



Sri Sathya Sai
VIDYA VAHINI
श्री सत्यसाई विद्या वाहिनी

Master Lesson Plan

for

06 - Algebra (ବୀଜ ଗଣିତ)

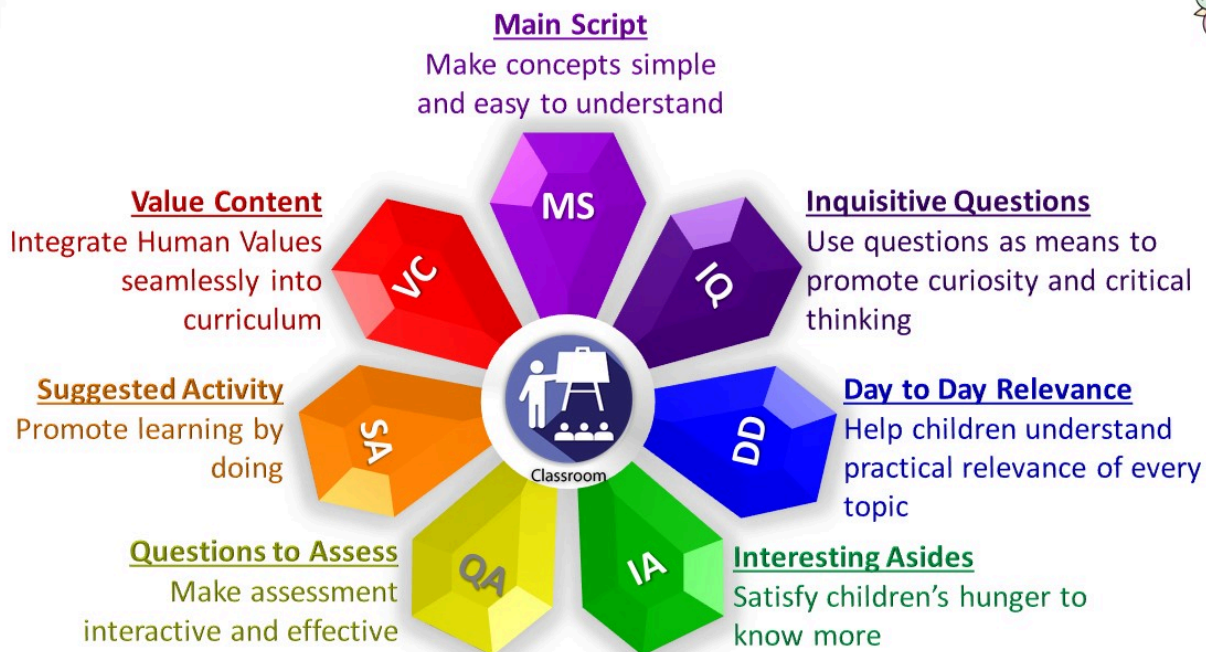
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Master Lesson Plan (MLP) - Covers the entire chapter with the help of these 7 asset types



For more information on how to use the lesson plan effectively, please scroll to the guidelines at the end of this document.

MS_Objectives_Algebraic Expressions

1. MS_Objectives_Algebraic Expressions

Notes to the teacher: This asset lays down the proposed plan for transacting this chapter. It states the asset objectives of the MLP. This asset is for the teacher's reference and need not be taught to the students.

Students will be able to

- • differentiate between variables and constants
- • identify the terms of an algebraic expression
- • identify like and unlike terms in an algebraic expression
- • identify the different types of algebraic expressions
- • identify algebraic expressions in day to day life
- • write mathematical statements into algebraic expressions
- • write algebraic expressions for given statements
- • relate Algebra with Ancient Indian history
- • identify the degree of a polynomial
- • identify the value of an algebraic expression
- • see different patterns using matchsticks
- • write expressions on addition and subtraction
- • adapt positive attitude towards people around us
- • use algebraic expressions in patterns
- • write formulae using algebraic expressions
- • solve problems on algebraic expressions

Time to teach	Asset type	Theme	Sub Theme
3 minutes	Main Script	Algebraic Expression & Identities	Addition and subtraction of algebraic expressions

IQ_How Do You Find x?**Difference between a variable and constant**

1) In Algebra, what is the difference between a constant and a variable?

We know that numbers, such as 1, π etc. are constants.

But in functions like $p(x) = ax^2 + bx + c$, it seems that a , b , c and x can all have any value, even though x is considered to be the only variable and the rest are constants.

What is the difference between constant and variables in such cases?

A constant's value never changes. 1 always equals 1; therefore, 1 is a constant. From one problem or set of problems to the next, 1 will always equal 1.

When you see something like $ax^2 + bx + c$, a , b , c are constants, they represent general values (remember general values are different from variables).

You might not know the value of them until you see the actual function (like $5x^2 + 3x - 4$), but, until you know what they are, you treat them as if the values never change.

The 'x' in these functions is a variable. The function applies to all the values that 'x' can take.

2) Identify the letters (as constant or variable) used in the following examples.

a) Suppose you must report to your teacher, the total number of library books read by you in one semester

Since you don't know this number at the beginning of the semester, you decide to represent this number by the letter 'b'.

Later you make a list of library books read by you and find the total.

You find that there are a total of eight books being read. Then the letter 'b' represents 8 and since 'b' cannot represent any other value, 'b' is a constant.

b) Suppose that a student is taking 3 mathematics classes per week. Each specific class can have at most one test/week.

If 'x' represents the total number of mathematics tests/week what is 'x'?

The letter 'x' represents any one of the values 0, 1, 2, and 3. Thus, 'x' is a variable.

Time to teach	Asset type	Theme	Sub Theme
7 minutes	Inquisitive Questions	Algebraic Expression & Identities	Terms in expression

MS_Algebraic Expressions

Variables & Constants

1. Perimeter of a square = $4 \times s$

Here, 4 is a constant and s is a variable.

2. The perimeter P of a rectangle of sides l and b is given by, $P = 2(l + b)$. Here, 2 is a constant and l and b are variables.

Variables:

The term variables imply that which varies. Variables are various numerical values. Variables can change e.g, the age of a person.

Thus we define variables as numbers that can change the value or represent a missing value (an unknown value).

Variables are usually represented by letters of the alphabet, and the letters x , y , and z are most commonly used.

Constants:

Constants contain only numbers. A quantity, which has a fixed numerical value, is called a constant. A symbol having a fixed numerical value is called a constant.

The value of constant does not change e.g, your date of birth.. The integers ...-2, -1, 0, 1, 2, 3 are constants. They are also called numerical coefficients.

Numerical expression:

It is a statement of expression consisting of numbers and any one or all 4 arithmetic operations.

Example: $5 \times (6 + 2)$, $(10 - 5) \div 5$

Algebraic expressions:

Algebraic expressions are a combination of constants and variables connected by the signs of fundamental operations of addition, subtraction, multiplication, and division.

Examples:

1. The sum of x and 3

$x + 3$. Here x is a variable, 3 is a constant and sum means addition.

2. Subtract 4 from y .

$y - 4$. Here y is a variable. 4 is a constant.

3. 5 times x

$5 \times x$. Here x is a variable and times means multiplication. We write as $5x$.

4. The product of x and y .

$x \times y$. Here x and y are variables. Product means multiplication. We write as $x \times y$.

Terms:

The basic unit of an algebraic expression is a term. It is a part of an algebraic expression. There is '+' or '-' sign between the two terms of expression.

A term is either a number or a combination of numbers and variables combined using the four fundamental operations.

Example: $5x$, $5/y$, $2c + 3$, $x + y - z$

In the first expression, there is only one term $5x$. In the second expression also, only one term

$5/y$.

In the third expression, there are two terms namely, $2c$ and 3 and in the fourth expression, there are 3 terms namely x , y , and z .

Factors:

Terms are the product of factors.

In the term $2c$, $2c$ is the product of its factors 2 and c .

Coefficient: We know that each term consists of a number and one or more alphabets. The number is called the coefficient of the alphabet or alphabets.

The coefficient of a particular variable will be the other factors of the variable in that expression. (Or)

In a term, any factor of the term is called the coefficient of other factors. The numerical factor of a term is called its numerical coefficient.

