4 Whole Numbers

01/07/2024

LOOKING BACK

DIAGNOSTIC ASSESSMENT

1. What number must be increased by 312 to get 786? ________
2. ________ added to 4516 gives 4643.
3. 5098 + ________ = 3109 + 6090
4. 1614 + 4132 = 7897 − ________
5. The students of Class 6 of a school are split into 5 sections of 48 students each. If the school decides to form 8 sections for Class 6, with equal number of students in each section, how many students will be there in each section?

NUMBERS

C-1.3

Natural Numbers (N)

Consider the following groups of objects.

1 apple	2 apples	3 apples
4 flowers	5 flowers	6 flowers
7 pencils	8 pencils	9 pencils

In the above examples, the numbers 1, 2, 3, etc., have meaning only when taken with an object. Without an object, the numbers 1, 2, 3, etc., have no meaning. You cannot ask someone to give you '5' as it is meaningless, but 5 objects refer to something concrete. In these examples, apples, flowers, and pencils are objects while 1, 2, 3, etc., indicate the quantity of these objects.

Hence, *a number gets its meaning and value only with reference to an object.*

When we count objects, we start counting from one and then go on to two, three, four, etc.

This is the natural way of counting any set of objects. Hence, 1, 2, 3, 4, ... are called ***counting numbers*** or ***natural numbers***. The number of students in a class, the number of days in a week, and the number of trees in a garden can all be presented using natural numbers.

Zero

Imagine you have 3 apples on a plate. You gave one apple to your friend Dev, one apple to your friend Sam, and one apple to your brother Rahim. You are now left with no apples. Then we say that you are left with ***zero*** apples. It means that there are no more apples left or there is an absence of apples. This does not mean that zero stands for nothing. In this case, zero apples only refer to an empty plate.

Let us consider an example to understand the concept of zero. Suppose 8 sweets are to be distributed equally among 3 children. We can do so by giving each child 2 sweets (3 × 2 = 6), and then we will be left with 2 sweets.

Similarly, if we want to divide 7 sweets equally among 3 children, 1 sweet will be left. But if we were to divide 6 sweets equally among 3 children, no sweets will be left.

Dividend	Divisor	Quotient	Remainder
8	3	2	2
7	3	2	1
6	3	2	0

We can express the remainder of no sweets or the absence of sweets with a number called **zero**. The symbol of the number zero is **0**. *Zero means absence of the item being referred to (or no item).*

Zero sweets means the absence of sweets, or simply no sweets. Zero pencils means the absence of pencils, or no pencils.

Remember

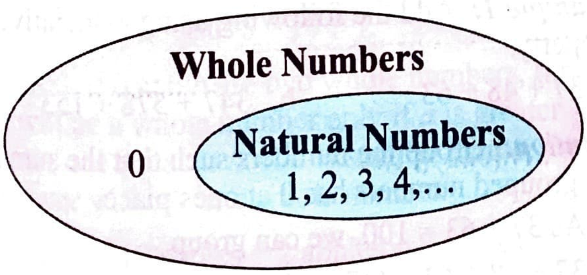
- Zero is not a natural number.
- **Numerals** are the symbols which represent numbers. For example,

Number name	one	two	three	four	five
Numeral	1	2	3	4	5

Whole Numbers (W)

We have seen that 1, 2, 3, …, are called natural numbers or counting numbers. When counting any given objects, we start counting from 1. But if we are measuring anything, for example, say the length of a rod, a room, a line, we cannot start with 1 as the starting point of measurement. We have to have a measuring unit, say, a metre. We cannot say that it is one metre at the starting point. It becomes one metre only after a length of one metre from the starting point. *So the measurement (length/distance) at the starting point is zero metre.*

One metre means the whole distance from the starting point, i.e., zero to the other end of the metre rod. Similarly, 8 metres means the whole distance from zero to the end of the eighth metre. That is why all measuring apparatuses are marked starting from zero.



Thus, by including 0 with the counting numbers 1, 2, 3, ..., we get the set of whole numbers represented by W = 0, 1, 2, 3, … .

Successor and Predecessor

The *successor* of a whole number is the number obtained by adding 1 to the given number.

For example, the successor of 12 is 13; the successor of 13 is 14. Each whole number has a successor.

The *predecessor* of a whole number is the number obtained by subtracting 1 from the given number.

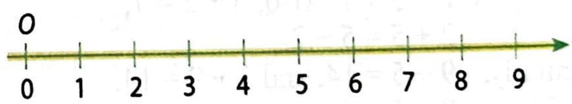
For example, the predecessor of 13 is 12; the predecessor of 12 is 11. Every whole number has a predecessor except zero. *0 does not have a predecessor.*

In general, if a and b are two whole numbers such that $a+1=b$ then b is called the successor of a and a is called the predecessor of b.

Whole Numbers on a Number Line

*A **number line** is a line on which we represent numbers.* We can represent whole numbers on a number line as explained below.

