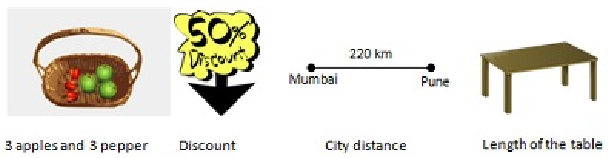
Class 6 Maths Whole Numbers Introduction

Introduction

Numbers play an important role in our life. We use numbers in our day to day life to count things.

While counting we use numbers to represent any quantity, to measure any distance or length.



3 apples and 3 pepper Discount City distance Length of the table

The counting numbers starting from 1, 2, 3, 4, 5, ……… are termed as natural numbers.

The set of counting numbers and zero are known as whole numbers.

Whole numbers are 0, 1, 2, 3, 4, 5, 6, 7,…….. and so on.

Question: Write the next three natural numbers after 10999.

Solution:

10999 + 1 = 11000

11000 + 1= 11001

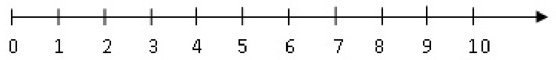
11001 + 2 = 11002

Thus, 11000, 11001, 11002 are the next three natural numbers after 10999

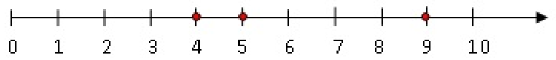
Whole numbers on a number line

Let’s understand first what is a number line? A pictorial representations of numbers evenly marked on a straight line is known as a number line.

- To mark whole numbers on a number line draw a horizontal line and mark a point on it as 0.
- Extend this line towards right direction.
- Starting from 0, mark points 1, 2, 3, 4, 5, 6, 7, 8, 9….on a line at equal distance towards right side.



- There is no whole number on the left of zero. Therefore zero is the smallest whole number.
- A whole number is greater than all the whole numbers which lie to the left of it on the number line.
- A whole number is less than all the whole numbers which lie to the right of it on the number line
- The number line also helps us to compare two whole numbers. i.e., to decide which of the two given whole numbers is greater or smaller.
- Therefore we can say that 5 is less than 9 and write 5 < We can also say that 5 is greater than 4 and write 5 > 4.



Question: In each of the following pairs of numbers, state which whole number is on the left of the other number on the number line. Also write them with the appropriate sign (>, <) between them. 530, 503 (b) 370, 307 (c) 98765, 56789 (d) 9830415, 10023001

Solution:

(a) 503 is on the left side of 530 on the number line. 530 > 503

(b) 307 is on the left side of 370 on the number line. 370 > 307

(c) 56789 is on the left side of 98765 on the number line. 98765 > 556789

(d) 9830415 is on the left side of 10023001 on the number line. 9830415 < 10023001

Operation on a number line

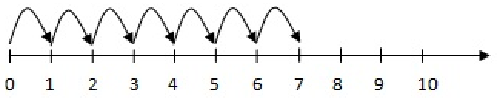
Addition

Add 2 and 5. i.e 2 + 5

Start from 0, 2 jumps towards right. You reach at 2.

Start from 2, 5 jumps towards right. You reach at 7.

Therefore, 2 + 5 = 7

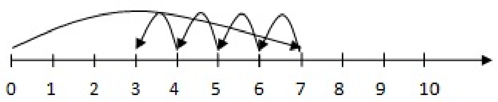


Subtraction

Subtract 4 from 7. i.e 7 - 4

Start from 0, jump directly to 7.

Start from 7, 4 jumps towards left. You reach at 3.



Multiplication

Example i.e 3 x 2

Multiplication means repeated addition. Since 3 x 2 means 3 added twice.

Start from 0. Make 2 jumps (each jump of 3 units).You reach at 6.

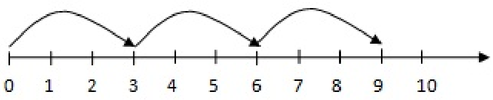
Question: Find (a) 3 × 3; (b) 4 × 2 using the number line.

