



Master Lesson Plan

For

Algebra

Board	Standard	Subject	Chapter	Language	Reference Link	Creation date
CBSE	STD VI	Mathematics	Algebra	English	Algebra	2020-06-20 16:37:19

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Algebra

1. MS_Objectives_Algebra

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 teacher's reference and need not be taught to the students.

Objectives of Algebra

Students will be able to

- 1) infer the importance of Algebra in calculations.
- 2) understand the relation between patterns and variables in Algebra.
- 3) deduce a rule with variables to form a particular pattern.
- 4) understand the use of variables in the Arithmetic and Geometry rules.
- 5) form Algebraic expressions with the given information.
- 6) recognise the importance of Algebra.
- 7) form Algebraic expressions for the given questions.
- 8) define and identify constants ,variables ,terms and coefficients.
- 9) solve questions on terms, variables, constants and coefficients.
- 10) solve the questions on formation of algebraic expressions.
- 11) understand the significance of Pi.
- 12) solve the questions using substitution.
- 13) find solutions to Algebraic expressions.
- 14) understand the use of Algebraic equations in day to day life.
- 15) formulate and solve the equations.
- 16) understand the importance of being calm no matter what the situation.

Time to teach	Asset Type	Theme	SubTheme
3 Minutes	Main Script	Algebraic Expression & Identities	

2. IQ_Introduction to Algebra

Let us consider a few interesting situations:

Situation 1:

Tom asked his Granny how old she was. Rather than giving him a straight answer, she replied:

"I have 6 children, and there are 4 years between each one and the next. I had my first child when I was 19. Now the youngest one is 19 herself. That's all I'm telling you!"

We can find granny's age using the following procedure:

Suggested Answer:

First child born: Granny is 19

Second child born: Granny is 23 ($19 + 4$)

Third child born: Granny is 27 ($23 + 4$)

Fourth child born: Granny is 31 ($27 + 4$)

Fifth child born: Granny is 35 ($31 + 4$)

Sixth child born: Granny is 39 ($35 + 4$)

Youngest child's present age = 19

Granny's present age = $39 + 19 = 58$ yrs.

Alternately, we can find the solution using following procedure:

Age of granny when n th child is born = $19 + (4 \times (n-1))$ where n can be 1, 2, 3.

Age of youngest child = 19

Granny's present age = Age of youngest child + Age of granny when sixth child was born.

$$= 19 + 19 + (4 \times (6-1))$$

$$= 19 + 19 + 20 = 58 \text{ yrs}$$

Situation 2:

There are 2 trees in a garden (tree "A" and "B") and on both the trees there are some birds. The birds of tree A say to the birds of tree B that if one of you comes to our tree, then our population will be the double of yours. Then the birds of tree B tell the birds of tree A that if one of you comes here, then our population will be equal to that of yours. How many birds are in each tree?

Suggested Answer:

The solution is 7 and 5, tree A has 7 birds and tree B has 5 birds.

We can find the solution using the following procedure:

Number of birds in tree A = x

Number of birds in tree B = y

Tree A says, $x + 1 = 2(y - 1)$

Tree B says, $x - 1 = y + 1$

We shall learn to solve these types of equations in higher classes, for time being observe that $x = 7$ and $y = 5$ satisfies both equations i.e., left hand side becomes equal to right hand side.

From the above examples, we get an idea about a new branch of mathematics called **Algebra**. The main feature of the new branch is the use of letters to devise rules, formulas or to determine unknown quantities.

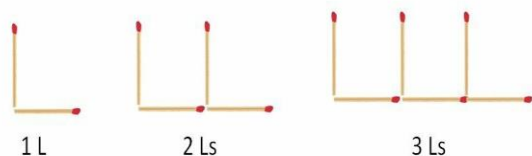
Time to teach	Asset Type	Theme	SubTheme
8 Minutes	Inquisitive Questions	Algebraic Expression & Identities	Value of an expression, Terms in expression, Standard identities and their applications, Polynomials, Multiplication of algebraic expression, Like and unlike terms, Identity, Expressions in Formulas and Rules , Expression based on terms(monomials, binomials and trinomials), Expression, Addition and subtraction of algebraic expressions, Value of an expression, Terms in expression, Standard identities and their applications, Polynomials, Multiplication of algebraic expression, Like and unlike terms, Identity, Expressions in Formulas and Rules , Expression based on terms(monomials, binomials and trinomials), Expression, Addition and subtraction of algebraic expressions

3. MS_Patterns and Variables

The word variable means something that can change or vary. It can take different values. Let us take the following examples.

Example 1:

A student would like to form patterns of letter “L” using match sticks as shown below:

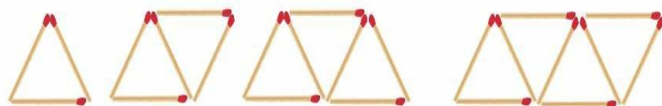


We would like to know, how many matchsticks are required to form a pattern of 100 Ls?

We observe that for 1 L we need 2 sticks, for 2 L we need 2×2 sticks, for 3 L we need 2×3 sticks and so on. Hence for 100 Ls we need $2 \times 100 = 200$ sticks. We can represent this situations using the expression, number of sticks required = $2 \times n$, where n denotes the number of Ls formed.

Example 2:

A student would like to form the following patterns with matchsticks



The student observes that every time two more match sticks are added to generate the pattern, and prepares a table as below.

The sequence generated is 3,5,7,9 ... (odd numbers).

If we use the letter “m” to denote the number of triangles to be formed, then “m” is a variable which can take any value say 1, 2, 3, 4....

Hence the total number of match sticks required can be given by the rule:

$$\text{No of Match sticks required} = 2m + 1.$$

Using this rule we can find the number of match sticks required for any number of triangles. If a student wants to form 100 triangles, then take $m=100$, then the number of match sticks required = $2 \times 100 + 1 = 201$.

