Ask the following questions: ○ Differentiate between algebraic equations and algebraic expressions? ○ Justify the examples they shared to differentiate between algebraic equations and algebraic expressions? ○ What are variables and constant in algebraic expressions? • Each time ask them to give the justification for their answers.
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Class 7	Subject: Math	Topic: Algebraic Expressions
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	Build a class consensus on all the answers of the questions. <i>Note: Students may come up with incorrect examples and differentiation in between algebraic expressions and algebraic equation. In this case, ask other students who may have the correct answers to explain and justify. It is important to build consensus on all answers – this will help eradicate any errors.</i>
Lesson Middle <u>Time</u>: 25mins <u>Purpose</u>: Introduce the topic Develop the conceptual understanding Consolidate students learning	<u>Terminologies/groups</u> - Inform students that they are going to know more about terms used in algebraic expressions. - Give each student Worksheet-2. - Tell students to complete the sheet while discussing within their group members and give 10 mins for that. <u>Whole class-discussion</u> - Project Worksheet-2. - Ask a few students at random to share the answers of all the questions. - Ask the following questions: - How expressions are formed? Give justifications? - Each time ask them to give the justification for their answers. - Build a class consensus on all the answers of the questions. - Project your explanation. Explanation: We now know very well what a variable is. We use letters x, y, l, m, ... etc. to denote variables. A variable can take various values. Its value is not fixed. On the other hand, a constant has a fixed value. Examples of constants are: 4, 100, -17, etc. We combine variables and constants to make algebraic expressions. For this, we use the operations of addition, subtraction, multiplication and division. We have already come across expressions like $4x + 5$, $10y - 20$. The expression $4x + 5$ is obtained from the variable x, first by multiplying x by the constant 4 and then adding the constant 5 to the product. Similarly, $10y - 20$ is obtained by first multiplying y by 10 and then subtracting 20 from the product. The above expressions were obtained by combining

Class 7	Subject: Math	Topic: Algebraic Expressions
----------------	----------------------	-------------------------------------



	variables with constants. We can also obtain expressions by combining variables with themselves or with other variables. Example: In $4xy + 7$, we first obtain xy, multiply it by 4 to get $4xy$ and add 7 to $4xy$ to get the expression. <i>Note: students may come up with incorrect answers. In this case, ask other students who may have the correct answers to explain and justify. It is important to build consensus on all answers – this will help eradicate any errors.</i>
Lesson End <u>Time:</u> 30mins <u>Purpose:</u> Develop the conceptual understanding Consolidate students learning	<u>Discussions group/Whole class</u> • Provide Worksheet-3 to each student to write the answers. • Collect the sheets for review. <u>Home Assignment</u> • Tell the students to practice questions on Pg 234-Exercise 12.1 of NCERT Textbook.

Name: _____

Worksheet-1

Skill: Logical Reasoning

Directions: Categorize the following into algebraic expressions and algebraic equations.

$x + 3,$	$x \times x \times x = x^3,$ $x \times y = xy$	$4x + 5,$
$10y - 5x \times x^2y - 5$		

Algebraic Expressions	Algebraic Equation

Class 7	Subject: Math	Topic: Algebraic Expressions
----------------	----------------------	-------------------------------------



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Justify your categorization.

Provide more examples of expression and equations to differentiate between them.

Name: _____

Worksheet-2

Skill: Procedural Fluency

1. Label constants and variables in the given expressions:

$4x + 5$

Class 7	Subject: Math	Topic: Algebraic Expressions
----------------	----------------------	-------------------------------------



$$y - 5$$

2. How expressions are formed? Explain in detail with examples.

3. Explain how this expression has been formed?

$$4xy + 7$$

Name: _____

Worksheet-3

Skill: Procedural Fluency

1. Write a note on the following:

Class 7	Subject: Math	Topic: Algebraic Expressions
----------------	----------------------	-------------------------------------



Terms of an expression:

Monomial

Binomial:

Trinomial:

Polynomial

Coefficients

Degree of polynomial

Class 7	Subject: Math	Topic: Algebraic Expressions
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Period 3

Lesson Objectives

At the end of this lesson students will be able to:

- Add and subtract Algebraic Expressions horizontally and vertically.
- Simplification of Algebraic Expressions.
- -Clear the Brackets.
- -Combine the like terms.
- -Combine the Constants.