Example1:

The coefficient of x in $5x$ is 5

The coefficient of y in $4xy$ is $4x$

The coefficient of z in $4xyz$ is $4xy$

The coefficient of xy in $4xyz$ is $4z$

The coefficient of xyz in $3xyz$ is 3

Find the coefficient of x, y, z, xyz in $-4xyz$

Solution:

The coefficient of x in $-4xyz$ is $-4yz$

The coefficient of y in $-4xyz$ is $-4xz$

The coefficient of xyz in $-4xyz$ is -4

If a variable has no number written before it, then its numerical coefficient is considered as 1 .

The numerical coefficient of x is 1 and the numerical coefficient of $-x$ is -1

Expression:

1. **No. of Note Books** 1 2 3 4 5 10 20 X

Cost 10/- 20/- 30/- 40/- ? 100/- 200/- ?

From the above table, it is clear that the cost of 5 books is $5 \times 10 = \text{Rs.}50/-$.

Cost of 20 books is $20 \times 10 = \text{Rs.}200/-$.

What will be the cost of 'X' books?

It would be $X \times 10 = \text{Rs.}10X/-$. So Cost of X books is $10X$. This is how algebraic expressions are formed.

2. It is interesting to know how these Algebraic expressions are formed by breaking them into factors. For example $3x + 7$.

First, multiply 3 with x then add 7 to it.

3. Similarly, $4xy + 7$ is formed by first multiplying 4 with x (we get $4x$), then $4x$ with y we get $4xy$, finally add $4xy$ with 7 to get $4xy+7$.

It can be explained with the help of a Tree diagram:

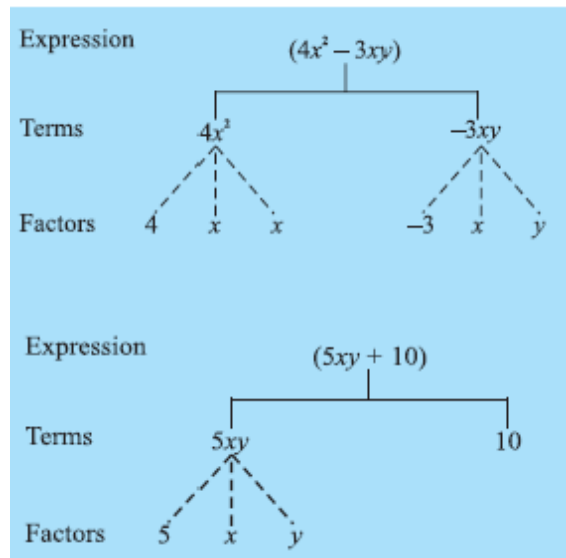


Image Source: Original contribution by rajeswariraju.tr@gmail.com

Time to teach	Asset type	Theme	Sub Theme
12 minutes	Main Script	Algebraic Expression & Identities	Expression

MS_Classification of Algebraic Expressions

Classification of algebraic expressions

Monomial

- Algebraic expressions with only one term are called **monomials**.
Some examples of monomials are 3, 2x, 5y, -2xy, $7x^2$ etc.

Binomial

- Algebraic expressions with two unlike terms are called **binomials**.
E.g. $2x + 3$, $5y - 2$, $2x + 3y$, $3ab - c$, $x^2 + 1$, $x^2 - y^2$.

Trinomial

- Algebraic expressions with three unlike terms are called **trinomials**.
Some examples of trinomials are, $3x + 2y + 3$, $x + y + z$, $ab + 2bc + 3ca$

Polynomial

- Algebraic expressions with many unlike terms are called **polynomials**.
 $x^4 + 3x^2 - 4x + 1$, $a^5 + a^4b - 5a^3b + 4a^3b^2 - 2ab^4 + 1$ are some examples of polynomials.

Note:

1) Like terms in an algebraic expression can be added up. Therefore, $a + 2a$ is not a binomial as its value is $3a$ and it's a monomial.

2) In terms of polynomials, variables are raised to whole powers. i.e. powers or exponents of variables are positive integers or zero.

When the power is zero, the variable becomes a constant.

Thus,

$2x^{-3}$ cannot be the term of a polynomial – the exponent is a negative number.

$y^{\frac{1}{2}}$ is not the term of a polynomial - the exponent is a fraction.

Time to teach	Asset type	Theme	Sub Theme
10 minutes	Main Script	Algebraic Expression & Identities	Expression based on terms(monomials, binomials and trinomials)

MS_Like and Unlike terms

Brief Description (Objective): Students will be able to identify like and unlike terms in an algebraic expression.

Teaching Aids Provided: PPT

Teaching Learning Material (TLM): Write on the blackboard

What do you need?: Chalk & blackboard

Get Ready:

TERMS:

1. LIKE TERMS
2. UNLIKE TERMS

1. LIKE TERMS:

Terms which contain the same variable are called '**like terms**'.

Examples:

- i) $7y$ and $3y$ are called like terms as they have the same variables y .
- ii) $-3a^2$ and $2a^2$ are called like terms as they have the same variables a^2 .
- iii) $4x$ and $5x$ have the same variables. That is x . Hence, they are called like terms.

2. UNLIKE TERMS:

Terms which have different variables are called '**unlike terms**'.

Examples:

- i) $7y$ and $4z$ are called unlike terms as they have different variables y and z .
- ii) $-4b^2$ and $-4c^2$ are called unlike terms as they have different variables b and c .
- iii) $5y^2$ and $5x$ have different variables. That is y and x . Hence, they are called unlike terms.

Important :- Simple way to identify like and unlike terms :

- a) Ignore the numerical coefficients.
- b) Concentrate on the algebraic part of the terms.
- c) Check the variables in the term. They must be the same.
- d) Check the power of each variable in the terms. They must be the same.
- e) Two things do not matter -
 - ❖ First the numerical coefficients of the terms
 - ❖ second the order in which the variables are multiplied.

Time to teach	Asset type	Theme	Sub Theme
10 minutes	Main Script	Algebraic Expression & Identities	Expression

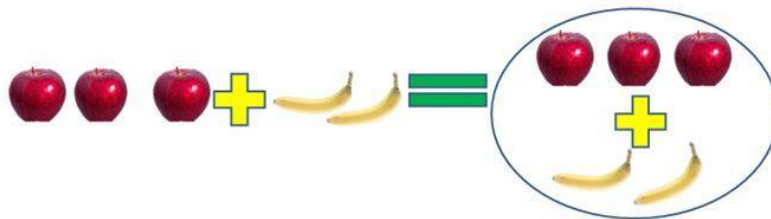
MS_Addition and Subtraction of Algebraic Expressions

Addition or subtraction of like terms

When you were first learning to add, you would do "three apples and two apples are five apples".



You have learned that "you can't add apples and bananas". That is, "three apples and two bananas" is just a pile of five fruits; it isn't something like "five apples" or "five bananas". Combining like terms works much the same way.



When you add like terms, follow the following steps.

- Obtain the numerical coefficients of all like terms.
- Find the sum of numerical coefficients of like terms.
- Write the required sum as a similar term, with the literal factor same as the literal factor of the given like terms and the numerical coefficient is the sum obtained in step 2

Follow the same steps when you subtract a term from another like term.

For example,

1) Find the sum of $2x^2y$, $7x^2y$ and $9x^2y$

- The literal factor of like terms is x^2y and the numerical coefficients are 2, 7, and 9 respectively.
- Sum of the numerical coefficients is $2 + 7 + 9 = 18$
- The sum $2x^2y + 7x^2y + 9x^2y = 18x^2y$.

2) Add $-4ab$, $-3ab$, and $-6ab$

- The literal factor of like terms is ab and the numerical coefficients are -4 , -3 and -6 respectively.
- Sum of the numerical coefficients is $(-4) + (-3) + (-6) = -13$.
- Thus, $(-4ab) + (-3ab) + (-6ab) = -13ab$.

3) Add $4x^3y^2$, $-2x^3y^2$, $-3x^3y^2$, $6x^3y^2$

- The literal factor of like terms is x^3y^2 , the numerical coefficients are 4, -2 , -3 and 6 respectively.
- Sum of numerical coefficients is $4 + (-2) + (-3) + 6 = 5$.
- Thus, $4x^3y^2 + (-2x^3y^2) + (-3x^3y^2) + 6x^3y^2 = 5x^3y^2$

4) Subtract $9x^2y$ from $12x^2y$

a) The literal factor of like terms is x^2y and the numerical coefficients are 9 and 12.

b) To obtain the difference $12x^2y - 9x^2y$, find the difference $12 - 9 = 3$.

c) Thus, $12x^2y - 9x^2y = 3x^2y$.

5) Subtract $-5xy$ from $3xy$.

