Lesson- 10

Algebra

M5G9A6

Let us understand from the pictures

(i)  = 4  = 4b

b b b b b

(ii)  = 2m+m = 3m

m m m m m

(iii) 

c c c c c c

Let us understand

If the symbol (letter) ‘b’ is used to denote one banana, then '4b' means four bananas. Similarly symbo 'm' and 'c' are used to denote mangoes and cows respectively.

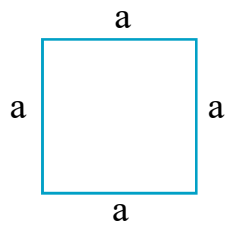
Use symbols to express the following

- 7 goats and 3goats equal 10 goats.

  (Use the symbol 'g' to denote goat)
- When 4 flowers are taken away from 8 flowers number of flowers left is 4.

  (Use the symbol 'f' to denote flower)

Let us understand from the picture



The side of the square shown in the figure is 'a'. Therefore, the perimeter = a + a + a + a

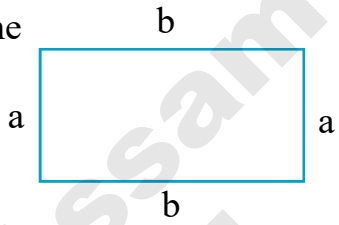
Or, P = 4a (Where P denotes perimeter)

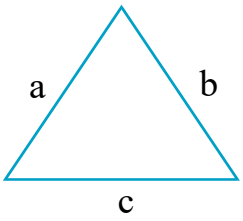
The measure of the sides of the rectangle shown in the figure is a and b respectively.

Therefore, the perimeter = a + a + b + b

Or P = 2a + 2b (P denotes the perimeter)

= 2 × (a + b)





The sides of the triangle shown in the figure is a, b, c

Therefore, the perimeter = a + b + c

Or, P = a + b + c (where P denote the perimeter)

Let us find the rule to determine the perimeter of the figure given below and write the rule inside the figure.

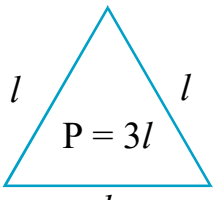


Fig-1

In figure1 if the measure of the side of the equilateral triangle is denoted by '*l*' and the perimeter is denoted by 'P' then, P = *l*+*l*+*l*=3*l*

Now, if the measure of the side is 2 cm (*l* = 2 cm) P = 3 × 2 cm = 6 cm.

If the measure of the side is 3cm (*l* = 3 cm), P = 3 × 3 cm = 9 cm

If the measure of the side is 4cm (*l* = 4 cm), P = 3 × 4 cm = 12 cm

Points to note

The relation P = 3*l*, shows that the perimeter of an equilateral triangle will be different for different values of *l*. In this relation, *l* has no fixed value. Therefore *l* and *P* are varying symbols or variables. In other words.

The symbols which can take different values are called variables.

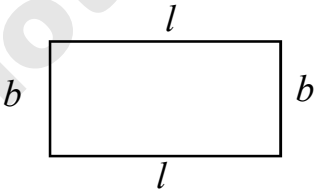


Figure- 2

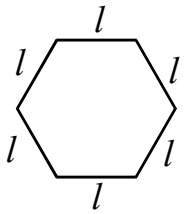


Figure- 3

In the Figure- 2 if '*l* ' denotes the length and '*b*' denotes the breadth, then the perimeter P = *l*+*l*+*b*+*b* = 2*l* + 2*b* = 2(*l*+*b*)

Again, in the figure-3, if the side of the regular hexagon is '*l*' then, P = *l*+*l*+*l*+*l*+*l*+*l* = 6*l*

Let us try

(i) a +a =2×a=2a (ii) b +b+b+b = 4×b = 4b (iii) 8+8+8=3×8 = 24

(iv) 7+7+7+7 = ...× .....= ..... (v) m+m+m+m+m = ...×..... = ...