No of triangles	1	2	3	4
No of Match sticks	3	5	7	9

We can also find the number of match sticks required to form pattern of squares.



The first square has 4 matchsticks, the second square has 7, then 10, 13 and so on. So we see that for each additional square in the pattern, 3 matchsticks get added.

Hence for every 'm' number of squares the number of matchsticks required = $3m + 1$.

Example 3:

The physical education teacher is planning for a mass drill. In one row he is planning to place 10 students. How many students can participate in the drill depends on the number of rows. If there are two rows then $2 \times 10 = 20$ students, if there are 10 rows then $10 \times 10 = 100$ students.

If there are "r" rows then the number of students who can participate = $10 \times r = 10r$.

Example 4:

Ramu's father's age is 10 more than twice the age of Ramu. Since we do not know Ramu's age, we can represent his age using a variable, let "x" denote Ramu's age.

Ramu's father's age = $2x + 10$.

In all the above examples, we have used different letters to show a variable. Any letter can be used to show a variable. A variable is nothing but a number which does not have fixed value. It takes on different values 1, 2, 3, 4....

Image Source: <https://pixabay.com/vectors/match-matches-fire-matchbox-1717377/>

Time to teach	Asset Type	Theme	SubTheme
20 Minutes	Main Script	Algebraic Expression & Identities	Terms in expression, Terms in expression

4. SA_Activity on Patterns and Variables

Activity setup: Indoor

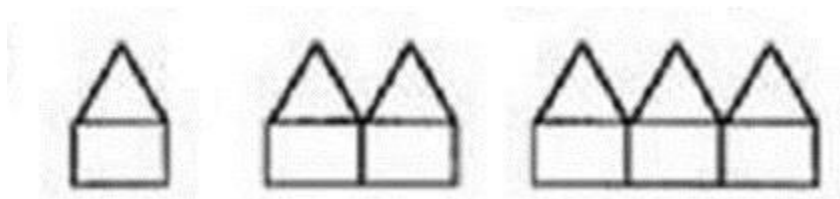
Activity type: Group (3 students in a group)

Aim: To find the rule which gives number of matchsticks required to generate a specific pattern.

Materials required: Match sticks -1 box, chart paper – 1, sketch pens, and ruler.

Procedure:

1. Assign to each group any two of the alphabets C, Z, T, U, V, E, S, R, L, F and the following pattern. The alphabets also need to be in 1's, 2's and 3's.



2. Ask the students to prepare a table as given below:

Pattern of _____ (letter/Shape)

No. of letter/shape	1	2	3
No of Matchsticks			

3. Ask the students to write the general rule to find the number of matchsticks required to form the pattern assigned to their group.

Conclusion: Students learn to find a general rule using variables which gives the number of matchsticks required to form a specific pattern.

Solution:

1. Letter C

Pattern of _____ C



No. of letter C	1	2	3
No of Matchsticks	3	5	7

General Rule = $3 \times n$, where n is the number of Cs.

2. Letter Z - Rule - $3n$.

3. Letter T - Rule - $2n$

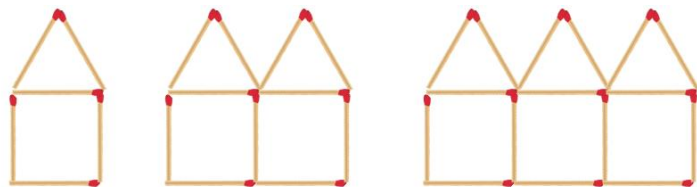
4. Letter U - Rule - $3n$.

5. Letter V - Rule - $2n$

6. Letters E and S - $5n$

7. Letter R – $6n$
8. Letter L – $2n$
9. Letter F – $4n$.

Matchsticks for House pattern



No. of Houses	1	2	3
No of Matchsticks	6	11	16

The Rule for the house pattern is $5n + 1$.

Image Source: Original Contribution sumanvijapurkar@gmail.com

Matchstick: <https://pixabay.com/vectors/match-matches-fire-matchbox-1717377/>

Time to teach	Asset Type	Theme	SubTheme
15 Minutes	Suggested Activity	Algebraic Expression & Identities	Expressions in Formulas and Rules , Expressions in Formulas and Rules

5. MS_Use of Variables in Geometry and Arithmetic Rules

Rules in Geometry/Mensuration:

Let us recall the definition of perimeter of a polygon. Perimeter is the sum of lengths of its sides.

1. Rule to find perimeter of a square:

In a square all sides are equal. Let the measurement of each side be l units.

Then,

Perimeter of square = Sum of lengths of its sides

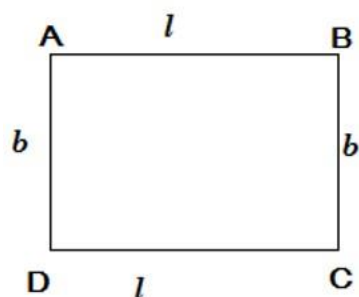
$$= l + l + l + l$$

$$= 4 \times l$$

$$= 4l$$

If perimeter of a polygon is represented using letter p then we have the rule for perimeter of square as $p = 4l$.

2. Rule to find perimeter of a rectangle:



A rectangle has two pairs of equal and opposite sides. Consider the rectangle ABCD.

The sides AB and CD are equal, let us write the measurement of these sides as l units.

The Sides AD and BC are equal, let us write the measurement of these sides as b units.

Then perimeter of a rectangle = Sum of lengths of all its sides

$$l + l + b + b$$

$$= 2l + 2b$$

$$= 2(l + b)$$

Rules in Arithmetic:

We know that, $3+5$ is same as $5+3$. Whether we add 5 to 3 or 3 to 5, we would always get 8.