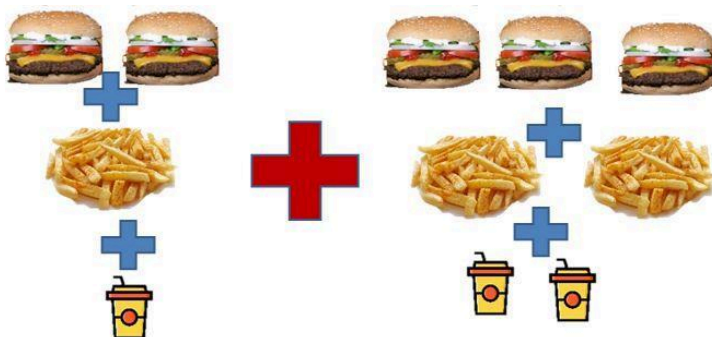
a) The literal factor is xy .

b) $3xy - (-5xy) = 3xy + 5xy = 8xy$.

Addition and subtraction of algebraic expressions with like and unlike terms

Think about cleaning your room. You probably put your clothes together, all the pillows and blankets together and so on. In a way, you are combining the like “terms” of your room.

Now you have an idea of grouping like terms. Look at the following example. Consider the following family order:

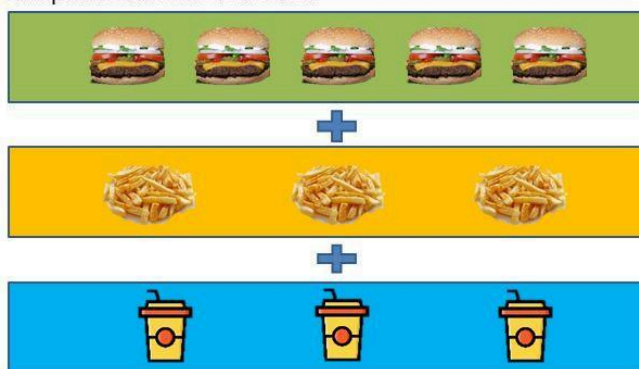


How can we write this in Algebraic form?

Can we write this in Algebra as: $2b + f + d + 3b + 2f + 2d$?

What do we get if we combine the like items ?

We get a simplified list as follows:



We can write this as: $5b + 3f + 3d$

Adding two algebraic expressions

In adding algebraic expressions containing like and unlike terms, we collect different groups of like terms and find the sum of like terms in each group by the method discussed above.

Add: $3x + 5x$

Horizontal method:

$$3x + 5x = 8x$$

Vertical method

$$3x$$

$$\begin{array}{r} +5x \\ \hline \end{array}$$

$$\underline{8x}$$

Find the sum of : $20a^3 + 35b^2 - 10c$ and $12a^3 + 30b^2 - 2c$

Horizontal method:

$$\begin{aligned} & (20a^3 + 35b^2 - 10c) + (12a^3 + 30b^2 - 2c) \\ &= 20a^3 + 35b^2 - 10c + 12a^3 + 30b^2 - 2c \\ &= 20a^3 + 12a^3 + 35b^2 + 30b^2 - 10c - 2c \\ &= 32a^3 + 65b^2 - 12c \end{aligned}$$

Add:

Vertical method:

$$\begin{array}{r} 20a^3 + 35b^2 - 10c \\ + 12a^3 + 30b^2 - 2c \\ \hline = 32a^3 + 65b^2 - 12c \end{array}$$

Subtraction:

Subtraction is addition of the additive inverse. To subtract an algebraic expression from another, change the sign of each term of the expression to be subtracted and then add the two expressions.

1. Subtract $4a^3$ from $-10a^3$

Horizontal Method

$$\begin{aligned} &= -10a^3 - 4a^3 \\ &= -14a^3 \end{aligned}$$

Vertical Method

$$\begin{array}{r} -10a^3 \\ - 4a^3 \\ \hline -14a^3 \end{array}$$

2. Subtract $x - y - z$ from $6x + 2y + 2z$

Horizontal Method

$$\begin{aligned} & (6x + 2y + 2z) - (x - y - z) \\ &= 6x + 2y + 2z - x + y + z \\ &= 6x - x + 2y + y + 2z + z \\ &= 5x + 3y + 3z \end{aligned}$$

Vertical Method

$$\begin{array}{rcl} 6x + 2y + 2z & \longrightarrow & 6x + 2y + 2z \\ (-) x - y - z & \longrightarrow & \underline{-x + y + z} \\ & & \underline{5x + 3y + 3z} \end{array}$$

3. What should be subtracted from $15a + 2b - c$ to obtain $a - 5b + 7$

Let us assume that unknown polynomial be x

$$\begin{aligned}\therefore 15a + 2b - c - x &= a - 5b + 7c \\ x &= (15a + 2b - c) - (a - 5b + 7c) \\ &= 15a + 2b - c - a + 5b - 7c \\ &= 15a - a + 2b + 5b - c - 7c \\ &= 14a + 7b - 8c\end{aligned}$$

4. If $m = 16x^2 + 10y + 2z$, $n = -10x^2 - 11y - z$, find $3m + n$

$$\text{Sol: } m = 16x^2 + 10y + 2z$$

$$3m = 3(16x^2 + 10y + 2z)$$

$$3m = 48x^2 + 30y + 6z$$

$$3m + n = (48x^2 + 30y + 6z) + (-10x^2 - 11y - z)$$

$$= 48x^2 + 30y + 6z - 10x^2 - 11y - z$$

$$= 38x^2 + 19y + 5z$$

For example:

1) Add $17x + 3$ and $13x - 1$

$$(17x + 3) + (13x - 1)$$

$$= (17x + 13x) + (3 - 1) \text{ (combining like terms)}$$

$$= 30x + 2$$

2) Simplify $8x + 7y + 4x - 3y$

$$8x + 7y + 4x - 3y$$

$$= (8x + 4x) + (7y - 3y) \text{ (combining like terms)}$$

$$= 12x + 4y$$

Subtraction of algebraic expressions

When you subtract one algebraic expression from another, follow the following steps.

1. Change the sign of all terms in the algebraic expression which is to be subtracted
2. Then add the two expressions

E.g.

1) Subtract $2x - 7y + 4$ from $5x - 2y + 1$

$$(5x - 2y + 1) - (2x - 7y + 4) = 5x - 2y + 1 - 2x + 7y - 4$$

$$= (5x - 2x) + (-2y + 7y) + (1 - 4) \text{ (combining like terms)}$$

$$= 3x + 5y - 3$$

2) Simplify $(4x^2 + xy + 3y^2) - (x^2 + y^2 - 3xy)$

$$(4x^2 + xy + 3y^2) - (x^2 + y^2 - 3xy)$$

$$= (4x^2 + xy + 3y^2) - x^2 - y^2 + 3xy$$

$$= (4x^2 - x^2) + (xy + 3xy) + (3y^2 - y^2) \text{ (combining like terms)}$$

$$= 3x^2 + 4xy + 2y^2$$

Image Source:

Apple and Banana :

[https://commons.wikimedia.org/wiki/File:Banana_\(1\).jpg](https://commons.wikimedia.org/wiki/File:Banana_(1).jpg)

<https://www.pexels.com/photo/apple-fruit-healthy-food-39803/>

french fries, drink, burger :

<https://pixabay.com/photos/french-fries-food-french-plate-1351062/>

<https://pxhere.com/en/photo/819865>

<https://pixabay.com/illustrations/soft-drink-drink-fresh-cool-2916290/>

Time to teach	Asset type	Theme	Sub Theme
15 minutes	Main Script	Algebraic Expression & Identities	Addition and subtraction of algebraic expressions

MS_Degree of a Polynomial

Degree of a polynomial:

- The degree of a polynomial with **only one variable** is the largest exponent of that variable.
- Consider a polynomial with only one variable say, $2x - 4x^2 + 3$. The variable is 'x' and the highest exponent of x is 2.
- The degree of the polynomial is 2.
- The degree of the polynomial $y^6 - 2y^3 + y$ is 6 and the degree of $2 - 3x^2 + 4x^5 + 2x^4 - 4x + x^3$ is 5.
- To find the degree of a polynomial with **more than one variable**, we need to look at each term. Terms are separated by + or - signs.
- For each term, find the degree by adding the exponents of each variable in it.
- The largest such degree is the degree of the polynomial.
- For example, What is the degree of $3x^3y^2 + 2xy + y^3 - 4x + 3$?
- The degree of the term $3x^3y^2$ is: exponent of x + exponent of y = $3 + 2 = 5$.
- The degree of $2xy$ is $1 + 1 = 2$, the degree of y^3 is 3 and the degree of $-4x$ is 1.
- The highest degree of the terms is 5. Thus the degree of the polynomial is 5.