(vi) y + y + y = ...× .....= ..... (vi) P + P + P + P + P + P + P = ...×..... = ...

Points to note

The name of an object can be denoted by a letter symbol.
For example, a + a = 2a, 2b + b = 3b etc.

Try these :

(i)  +  +  +  = 2  + 2  = 2a+2m

a a m m

(ii)  +  +  +  +  +  = 4  +2  = ... + ...

g g g g a a

(iii)  +  +  +  +  = 3  +2  = ... + ...

c c c z z

(iv) (s+s+s+s+s) + (t+t+t+t+t+t+t) =

(iv) (y+y+y+y+y+y) + (z+z+z+z+z+z+z) =

(iv) (p+p+p) – (q+q+q+q) =

(iv) (a+a+a) + (b+b) + (c+c+c) =

Let us express as per direction

(i) Sum of two mangoes and three grapes = 2m + 3g (ii) 10 more than m = m + 10

(iii) 7 less than $x = x - 7$ (iv) Five times c = 5c

(v) 2 less than b = 2– b (vi) Product of p and q =

(vii) Half of the number b = (viii) 3 more than two times x =

ix) 3 less than y = (x) Sum of x, y and z =

(xi) Divide twice of **a** by 4 =

What we have learnt :
An algebraic expression is a combination of symbols. It may contain one term or more than one term. For example the terms of the expression 2a + b are 2a and b

Lai and Lessai brought marbles from home to play. But neither of then knew the number of marbles each had. They started to talk among themselves.

Lai : I can tell the number of marbles you have in your hand.

Lessai : How?

Lai : I shall give you some instructions and you have to tell me the end-answer accordingly. Multiply the number of marbles you have by 2. Now add 5 to the result. Tell me your answer.

Lessai : 19

Lai : Fine, you have 7 marbles with you. Lessai thought for a while and said,'I know, how you could find the ansewer. Can you find out how Lai found the answer? You can try.

In our daily life too, we come across some problems where we have to find answer of unknown questions. For example -

(a) The fathers present age is 1 year more than 3 times the age of the son. If the father's age is 37, what is the age of the son?

(b) Romen had Rs. 133.00 in his pocket. He bought 3 kg of grams. Now, money left with him is Rs. 7.00. What is the cost price of 1kg of gram?

(c) In a fruit stall, cost price of 3 kilograms of guava is Rs.630.00. Cost price of 1kg of apple and 1kg of guava is Rs. 340.00. What is the cost price of 1 kg of each type of fruits?

To find solutions of these type of problems it is required to find the value of unknown term. You can solve some problems orally. But it is not possible in certain type of cases. Then, we have to take help of symbols.

Let us take some easy problems which we can solve with the help of addition, subtraction, multiplication and division tables. For example, with what numbers should we fill in the following blanks to obtain the answers on the right hand side?

$15 + \square = 20$

$15 - \square = 5$

$15 \times \square = 30$

The first box of the questions on the previous page will be filled in by 5. Similarly 10 in the second box and 2 in the third box. Is not it? The numbers in the boxes are different in each case. The numbers in the boxes is the unknown term or the unknown number. If we use any letter of the English alphabets say "**x**" to denote the unknown term or the box, then the question can be reframed as-

$15 + x = 20$

$15 - x = 10$

$15 \times x = 30$

In this way we use the letter *a, b, c,..... x, y, z* etc. of the English alphabets as symbols to denote unknown terms. In this lesson we shall discuss how we can express and solve mathematical problems with the help of English alphabets instead of numbers.

Constant and Variable

The numbers which we use always mean fixed values. When we say three apples we mean  . Not  or  . Similarly when we say five fingers of the hand we mean  In other words these numbers have fixed values. They do not vary. Therfore we call them constant.

We use symbols to indicate numbers. For example we use 1 to indicate one object, 2 for two objects 3 for these objects and so on. The symbols 1, 2, 3...etc have fixed values. The values of the numbers do not vary. Therefore these are constants. The numbers which we use each of them is a constant.