Solution:

(a) Start from 0. Make 1 jump of 3 steps towards right. You reach at 3.

Start from 3. Make 1 jump of 3 steps towards right. You reach at 6.

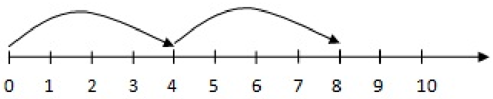
Start from 6. Make 1 jump of 3 steps towards right. You reach at 9.



Therefore, 3 x 3 = 9

(b) Start from 0. Make 1 jump of 4 steps towards right. You reach at 4.

Start from 4. Make 1 jump of 4 steps towards right. You reach at 8.



Therefore, 4 x 2 = 8

Predecessor and Successor

Predecessor

The number which comes before the given number is known as predecessor.

Since 0 is the first whole number it does not have predecessor which is a whole number.

Number	Predecessor
20	19
1000	999
1599	1598

Successor

The number which comes after the given number is knows as successor.

Number	Successor
0	1
99	100
1999	2000

Question: Which of the following statements are true (T) and which are false (F)?

The successor of a two digit number is always a two digit number.
400 is the predecessor of 399.

Solution:

False, The successor of 99 is 100 which is a 3 digit number.
False, 398 is the predecessor of 399.

Properties of addition

Closure property:

For any two whole numbers a and b, their sum a + b is always a whole number.

E.g. 12 + 45 = 57

12, 45 and 57 all are whole numbers.

Commutative property:

For any two whole numbers a and b, a +b = b + a We can add any two whole numbers in any order.

E.g 12 + 45 = 45 + 12

Associative property

For any three whole numbers a, b and c, (a + b) + c = a + (b + c). , This means the sum is regardless of how grouping is done.

E.g 31 + (24 + 38) = (31 + 24) + 38

Additive identity property:

For every whole number a, a + 0 = a. Therefore ‘0’ is called the Additive identity.

E.g. 19 + 0 = 19

Question: Find the sum by suitable arrangement.

1962 + 453 + 1538 + 647 b. 837 + 208 + 363

Solution:

1962 + 453 + 1538 + 647 = (1962 + 1538) + (453 + 647) = 3500 + 1100 = 4600
837 + 208 + 363 = (837 + 363) + 208 = 1200 + 208 = 1408

Properties of subtraction

Closure property:

For any two whole numbers, a and b, if a > b then a – b is a whole number and if a < b then a – b is never a whole number. Closure property is not always applicable to subtraction.

E.g. 150 – 100 = 50, is a whole number but 100 – 150 = -50 is not a whole number.

Commutative property: For any two whole numbers a and b, a – b ≠ b – a . Hence subtraction of whole number is not commutative.

E.g 16 – 7 = 9 but 7 – 16 ≠ 9

Associative property:

For any three whole numbers a, b and c, (a – b) – c ≠ a – (b – c). Hence subtraction of whole numbers is not associative.

E.g. 25 – (10 – 4) = 25 – 6 = 19

(25 – 10) – 4 = 15 – 4 = 11

This means that 25 – (10 – 4) ≠ (25 – 10) – 4

Properties of multiplication:

Closure property:

For any two whole numbers a and b,their product ax b is always a whole number.

E.g. 12 x 7 = 84, 12, 7 and 84 all are whole numbers.

Commutative property:

For any two whole numbers a and b, a a x b = b x a Order of multiplication is not important.

E.g 11 x 6 = 66 and 6 x 11 = 66

Therefore, 11 x 6 = 6 x 11

Associative property:

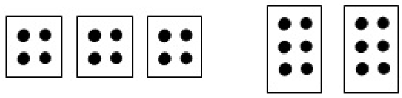
For any three whole numbers a, b and c, (a x b) x c = a x (b x c), this means the product is regardless of how grouping is done.