Teaching Learning Materials required

- **Brainstorm:** Math Notebooks (1 per student)
- **Worksheet-4** (1 per student); projector (1 per class)

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4 to 6

Lesson Beginning <u>Time:</u> 20mins <u>Purpose:</u> Activate prior knowledge Generate interest to the topic Introduce the topic Develop conceptual understanding	<u>Brainstorm/Groups</u> • Inform students today we are going to know about addition and subtraction of algebraic expressions. • Write the given expressions on the board: ○ $7x + 5y + 8 + 9 + 5y + 3x$ ○ $24ab - 10b - 18a - 30ab + 12b + 14a.$ • Tell them to discuss and try adding and subtracting the given expression. • Give them 5 to 10 minutes to solve the expressions <u>Whole class-discussion</u> • At random call groups one by one to share the method and steps used by them in order to solve the given expression. • Ask the following questions from the representative groups:
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Class 7	Subject: Math	Topic: Algebraic Expressions
----------------	----------------------	-------------------------------------

	○ How did you solve the expression? ○ What is the first step you used? ● Build a class consensus on the steps used by the students. <i>Note: The intent of this activity is to provide an opportunity to try out adding and subtracting the expression by ordering like terms together and then add and subtract. Also, while subtracting they need to change the signs addition to subtraction and subtraction to addition. They can either use horizontal way or vertical way. Appreciate both the correct ways.</i>
Lesson Middle <u>Time:</u> 10mins <u>Purpose:</u> Develop conceptual understanding	<u>Practice questions/pairs</u> ● Tell them they are going to know more about addition and subtraction of algebraic expressions to develop their understanding. ● Provide students with Worksheet-4 and ask them to complete ● Give students 10-15 mins time to complete the worksheet and then discuss the worksheet in class.
Lesson End <u>Time:</u> 10mins <u>Purpose:</u> Consolidate students learning	<u>Whole class-discussion</u> ● At random call different students one by one to share the solution of the questions. ● Ask the following questions from the representative students: ○ What can you understand related to addition and subtraction of algebraic problems? ○ How did you solve the problems? Explain the steps you used. ● Build a class consensus on all the answers of the problems. ● Collect the sheets for review and feedback. <i>Note: Students may come up with incorrect solutions. In this case, ask the mentioned questions to help them to justify their solutions. It is important to build consensus on all answers – this will help eradicate any errors. Also, students may use either vertical or horizontal ways in order to solve the problems. Appreciate and clear both the ways so, that they can select the suitable way.</i> <u>Home Assignment</u>

Class 7	Subject: Math	Topic: Algebraic Expressions
----------------	----------------------	-------------------------------------



	Tell the students to practice questions on Pg 239-Exercise 12.2 of NCERT Textbook
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Name: _____

Worksheet-4

Skill: Problem Solving

Practice questions:

1. Add the following:

a. $3m(6 - m)$ and $7m^2 - 15m$

b. $4p(5p^2 + 4p - 7)$ and $5(p^3 - 4p^2 + 3)$

2. Subtract the following:

a. $5a^2 - 7ab + 5b^2$ from $3ab - 2a^2 - 2b^2$

Class 7	Subject: Math	Topic: Algebraic Expressions
----------------	----------------------	-------------------------------------



b. $a(b - 5)$ from $b(5 - a)$

3. What should be added to $x^2 + xy + y^2$ to obtain $2x^2 + 3xy$?

4. What should be subtracted from $2a + 8b + 10$ to get $-3a + 7b + 16$?

5. Add $3x + 11$ and $7x - 5$

Class 7	Subject: Math	Topic: Algebraic Expressions
----------------	----------------------	-------------------------------------



6. Add $3x + 11 + 8z$ and $7x - 5$.

7. 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 $-y^2 + yz + z^2$.