Standard form of a polynomial:

Consider a polynomial, $3x^3 + 7x^2 - 2x + 5$

Notice the exponent of the terms. The first term has an exponent of 3, the second term has an exponent of 2, the third term has an exponent of 1 and the last term doesn't have any variable at all.

The polynomials are written this way, with the terms written in decreasing order of exponents, i.e. with the largest exponent first, the next highest next, and so forth, are called **polynomials in standard form**.

Degree of a monomial is the sum of the degree of all its variables.

E.g.: Degree of $4x^3yz^4$

$$= 3+1+4$$

$$= 8$$

Note: Remember that the degree of a constant is zero.

Study the following table:

Algebraic Expression	Degree of each term				Degree of expression
	1 st term	2 nd term	3 rd term	4 th term	
$7xy^2$	3	-	-	-	3
$3y - x^2y^2$	1	4	-	-	4
$4x^2 + 3xyz + y$	2	3	1	-	3
$pq - 6p^2q^2 - p^2q + 9$	2	4	3	0	4

Note:

1. General form of **first-degree polynomial** is $ax + b$.

E.g.: $2x + 4$, $5x - 4$, $2y - 3$ etc.

1. General form of **second-degree polynomial** is $ax^2 + bx + c$. It is also called quadratic expression.

E.g. $4x^2 + 3x - 7$, $-2x^2 + 7x - 3$ etc

Zero of Polynomial

The value which is substituted in place of the variable so that the whole expression becomes zero is called **zero of polynomial**.

E.g.

1) In $x - 2$, 2 is the zero of the polynomial

2) $2x - 4$

When x is replaced by 2, the value of the whole expression becomes zero.

$$= 2(2) - 4$$

$$= 4 - 4$$

$$= 0$$

Therefore, 2 is the zero of the polynomial $2x - 4$

Degree of the Expression

Compare the degrees of all the terms in an expression. The highest of the degrees of all the terms of an expression is called the **degree of the expression**.

Study the following table:

Monomial	Exponents of x / y / z			Degree of the monomial
	x	y	z	
x	1	-	-	1
$7x^2$	2	-	-	2
$-3xyz$	1	1	1	$1 + 1 + 1 = 3$
$8y^2z^2$	-	2	2	$2 + 2 = 4$

Time to teach	Asset type	Theme	Sub Theme
10 minutes	Main Script	Algebraic Expression & Identities	Polynomials

DD_Use of Algebraic Expressions

The formulae which we use on a day to day basis are algebraic expressions. These formulae are parts of our daily lives.

Algebraic formulae are generally used to calculate various things such as the total distance traveled while driving a car, or to find the volume of a milk container etc.,. Some of the situations where phrases are converted into algebraic expressions in a day-to-day life are:

- 1) Area/volume/perimeter problems involving basic geometrical formulas
- 2) Distance problems involving speed, distance and time
- 3) Investment problems involving investments, interest rates
- 4) Percentage problems involving percentage of discounts, bonus etc.
- 5) Mixture problems involving combining elements and finding the percentage and prices of elements in the mixture

Time to teach	Asset type	Theme	Sub Theme
4 minutes	Day-to-day Relevance	Algebraic Expression & Identities	Expression

MS_Translating Mathematical Statements to Algebraic Expressions

Translating Mathematical Statements into Algebraic Expressions

Consider the mathematical statement 'The sum of 5 times a number and 3'. How can you convert it into a mathematical statement?

- Phrases like 'a number' or 'the number' tell us that our expression has an unknown quantity and we use the letter 'x' to denote the unknown.
- The words 'five times' tell us that the unknown 'x' is multiplied by 5. In algebraic expression, we don't need a multiplication symbol or parenthesis to write the product. We simply write it as $5x$.
- 'The sum of' tells us that we are going to add $5x$ to 3 and we need a plus sign between $5x$ and 3. Thus, we get the algebraic expression $5x + 3$.

Let us consider some more examples.

Translate the following statements into algebraic expressions:

- 1) The product of a number and the number less 3.
 - a) The phrase 'a number' tells us that the expression has an unknown quantity 'x'.
 - b) 'The same number less than 3' gives us the term ' $x - 3$ '.
 - c) The words 'the product of' tell us that we are going to multiply 'x' and ' $x - 3$ '. We use parenthesis to represent multiplication symbol and write the algebraic expression as $x(x - 3)$.
- 2) The length of a football field is 30 yards more than its width. Express the length of the field in terms of its width 'w'.
 - a) The width 'w yards' is a variable. Whatever be the width, the length is 30 more than this.
 - b) 'More than' means that 'plus that much'. Thus the algebraic expression of the length of the field is $w + 30$.
- 3) 40 liters of petrol were poured into two containers of different sizes. Express the amount of petrol poured into the smaller container in terms of the amount 'l' liters poured into the larger container.
 - a) The amount 'l' liters poured into the larger container is a variable.
 - b) There are 40 liters of petrol and we have already poured 'l' liters into the larger container.
 - c) The amount of petrol left to pour into the smaller container is $40 - l$.

Time to teach	Asset type	Theme	Sub Theme
8 minutes	Main Script	Algebraic Expression & Identities	Expression

QA_Write as Algebraic Expressions**Answer the following:**

1) Write the algebraic expressions corresponding to the following statements.

- The sum of 8 and a number
- 20 decreased by a number
- 7 less than a number
- The product of 10 and a number
- 72 divided by a number y
- The sum of 10 and y
- 4 less than x
- x multiplied by 13
- The quotient of x and 5
- The difference of 5 and y
- 3 more than twice a number
- 13 divided by 3 times a number x
- 5 times a number decreased by 2
- The ratio of 9 more than x to x
- 7 less than a total of a number and 12

Solutions:

- a) $x + 8$ b) $20 - x$ c) $x - 7$ d) $10x$ e) $72/y$ f) $10 + y$ g) $x - 4$ h) $13x$ i) $x/5$
 j) $5 - y$ k) $2x + 3$ l) $13/(3x)$ m) $5x - 2$ n) $(x + 9)/x$ o) $(x + 12) - 7$ or $x + 5$

2) State True or False

The algebraic expression of the phrase,

- The sum of a number and 5 is $n + 5$ (True)
- Twice a number divided by 5 is $2x - 5$ (False)
- 7 decreased by 3 times a number is $7 - 3x$ (True)
- 5 less than a number is $5x$ (False)
- 100 divided by 7 times a number is $100/(7n)$ (True)
- The product of a number and 9 is decreased by 6 is $(9n)/6$ (False)
- 3 times a number increased by 17 is $3x + 17$ (True)
- Jenny earns rupees 300 per day for part-time work. The amount of money she earns in d days is $300/d$ (False)

Time to teach	Asset type	Theme	Sub Theme
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12 minutes	Questions to Assess	Algebraic Expression & Identities	Expression
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IA_Algebra - Ancient Indian History

You know that we get TV telecast from satellites.

You must have heard of the name Aryabhatta, the first satellite of India. Do you know after whom was the satellite named?

Aryabhatta was a 6th century Indian Mathematician who lived about 1500 years ago. He developed and used algebraic expressions in those days itself.

We must be proud of our ancient Indians who developed great sciences even without the modern facilities we have today.

However, in the modern days, the science of Algebra was developed separately though they have taken advantage of eastern sciences.

In fact, the word Algebra comes from the East, from the Arabic word '*Al-Jabr*'.

You must be aware that Algebra is a branch of Mathematics that uses Mathematical statements to describe things that vary over time.

For example: Climatic variations, cost variation, variation in the system of education, variation in lifestyle, quality variations etc.

Time to teach	Asset type	Theme	Sub Theme
3 minutes	Interesting Asides	Algebraic Expression & Identities	Expression

QA_Finding solutions on Algebraic Expressions

1. Separate Monomials, Binomials & Trinomials from the following expressions.

i) $a+b$, ii) $ab+a+b$, iii) $ab+a+b-5$, iv) xy ,
v) $xy+5$, vi) $5x^2-x-2$, vii) $4mn+7$, viii) $4m-7n+10$.