Some constants are associated with our day to day activities. For example- number of wheels in a bicycle, number of days in a week, number of months in a year, number of valid balls thrown in an over in circket etc.

Try to cite more examples where constants are associated.

Variable :

Example 1 : Hima wanted to count the number of wheels of the bicycles in the bicycle-stand of the school. She started to count.

Number of wheels in 1 bicycle is 2 

Number of wheels in 2 bicycles is 2 + 2 = 

Number of wheels in 3 bicycles 2 + 2 + 2 

As she continued to count she realised that if she counts the number of bicycles and multiply the number by 2, then she will get the total number of wheels.

That means, total number of wheels = 2 × number of bicycles.

We have already mentioned that we use the letters *a, b, c,.... x, y, z* to denote unknown terms. If we denote number of cycles by the symbol *x,* then total number of wheels = $2 \times x$.

If the number of cycles vary, number of wheels also will vary. Number of cycles changes everyday. That means, number of cycles is variable. Therefore, this is an example of variable. But, number of wheels in each cycle is same. That means number of wheels is a constant. But in the pervious examples, $15 + x = 20$, $15 - x = 10$, $15 \times x = 30$ the value of the variables is different in each situation.

Example : 2

Sansuma and Jerina made pattern of triangle by using match sticks. They made the following patterns of triangles.

(a) (b) (c) (d)

Now, they counted the number of match sticks used in each figure.

In figure (a) number of match sticks =3, in figure (b) number of match sticks = 6

In figure (c) number of match sticks = 9, In figure (d) number of match sticks = 12

A question arose in their mind. If they make 9 or 10 or 12 or any number of patterns of triangles then how many match sticks will be required.

They found that in every pattern of triangle 3 match sticks are required.

In figure (a) there is 1triangle, therefore total number of matchstick = $3 \times 1 = 3$

In figure (b) there are 2 triangles, therefore total number of matchsticks = $3 \times 2 = 6$

In figure (c) there are 3triangles, therefore total number of matchsticsks = $3 \times 3 = 9$

In figure (d) there are 4 triangles, therefore total number of matchsticks = $3 \times 4 = 12$

This means, if we multiply the number of triangles by 3,we can find the total number of match sticks required.

Therefore Number of match sticks = Number of matchsticks used in one triangle × Number of triangle

If x denotes the number of triangle then the number of matchsticks = $3 \times x$

Points to note : In this type of patterns we always find the number of items used in a single pattern.

Let us take few problems

Example 1 : Rupees 10.00 is added to the amount of money Hima has in her pocket. What is the total amount?

Solution : The amount of money in Hima's pocket is an unknown quantity. If we use 'm' to denote the amount of money Hima has in her pocket, than the total amount is $10 + m$.

Example 2 : From a bunch of bettle nut, 5 bettle nuts fell down. What is the total number of bettle nuts in the bunch?

Solution : We do not know the number of bettle nuts in the bunch.

If we suppose that the number of bettle nut in the bunch is 'y' then the number of bettle nuts left will be $y - 5$.

Example 3 : Pradeep brought a packet of chocolates for his birthday and distributed all the chocolates among his 7 friends. How many chocolates each of his friends get?

Solution : If we denote the total number of chocolate in the packet as 'a', then each friend will get $a \div 7$ or $\frac{a}{7}$ chocolates.

From the above discussion we find that we use a variable to denote an unknow quantity. Use of English alphabets to solve mathematical problems is the branch of mathematics called Algebra. The term that we use like x, $3y$, $y + 3$, $z - 4$ etc. are algebraic expression. The rules used in arithmetic are also used in algebra. That is why arithmetical problems can be solved very easily with the help of algebra.

Try these :

1. **Fill in the blanks with variable**

Suppose x is a number.