Draw a straight line and mark a point O on it. This point represents the number zero. Now put marks on the right-hand side of O at equal distances. Label the marks as 0, 1, 2, 3, …, as shown below. *Note that this line has an arrow head at the right end which means that the line can be extended in that direction indefinitely.*



The distance between any two consecutive points, say, 0 and 1 or 3 and 4, is equal to one unit.

Remember

- The smallest natural number is 1.
- The smallest whole number is 0.
- The number line for whole numbers can be extended indefinitely.
- Every natural number is a whole number but every whole number is not a natural number as 0 is not a natural number.

PROPERTIES OF WHOLE NUMBERS

Four basic operations—addition, subtraction, **C-1.4** multiplication, and division, can be performed on whole numbers. Let us now learn about the properties of whole numbers under these operations.

Properties of Addition

Closure Property

Let us add any two whole numbers.

3	+	4	=	7
2	+	8	=	10
whole number	+	whole number	=	whole number

We can see that when we add two whole numbers, we always get a whole number as the answer. So, we say that *whole numbers are* ***closed*** *under addition.* Let us write this as a general statement.

If a and b are two whole numbers and their sum is c, i.e., $a + b = c$, then c also will always be a whole number.

This property of addition is called the ***closure property*** of addition.

Commutative Property

If $3 + 4 = 7$ then $4 + 3$ is also equal to 7. *In the case of addition of whole numbers, the order in which we add does not change the sum.*

For example,

$2 + 5 = 7$. Also, $5 + 2 = 7$,

i.e., $2 + 5 = 5 + 2$

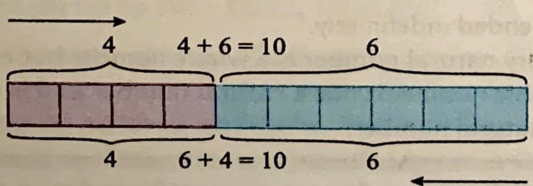
Similarly, $9 + 5 = 14$, and $5 + 9 = 14$.

$\therefore$ $9 + 5 = 5 + 9$.

Thus, in general, *if a and b are two whole numbers, then $a + b = b + a$.*

This property of addition, where the order in which we add does not change the sum, is called the ***commutative property*** of addition.

The commutative property of addition of two whole numbers can be shown as:



So, $4 + 6 = 6 + 4 = 10$.

Associative Property

Look at the following example.

$$3 + (4 + 5) = (3 + 4) + 5$$

or, $$3 + 9 = 7 + 5$$

or, $$12 = 12$$

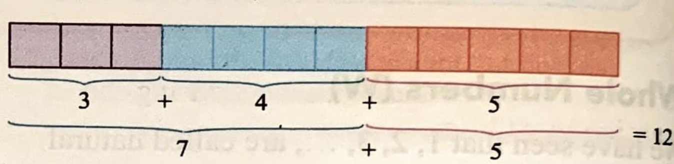
If a, b, and c are three whole numbers, then

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

In other words, *when adding whole numbers, the sum does not change even if the grouping is changed.* This property is called the ***associative property*** of addition.

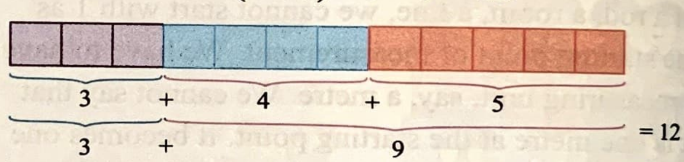
On grouping the numbers 3, 4, and 5 as:

$$(3 + 4) + 5 = 7 + 5 = 12$$



When the whole numbers 3, 4, and 5 are grouped and added as:

$$3 + (4 + 5) = 3 + 9 = 12$$



Observe that in both the cases answer is equal to 12.

Remember that operations inside brackets are to be carried out first.

While adding three or more numbers whichever way we group the numbers, whichever order we add, the final result remains the same. This means we can ***associate*** any group of numbers to add according to our choice.

Example 1: Add the following using associative property.

a. $37 + 48 + 63$ **b.** $347 + 578 + 153$

Solution: Group the numbers such that the sum of the grouped numbers has 0 at ones place.

a. As $37 + 63 = 100$, we can group

$37 + 48 + 63 = (37 + 63) + 48 = 100 + 48$

b. As $347 + 153 = 500$, we can group

$347 + 578 + 153 = (347 + 153) + 578$

$= 500 + 578 = 1078$

Try This!

Add the following by suitable rearrangement.

a. $65 + 115 + 35$ b. $185 + 15 + 125$

Additive Identity

Consider the following example where the addition of two whole numbers is shown.

