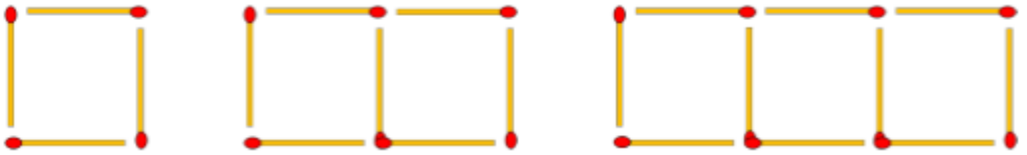
Board- CBSE	Std- 6	Topic- Algebra	Revision Notes

Algebra

Algebra is a part of mathematics in which the letter and symbols are used to represent numbers in equations. It helps us to study unknown quantities.

Matchstick Patterns



No. of matchsticks used to make 1^{st} square $= 4$

No. of matchsticks used to make 2^{nd} square $= 7$

No. of matchsticks used to make 3^{rd} square $= 10$

So, the pattern that we observe here is $3n + 1$

With this pattern, we can easily find the number of matchsticks required in any number of squares.

Example

How many matchsticks will be used in the 50^{th} figure?

Solution

$3n + 1$

$3 \times 50 + 1$

$= 151$ matchsticks

The Idea of a Variable

Variable refers to the unknown quantities that can change or vary and are represented using the lowercase letter of the English alphabet.

One such example of the same is the rule that we used above in the matchstick pattern

$3n + 1$

Here the value of n is unknown and it can vary from time to time.

More Examples of Variables

- We can use any letter as a variable, but only lowercase English alphabets.
- Numbers cannot be used for the variable as they have a fixed value.
- They can also help in solving some other problems.

Example: 1

Karan wanted to buy some storybooks from a bookshop. She wanted to buy 3 books for herself, 2 for her brother and 4 for 2 of her friends. Each book cost Rs.15. Calculate the total amount of money she pays to the shopkeeper.

Solution: 1

Cost of 1 book = Rs.15

No. of books she bought = 3 + 2 + 4

We need to find the cost of 9 books.

No. of notebooks	1	2	3	4	…….	a	……..
Total cost	15	30	45	60	…….	15 a	…….

In the current situation, a (a variable) stands for 9

Therefore,

Cost of 9 books = 15 × 9

= 135

Therefore Karan needs to pay Rs.135 to the shopkeeper of the bookstall.

The variable and constant not only multiply with each other but also can be added or subtracted, based on the situation.

Example: 2

Manu has 2 erasers more than Tanu. Form an expression for the statement.

Solution: 2.1

Erasers that Tanu have can be represented using a variable (x)

Erasers that Manu have = erasers that Tanu have + 2

Erasers with Manu = x + 2

Solution: 2.2

Erasers that Manu have can be represented using a variable (y)

Erasers that Tanu has = erasers that Manu have - 2

Erasers with Tanu = y - 2

Use of Variables in Common Rules (Geometry)

1. Perimeter of Square

The perimeter of a square = Sum of all sides

= 4 × side

= 4s

Thus, p = 4s

Here s is variable, so the perimeter changes as the value of side changes.

2. Perimeter of Rectangle

Perimeter of rectangle = 2(length + breadth)

= 2 (l + b) or 2l + 2b

Thus, p = 2 × (l + b) or 2l + 2b

Where l and b are variables and the value of perimeter changes with the change in values of l and b.

Use of Variables in Common Rules (Arithmetic)

1. Commutativity of Addition

5 + 4 = 9

4 + 5 = 9

Thus, 5 + 4 = 4 + 5

This is the commutative property of addition of numbers, in which the result remains the same even if we interchanged the numbers.

a + b = b + a

Here, a and b are different variables.

Example

$a = 16$ and $b = 20$

According to commutative property

$16 + 20 = 20 + 16$

$36 = 36$

2. Commutativity of Multiplication

$8 \times 2 = 16$

$2 \times 8 = 16$

Thus, $8 \times 2 = 2 \times 8$

This is the commutative property of multiplication, in which the result remains the same even if we interchange the numbers.

$a \times b = b \times a$

Here, a and b are different variables.

Example

$18 \times 12 = 216$, $12 \times 18 = 216$

Thus, $18 \times 12 = 12 \times 18$

3. Distributivity of Numbers

6×32

It is a complex sum but there is an easy way to solve it. It is known as the distributivity of multiplication over the addition of numbers.

$6 \times (30 + 2)$

$= 180 + 12$

$= 192$

Thus, $6 \times 32 = 192$

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

Here, a, b and c are different variables.

4. Associativity of Addition

This property states that the result of the numbers added will remain the same regardless of their grouping.

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

Example

$(4 + 2) + 7 = 4 + (2 + 7)$

$6 + 7 = 4 + 9$

$13 = 13$

Expressions

Arithmetic expressions may use numbers and all operations like addition, subtraction, multiplication, and division

Example

$2 + (9 - 3)$, $(4 \times 6) - 8$ etc…

$(4 \times 6) - 8 = 24 - 8$

$= 16$

Expressions with variable

We can make expressions using variables like

$2m$, $5 + t$, etc…..

An expression containing variable/s cannot be analyzed until its value is given.

Example

Find $3x - 12$ if $x = 6$

Solution

$(3 \times 6) - 12$

$= 18 - 12$

$= 5$

Thus,

$3x - 12 = 5$

Formation of Expressions

Statement	Expression
y subtracted from 12	12 - y
x multiplied by 6	6x
t multiplied by 4 and then 5 is subtracted from the product.	4t - 5

Practical use of Expressions

Example

3 boys go to the theatre. The cost of the ticket and popcorn is $33 and $15 respectively. What is the cost per person?

Solution

Let's say,

x = cost of ticket per person

y = cost of popcorn/person

Total cost (ticket + popcorn) per person $= x + y = 33 + 15 = 48$

Total cost of ticket + popcorn for 3 boys $= 3(x + y)$

$= 3\ (33 + 15)$

$= 3\ (48)$

$= 144$

Hence the total cost of movie tickets and popcorns for 3 boys is $144 and the cost per person is $48.

Equation

If we use the equal sign between two expressions then they form an equation.

An equation satisfies only a particular value of the variable.

The equal sign says that the LHS is equal to the RHS and the value of a variable that makes them equal is the only solution of that equation.

Example

$3 + 2x = 13$

$5m - 7 = 3$

$p/6 = 18$

If there is the greater then or less than sign instead of the equal sign then that statement is not an equation.

Some examples which are not an equation

$23 + 6x > 8$

$6f - 3 < 24$

The Solution of an Equation

The value of the variable which satisfies the equation is the solution to that equation. To check whether a particular value is a solution or not, we have to check that the LHS must be equal to the RHS with that value of the variable.

Trial and Error Method

To find the solution of the equation, we use the trial and error method.

Example

Find the value of x in the equation $25 - x = 15$.

Solution

Here we have to check for some values which we feel can be the solution by putting the value of the variable x and check for LHS = RHS.

Let's take $x = 5$

$25 - 5 = 15$

$20 \neq 15$

So $x = 5$ is not the solution of the given equation.

Let's take $x = 10$

$25 - 10 = 15$

$15 = 15$

LHS = RHS

Hence, $x = 10$ is the solution of the given equation.