This property of numbers is called **commutative property of addition of numbers**. This property is true for any two numbers.

If we use the variables 'a' and 'b' to denote any two numbers, then commutative property of addition of numbers can be written as $a+b = b+a$.

Similarly, we know that the order of multiplication of two numbers does not matter. **Thus, commutative property of multiplication of numbers can be written as**

$$a \times b = b \times a.$$

Thus use of variables allows us to create rules which can denote properties in Arithmetic and Mensuration in a general and precise form.

Time to teach	Asset Type	Theme	SubTheme
20 Minutes	Main Script	Algebraic Expression & Identities	Expressions in Formulas and Rules , Expressions in Formulas

		and Rules
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6. MS_Algebraic Expressions-Formations and Examples

We know that an algebraic expression is made up of numbers, variables and arithmetic operations.

Examples of algebraic expression are $60x$, $5x - 8$, $3x + 4y - 1$.

In the first expression, $60x$, there is one term; in $5x - 8$, there are two terms $5x$ and 8 and in $3x + 4y - 1$ there are three terms $3x$, $4y$ and -1 . In the first and second terms x is the only variable while in the third expression, x and y are the two variables.

Expressions can be simplified by combining like terms and completing all operations: This process is called **Simplification**.

Example: $m + 8 + m = 2m + 8$

Consider $6 + (3 \times 5)$. This is an expression with numbers. It can be evaluated as $6 + 15 = 21$.

Now consider the expression $4x - 7$. This is an expression with variables and cannot be evaluated as it is unless we supply a value to the variable x .

This process of supplying a value to the variable is called **Substitution**.

When $x = 10$, the above expression is evaluated as $4 \times 10 - 7 = 40 - 7 = 33$.

Let us learn to write expressions with variables (or algebraic expressions) based on some information or instruction:

- | | |
|---|-----------|
| 1. n multiplied by 2 and 3 subtracted from the product : | $2n - 3$ |
| 2. x multiplied by -5 : | $-5x$ |
| 3. 4 is added to 7 times v : | $7v + 4$ |
| 4. 3 is multiplied by y and the result is subtracted from 15: | $15 - 3y$ |
| 5. 9 increased by a number x : | $9 + x$ |
| 6. Fourteen decreased by a number p : | $14 - p$ |
| 7. Three less than a number x : | $x - 3$ |
| 8. Hundred divided by a number y : | $100/y$ |

Even if the variable is not mentioned, we can still write algebraic expressions based on given instruction.

For example:

- | | |
|---------------------------------|----------|
| I. Six more than twice a number | $2n + 6$ |
|---------------------------------|----------|

- | | | |
|------|-------------------------------------|-----------|
| II. | Sixty four divided by a number | $64 / y$ |
| III. | Seven times a number decreased by 8 | $7n - 8$ |
| IV. | Thrice a number subtracted from 12 | $12 - 3x$ |

Let us consider a few expressions and try to write how they have been formed

- | | | |
|----|----------|---|
| A. | $12 + y$ | y added to 12 |
| B. | $10 - x$ | x subtracted from 10 or 10 decreased by x |
| C. | $s - 9$ | 9 subtracted from s or s decreased by 9 |
| D. | $5y$ | 5 multiplied by y |
| E. | $2x + 1$ | First 2 multiplied by x and the result added with 1 |
| F. | $3y - 6$ | First 3 multiplied by y and 6 is subtracted from the product. |

Time to teach	Asset Type	Theme	SubTheme
15 Minutes	Main Script	Algebraic Expression & Identities	Value of an expression, Terms in expression, Expressions in Formulas and Rules , Expression, Value of an expression, Terms in expression, Expressions in Formulas and Rules , Expression

7. IA_History of Algebraic Expressions.

Bhaskara II was the leading mathematician of the 12th century. He was the author of two texts on mathematics, **Lilavati** and **Bija-ganita**. The **Bija-ganita** deals with unknown numbers expressed by symbols, just like we have in Algebra. He used to use the initial syllables of the names of colours as the symbols of unknown variables. For example **ka** from **kala** and **nee** from **neela**.

Brahmagupta expressed the mathematical operation of addition by writing the numbers side by side, subtraction by placing a dot on the subtrahend. For division the divisor was placed below the dividend but there was no bar separating the two like we have now. Multiplication and evolution was represented by using abbreviations of appropriate terms.

Example: $(-x-7) + 9$ will be represented as



Where **ka** represents the first syllable of the colour **kala** and the dots on the numbers represent subtraction.

Source: https://en.wikipedia.org/wiki/History_of_algebra

NCERT: Mathematics, chapter Algebra, VI standard

Time to teach	Asset Type	Theme	SubTheme
5 Minutes	Interesting Asides	Algebraic Expression & Identities	

8. SA_Activity on Algebraic Expressions

Aim: To formulate algebraic expression based on given conditions.

Materials required:

- 1) Paper (each student)
- 2) Pencil (each student)
- 3) 40 post card size charts
- 4) Sketch pens

Pre Requisite:

Divide the class into two groups. Two days before the activity, ask the students to cut one post card sized chart. Instruct one group of students to write “I have _____ and who has _____” on the card. Ask the other group of students to write “Answer: _____” on the card.