Answers:

iv) is a Monomial,
i), v) & vii) are Binomials and
ii), iii), vi) & viii) are Trinomials.

2. (i) Simplify these expressions if possible

1) $4a + 11a$

Solution : $4a + 11a$
 $= 15a$

2) $4ab - 6a$

Cannot be done

3) $3t + 7t - 4t$

Solution: $3t + 7t - 4t$
 $= 10t - 4t$
 $= 6t$

4) $3gh + 6hg - 15gh$

Solution: $3gh + 6hg - 15gh$
 $= 9gh - 15gh$
 $= -6gh$

5) $3a + 6b - a + 3b$

Solution: When re-ordering terms move the term and the sign in front of it.
 $3a + 6b - a + 3b$
 $= 3a - 1a + 6b + 3b$
 $= 2a + 9b$

6) $6fg - 4f + 9 - fg + 2f - 7$

Solution: $6fg - 4f + 9 - fg + 2f - 7$
 $= 6fg - 1fg - 4f + 2f + 9 - 7$
 $= 5fg - 2f + 2$

2. Simplify the following algebraic expressions

- 1) $10 - 6k + 7k + 2$
- 2) $mn^3 + 4mn^3 - 9m - 5n$
- 3) $5x^2 - 6x - 3x + 8$
- 4) $12p^3 + 11p^2 + 8p^3$
- 5) $6a + 7a^3 + 11a^2 - 9a^2 - 5a^3$
- 6) $-12b + 15c^2 - 20c^2 + 7c - 5b + 4b$
- 7) $2a^3 - 10ab^2 + 3a^2 - ab^2 - 7$
- 8) $6x^2 + 5x + 8y - 2x^2 + 4x - y$
- 9) $4x^2y + 7xy + 4x - x^2y + 3xy$
- 10) $5x^2 + 6x - 3 + 2x^2 - 7x - 9$

Solutions:

- 1) $k + 12$ 2) $5mn^3 - 9m - 5n$ 3) $5x^2 - 9x + 8$ 4) $20p^3 + 11p^2$ 5) $2a^3 + 2a^2 + 6a$
- 6) $-5c^2 - 13b + 7c$ 7) $2a^3 - 11ab^2 + 3a^2 - 7$ 8) $4x^2 + 9x + 7y$ 9) $3x^2y + 10xy + 4x$
- 10) $7x^2 - x - 12$

3. Answer the following:

1. Add: $25a$, $36a$ and $41a$
2. Add: $5c^3 + 3c^2$, $-20c^3 + 10c^2$, $2c^3 - 4c^2$
3. Subtract: $5m^2 + 3mp$ from $2m^2 - mp$
4. What should be added to $5a^2 + 2ab + 3b^2$ to obtain $7ab - 10b^2$?

Answer:

1. $102a$
2. $-13c^3 + 9c^2$
3. $-3m^2 - 4mp$,
4. $-5a^2 + 5ab - 13b^2$

Time to teach	Asset type	Theme	Sub Theme
15 minutes	Questions to Assess	Algebraic Expression & Identities	Expression based on terms(monomials, binomials and trinomials)

SA_Class Party

Aim

To use simple equations to plan a party.

Materials required

Chips, lemons, water, sugar, bread, cheese, tomatoes, cucumber etc.

Procedure

Instructions to teacher:

- Make 3 or more groups of the class with 10 children in each group.
- Tell them to decide what they want to bring for the party in a previous class.
- They can bring anything of their choice like lemon, bread, sugar, water, cheese, tomato, cucumber, chips, chikki (ground nut balls or ground nut cake) etc.

Plan the party

1. Each group of students will decide upon menu.
2. Then they will decide who will bring which item from the menu.
3. Items in the menu like chips, juice tetrapacks, bread, tomatoes can be brought by two or more children.
4. If a group decides to give lemonade (lemon juice), sandwich and chips, they have to form linear equations for each item they make.

Form equations

Examples

1. A glass of lemonade-

1 glass of lemonade is made with 1 lemon + 2 teaspoons sugar + 200 ml water.

Let us denote 1 glass of lemonade by 'g', lemon by 'l', 1 tsp sugar by 's', 1 liter of water by 'w'.

Then the equation for 1 glass of lemonade will be

$$g = l + 2s + (w/5)$$

1. Sandwich-

1 sandwich 's' can be made by slices of bread 'b', cheese 'c', tomatoes 't' and cucumber 'v'

$$s = 2b + c + (t/6) + (v/10)$$

More examples

- If 60 slices of bread is required for 30 children and 1 loaf of bread has 12 slices, five children can bring 1 loaf each.

Let us start the equation with 1 loaf of bread 'p' has 12 slices of bread 'b'

$$p = 12b$$

Since $60 = 12(5)$, multiply both sides of the above equation by 5

$$5p = 60b$$

If 5 children are planning to bring bread then divide the above equation by 5.

Each of them will bring

$$(5p/5) = (60/5)$$

If one of them is bringing 1 loaf of bread and 10 tomatoes,

$p + 10t$ will be the expression.

Form equations from solution

Let the students form equations at random starting with the solution.

Perform any mathematical operation like addition, subtraction, multiplication or division on both sides of the equation.

Form another equation.

For example

Start with the solution $t = 6$

Multiplying both sides by 2

we get $2t = 12$ ---(1)

3. Subtract 2 from both sides now to get

$2t - 2 = 12 - 2$. ---(2)

4. $t = 6$ is a solution to the above two equations also.

Hence, we have worked backwards from the solution to form an equation.

Earlier we solved an equation to find the solution.

Can you try adding the same number on both sides of the equation $t = 6$ or divide both sides of the equation by the same number?

What are the new equations formed?

Is $t = 6$ still a solution to these new equations?

Conclusion

Simple equations can be used to plan a class party.

Time to teach	Asset type	Theme	Sub Theme
15 minutes	Suggested Activity	Equations	Application of simple equations

MS_Elimination Method

Elimination method

The trial and error method for solving equations can get very difficult if the answer is big. It can take a lot of time to solve. This is not feasible to solve all equations.

Now, we will see about the elimination method which will work always with any equation.

An equation can be thought of as a simple balance that balances the weights on both sides.

When the weights are equal, the beam is straight. When the weights are unequal, the beam is tilted to the heavier side.

We have to keep in mind to keep the beam straight.

Rules for elimination method

1. Let us take an equation $x + 5 = 8$.

Since we have to find the value of x , if we take away 5 from L.H.S. we will be left only with x on the L.H.S.

In a simple balance, once the beam is straight, if any weight is removed from one side, the same weight should be removed from the other side too to keep the beam straight.

Similarly in an equation, if any number is subtracted from one side of the equation, the same number must be subtracted from the other side too to keep it balanced.

In the above equation, let us take away 5 from both sides

$$x + 5 - 5 = 8 - 5$$

$$\text{or } x + 0 = 3$$

$$\text{or } x = 3$$

$x = 3$ is the solution of the equation $x + 5 = 8$

To verify this, let us substitute $x = 3$ in $x + 5 = 8$

$$x + 5 = 8$$

when $x = 3$ L.H.S. $= 3 + 5 = 8 = \text{R.H.S.}$

Hence, verified.

2. Let us take the equation $y - 13 = 70$.

In this equation we can isolate y from the L.H.S. by adding 13.

In a simple balance if we add any weight on one side, we must add the same weight on the other side to keep the beam straight.

Similarly in an equation if any number is added to one side of the equation, the same number must be added on the other side too to keep the balance.

In the above equation let us add 13 on both sides

$$y - 13 = 70$$

$$y - 13 + 13 = 70 + 13$$

$$y = 83$$

Verify

put $y = 83$ in $y - 13 = 70$

$$\text{L.H.S.} = 83 - 13 = 70 = \text{R.H.S.}$$

Hence, verified.

3. Let us take the equation $5z = 75$.

To isolate z from L.H.S. if we divide $5z$ by 5, we will be left with only z .

Similar to what we did with the equations in 1 and 2 above, if we divide any side of an equation by a number, we must divide the other side of the equation too by the same number, to keep the balance.

$$5z = 75$$

Dividing both sides of the on by 5, we get

$$(5z/5) = (75/5)$$

$$\text{or } z = 15$$

Verify

$$5z = 75$$

put $z = 15$ L.H.S. = $5(15) = 75 = \text{R.H.S.}$

4. Let us take the equation $m/9 = 2$.

To isolate m from L.H.S. if we have to multiply the L.H.S with 9.