(a) If we add 10 to the number we will get _____

(b) If we subtract17 from the number we will get _____

(c) If we multiply the number by 9 we will get _____

(d) If we divide the number by 15 we will get_____

2. Match part 'A' with part 'B'

'Part-A'	'Part-B'
$2m$	subrtact m from 17
$m - 3$	Divide m by 5
$m + 7$	m multipled by 2 (or two times m)
$17 - m$	Subtract 3 from m
$\frac{m}{5}$	Add 7 to m

3. Choose the correct answer :

If 5 is added to a number x, the sum is —

(a) $5x$ (b) $x + 5$ (c) $\frac{x}{5}$ (d) $5 - x$

4. 3 times a number is—

(a) $m + 3$ (b) $m - 3$ (c) $3m$ (d) $\frac{m}{3}$

5. Riyan scored 76 marks in Mathematics. We donot know his marks in science. If we take the mark scored in science as x, then what is the total marks scored by Rian in these two subjects?

6. Ankita had some chocolates with her. Mridusmita has 5 chocolates more than Ankita. Use an appropriate variable to write the algebraic expression for the number of chocolates Mridusmita has.

7. Some patterns were made with matchsticks. Look at the patterns and complete the following table.

(a)

Number of V	1	2	3	4	10	n
Number of matchsicks	2	4	6	...	...	...

(b)

Number ofΔ	1	2	3	4	5	6	n
Number of matchsicks	3	5	7	...	...	...	...

(c)

Number of	1	2	3	4	5	6	m
Number of matchsicks	6	12	18	?	?	?	?

Use of variable to frame rule

A. Perimeter of a square

Chintu and Jintu decided to frame a rule to find the perimeter of a square

Chintu : What is a perimeter?

Jintu : Perimeter is the distance covered along the boundary of a closed figure in a plane.

Chintu : Are the four sides of a square equal or unequal ?

Jintu : Equal.

Chintu : Then, if we know the side of the square by multiplying it by 4 we can find the perimeter.

Jintu : But the length of the side of square may vary according to the size of the square.

Chintu : Yes, so the length of the side of a square is a variable. Now, tell me how will we proced?

Jintu : Let us suppose that the length of a side of the square is **a** unit.

Chintu : You are right. Therefore,

Perimeter of the square = 4 × length of one side of a square.

$= 4 \times a$

$= 4a$

$\therefore$ Perimeter of a square = $4a$ units Where a = length of a side of the square.

So, if a side of the square a = 2cm then the perimeter of the square will be

4×2 cm = 8 cm.

Similarly,

If a = 3 cm the perimeter = $4a = 4 \times 3$ = 12 cm

If a = 4 cm the perimeter = $4a = 4 \times 4$ = 16 cm

If a = 10 cm the perimeter = $4a = 4 \times 10$ = 40 cm etc.

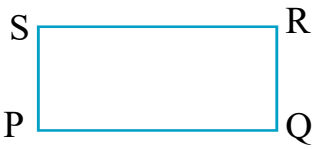
Generally the multiplication sign (×) is not written to express the product of a number and an algebraic term a expression. For example : $5 \times a$ or $5a$; $11 \times b$ or $11b$; $(-9) \times l$ or $-9l$ etc. The number is written in front of the variable. For example: $l \times 16 = 16l$; $p \times 6 = 6p$ etc.

B. Perimeter of a rectangle

Chintu : Are the sides of a rectangle equal?

Jintu : The opposite sides of a rectangle are equal. This means PQ = SR, PS = QR

Chintu : So, for different values of length and breadth we will have different perimeter



Jintu: Here, there are two variables. length and breadth. Let us suppose, the length of the rectangle is l, and the breadth of the rectangle is b

Chintu : Then the perimeter of the rectangle = length + breadth + length + breadth

$= l + b + l + b$

$= 2l + 2b$

∴ Perimeter of a rectangle = $2l + 2b$

The sum of two dissimilar variables a and b is expressed as $a + b$.