Collect the cards from the students and fill the cards with appropriate information:

Example

- | | |
|---|-----------------------|
| 1. I have $6y + 2$. Who has this divided by 2? | Answer: $3y + 1$ |
| 2. I have $3y + 1$. Who has this decreased by 1? | Answer: $3y$ |
| 3. I have $3y$. Who has this multiplied by 3? | Answer: $9y$ |
| 4. I have $9y$. Who has this subtracted from 11? | Answer: $11 - 9y$ |
| 5. I have $11 - 9y$. Who has this multiplied by 5 and then increased by 11? | Answer: $66 - 45y$ |
| 6. I have $66 - 45y$. Who has this subtracted from 1? | Answer: $45y - 65$ |
| 7. I have $45y - 65$. Who has this divided by 5? | Answer: $9y - 13$ |
| 8. I have $9y - 13$. Who this multiplied by 2 and the result added to 10? | Answer: $18y - 16$ |
| 9. I have $18y - 16$. Who has this multiplied by -2? | Answer: $-36y + 32$ |
| 10. I have $-36y + 32$. Who has this decreased by 32? | Answer: $-36y$ |
| 11. I have $-36y$. Who has this divided by 9 and result subtracted from 4? | Answer: $4 + 4y$ |
| 12. I have $4 + 4y$, whose has this divided by -2? | Answer: $-2 - 2y$ |
| 13. I have $-2 - 2y$, who has this multiplied by -1 and result increased by 8? | Answer: $2y + 10$ |
| 14. I have $2y + 10$, who has $\frac{3}{4}$ th of this? | Answer: $(3y + 15)/2$ |

15. I have $(3y+15)/2$, who has this divided by 3? Answer: $(y+5)/2$
16. I have $(y+5)/2$, who has this multiplied by 10 and the result decreased by 25? Answer: $5y$
17. I have $5y$, who has thrice this subtracted from 15? Answer: $15-15y$
18. I have $15-15y$, who has $1/15$ th of this? Answer: $1-y$
19. I have $1-y$, who has this added to $2x+y$? Answer: $2x+1$
20. I have $2x+1$, who has this multiplied by 4 and the result decreased by 5? Answer: $8x-1$

Procedure:

Step 1: On the day of the activity, distribute all cards to students making sure each student receives at least one card.

Step 2: Call the student who has the first question, ask the first student to read the “I have... and who has” card aloud. Instruct all the students to solve the expression. The student with the answer card can tell the answer. The student with the announced answer in the question part should read out next “I have.... And who has” and the process continues till all the questions are answered.

Step 3: Draw a table with three columns on the board. As and when a question is solved fill the table.

I have	Who has	Answer
$2y$	This doubled	$4y$
$4y$	This increased by 5	$4y+5$
$4y+5$	This multiplied by 2	$8y+10$
$8y+10$		

Conclusion: Students learn to formulate algebraic expressions based on given conditions.

Time to teach	Asset Type	Theme	SubTheme
10 Minutes	Suggested Activity	Algebraic Expression & Identities	Value of an expression, Terms in expression, Expression, Value of an expression, Terms in expression, Expression

9. MS_Constants, Variables, Terms and Coefficients, Definition and Examples

Constant: A constant is a number that is fixed and known. The number of minutes in an hour is fixed and known, which is 60. The conversion of unit cm to mm is fixed and known, that is $1\text{ cm} = 10\text{ mm}$. A number itself is nothing but a constant.

Example : 4, 11, 230 etc.

Let us consider the following situations:

Example 1:

Cost of an apple in a fruit shop is Rs. 20, then cost of 2 apples will be $2 \times 20 = 40$, cost of 10 apples will be $10 \times 20 = 200$. The shop keeper was supplied with a crate full of apples and the total cost of the crate was Rs. 2,000. He would like to find the number of apples in the crate.

We can find the solution using the following procedure,

Since we do not know the number of apples in the crate, let us denote this unknown value using variable 'n',

$n \times \text{cost of each apple} = \text{total cost}$

$$n \times 20 = 2000$$

$$n = \frac{2000}{20}$$

$$n=100$$

In the above example 'n' is a variable, cost of apples is fixed value.

Example 2:

In a hotel, cost of one dosa is Rs.12. On the bill they generally add a service charge of Rs.15. Find the general rule to calculate the total bill amount.

Solution:

Let 'x' be the number of dosas ordered.

Let 'y' be the total bill amount.

Then, total bill amount = (Cost of one dosa X number of dosas ordered) + 15

The general rule is $y = 12x + 15$

In the above example 15 is the constant term, 'x' and 'y' are variables. $12x$ is one term and 15 is another term.

Thus we have the following definitions:

Constant:

Constant is a value that does not change. A number on its own is a constant.

Variable:

A variable is a symbol or letter used to denote a value which we do not know yet. Variables can take different values.

Term:

A term is single number or a variable or numbers and variables multiplied together.

Coefficient:

A coefficient is a number that is multiplied with a variable.

Expression:

An expression is a group of terms which are separated by + or – sign.

An arithmetic expression is made up of numbers and arithmetic operations +, -, x, or ÷

For example, $(3 \times 5) - 10$, $(5+15) \times 12$ etc.

An Algebraic expression is made up of numbers, variables and arithmetic operations.

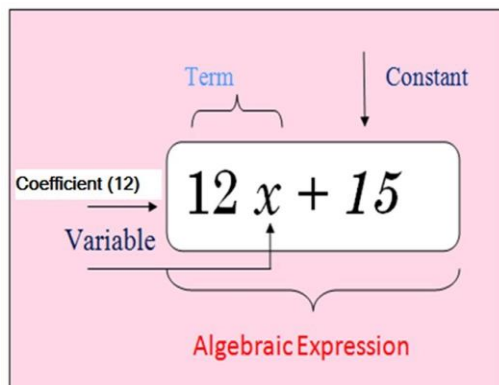


Image source: Saranya.chenchu@gmail.com

Time to teach	Asset Type	Theme	SubTheme
15 Minutes	Main Script	Algebraic Expression & Identities	Terms in expression, Expressions in Formulas and Rules , Terms in expression, Expressions in Formulas and Rules

10. QA_Questions on Terms, variables, coefficients and constant

I. Identify the number of terms, variables, coefficients and constant term in the following expressions:

- $12a - 6b + 4$
- $4x - 2y$
- $c - 32$
- $3x + 2$
- $23x + y - 23$

$$5x^2y - 13x - 3.$$

II. Consider the expression

Now match the following:

- | | |
|------------------------------------|---------|
| 1. The coefficient of x | a. 3 |
| 2. Constant | b. $5y$ |
| 3. Numerical coefficient of x^2y | c. -13 |
| 4. No. of terms | d. 5 |
| 5. Coefficient of x^2 | e. -3 |

III. Complete the following table

I.