E.g 8 x (4 x 5) = 8 x 20 = 160; (8 x 4) x 5 = 32 x 5 = 160

Therefore, 8 x (4 x 5) = (8 x 4) x 5

We can explain the associative property with the help of following example

Count the number of dots in figure (a) and figure (b)



In figure (a), there are 2 rows and 2 columns which means 2 x 2 dots in each box. So the total number of dots are (2 x 2) x 3 = 12

In figure (b), there are 3 rows and 2 columns which means 3 x 2 dots in each box. So the total number of dots are 2 x (3 x 2) = 12

This explain the associative property of multiplication.

Multiplicative identity:

For any whole number a, a x 1 = a Since any number multiplied by 1 doesn't change its identity hence 1 is called as multiplicative identity of a whole number. E.g. 21 x 1 = 21

Multiplication by zero:

For any whole number a, a x 0 = 0,

E.g 25 x 0 = 0

Distributive property of multiplication over Addition:

This property is used when we have to multiply a number by the sum.

For any three whole numbers a, band c a × (b + c) = a × b + a × c

In order to verify this property, we take any three whole numbers a, b and c and find the values of the expressions a × (b + c) and a × b + a × c as shown below:

Find 3 × (4 + 5).

In this case either you can add the numbers 4 and 5 and then multiply them by 3

3 × (4 + 5) = 3 × 9 = 27

OR you can multiply each addend by 3 and then add the products

3 × 4 + 3 × 5 = 12 + 15 = 27
Therefore, 3 × (4 + 5) = 3 × 4 + 3 × 5

Questions:Find using distributive property : (a) 728 × 101 (504 x 35

Solution:

728 x 101 = 728 x (100 + 1) = 72800 + 728 = 73528
504 x 35 = (500 + 4) x 35 = 500 x 35 + 4 x 35 = 17500 + 140 = 17640

Match the following:

425 × 136 = 425 × (6 + 30 +100)
2 × 49 × 50 = 2 × 50 × 49

(i) Commutativity under multiplication

(ii) Commutativity under addition

(iii) Distributivity of multiplication over addition

Solution:

(iii)
(i)

Properties of division

Closure property:

For any two whole numbers a and b, a ÷ b is not always a whole number. Hence closure property is not applicable to division.

E.g. 68 and 5 are whole numbers but 68 ÷ 5 is not a whole number.

Commutative property:

For any two whole numbers a and b, a ÷ b ≠ b ÷ a. This means division of whole number is not commutative.

E.g. 16 ÷ 4 ≠ 4 ÷ 16

Associative property:

For any 3 whole numbers a, b and c,(a ÷ b) ÷ c ≠ a ÷ (b ÷ c) E.g. consider (80 ÷ 10) ÷ 2 = 8 ÷ 2 = 4

80 ÷ (10 ÷2) = 80 ÷ 5 = 16

(80 ÷ 10) ÷ 2 ≠80 ÷ (10 ÷2)

Hence division does not follow associative property.

Division by 1

For any whole number a, a ÷ 1 = a, this means any whole number divided by 1 gives the quotient as the number itself.

E.g. 14 ÷ 1 = 14; 26 ÷ 1 = 26

Division of 0 by any whole number

For any whole number, a ≠ 0, 0 ÷ a = 0, this shows zero divided by any whole number (other than zero) gives the quotient as zero.

E.g. 0 ÷ 1 = 0; 0 ÷ 25 = 0;

Division by 0

To divide any number, say 7 by 0, we first have to find out a whole number which when multiplied by 0 gives us 7. This is not possible. Therefore, **division by 0 is not defined**

Question: Is (6 ÷ 3) same as (3 ÷ 6)? Justify it by taking few more combinations of whole numbers.

Solution:(6 ÷ 3) = 2 but (3 ÷ 6) = 1/2 ≠ 2. Therefore (6 ÷ 3) is not same as (3 ÷ 6).

Few examples

(8 ÷ 4) = 2 but (4 ÷ 8) = 1/2 ≠ 2. Therefore (8 ÷ 4) is not same as (4 ÷ 8).

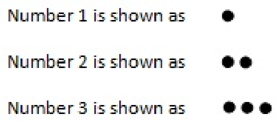
(20 ÷ 5) = 4 but (5 ÷ 20) = 1/4 ≠ 2. Therefore (20 ÷ 5) is not same as (5 ÷ 20).