The length of a rectangle = 4 cm and breadth = 3 cm,

then, perimeter of the rectangle = $2l + 2b$

$= 2 \times 4 + 2 \times 3$

$= 8 + 6$

$= 14$ cm

Again, if the length of the rectangle = 6 cm and breadth b = 4 cm

then perimeter of the rectangle $= 2l + 2b$

$= 2 \times 6 + 2 \times 4$

$= 12 + 8$

$= 20$ cm

Try these

(a) Frame a rule to find the perimeter of a scalene triangle by using variables.

(b) Frame a rule to find the perimeter of an equilateral trianlge by using variables. If the side of an equilateral triangle is 7 cm.What is its perimeter ++?

Rules from arithmetic

(a) Commutativity of addition : Note addition of two numbers —

$7 + 8 = 15$ and $8 + 7 = 15$ therefore $7 + 8 = 8 + 7$

$13 + 5 = 18$ and $5 + 13 = 18$ therefore $13 + 5 = 5 + 13$

$109 + 35 = 144$ and $35 + 109 = 144$ therefore $109 + 35 = 35 + 109$ etc.

What have you learnt? Sum of two number does not depend on the order of the two numbers. This rule is applicable for any numbers. If we denote the two numbers as a and b then,

$$a + b = b + a$$

This property of number is known as commutativity of addition of two numbers.

(a) Commutativity of multiplication : Note in the case of multiplication

$4 \times 6 = 24$ and $6 \times 4 = 24$ therefore $4 \times 6 = 6 \times 4$

$11 \times 9 = 99$ and $9 \times 11 = 99$ therefore $11 \times 9 = 9 \times 11$

$15 \times 123 = 1845$ and $123 \times 15 = 1845$ therefore $15 \times 123 = 123 \times 15$ etc.

Therefore the product of two numbers does not depend the order of the two numbers. If we donote the two numbers with the variables p and q then.

$$p \times q = q \times p$$

This rule is applicable to any number.

For example, if $p = 18$ and $q = 29$ then

$$p \times q = 18 \times 29 = 522$$

and $q \times p = 29 \times 18 = 522$

$\therefore \quad p \times q = q \times p$

Note that : Product of two variable and p **and** q is written as $p \times q$ or pq.

(c) Distributivity of numbers

Example 1 :

Suppose we are to find the product of 9×28. We usally proceed in this way-

$$9 \times 28 = 9\,(20 + 8)$$
$$= 9 \times 20 + 9 \times 8$$
$$= 180 + 72$$
$$= 252$$

$$\begin{array}{r} 28 \\ \times\ 9 \\ \hline = 252 \end{array}$$

Example2 :

$$7 \times 35 = 7 \times (30 + 5)$$
$$\therefore \quad 7 \times 30 + 7 \times 5 = 210 + 35 = 245$$

$$\begin{array}{r} 35 \\ \times\ 7 \\ \hline = 245 \end{array}$$

Example 3 :

$5 \times (19 + 8) = 5 \times 19 + 5 \times 8$

$17 \times (12 + 31) = 17 \times 12 + 17 \times 31$ etc.

From the example it is found that the above rule is applicable in the case of any three numbers. Therefore if we use three variable like *a*, *b and c* instead of numbers we write the rule as-

$$a \times (b + c) = a \times b + a \times c$$

In this rule the multiplicand a is distributed over $b + c$. That is why this rule is called distribution of multiplication over addition of numbers.

$$a \times b + a \times c = a \times (b + c)$$

Similarly,

$$p \times q + p \times r = p \times (q + r)$$
$$l \times m + l \times n = l \times (m + n)$$
$$x \times y + x \times z = x \times (y + z) \text{ etc.}$$

Variables with expressions

We have seen that variables have no fixed value. They can take any value. But each variable is a number. That is why we can do addition, subtraction, multiplication, division, operations on variables as we do on numbers. For example.