$X =$	1	2	3	4	5	6
$5x+3 =$		13			28	

Suggested Answers

I.

1. No of terms = 3

Variables are a and b

Coefficient of ' a ' is 12, coefficient of ' b ' is -6 .

Constant term is 4

2. No of terms = 2

Variables are x and y

Coefficient of ' x ' is 4, coefficient of ' y ' is -2 .

There is no constant term.

3. No of terms = 2

Variable is c

Coefficient of ' c ' is 1.

Constant term is -32 .

4. No of terms = 2

Variable is x

Coefficient of 'x' is 3.

Constant term is 2.

5. No of terms = 3

Variables are x and y

Coefficient of 'x' is 23, coefficient of 'y' is 1.

Constant term is – 23.

II.

1. (c)

2. (e)

3. (d)

4. (a)

5. (b)

III.

X =	1	2	3	4	5	6
$5x+3 =$	8	13	18	23	28	33

Time to teach	Asset Type	Theme	SubTheme
10 Minutes	Assessments	Algebraic Expression & Identities	Value of an expression, Terms in expression, Value of an expression, Terms in expression

11. QA_Test Yourself on Formation and examples

Work sheet I:

I. Write the algebraic expression based on given instructions:

- i) 5 added to m ii) 6 subtracted from y iii) 9 added to twice r iv) 16 subtracted from thrice f
v) x multiplied by -7 vi) 5 divided by $-t$ vii) 8 is multiplied by x and the result is subtracted from 48 viii)
14 is divided by y and the result is added with 2

II. Let Sarika's present age be m years. Answer the following questions:

- I. What will be her age 10 years hence?
- II. What was her age 3 years ago?
- III. If her mother's age is thrice hers, what is her mother's age?
- IV. If her father's age is 4 years more than her mother's age, what is his present age?

III. Simplify the following expressions:

- I. $5p \times 2$
- II. $6xy \times 4$
- III. $12y \times 2z$
- IV. $4p \times 2q$
- V. $(3n \times 2) + (4n \times 3)$

IV. Write algebraic expressions for these word phrases:

- I. Four more than s.
- II. The product of 7 and c.
- III. Nine less than x.
- IV. A number divided by the sum of 4 and 7.
- V. Twice the sum of a number and 4.
- VI. The sum of $\frac{3}{4}$ of a number and 7.
- VII. Ten times a number increased by 150.
- VIII. A car was traveling 35 miles per hour for x number of hours. Distance covered by car will be?
- IX. Bob ran 7 times a week for y number of weeks. Total number of time Bob ran would be?
- X. The plumber added an extra Rs.35 to her bill which was r Rs.
- XI. Thirty-five fewer people came than y number of people expected expected.

Worksheet II

I. Fill the table:

S.No	Statement	Algebraic Expression
(i)	Sum of y and 9	
(ii)	t reduced by 3	
(iii)	product of 15 and 9	
(iv)	One third of x	
(v)	product of q and $d-3$	
(vi)	Sum of thrice of x and 5	

II. Answer the following

1) You are taking some friends for a movie and want to treat them with pizza. The cost of movie ticket is ₹120 and the pizza costs ₹30. Let x represent the number of friends then

- Write an expression for the total amount you will spend
- If $x = 5$, what will be your total expenditure?

2) a) The weight of an apple is 160 gm. Find the total weight of x number of apples.

b) The cost of a notebook is ₹ z . Find the amount required to buy 20 such note books.

3) The cost of x pencils is ₹150. Write the algebraic expression for the cost of each pencil.

III. Write the algebraic expression for the following cases

- A small company has Rs 30,000 to distribute to its employees as a bonus. How much money will each employee get?
- My brother is 5 years younger than me. Express this statement.
- My monthly saving is Rs 100 more than my sister's. Express this statement.
- An old man wanted to distribute his property equally among his four sons. What is the property that will be owned by each son?
- Ramu weighs 70 kilograms, and Shamu weighs k kilograms. Write an expression for their combined weight.
- There are 2000 litres of water in a swimming pool. Swimming pool is filled at the rate of 100 litres /minute. Write an expression, in litres, for the amount of water in the swimming pool after m minutes.

Solutions:**Worksheet I**

- $m+5$, $y-6$, $2r+9$, $3f-16$, $-7x$, $5/(-t)$, $48-8x$, $14/y+2$
- $m+10$, $m-3$, $3m$, $3m+4$
- $10p$, $24xy$, $24yz$, $8pq$, $6n+12n=18n$

- iv) (i) $s+4$, (ii) $7c$, (iii) $x-9$, (iv) $x / 11$, (v) $2(x+4)$, (vi) $\frac{3}{4}x + 7$, (vii) $10x+150$ (viii) $35x$, (ix) $7y$,
 (x) $r +35$, (xi) $y - 35$

Worksheet II

I. ANSWERS

S.No	Statement	Algebraic Express
(i)	Sum of y and 9	$y+9$
(ii)	t reduced by 3	$t-3$
(iii)	product of 15 and 9	15×9
(iv)	One third of x	$1/3x$
(v)	product of q and -3	$q \times -3$
(vi)	Sum of thrice of x and 5	$3x+5$

II. 1. a) $120n + 30n = 150n$ b) $150 \times 5 = 750$

2. a) $160x$ b) $20z$

3. $150/x$

III.

