CLASS - VI

CHAPTER – 2

WHOLE NUMBERS

Module – 2/3

1. Properties of Whole Numbers

(i) Closure property : Whole numbers are closed under addition and also under multiplication.

The whole numbers are not closed under subtraction. Why?

Your subtractions may be like this:

6	–	2	=	4, a whole number
7	–	8	=	?, not a whole number
5	–	4	=	1, a whole number
3	–	9	=	?, not a whole number

Are the whole numbers closed under division? No. Observe this table :

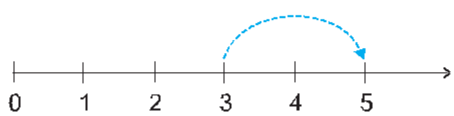
8	÷	4	=	2, a whole number
5	÷	7	=	$\frac{5}{7}$, not a whole number
12	÷	3	=	4, a whole number
6	÷	5	=	$\frac{6}{5}$, not a whole number

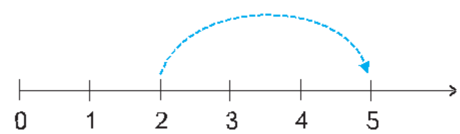
- **Division of a whole number by 0 is not defined.**
- **Adding two whole numbers always gives a whole number. Similarly, multiplying two whole numbers always gives a whole number. We say that whole numbers are closed under addition and also under multiplication. However, whole numbers are not closed under subtraction and under division.**
- **Zero is the identity for addition of whole numbers. The whole number 1 is the identity for multiplication of whole numbers.**

<u>(ii) Commutative property :</u>

You can add two whole numbers in any order. You can multiply two whole numbers in any order. We say that addition and multiplication are commutative for whole numbers.

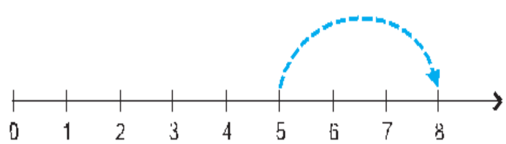
What do the following number line diagrams say?

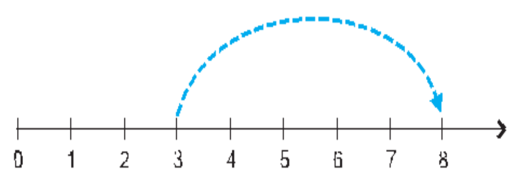




In both the cases we reach 5. So, 3 + 2 is same as 2 + 3.

Similarly, 5 + 3 is same as 3 + 5.





You can multiply two whole numbers in any order.

We say multiplication is **commutative** for whole numbers.

Thus, addition and multiplication are commutative for whole numbers.

E.g.: 6 + 5 = 5 + 6 = 11. Also 6 x 5 = 5 x 6 = 30 etc.

(iii) Associative property of addition and multiplication:

Addition and multiplication, both, are associative for whole numbers.

Observe the following additions :

(a) (2 + 3) + 4 = 5 + 4 = 9

(b) 2 + (3 + 4) = 2 + 7 = 9

In (a) above, you can add 2 and 3 first and then add 4 to the sum and in (b) you can add 3 and 4 first and then add 2 to the sum.

Are not the results same?

We also have, (5 + 7) + 3 = 12 + 3 = 15 and 5 + (7 + 3) = 5 + 10 = 15.

So, (5 + 7) + 3 = 5 + (7 + 3)

Example 1 : Add the numbers 234, 197 and 103.

Solution : 234 + 197 + 103 = 234 + (197 + 103)

= 234 + 300 = 534

Example 2 : Find 14 + 17 + 6 in two ways.

Solution : (14 + 17) + 6 = 31 + 6 = 37,

14+17+6=14+6+17=(14+6)+17=20+17=37

Here, you have used a combination of associative and commutative properties for addition.

Do you think using the commutative and the associative property has made the calculation easier?

Example 3 : Find 12×35.

Solution : $12 \times 35 = (6 \times 2) \times 35 = 6 \times (2 \times 35) = 6 \times 70 = 420$.

In the above example, we have used associativity to get the advantage of multiplying the smallest even number by a multiple of 5.

Example 4 : Find $8 \times 1769 \times 125$

Solution : $8 \times 1769 \times 125 = 8 \times 125 \times 1769$ (What property do you use here?)

$= (8 \times 125) \times 1769$

$= 1000 \times 1769$

$= 17,69,000$.

(iv) Distributivity of multiplication over addition:

Multiplication is distributive over addition for whole numbers.