	Expression	How is it formed
(i)	$w + 9$	9 is added to w
(ii)	$3z$	z is multiplied by 3
(iii)	$x - 11$	11 is subtracted from x
(iv)	$\frac{y}{13}$	y is divided by 13
(v)	$-9m$	$-m$ is multiplied by 9 (or -9 is multiplied by m)
(vi)	$3x + 4$	In the first step x is multiplied by 3 and then 4 is added to the product.
vii)	$2y - 11$	In product the first step y is multiplied by 2 and then 11 is subtracted from the product.

Try these : Write ten algebraic expressions and write how they are formed

Express the following in algebraic terms.

(i) Sum of a and 10.
(ii) Product of a and 10.
(iii) $-m$ is multiplied by 8.
(iv) Multiply x by 7 and subtract 10 from the product
(v) Subtract the product of 9 and y from 18
(vi) Subtract 8 from $-m$

(vii) Multiply $-p$ by 5.

(viii) Subtract 11 from $2m$.

(ix) Divide y by 5.

(x) Divide m by 7 and subtract 12 from the quotient.

Let us see how expressions can be used in real situations

Situation	Variable	Statements
(i) Rumi's age after 4 years from now.	Let y be Rumi's present age in years.	4 years from now Rumi will be $(y + 4)$ years old.
(ii) Babu is 6 years younger than Maina.	Let Maina's age be x years.	Babu's age is $(x - 6)$ years.
(iii) Anushka's father's present age is 2 times Anushkas' present age.	Let the present age of Anushka be x years.	Anushka's fathers present age is $2x$ years.
(iv) Cost of 1 kg of gram dal is Rs 7 more than cost of 2kg of potatoes	Let the price of 1kg of potato be Rs m	Cost of 1kg of gram dal is Rs. $(2m + 7)$
(v) The denominator of a fraction is 7 more than 2 times its numerator.	Let the numerator of the fraction be x.	The denominator of the fraction is $2x + 7$ the fraction is $\frac{x}{2x+7}$
(vi) The speed of a train is 45 km/ hr more than speed of a bus.	Let the speed of the bus be x *km/hr*	The speed of the train is $(x + 45)$ km/hr

Equation :

Example 1 : The sum of a numebr is 113 when 9 is added to it. What is the number?

Solution : Here the number is the unknown quantity.

Let the number be x.

When 9 is added to it the sum is $x + 9$

According to the question the sum is 113

Therefore $(x + 9)$ is equal to 113. we express it as $x + 9 = 113$.

When an algebraic expression is used in a statement () is used for convenience of understanding.

Example 2 : Rashmi counted the number of wheels of the rickshaws kept in the rickshaw-stand and found it to be 39. How many rickshaws were there in the rickshaw stand?

Here, number of rickshaws is the unknown quantity.

Let the number of rickshaws in the rickshaw stand = n.

Then, total number of wheels = 3 × number of rickshaws.

$\therefore \quad 39 = 3n$

or $\quad 3n = 39$

Example 3 : 9 minutes is left when 3 minutes is subtracted from twice the time required by Tagar to walk from home to school. What is the time required by Tagar to walk from home to school?

Suppose, Tagar takes 'm' minutes to walk from home to school.

Twice of 'm' is $2 \times m$ or $2m$

If we take away 3 minutes from 2 m we are left with $(2m - 3)$,

This means $2m - 3 = 9$

In all these examples we have used some algebraic expressions. For example $(x + 9)$, $3n$, $(2m - 3)$ etc. At the same time, we have used equal sign (=) to equal them with some numbers.

For example- $x + 9 = 113$ $\quad 3n = 39$ $\quad 2m - 3 = 9$ ।

Algebraic expressions equated with numbers or variables are called equations.

Examples of such equations are–

(i) $x + 5 = 11$ $\quad$ (ii) $3m - 8 = 13$ $\quad$ (iii) $\frac{y}{9} = 3$

(iv) $\frac{z}{3} = 3z + 2$ $\quad$ (v) $4x + 10 = -30$ etc.

An equation has two sides. Left hand side and Right hand side. The equal sign '=' is between the Left hand side and Right hand side.