8. From the sum of $3x - y + 11$ and $-y - 11$, subtract $3x - y - 11$.

9. From the sum of $4 + 3x$ and $5 - 4x + 2x^2$, subtract the sum of $3x^2 - 5x$ and $-x^2 + 2x + 5$.

Class 7	Subject: Math	Topic: Algebraic Expressions
----------------	----------------------	-------------------------------------



Period 4

Lesson Objectives

At the end of this lesson students will be able to:

- Simplification of Algebraic Expression.
 - Clear the Brackets
 - Combine the like terms.
 - Combine the Constants.
- Finding the value of expression.

Teaching Learning Materials required

- **Brainstorm:** Math Notebooks (1 per student)
- **Worksheet-5** (1 per Student)

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4 to 6

Lesson Beginning <u>Time:</u> 10 mins <u>Purpose:</u> Activate prior knowledge	<u>Brainstorm/Groups</u> • Inform students today we are going to see how to simplify algebraic expressions and then finding the value of expression. • Write the given expression on the board: ○ $5 + (1 + f) =$ ○ $8 (2d) =$ ○ $5r + 10r + 4 + 4$
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Class 7	Subject: Math	Topic: Algebraic Expressions
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Generate interest to the topic Introduce the topic Develop conceptual understanding	- Tell them to discuss and try simplifying the given expression. - Give them 2 to 3 minutes to solve the expressions <u>Whole class-discussion</u> - At random call groups one by one to share the steps involved in simplifying the expressions. - Ask the following questions from the representative groups: - How did you simplify the expression? - Did they use any property of addition? Why and how? - What expression you get after simplifying the expression? - Finding the value of expression - Build a class consensus on the steps used by the students. - Show the correct solution: $\begin{aligned} 5 + (1 + f) &= (1 + f) + 5 && \text{Apply the commutative property of addition} \\ &= (f + 1) + 5 && \text{Apply the commutative property of addition} \\ &= f + (1 + 5) && \text{Apply the associative property of addition} \\ &= f + 6 && \text{Simplify} \end{aligned}$ $\begin{aligned} 8(2d) &= (8 \cdot 2)d && \text{Apply the associative property of multiplication} \\ &= 16d && \text{Simplify} \end{aligned}$ Combine the r terms by adding their coefficients: $\begin{aligned} &5r + 10r + 4 + 4 \\ &= 15r + 4 + 4 \end{aligned}$ Combine the constants: $\begin{aligned} &15r + 4 + 4 \\ &= 15r + 8 \end{aligned}$ The answer is $15r + 8$. <i>Note: The intent of this activity is to provide an opportunity to try out the process of simplifying algebraic expressions using the properties of addition. Through</i>
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Class 7	Subject: Math	Topic: Algebraic Expressions
----------------	----------------------	-------------------------------------

	<i>discussion make them understand that they can use properties of addition in order to simplify the expressions.</i>
Lesson Middle <u>Time:</u> 20 mins <u>Purpose:</u> Develop conceptual understanding	<u>Discussion group/pairs</u> • Tell them they are going to know more about simplification of algebraic expressions. • They will have to make a note of the steps in their math notebook, which are used in class to solve each of the expressions. • Provide Worksheet-5 and ask students to complete the worksheet in 10-15 mins • Discuss the worksheet after they complete their task. <i>Note: the intent of practicing worksheet is to provide an exposure to students to understand the essential steps required in order to simplify the algebraic expressions and then finding the value of expression. Through discussion make them understand that there are various steps using which they can simplify the equations. In certain situations they will have to use properties of addition in certain situations they will have to combine like terms and then add them to make a simple expression out of the complicated one.</i>
Lesson End <u>Time:</u> 10 mins <u>Purpose:</u> Consolidate students learning	<u>Practice questions/pairs</u> • Tell the students to practice questions on Pg 242-Exercise 12.3 of NCERT Textbook.