Like in all the above cases, if we multiply any side of an equation with a number, we must multiply the other side too with the same number, to keep the balance.

$$m/9 = 2$$

Multiply both sides of the equation with 9

$$(m/9) \times 9 = 2 \times 9 = 18$$

$$\text{or } m = 18$$

Verify

$$m/9 = 2$$

put $m = 18$ L.H.S. = $(18/9) = 2 = \text{R.H.S.}$

Hence, verified.

In some equations we might have to do more than one of the above operations to arrive at the answer.

For example, let us take the equation $2x + 5 = 25$

$$2x + 5 = 25$$

Subtract 5 from both sides of the equation

$$2x + 5 - 5 = 25 - 5 = 20$$

$$2x = 20$$

Divide both sides of the equation by 2

$$(2x/2) = (20/2)$$

$$\text{or } x = 10$$

Verify

$$2x + 5 = 25$$

put $x = 10$, L.H.S. = $\{2(10/2)\} = 10 = \text{R.H.S.}$

Hence, verified.

Thus, $x = 10$ is the solution of the equation $2x + 5 = 25$.

Time to teach	Asset type	Theme	Sub Theme
15 minutes	Main Script	Equations	

QA_Exercise-Elimination Method

Assessment

1. Solve the following equations using elimination method

- a. $x + 2 = 6$
- b. $a + 7 = 36$
- c. $37 = 7 + w$
- d. $a - 3 = 29$
- e. $w - 7 = 17$
- f. $-221 = a - 447$
- g. $2x = 50$
- h. $3p = 36$
- i. $-27v = 405$

2. Solve the following equations by elimination method

1. a. $2x + 7 + x = 10$
2. b. $6x - 2 = 3x + 7$
3. c. $2x - 5 = 9 - 2(6x - 7)$

Answers

1.

1. a. $x + 2 = 6$
 $x + 2 - 2 = 6 - 2$
 $x = 4$

1. b. $a + 7 = 36$
 $a + 7 - 7 = 36 - 7$
 $a = 29$

• c. $37 = 7 + w$
 $7 + w = 37$
 $w + 7 = 37$
 $w + 7 - 7 = 37 - 7$
 $w = 30$

d. $a - 3 = 29$
 $a - 3 + 3 = 29 + 3$
 $a = 32$

e. $w-7=17$

$$w-7+7=17+7$$

$$w=24$$

f. $-221=a-447$

$$a-447=-221$$

$$a-447+447=-221+447$$

$$a=226$$

g. $2x=50$

$$(2x/2)=50/2$$

$$x=25$$

h. $3p=36$

$$(3p/3)=36/3$$

$$p=12$$

i. $-27v=405$

$$(-27v/-27)=(405/-27)$$

$$v=-15$$

2.

a. $2x+7+x=10$

$$3x+7=10$$

$$3x+7-7=10-7$$

$$3x=3$$

$$x=1$$

b. $6x-2=3x+7$

$$6x-2+2=3x+7+2$$

$$6x=3x+9$$

$$6x-3x=3x+9-3x$$

$$3x=9$$

$$(3x/3)=9/3$$

$$x=3$$

c. $2x-5=9-2(6x-7)$

$$2x-5=9-12x+14=23-12x$$

$$2x-5+5=23-12x+5$$

$$2x=28-12x$$

$$28-12x=2x$$

$$28-12x+12x=2x+12x$$

$$28=14x$$

$$14x=28$$

$$(14x/14)=(28/14)$$

$$x=2$$

Time to teach	Asset type	Theme	Sub Theme
15 minutes	Questions to Assess	Equations	

MS_Transposition method

In this section we will learn about the transposition method of solving equations which is the modified simpler version of elimination method.

Example

Let us take the equation

$$x + 5 = 18$$

In elimination method, we subtract 5 from both sides of the equation

$$x + 5 - 5 = 18 - 5$$

$$\text{or } x = 18 - 5$$

we can arrive at this step by shifting 5 from L.H.S. to R.H.S. and changing '+' to '-'.

i.e.

$$x + 5 = 18$$

$$x = 18 - 5$$

$$\text{thus } x = 13$$

Shifting any term from one side of an equation to the other side is called transposition. The term which gets transposed could be either a constant or a variable.

When a term moves from one side of the equation to the other side, its operation changes to its inverse operation. The inverse operation of addition is subtraction. The inverse operation of multiplication is division. This keeps the linear equation balanced.

Rules of transposing

1. Addition '+' changes to subtraction '-'.

If any term is added on one side of the equation, upon transposing, it will be subtracted from the other side.

Example -

$$3x + 8 = 17$$

$$3x = 17 - 8$$

2. Subtraction '-' changes to '+'.

If any term is subtracted on one side, upon transposing, it will be added to the other side.

Example-

$$x - 7 = 3$$

$$x = 3 + 7$$

3. Multiplication 'x' becomes division '÷'

When a term is multiplied by on one side, upon transposing, it will divide the term on the other side.

Example-

$$7x = 56$$

$$x = 56 \div 7$$

$$x = (56 / 7)$$

4. Division '÷' becomes multiplication 'x'

When a term is divided on one side of the equation, upon transposing, it will get multiplied on the other side.

Example-

$$x \div 9 = 7$$

$$x = 7 \times 9$$

Note that a term containing a variable can also be transposed using the above rules.

Example-

$$3x + 6 = 5x + 4$$

$$-5x + 3x + 6 = 4 \quad (\text{transposing } 5x \text{ to L.H.S., when there is no sign for a term at the beginning of an expression it is positive})$$

$$-2x + 6 = 4$$

$$-2x = 4 - 6 \quad (\text{transposing } 6 \text{ to R.H.S.})$$

Let us now use the method of transposition to solve the following-

- $4y + 12 = 96$
- $4y + 12 = 96$
- $4y = 96 - 12 \quad (\text{transposing } 12 \text{ to R.H.S.})$
- $4y = 84$
- $y = (84/4) \quad (\text{transposing } 4 \text{ to R.H.S.})$
- $y = 21$

Verify

$$4y + 12 = 96$$

$$\text{put } y = 21$$

$$\text{L.H.S.} = (4 \times 21) + 12 = 84 + 12 = 96 = \text{R.H.S.}$$

Hence verified.

$$2. \quad 12 - 8z = 148$$

$$12 - 8z = 148 \quad (\text{transposing } 12 \text{ to the other side})$$

$$-8z = 148 - 12$$

$$-8z = 136 \quad (\text{transposing } -8 \text{ to R.H.S.})$$

$$z = 136 / (-8)$$

$$z = -17$$

Verify

$$12 - 8z = 148$$

$$\text{Put } z = -17$$

$$\text{L.H.S.} = 12 - 8(-17) \quad \text{note : } (-8 \times (-17)) = + (8 \times 17)$$

$$= 12 + 136 = 148 = \text{R.H.S.}$$

Hence verified.

3.

$$3(k + 1) = 24 \quad (\text{transpose } 3 \text{ to R.H.S.})$$

$$k+1 = 24/3$$

$$k+1 = 8 \quad (\text{transpose 1 to R.H.S.})$$

$$k = 8-1$$

$$\text{or } k = 7$$

Verify

Put $k = 7$ in $3(k + 1) = 24$

L.H.S. = $3(7+1) = 3 \times 8 = 24 = \text{R.H.S.}$

Hence verified.

4. $3m + 5 = 2(m + 2)$

$$3m + 5 = 2m + 4$$

$$3m + 5 = 2m + 4 \quad (\text{transpose 5 to R.H.S.})$$

$$3m = 2m + 4 - 5$$

$$3m = 2m - 1$$

$$3m = 2m - 1 \quad (\text{transpose } 2m \text{ to L.H.S.})$$

$$3m - 2m = -1$$

$$m = -1.$$

Verify

Put $m = -1$ in $3m + 5 = 2m + 4$

L.H.S. = $3(-1) + 5 = -3 + 5 = 2$

R.H.S. = $2(-1) + 4 = -2 + 4 = 2$

Since L.H.S. = R.H.S. = 2

Hence verified.