For example in the equation $3x - 7 = 11$, $3x - 7$ is the Left hand side and 11 is the Right hand side. If the left hand side is not equal to right hand side then it is not an equation. For example : $9x + 7 > 18$, $5l - 7 < 20$ etc. are not equations.

Try these

Give 5 examples of equations and unite the left hand side and right hand side in each equation.

Equation and a balance

Have you seen a balance? We can compare the balanced state of a balance with algebraic equation. In a balance weight are put on the left hand side of the balance to measure the weight of the things placed on the right hand weight of the things placed on the right hand side of the balance. The balance comes to a balanced state when the weight on either side are equal. The measure of the weight placed on the left hand side of the balance gives the measure of the weights of the things. In the same way, the value of the expression on the left hand side of the equality sign of an equation is equal to the value of the expressions on the right hand side. If we want to keep a balance in the balanced state then-

(a) If we increase the weight on one side we must increase the weight a the other side too.

(b) If we decrease the weight on one side we must decrease the weight on the other side too.

The same rule applies in the case of equations. This means if we add (or subtract) a number on the right hand side of the equation we must add (or subtract) the same number on the left hand side. Otherwise, it will not be balanced. The same rule applies in multiplication and division also.

Solution of an equation

Let us now see how far different values of the variable there is a variation of values of right hand side and left hand side of the equation $y + 5 = 9$

Here left hand side of the equation = $y + 5$

Right hand side of the equation = 9

You can rightly guess that if the value of y is *4,* then $y + 5 = 9$ and the right hand side of the equation is equal to the left hand side of the equation. This means Left hand side = Right hand side. But for any other value other than y = 4, right hand side is not equal to left hand side (This you can prove by yourself)

What have you found?

This means the equation $y + 5 = 9$ is satisfied when y = 4 (Since right hand side equals left hand side.)

The value of the unknown quatity for which the left hand side of the equation is equal to the right hand side of the equation that value is said to satisfy the equation and that value is the solution of the equation. The procedure by which a solution to the equation is found, that procedure is the solution of the equation.

For the equation $y + 5 = 9$ the solution is $y = 4$.

Let us take another example–

$x - 9 = 10$

$x = 19$ is the solution of the solution. Because if we put $x = 19$

Left hand side $= 19 - 9$

$= 10$

= Right hand side

But, if we put $x = 16$, then left hand side $= 16 - 9 = 7$,

which is not equal to the right hand side.

Therefore, $x = 16$, is not a solution of the equation $x - 9 = 10$.

Similarly $x = 5$ also is not a solution of the equation $x - 9 = 10$. etc

In this lesson, the equations which we will discuss will have only one solution in each case.

Try these

1. Fill in the blanks of the following table and write whether the variables in each equation is a solution of the corresponding equation on not.

Equation	Value of the variable	Right hand side	Left hand side	Left hand side = Right hand side	Solution (Yes/No)
$x - 2 = 3$	1	$1 - 2 = -1$	3	No	No
$x - 2 = 3$	2	$2 - 2 = 0$	3	No	No
$x - 2 = 3$	–1				
$x - 2 = 3$	0				
$x - 2 = 3$	5				

This process of finding a solution of the equation by picking up different values of the unknown quantity is called '**trial and error method**'.

2. Complete the following table and find the solution of the equation $p - 5 = 3$.

p	0	1	– 1	3	4	– 3	5	8
$p - 5$								

Beginning of Algebra

About 1550 BC people in Egypt and Babylon first used symbols to denote numbers. It was the beginning of algebra. About 300 BC Indian mathematicians used symbols in place of numbers to find the value of an unknown quantity and ushered in the study of algebra. At different periods in India great Indian Mathematicians viz.

Aryabhatt (born 476 AD), Brahmagupta (born 598 AD), Mahavira (born 850 AD) and Bhaskara II (born 1114 AD) and others contributed a lot to the study of algebra.