- Solution: If e is the number of employee, each employee will get Rs $30,000/e$.
- Solution: If my present age is x years, my brother's age is $x - 5$.
- Solution: If x is the monthly saving of my sister, then my monthly saving is $x + 100$.
- Solution : If his property is x , each son gets $x/4$
- Solution : Their combined weight is $70 + k$ kilograms
- Solution : Amount of water filled in m minutes is $100m$ litres. Since the pool has already 2000 litres of water, amount of water at the end of m minutes is $2000 + 100m$ litres.

Time to teach

Asset Type

Theme

SubTheme

25 Minutes	Assessments	Algebraic Expression & Identities	Value of an expression, Terms in expression, Expressions in Formulas and Rules, Expression, Value of an expression, Terms in expression, Expressions in Formulas and Rules, Expression
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12. IA_Interesting fact-Pi

The most famous constant in the world is π . The value of this constant is 3.14159 The numbers keep on recurring so they have been rounded off to 3.14.

Few facts about π

1) The ratio of circumference to diameter of a circle remains the same for all circles even if the radii are different. This value is denoted by the Greek letter, π , which is read as 'pi'.
If radius is 'r', then $\text{circumference}/2r = \pi$, for any 'r'.

2) The 14th of March is celebrated the world over as π Day. Can you guess why? As it is the 14th day of the third month. Many programmes are held to commemorate the pi day. Many people just celebrate by eating a slice of pie.



3) The number pi is all encompassing, that means that almost all the different combinations of the numbers from 0 to 9 will be present in the number pi. That means every phone number will be present in the number pi. Many people try to memorize the digits of pi. In the year 2015, a man who used to sell vegetable Mr. Suresh Kumar Sharma, from Jaipur, India, created a world record when he recited successfully, more than 17,000 digits of pi. This feat took him 17 hours to complete !!!

Image Source:

<https://pixabay.com/photos/pecan-pie-nut-nuts-nature-walnut-4858473/>

Time to teach	Asset Type	Theme	SubTheme
2 Minutes	Interesting Asides	Algebraic Expression &	Terms in expression,

		Identities	Terms in expression
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13. IQ Introduction to Equations

Let us consider a few hypothetical situations to understand equations.

1) First situation, where a bag full of chocolates is distributed to students. Each student should get 2 chocolates. The bag contains 50 chocolates. How many students would get chocolates?

We can directly find the answer by calculating $50/2 = 25$.

2) Second situation, suppose, the teacher takes out certain number of chocolates from the bag and keeps aside, then distributes the remaining to the students. How many chocolates should be in the bag so that 20 students get 2 chocolates each?

This can be formulated as follows:

Let x be the number of chocolates kept aside

Number of chocolates left in the bag would be $(50 - x)$

To find the solution, we need to find x which satisfies the following condition.

$$(50 - x)/2 = 20$$

The above expression is an algebraic expression with an equal sign (=) in it. Algebraic expression with an equal sign in it is an equation. It divides the expression in to two parts left hand side (LHS) and right hand side (RHS). An equation gives a condition on a variable. LHS becomes equal to RHS or equation is satisfied only for a specific value of the variable. In the above example $LHS = RHS$ only for $x = 10$, not for any other value of x .

3) Consider another situation, Ravi has some pencils, Ajay has pencils two times what Ravi has and Shyam has pencils three times what Ajay has. Totally, there are 18 pencils. How many pencils each has?

Solution:

Let number of pencils with Ravi = x

Then number of pencils with Ajay = $2x$

And number of pencils with Shyam = $6x$

All together $x + 2x + 6x = 18$ $9x = 18$

$$x = 2$$

Ravi has 2, Ajay has 4 and Shyam has 12 pencils.

The equation $3a = 15$, is satisfied only when $a = 5$. Can we get any other equation to get $a = 5$?

Yes, multiply both sides of the equation by 3, we get a new equation $9a = 45$, which is satisfied only for $a = 5$.

Is it possible to find many more equations which would have $a = 5$? How many such equations can be obtained?

Yes, we can multiply both sides of equation by a chosen number to get new equation.

We can find infinitely many such equations.

An equation basically gives a condition on the variable which helps us find a specific value for the variable. The specific value is called as solution of the equation.

Time to teach	Asset Type	Theme	SubTheme
8 Minutes	Inquisitive Questions	Algebraic Expression & Identities	Value of an expression, Terms in expression, Addition and subtraction of algebraic expressions, Value of an expression, Terms in expression, Addition and subtraction of algebraic expressions

14. MS_Equation

Equation:

An equation is a mathematical statement which states that two expressions are equal.

We represent an equation in a symbolic form by writing the two expressions with an equal sign in between. So, an equation has following general form

$$\text{LHS} = \text{RHS}$$

'LHS' is the expression to the left hand side of equal sign and 'RHS' is the expression to the right hand side of equal sign.

Consider the following equations:

$$2+3 = 7-2$$

$$2 \times 5 = 10$$

$$10+ 2 - 5 = 7$$

In all the above examples, both LHS and RHS are purely arithmetic expressions (no use of variables). So, we call them as **arithmetic equations**.

We can easily verify the correctness of the above arithmetic equations. For example, we can easily verify that ' $2 + 3$ ' is indeed equal to ' $7 - 2$ '.

Algebraic Equation

Consider the following equation

$$2x + 8 = 20$$

In the above equation, LHS is not purely an arithmetic expression. There is an occurrence of variable 'x'. ' $2x + 8$ ' is an algebraic expression. So, the above equation is an algebraic equation or equation with variable.

Can we verify the correctness of the equality relation stated in the above equation?

No, because the value of 'x' is not fixed. Unless, we fix a particular value for variable 'x', we cannot say whether the equality relationship is correct or not.