Class 7	Subject: Math	Topic: Algebraic Expressions
----------------	----------------------	-------------------------------------



Name_____

Worksheet-5

1. Observe the given expression and answer the questions.

$$10y^2 - 3y$$

$$3y^3 + 5y - 7$$

a) Identify the numerical coefficients of terms (other than constants) in the above expressions.

b) Define the term coefficient. Identify the term, that contains y^3 and give the coefficient of y^3

2. $3x^3 + 2y$, is not a monomial. Justify the statement and give an example of monomial.

3. What is a trinomial? Describe and give an example.

4. Solve the given algebraic expressions.

Add <i>$ab - bc$ and $4bc - 3ab$</i>	Subtract <i>$4a - 3b$ from $6a - 5b$</i>
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Class 7	Subject: Math	Topic: Algebraic Expressions
----------------	----------------------	-------------------------------------

Add $4p^3 - 3p$ & $4p^2 - 5p$	Subtract $2ab - 5c$ from $2a + 3b$
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5. Add

$$3p^2q^2 - 4pq + 5, -10p^2q^2, 15 + 9pq + 7p^2q^2$$

6. Subtract $-10b - 18a + 16c + d + 24ab$ from $34ab + 14b + 14a + 12c$

7. Simplify: $2(a^2 + 2a + 1) + 5(2a^2 + a)$

8. What should be taken away from $4x^2 - 4y^2 + 7xy + 20$ to obtain $-x^2 - y^2 + 6xy + 20$?

9. Check the sum solved by Neha. Identify and rectify the error, if any.

A. Add: $7xy + 5yz - 3zx$, $4yz + 9zx - 4y$, $-3xz + 5x - 2xy$.

$$\begin{array}{r}
 7xy + 5yz - 3zx \\
 4yz + 9zx - 4y \\
 + \quad -2xy \quad -3zx + 5x \\
 \hline
 5xy + 9yz - 6zx + 5x - 4y - 3zx
 \end{array}$$

B. What should be added to $5x^2 - 4y^2 + 6y - 3$ to get $7x^2 - 4xy + 8y^2 + 5x - 3y$.

$$\begin{array}{r}
 7x^2 - 4xy + 8y^2 + 5x - 3y \\
 5x^2 \quad - 4y^2 \quad + 6y - 3 \\
 (-) \quad (+) \quad (-) \quad (+) \\
 \hline
 \end{array}$$

$$12x^2 - 4xy + 12y^2 + 5x + 3y + 3$$

Class 7	Subject: Math	Topic: Algebraic Expressions
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Period 5

Lesson Objectives

At the end of this lesson students will be able to:

- Use Algebraic Expressions- Formulas and Rules

Teaching Learning Materials required

- **Board work:** Math notebook (1 per student)

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4 to 6

Lesson Beginning <u>Time:</u> 15 mins <u>Purpose:</u> Activate prior knowledge Generate interest to the topic Introduce the topic Develop conceptual understanding	<u>Whole Class Discussion/Groups</u> • Teacher will discuss that formulas and rules in mathematics can be written using algebraic expressions. • Teacher will discuss the perimeter and area formulas with the students. • Give them 5 to 7 mins to complete the task.
Lesson Middle <u>Time:</u> 20 mins	<u>General discussion/Whole class</u> ○ Teacher will discuss the rules for number patterns in algebra, geometry, etc.

Class 7	Subject: Math	Topic: Algebraic Expressions
----------------	----------------------	-------------------------------------

<u>Purpose:</u> Develop conceptual understanding	○ She will discuss the questions on Pg 246-Exercise 12.4 of NCERT Textbook
Lesson End <u>Time:</u> 5 mins <u>NA</u>	