Bharamagupta wrote 'Jaa' for unknown numbers. To denote the next unknonwn number wrote 'Kaa'. This 'kaa' comes from 'kala' the black colour. Bhaskaracharyaa found a rule to solve quadratic equations. This rule is known as 'Hindu rule'. He has discussed a lot about algebra in the books titled' 'shidhant-shiramoni', 'Beejaganit' etc.

The word ' algebra' is devied from a book Hisab Al-jabr w'al-muqabala written about 825 AD by the Arab mathematician Mohammed Ibn Musa al-khwarizmi who lived in Baghdad.

Exercise

1. State which of the following are equations. Give reasons for your answer.

(a) $x - 19 = 10$ (b) $a + 9 = -9$ (c) $3b = 15$

(d) $2l - 1 \rangle 5$ (e) $2n + 6 \langle 18$ (f) $3 \times 8 - 4 = 3x$

(g) $4 = 8 \times 3 - 5 \times 4$ (h) $\frac{3z}{8} = 5$

2. Identify the variables in the following equations.

(i) $3p - 7 = 5$ (ii) $\frac{5q}{3} = 8$ (ii) $3 \times 9 - 11 = r$

(iv) $2 + m = -1$ (v) $4x + 9 = 2x + 11$

3. Choose the correct answer.

(i) Value of m in the equation $m + 4 = 7$ is

(a) 0 (b) 4 (c) 3 (d) 7

(ii) Solution of the equation $4p = 20$ is.

(a) $p = 4$ (b) $p = 5$ (c) $p = 20$ (d) $p = 0$

(iii) Solution of the equation $2x - 1 = 5$ is.

(a) $x = 0$ (b) $x = -1$ (c) $x = 5$ (d) $x = 3$

(iv) Solution of the equation $2x - 3 = 7$ is

(a) $x = 5$ (b) $x = -2$ (c) $x = 1$ (d) $x = 11$

4. (i) Complete the following table.

x	0	1	2	3	4	5	6	7
$2x + 3$								

(ii) From the table above find the solution to the equation $2x + 3 = 11$.

5. State whether the value of the variable shown in the table against the equation satisfy the corresponding equation.

Equation	Value of variable	Equation satisfied Yes/No
$l + 9 = 101$	$l = 92$	
$m - 9 = 12$	$m = 15$	
$2p = 18$	$p = 3$	
$h - 7 = 0$	$h = 4$	
$3a = 2a + 2$	$a = 1$	
$b + 4 = 1$	$b = -3$	
$3q + 4 = 7$	$q = 2$	

6. Solve the following equations by trial and error method.

(i) $x - 9 = 18$ (iii) $2r + 1 = 7$ (ii) $p + 4 = 16$ (iv) $4m = 24$

7. State the following statements in equations.

(i) When Rs.10 is subtracted from the cost of Rs. 3kg of rice, Rs.80 is left.

(ii) In a cricket game when 7 runs are added to the runs scored in 5 overs, the total run is 39. If the number of runs per over is same, express the above statement in an equation.

(iii) Number of students in a class is 40. On a certain day when total number of students present was doubled and 6 added to it then the number was found to be equal to the total number of students.

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Answers

1. (a) Yes (b) Yes (c) Yes (d) No (e) No (f) Yes (g) No (h) Yes

2. (i) p (ii) q (iii) r (iv) m (v) x 3. (i) (c) 3 (ii) (b) p=5 (iii) (d) x=3 (iv) (a) x=5

4. (i)

x	0	1	2	3	4	5	6	7
$2x + 3$	3	5	7	8	11	13	15	17

(ii) x =4

5.

Equation	Value of variable	Equation satisfied Yes/No
$l + 9 = 101$	$l = 92$	Yes
$m - 9 = 12$	$m = 15$	No
$2p = 18$	$p = 3$	No
$h - 7 = 0$	$h = 4$	No
$3a = 2a + 2$	$a = 1$	No
$b + 4 = 1$	$b = -3$	Yes
$3q + 4 = 7$	$q = 2$	No

6. and 7. Discuss with the teacher.