Now, let us verify the correctness of the above equation for different values of variable 'x'.

If $x=1$, then $2(1) + 8 = 20 \Rightarrow 10=20$ which is false
If $x=2$, then $2(2) + 8 = 20 \Rightarrow 12=20$ which is false
If $x=3$, then $2(3) + 8 = 20 \Rightarrow 14=20$ which is false
If $x=4$, then $2(4) + 8 = 20 \Rightarrow 16=20$ which is false
If $x=5$, then $2(5) + 8 = 20 \Rightarrow 18=20$ which is false
If $x=6$, then $2(6) + 8 = 20 \Rightarrow 20=20$ which is TRUE!!

So, we can say that the algebraic equation is satisfied when $x=6$. The value $x=6$ is called the “solution to the algebraic equation”.

Thus, an **algebraic equation** is a condition on a variable. It is satisfied only for a definite value of a variable.

The definite value of the variable in an equation which satisfies the equation is called a **solution to the equation**.

In the above example, we found that the equation ' $2x + 8 = 20$ ' is satisfied when $x=6$. So, we say that $x=6$ is a **solution** to the above equation.

More such examples -

$2n=10$ is satisfied only when $n=5$ and this is the solution to the equation.

$x - 3 = 11$ is satisfied only when $x=14$ and this is the solution to the equation.

In all the above examples of algebraic equations we have tried various values for 'x' and finally identified the value that satisfies the algebraic equation. This method is therefore called '**Trial and error method**'.

Example 1: Find the solution of $x + 4 = 15$ using trial and error method.

Solution:

Value of x	1	2	3	4	5	6	7	8	9	10	11	12
$x + 4$	5	6	7	8	9	10	11	12	13	14	15	16
Is ' $x+4=15$ '	No	No	No	No	No	No	No	No	No	No	Yes	No

From the above results, we can see that the equation is satisfied when $x=11$.

So, the solution of the above equation is ' $x=11$ '.

Example 2: Find the solution of $3n-1=14$.

The equation $3n-1=14$ can also be solved by trial and error method. That is, we can substitute $n=1, 2, 3, 4, \dots$ in $3n-1$ (LHS) of the equation until the value '14' is obtained in RHS. Substitute n in LHS($3n-1$).

n	LHS	RHS	LHS = RHS?
1	$3 \times 1 - 1 = 3 - 1 = 2$	14	No
2	$3 \times 2 - 1 = 6 - 1 = 5$	14	No
3	$3 \times 3 - 1 = 9 - 1 = 8$	14	No
4	$3 \times 4 - 1 = 12 - 1 = 11$	14	No
5	$3 \times 5 - 1 = 15 - 1 = 14$	14	Yes
6	$3 \times 6 - 1 = 18 - 1 = 17$	14	No

We observe that $LHS=RHS$ only when $n=5$.

Hence, this is the 'solution' to the equation $3n-1=14$.

Time to teach	Asset Type	Theme	SubTheme
20 Minutes	Main Script	Algebraic Expression & Identities	Value of an expression, Value of an expression

15. DD_Applications of Equations in daily Life

Every time you need to solve a situation that involves time, money, distance, area of something, comparing prices of articles, buy or rent something you are using algebra.

Examples:

1. If cost of pen is three times that of the pencil and total money spent is Rs. 200. We can find the cost of pen and pencil using Algebra.

Solution : $x + 3x = 200$

$$4x = 200$$

$$\text{Or } x = 50$$

Therefore, cost of pencil = Rs. 50

And cost of pen = Rs. 150

2. If the speed of the car is given, we can find out the distance to be covered in a particular time using Algebra.

$$\text{Distance} = \text{speed} \times \text{time}$$

3. If a class room floor is to be tiled, then the number of tiles required can be calculated by dividing area of class room by area of a tile. Area of the class room can be calculated using the rule

$$\text{Area} = \text{length} \times \text{breadth}$$

4. When we need to use wire to fence a rectangular field, we can find the length of wire to be purchased by calculating perimeter of the field and multiplying the result with required number of layers or rounds.

Time to teach	Asset Type	Theme	SubTheme
5 Minutes	Day-to-day Relevance	Algebraic Expression & Identities	Value of an expression, Terms in expression, Standard identities and their applications, Polynomials, Multiplication of algebraic expression, Like and unlike terms, Identity, Expressions in Formulas and Rules , Expression based on terms(monomials, binomials and trinomials), Expression, Addition and subtraction of algebraic expressions, Value of an expression, Terms in expression, Standard identities and their applications, Polynomials, Multiplication of algebraic expression, Like and unlike terms,

			Identity, Expressions in Formulas and Rules , Expression based on terms(monomials, binomials and trinomials), Expression, Addition and subtraction of algebraic expressions
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16. QA_Questions on Equations

1. State which of the following are equations:

- i) $14 - y = 6$
- ii) $12 \times m$
- iii) $k = 15/3$
- iv) $12u - 13v + 3$

Suggested Answer:

- i) Equation
- ii) Not an equation
- iii) Equation
- iv) Not an equation

2. Pick out the solution from the values given in the brackets:

- i) $d + 10 = 15$ (2, 6, 5, 12)
- ii) $25 - r = 21$ (3, 6, 7, 4)
- iii) $39/g = 13$ (5, 3, 8, 10)
- iv) $25 \times h = 100$ (2, 4, 6, 8)

Suggested Answer:

(i) $d + 10 = 15$	(ii) $25 - r = 21$	(iii) $39/g = 13$	(iv) $25 \times h = 100$
$d = 15 - 10$	$r = 25 - 21$	$g = 39/13$	$h = 100/25$
$d = 5$	$r = 4$	$g = 3$	$h = 4$