Patterns in whole number

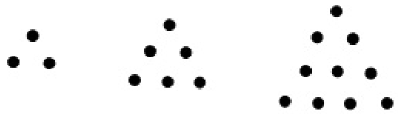
A pattern is a sequence of numbers or picture.

We can arrange numbers in elementary shapes consisting of dots.

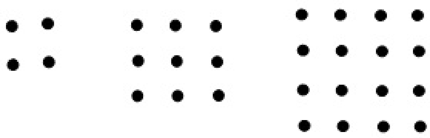
Every number can be arranged as a line.



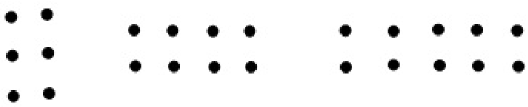
Some numbers like 3, 6 and 10 can be arrange as a triangle.



3. Some numbers like 4, 9 and 16 can be arrange as a square



4. Some numbers like 6, 8 and 10 can be arrange as a rectangle.



Observe the following table.

Number	Line	Triangle	Square	Rectangle
2	YES	NO	NO	NO
3	YES	YES	NO	NO
4	YES	NO	YES	YES
5	YES	NO	NO	NO
6	YES	YES	NO	YES

7	YES	NO	NO	NO
8	YES	NO	NO	YES
9	YES	NO	YES	NO
10	YES	YES	NO	YES

Patterns observations:

Multiply 3 by 9, 99, 999, 9999. Study the pattern.

Solution: 3 x 9 = 3 x (10 – 1) = 27

3 x 99 = 3 x (100 – 1) = 297

3 x 999 = 3 x (1000 – 1) = 2997

3 x 9999 = 3 x (10000 – 1) = 29997

Observe the following pattern.

44 x 5 = 44 x 10/2 = 22 x 10 = 220 x 1

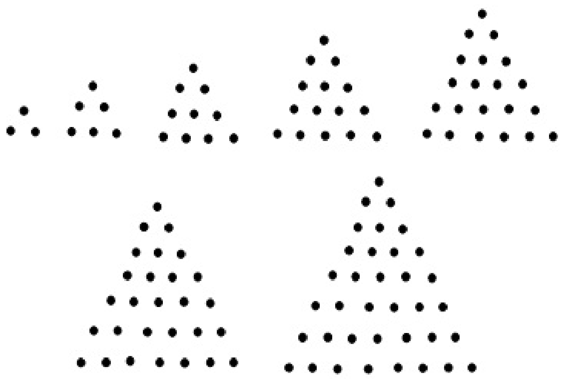
44 x 10 = 44 x 20/2 = 22 x 20 = 220 x 2

44 x 15 = 44 x 30/2 = 22 x 30 = 220 x 3

44 x 20 = 44 x 40/2 = 22 x 40 = 220 x 4

Questions: Write down the first seven numbers that can be arranged as triangles, e.g. 3, 6, ...

Solution:



Threfore, first 7 numbers which can be arranged as triangles are 3, 6, 10,15, 21, 28, 36,

Study the pattern:

1 × 8 + 1 = 9

12 × 8 + 2 = 98

123 × 8 + 3 = 987

$1234 \times 8 + 4 = 9876$

$12345 \times 8 + 5 = 98765$

Write the next two steps. Can you say how the pattern works?

(Hint: 12345 = 11111 + 1111 + 111 + 11 + 1).

Solution:

123456 x 8 + 6 = 987648 + 6 = 987654

1234567 x 8 + 7 = 9876536 + 7 = 9876543

Yes, the pattern works.

123456 = 111111 + 11111 + 1111 + 111 + 11 + 1

123456 x 8 = (111111 + 11111 + 1111 + 111 + 11 + 1) x 8

= 111111 x 8 + 11111 x 8 + 1111 x 8 + 111 x 8 + 11 x 8 + 1 x 8

= 888888 + 88888 + 8888 + 888 + 88 + 8 = 987648

123456 x 8 + 6 = 987648 + 6 = 987654