Time to teach	Asset type	Theme	Sub Theme
15 minutes	Main Script	Equations	

QA_Exercise-Transposition Method

Assessment

I. Solve the following equations using transposition method

- a) $x + 5 = 3$
- b) $36 + x = 18$
- c) $y - 4 = 8$
- d) $14 - z = 15$
- e) $5x = 1$
- f) $3x - 2 = 16$
- g) $4x - 7 = -1$
- h) $-6x = 20 - x$
- i) $5y - 8 = 2y + 7$

II. Solve the following equations by transposition method

- a) $\frac{x}{2} + \frac{x}{5} = 5$
- b) $\frac{3x}{2} + 4 = 17$
- c) $\frac{3x-1}{2} - \frac{x-1}{3} = 1$
- d) $\frac{x}{3} - 1 = \frac{5x+10}{6}$

Solution

I.

1. a) $x + 5 = 3$
 $x = 3 - 5$ (transpose 5 to R.H.S.)
 $x = -2$
1. b) $36 + x = 18$
 $x = 18 - 36$ (transpose 36 to R.H.S.)
 $x = -18$
1. c) $y - 4 = 8$
 $y = 8 + 4$ (transpose 4 to R.H.S.)
 $y = 12$
- d) $14 - z = 15$

$$-z = 15 - 14 \text{ (transpose 14 to R.H.S.)}$$

$$-z = 1$$

$$z = -1 \quad \text{(multiply both sides of the equation by -1)}$$

$$\text{e) } 5x = 1$$

$$x = 1/5 \text{ (transpose 5 to the R.H.S.)}$$

$$\text{f) } 3x - 2 = 16$$

$$3x = 16 + 2 \text{ (transpose 2 to R.H.S.)}$$

$$3x = 18$$

$$x = 18/3 \text{ (transpose 3 to R.H.S.)}$$

$$x = 6$$

$$\text{g) } 4x - 7 = -1$$

$$4x = -1 + 7 \text{ (transpose 7 to R.H.S.)}$$

$$4x = 6$$

$$x = 6/4 \text{ (transpose 4 to R.H.S.)}$$

$$x = 3/2 \quad \text{(divide numerator and denominator by 2)}$$

$$\text{h) } -6x = 20 - x$$

$$-6x + x = 20 \text{ (transpose x to L.H.S.)}$$

$$-5x = 20$$

$$-x = 20/5 \text{ (transpose 5 to R.H.S.)}$$

$$-x = 4$$

$$x = -4 \quad \text{(multiply both sides of the equation by -1)}$$

$$\text{i) } 5y - 8 = 2y + 7$$

$$5y = 2y + 7 + 8 \text{ (transpose 8 to R.H.S.)}$$

$$5y = 2y + 15$$

$$5y - 2y = 15 \quad \text{(transpose 2y to L.H.S.)}$$

$$3y = 15 \quad \text{(transpose 3 to R.H.S.)}$$

$$y = 15/3 \text{ (transpose 3 to R.H.S.)}$$

$$y = 5$$

II

• a) $\frac{x}{2} + \frac{x}{5} = 5$

L.C.M. of 2 and 5 is 10

$$x \left(\frac{1}{2} + \frac{1}{5} \right) = 5$$

$$x \left(\frac{7}{10} \right) = 5$$

$$\frac{7x}{10} = 5 \quad (\text{transpose 10 to the other side})$$

$$7x = 50 \quad (\text{transpose 10 to the other side})$$

$$x = \frac{50}{7} \quad (\text{transpose 7 to R.H.S.})$$

• b) $\frac{3x}{2} + 4 = 17 \quad (\text{transpose 4 to R.H.S.})$

$$\frac{3x}{2} = 17 - 4$$

$$\frac{3x}{2} = 13 \quad (\text{transpose 2 to R.H.S.})$$

$$3x = 26 \quad (\text{transpose 3 to R.H.S.})$$

$$x = \frac{26}{3}$$

• c) $\frac{3x-1}{2} - \frac{x-1}{3} = 1$

L.C.M. of 2 and 3 is 6

$$\frac{3(3x-1) - 2(x-1)}{6} = 1$$

$$\frac{9x-3-(2x-2)}{6} = 1$$

$$\frac{9x-3-2x+2}{6} = 1$$

$$\frac{7x-1}{6} = 1$$

$$7x-1 = 6 \quad (\text{transpose 6 to R.H.S.})$$

$$7x = 6 + 1 \quad (\text{transpose 1 to R.H.S.})$$

$$7x = 7 \quad (\text{transpose 7 to R.H.S.})$$

$$x = \frac{7}{7} \quad (\text{transpose 7 to R.H.S.})$$

$$x=1$$

$$d) \frac{x}{3} - 1 = \frac{5x+10}{6} \quad (\text{transpose 1 to R.H.S.})$$

$$\frac{x}{3} = \frac{5x+10}{6} + 1 \quad (\text{transpose } \frac{5x+10}{6} \text{ to L.H.S.})$$

L.C.M. of 3 and 6 is 6

$$\frac{2(x) - (5x+10)}{6} = 1$$

$$\frac{2x-5x-10}{6} = 1$$

$$\frac{-3x-10}{6} = 1$$

$$-3x - 10 = 6 \quad (\text{transpose 6 to R.H.S.})$$

$$-3x = 6 + 10 \quad (\text{transpose 10 to R.H.S.})$$

$$-3x = 16$$

$$-x = \frac{16}{3} \quad (\text{divide both sides by } -3)$$

$$x = -\frac{16}{3} \quad (\text{multiply both sides of the equation by } -1)$$

Time to teach	Asset type	Theme	Sub Theme
15 minutes	Questions to Assess	Equations	

MS_Trial and Error method

Trial and error method

Example

Let us take the equation $x+5=8$

Since x is a variable, it can take any value. Let us find out the value of x such that L.H.S. = R.H.S.

1. Put $x=1$

L.H.S. is $x+5=1+5=6$

R.H.S. is 8

L.H.S. is not equal to R.H.S.

2. Put $x=2$

L.H.S. is $x+5=2+5=7$

R.H.S. is 8

L.H.S. is not equal to R.H.S.

3. Put $x=3$

L.H.S. is $x+5=3+5=8$

R.H.S. is 8

In this case L.H.S. is equal to R.H.S.

When $x=3$, L.H.S. of the equation is equal to R.H.S. $x=3$ is the **solution** of the equation $x+5=8$.

The value of the variable for which the L.H.S. of an equation is equal to the R.H.S. is called the **solution of the equation**.

In this method we have tried different values for the variable to check if the equation is satisfied or not. We have to guess and try different numbers till we get the answer.

This method of finding the solution of the equation is called **trial and error method**.

Time to teach	Asset type	Theme	Sub Theme
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5 minutes	Main Script	Equations	Solving an equation by trial and error method
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QA_Solve using Trial and Error method

I. Check whether the value of the variable given makes the equation true.

- $3x + 7 = 22$, $x = 0$
- $11y - 6 = 60$, $y = 6$

II. Substitute the values given in the bracket and tick the one that satisfies the equation.

1. $x + 3 = 5$ (4, 5, 1, 2)
2. $\frac{x}{2} = 3$ (6, 1, 5, 4)

III. Solve the following simple equations by trial and error method.

1. $14 + m = 17$
2. $2(b + 9) = 20$
3. $5m + 10 = 25$

ANSWERS

I.

1. Put $x=0$ in $3x+7 = (3 \times 0)+7 = 0+7 = 7 \neq 22$

The equation is not true when $x=0$

2. Put $y=6$ in $11y-6 = (11 \times 6)-6 = 66-6 = 60$

The equation is true when $y=6$.

II.

1. put $x=4$ in $x+3 = 5$. $4+3=7 \neq 5$

put $x=5$ in $x+3=5$ $5+3=8 \neq 5$

put $x=1$ in $x+3=5$ $1+3=4 \neq 5$

put $x=2$ in $x+3=5$

$2+3=5=5$

Hence $x=2$ satisfies the equation $x+3=5$.

2. $x/2 = 3$

$(6/2) = 3$

Hence $x=6$ satisfies the equation $x/2 = 3$

There can be only one solution to a linear equation. We can stop it here. All the other values of x do not satisfy the equation.

III.

1. Put $m=1$, we get $14+m=14+1=15$

Put $m=3$, we get $14+3=17$

Since L.H.S.=R.H.S. when $m=3$, $m=3$ is the solution.

2. Put $b=0$

$$2(0+9)=2 \times 9=18$$

Put $b=1$

$$2(1+9)=2 \times 10=20=R.H.S.$$

$b=1$ is the answer

3. Put $m=1$

$$(5 \times 1)+10=5+10=15$$

Put $m=2$

$$(5 \times 2)+10=10+10=20$$

put $m=3$

$$(5 \times 3)+10=15+10=25 \text{ R.H.S}$$

Hence $m=3$ is the solution for $5m+10=25$.