3. Solve by trial and error method

- i) $y + 4 = 9$

Suggested Answer : Substitute for different values for y such as 1,2, 3 till we get the answer 9.

$$1 + 4 \neq 9, 2 + 4 \neq 9, 3 + 4 \neq 9, 4 + 4 \neq 9, 5 + 4 = 9 \text{ So, } y = 5$$

$$\text{ii) } 2 - p = 0$$

Substitute for different values for p such as 1, 2, 3 till we get the answer 0

$$2 - 1 = 0, 2 - 2 = 0 \text{ So, } p = 2.$$

$$\text{iii) } 15/q = 3$$

Substitute for different values for q such as 1, 2, 3 till we get the answer 3

$$15/1 \neq 3, 15/2 \neq 3, 15/3 = 3, 15/4 \neq 3, 15/5 \neq 3 \text{ So, } q = 3$$

$$\text{iv) } 12 \times m = 12$$

Suggested answer: Substitute for different values for m such as 1, 2, 3 till we get the answer 12 .

$$12 \times 1 = 12$$

$$\text{So } m = 1$$

4. Change the following sentences into algebraic equations.

- A number increased by 19 is 30.
- Twice a number is 34.
- Four less than a number is 28.
- A number divided by 8 is 3.
- In eleven years Shruthi will be twenty five years old.
- Each piece of candy costs Rs 4. The price of p pieces of candy is Rs 400.
- Rema made a withdrawal of r rupees from her savings account. Her old balance was Rs 2800 and her new balance is Rs 800.
- A large pizza with 15 slices is shared among x students so that each student's share is 3 slices.
- A number is 4 more than -5.
- Twice some number is 3 more than that number.
- Four times some number is 7 less than that number.
- A number plus 17 is 2 less than twice that number.

Suggested Answer: (a) $y + 19 = 30$ (b) $2x = 34$ (c) $x - 4 = 28$

(d) $y/8 = 3$ (e) $x + 11 = 25$ if x years is her present age

(f) $4p = 400$ (g) $2800 - r = 800$

(h) $15/x = 3$ (i) $x = -5 + 4$

(j) $2x = x + 3$

(k) $4x = x - 7$

(l) $x + 17 = 2x - 2$

Time to teach	Asset Type	Theme	SubTheme
20 Minutes	Assessments	Algebraic Expression & Identities	Value of an expression, Expression, Value of an expression, Expression

17. VC_Inner Peace

We have just learnt that a variable takes on different values; its value is not fixed. An equation is a condition on a variable, e.g. $x - 3 = 10$. Here 10 is a fixed value and x will vary suitably to maintain the equation condition.

In real life, as we grow, several things change in our lives. Biological changes, education, friends, status, etc. People come and go and good and bad events happen to us. We easily become affected because of these circumstances that are constantly changing. But we can be less affected and upset if we hold on to the only constant in our lives, which is our own inner peace - the kind of peace that does not become ruffled even if we have adverse people or circumstances around us.

Let me narrate to you a real incident:

On the first day of office, as President Abraham Lincoln entered the Senate to present his inaugural address, one rich Aristocrat Member of the gathering there stood up and said – “Mr. Lincoln! Your father used to make shoes for my family.” The whole gathering there laughed; they thought they had made a fool of Lincoln.

But Lincoln and that type of people are made of different mettle.

Lincoln looked at the man and said – “Sir, I know that my father used to make shoes at your home for your family and there will be many others too. But the way he made shoes, nobody else can. He was a creator. His shoes were not just shoes; he poured his whole soul into it. But I want to ask you; have you any complaint? I can make shoes myself. If you have any complaint, I can make another pair of shoes. But as far as I know, nobody ever complained about my father’s shoes. He was a genius and a great creator and I am proud of my father.”

The whole senate was dumb. They could not understand what type of man Lincoln was.

Here we can see that Abraham Lincoln did not get upset when he was ridiculed by others. He did not get angry or sad. He was calm and cool. He was able to reply peacefully to the person who ridiculed him. It was mainly because he kept his composure at a constant level.

Children, do not be affected by either happiness or sadness in your lives. Keep your inner self at peace at all times. Keep it constant at any cost.

This will take you far in life.

Time to teach	Value Type	Value Sub Type	Value Attribute
3 Minutes	Peace		Stories

18. MS_Summary_Algebra

Summary

1. The main feature of Algebra is the use of letters to devise rules, formulas or to determine unknown quantities.
2. A variable is nothing but a number which does not have fixed value.
3. Variables are used in the rules of Arithmetic and geometry.
4. An algebraic expression is made up of numbers, variables and arithmetic operations.
5. Expressions can be simplified by combining like terms and completing all operations. This process is called **Simplification**.
6. The process of supplying a value to the variable is called **Substitution**.
7. Bhaskara II and Brahmagupta contributed to Algebra.
8. A constant is a number that is fixed and known.
9. Variable is a symbol or letter used to denote a value which we do not know yet. Variables can take different values.
10. A term is a single number, or a variable or numbers and variables multiplied together.
11. A coefficient is a number that is multiplied with a variable.
12. An Algebraic expression is made up of numbers, variables and arithmetic operations. An expression is a group of terms which are separated by + or – sign.
13. An equation basically gives a condition on the variable which helps us find a specific value for the variable. The specific value is called as solution of the equation.
14. An equation is a mathematical statement which states that two expressions are equal.
15. We represent an equation in a symbolic form by writing the two expressions with an equal sign in between. So, an equation has following general form $LHS = RHS$.
16. 'LHS' is the expression to the left hand side of equal sign and 'RHS' is the expression to the right hand side of equal sign.
17. An algebraic equation is a condition on a variable. It is satisfied only for a definite value of a variable.

Time to teach	Asset Type	Theme	SubTheme
5 Minutes	Main Script	Algebraic Expression & Identities	