$(6 \times 5) + (6 \times 3) = 30 + 18 = 48$? Does it mean that $6 \times 8 = (6 \times 5) + (6 \times 3)$? But,
$6 \times 8 = 6 \times (5 + 3) = 48$

This shows that $6 \times (5 + 3) = (6 \times 5) + (6 \times 3)$. Similarly, you will find that
$2 \times (3 + 5) = (2 \times 3) + (2 \times 5)$

This is known as distributivity of multiplication over addition.

Example 5 : The school canteen charges Rs 20 for lunch and Rs 4 for milk for each day. How much money do you spend in 5 days on these things?

Solution : This can be found by two methods.

Method 1 : Find the amount for lunch for 5 days.

Find the amount for milk for 5 days.

Then add i.e.

Cost of lunch = 5×20 = Rs 100

Cost of milk = 5×4 = Rs 20

Total cost = Rs (100 + 20) = Rs 120

Method 2 : Find the total amount for one day.

Then multiply it by 5 i.e.

Cost of (lunch + milk) for one day = Rs (20 + 4)

Cost for 5 days = Rs $5 \times (20 + 4)$ = Rs (5×24)

= Rs 120.

The example shows that

$5\times(20+4)=(5\times20)+(5\times4)$

This is the principle of distributivity of multiplication over addition.

Example 6 : Find 12×35 using distributivity.

Solution : $12 \times 35 = 12 \times (30 + 5)$

$=12\times30+12\times5$

=360+60=420

Example 7 : Simplify: 126 × 55 + 126 × 45

Solution : 126 × 55 + 126 × 45 = 126 × (55 + 45)

= 126 × 100

= 12600.

(v) Identity (for addition and multiplication):

When you add zero to any whole number what is the result?

It is the same whole number again! Zero is called an identity for addition of whole numbers or additive identity for whole numbers.

Zero has a special role in multiplication too. Any number when multiplied by zero becomes zero!

For example, observe the pattern :

5×6=30

5×5=25 Observe how the products decrease.

5×4=20 Do you see a pattern?

5×3=15 Can you guess the last step?

5×2=... Is this pattern true for other whole numbers also?

5×1=... Try doing this with two different whole numbers.

5×0=?

You came across an additive identity for whole numbers. A number remains unchanged when added to zero. Similar is the case for a multiplicative identity for whole numbers. Observe this table.

You are right. 1 is the identity for multiplication of whole numbers or multiplicative identity for whole numbers.

7	×	1	=	7
5	×	1	=	5
1	×	12	=	12
1	×	100	=	100
1	×	......	=	......

EXERCISE

1. Calculate using suitable rearrangements:

(i) 31+32+33+34+35+65+66+67+68+69

(ii) 1+2+3+4+996+997+998+999

(iii) 12+14+16+18+20+80+82+84+86+88

2. What is the difference between the largest number of 5 digits and the smallest 6 digits?

3. The digits of 6 and 9 of the number 36490 are interchanged. Find the difference between the original number and the new number.

4. Determine the products by suitable rearrangement:

(i) 8 x 125 x 40 x 25 (ii) 250 x 60 x 50 x 8 (iii) 37256 x 25 x 9 x 40

5. Determine the product of:

(i) The greatest number of 4-digits and the smallest number of 3-digits

(ii) The smallest number of 2-digits and the greatest number of 5-digits.

6. A dealer purchased 120 LCD television sets. If the cost of each set is Rs. 20000, determine the cost of all sets together.

7. Find the value of each of the following using properties:

(i) 493 x 9 + 493 x 2(ii) 24579 x 93 + 7 x 24579

(ii) 1568 x 184 – 1568 x 84(iv) 5625 x 1625 – 5625 x 625

8. The product of two whole numbers is zero. What do you conclude?

9. Determine the products by suitable rearrangement:

(i) 2 x 1497 x 50 (ii) 4 x 358 x 25 (iii) 625 x 20 x 8 x 50

10. Find the product 8739 × 102 using distributive property.

11. Write in expanded form :

(a) 74836

(b) 574021

(c) 8907010

12. A person had Rs 1000000 with him. He purchased a colour T.V. for Rs 16580, a motor cycle for Rs 45890 and a flat for Rs 870000. How much money was left with him?

13. Out of 180000 tablets of Vitamin A, 18734 are distributed among the students in a district. Find the number of the remaining vitamin tablets.

14. Chinmay had Rs 610000. He gave Rs 87500 to Jyoti, Rs 126380 to Javed and Rs 350000 to John. How much money was left with him?

15. Find the difference between the largest number of seven digits and the smallest number of eight digits.

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