Time to teach	Asset type	Theme	Sub Theme
10 minutes	Questions to Assess	Equations	Solving an equation by trial and error method

VC_Value the expression

Learning Domain- Classroom

We just learned that in situations such as solving an equation and using a formula, we have to **find the value of an expression**.

The value of the expression depends on the value of the variable from which the expression is formed.

In our lives too we have a constant and many variable values. Constant can be said to be our family background at the time of our birth in which we have no control.

But as we grow, we can add variables in the form of cultivation of human values that change our name, fame, reputation, etc.

The expression we create in society and success in life depends on these variables that we keep adding.

Children! Abraham Lincoln is a standing example for us in this context. Coming from a poor background in which he had no control, he learned self-respect & dignity from the lap of his mother. She taught him to be unafraid of his financial position, to speak truth & conduct himself with dignity.

When little Abraham shared with his mother that he was disrespected and felt ashamed in the midst of his friends for wearing old & shabby clothes, his mother told him that he need not feel so.

She counseled him that poverty, though viewed in poor light by others, will eventually help him gain respect.

Lincoln later in his life declared, "You may disrespect me, but truth cannot be disrespected. It will emerge triumphantly"

He proceeded on the path of truth and self-confidence taught by his mother and became the President of the United States of America.

Discussion:

- Children, can you think of any other constant in life?

(Let children come out with their thoughts. The teacher can add:

One more constant in our life is God).

1. How can we achieve this constant?

(By allowing in the 5 values, which are also constants, i.e. they never change).

Children! Remember, your place in the society is not necessarily because of the family background. Your place in the society is because of your good human values you develop and your positive attitude towards people around you.

(Lincoln Narrative –

Divine Discourse by Sathya Sai Baba, 'My Dear Students', Vol 2, Ch 9, Feb 24, 2005.-- Courtesy – Sister Rama Ganapathy's blog <http://evaluation.blogspot.com/search/label/Dignity>)

Time to teach	Asset type	Value	Sub Value
5 minutes	Value Content	Truth	Study of oneself

MS_Summary_Algebraic Expressions

Summary of Algebraic Expressions

1. Algebraic expressions are formed from variables and constants.
2. We use the operations of addition, subtraction, multiplication, and division on the variables and constants to form expressions.
3. Expressions are made up of terms. Terms are added to make an expression. For example, the addition of the terms $4xy$ and 7 gives the expression $4xy + 7$.
4. A term is a product of factors. The term $4xy$ in the expression $4xy + 7$ is a product of factors x , y , and 4 . Factors containing variables are said to be algebraic factors.
5. The coefficient is the numerical factor in the term. Any factor in a term is called the coefficient of the remaining part of the term.
6. Any expression with one or more terms is called a polynomial. Specifically, a one term expression is called a monomial; a two-term expression is called a binomial, and a three-term expression is called a trinomial.
7. Terms which have the same algebraic factors are like terms. Terms which have different algebraic factors are unlike terms. Thus, terms $4xy$ and $-3xy$ are like terms; but terms $4xy$ and $-3x$ are not like terms.
8. The sum (or difference) of two like terms is a like term with a coefficient equal to the sum (or difference) of the coefficients of the two like terms.
Thus, $8xy - 3xy = (8 - 3)xy$, i.e., $5xy$.
9. When we add two algebraic expressions, the like terms are added as given above; the unlike terms are left as they are.
10. In situations such as solving an equation and using a formula, we have to find the value of an expression. The value of the expression depends on the value of the variable from which the expression is formed. Thus, the value of $7x - 3$ for $x = 5$ is 32 , since $7(5) - 3 = 35 - 3 = 32$.
11. Rules and formulas in mathematics are written in a concise and general form using algebraic expressions: Thus, the area of rectangle = lb , where l is the length and b is the breadth of the rectangle.
12. The general (n th) term of a number pattern (or a sequence) is an expression in n . Thus, the n th term of the number pattern $11, 21, 31, 41, \dots$ is $(10n + 1)$.

Time to teach	Asset type	Theme	Sub Theme
5 minutes	Main Script	Algebraic Expression	Addition and

		& Identities	subtraction of algebraic expressions
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Master Lesson Plan

Seven Asset Methodology for MLP

What is the purpose of this Master lesson Plan?	This Master Lesson Plan (MLP) prepared by Sri Sathya Sai Vidya Vahini (SSSVV), covers the entire chapter for the given board. The MLP for the chapter given in the textbook is broken down into smaller modules known as assets. Any chapter can be taught using the 7 asset types in SSSVV methodology. Several different assets together complete the entire chapter. Depending on the requirement, each asset is supported by teaching aids such as animated presentation, audio, video, and learning aids such as worksheets. The MLP is for the teacher's preparation and the teaching aids are for use in the classroom.
How to use it?	You can prepare for your class with this MLP by following 3 simple steps: 1. Read your textbook; 2. Go through the information given in the assets (document & multimedia); 3. Prepare your teaching notes. Great! Now you are ready to transact the chapter.
Duration	Kindly note the duration given for each asset. Due care has been taken in planning the assets, to ensure the chapter is completed within the time specified by the Board. Note: Preparation time is not included in the asset duration. The teaching time depends on the duration of the teaching aids and is not impacted by the length of the MLP.
What is a 'Main Script' (MS) Asset?	The Main Script asset is there for explaining the main concepts of the chapter clearly. The information given in the textbook is simplified, organised and structured to give more clarity. Additionally, you may find a video or mnemonics or a graphic organiser to deepen the understanding of the concept.
How to teach using the MS asset?	Please use the blackboard, slides and interaction to develop the concept.
What is an 'Inquisitive Questions' (IQ) asset?	The Inquisitive Questions asset uses questions to promote higher order thinking like the n^{th} why, what-if, new perspectives, cause-effect, and others, creating curiosity.
How to teach using the IQ asset?	You may use the questions to connect with the students, encourage exploration to engage them in the learning process. You may allow multiple responses and instead of rejecting any of the responses, ask why, before revealing the suggested answer or hints.
What is a 'Day to day Relevance' (DD) Asset?	The Day to Day Relevance asset helps students understand the practical relevance of every topic, making them eager participants in the classroom. If students connect the concepts to their environment, they would learn meaningfully without dislike or simply memorizing for exams.

How to teach using the DD asset?	You may use the asset by asking questions about their experience and use it to establish why they are learning the topic. If necessary you may substitute with a recent or local example.
What is an 'Interesting Aside' (IA) asset?	The Interesting Aside asset uses attention grabbing titbits or anecdotes to bring joy and satisfy the child's hunger to know more. This is a quick/short asset intended to bring attention back to the main concept being taught.
How to teach using the IA asset?	You may use this asset to give a piece of interesting information relevant to the topic, without prolonged explanation/discussion. You may suggest appropriate books for further reading.
What is a 'Suggested Activity' (SA) Asset?	The Suggested Activity asset provides a detailed step by step procedure for the teacher to conduct a hands-on activity. This promotes Activity Based Learning.
How to teach using the SA asset?	You may use this asset to energise your students to learn by doing simple, fun-filled activities based on the topic. The asset includes - preparation, activity, and follow-up. You may engage the students in the preparation and follow-up stages to develop collaboration and responsibility. You could try it once, yourself, before the actual delivery to be more comfortable with it. Note: The duration mentioned in the asset is usually for the activity part only.
What is a 'Value Content' (VC) Asset?	The Value Content asset integrates Universal Human Values (such as empathy, inclusivity, respect for nature that translates into responsible behaviour) seamlessly into the curriculum, as the "End of education is character".
How to teach using the VC asset?	You may use this asset to engage with the students to bring out their innate values and connect with the intrinsic values in the topic/concept. The asset includes pointers on the specific pedagogical technique followed.
What is a 'Questions to Assess' (QA) asset?	The Questions to Assess asset uses an interactive approach to check learning of different types of learners, and provides feedback to the teacher for appropriate action. The questions cater to all the levels of Bloom's Taxonomy. Questions from 'Apply' level and above enable students to reflect on their learning.
How to teach using the QA asset?	You may go through the slides to understand its flow and know when to click for the answer (slides include suggested answers). While presenting in the class, you may display the question and encourage multiple responses, before revealing the answer. In some cases, this asset may include extra questions/worksheet that can be given as homework.