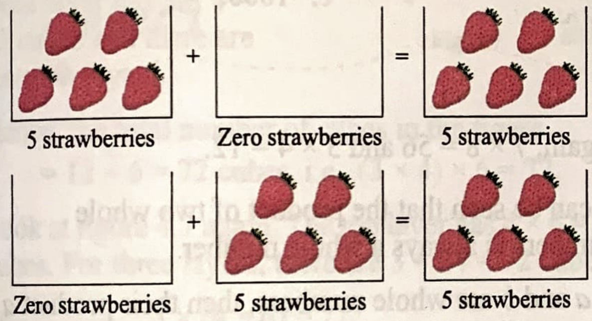
$$7 + 0 = 0 + 7 = 7; \qquad 15 + 0 = 0 + 15 = 15$$

Here we find that adding 0 to the whole numbers 7 and 15 did not change the value of the whole numbers. That is to say, if a is a whole number then

$$a + 0 = 0 + a = a.$$

Hence, *zero is called the additive identity of whole numbers* because it maintains (or does not change) the identity (value) of the numbers during the operation of addition.

Look at the example below:



So, $5 + 0 = 0 + 5 = 5$.

Properties of Subtraction

Closure Property

Consider the following example:

$$8 - 3 = 5 \text{ and } 8 - 8 = 0.$$

$$\text{But } 8 - 10 = ?$$

In general, if a and b are two whole numbers, then $a - b$ will be a whole number only if a is greater than b or a is equal to b. If a is smaller than b, then the answer will not be a whole number.

For example, 10 apples – 2 apples = 8 apples, i.e., $10 - 2 = 8$. It gives an impression that whole numbers are closed under subtraction.

But there are situations in which subtraction is not possible with in the set of whole numbers.

For example, from a collection of 10 peaches, you cannot take away 15 peaches. We cannot find a result for $10 - 15$ among the whole numbers. Therefore, it is not always true that a whole number subtracted from another whole number will give a whole number as its result.

If the number getting subtracted is greater than the other number then the answer is not a whole number.

Hence, *whole numbers are not closed under subtraction.*

Commutative Property

Consider the following examples:

$8 - 3$ is not equal to $3 - 8$.

Similarly, $7 - 5 \neq 5 - 7$;

$20 - 6 \neq 6 - 20$.

If a and b are two distinct whole numbers, then

$$a - b \neq b - a.$$

Hence, the *commutative property is not true for subtraction of whole numbers.*

Associative Property

Consider the following:

$(12 - 4) - 3 = 8 - 3 = 5$

$12 - (4 - 3) = 12 - 1 = 11$

Hence, $(12 - 4) - 3$ is not equal to $12 - (4 - 3)$.

If a, b, and c are whole numbers, then $(a - b) - c$ is not equal to $a - (b - c)$.

So, *the associative property also does not hold true for subtraction of whole numbers.*

Remember

- Closure, commutativity, and associativity hold true for addition of whole numbers.
- Closure, commutativity, and associativity do not hold true for subtraction of whole numbers.

Property of Zero

If zero is subtracted from any whole number, then the result is the number itself.

For example, $3 - 0 = 3$; $4 - 0 = 4$; $5 - 0 = 5$

Therefore, for any whole number a, $a - 0 = a$.

Exercise 4 A

02/07/2024

1. Fill in the blanks.
   a. $8 + 7 = $ 7 $+ 8$ ✓
   b. $472 + 36 = 36 +$ 472 ✓
   c. $89 + 87 =$ 87 $+ 89$ ✓
   d. $83 + 100 = 100 +$ 83 ✓
   e. $367 + 478 =$ 478 $+ 367$ ✓
   f. $836 + 0 =$ 0 $+ 836$ ✓
2. Mark whether true or false.
   a. $23 - 3 = 3 - 23$ F ✓
   b. $16 + 4 = 4 + 16$ T ✓
   c. $863 - 0 = 0 - 863$ F ✓
   d. $17 + 8 = 8 + 17$ T ✓
   e. $341 + 21 = 21 + 341$ T ✓
   f. $673 - 241 = 241 - 673$ F ✓
   g. $(18 - 3) - 1 = 18 - (3 - 1)$ F ✓
   h. $(46 + 4) + 8 = 46 + (4 + 8)$ T ✓
3. Solve the following using the associative property.
   a. $87 + 64 + 36 = 187$
   b. $367 + 243 + 57 = 667$
   c. $63 + 82 + 8 = 153$
   d. $918 + 712 + 82 = 1712$
   e. $713 + 87 + 200 = 1000$
   f. $47 + 313 + 53 = 413$
4. Fill in the blanks.
   a. $90 + 73 + 10 + 7 = 100 +$ 80 ✓
   b. $198 + 73 + 27 = 198 +$ 100 ✓
5. Name the property.
   a. $19 + 63 = 63 + 19$ = C ✓
   b. $20 + 0 = 20$ = I ✓
   c. $16 + 95 = 95 + 16$ = C ✓
   d. $(20 + 3) + 16 = 20 + (3 + 16)$ = A ✓
   e. $37 + (93 + 7) = (37 + 93) + 7$ = A ✓
6. Find the successor and predecessor of each of the following.
   a. 2949: S = 2950, P = 2948
   b. 8999 S = 9000, P = 8998
   c. 1000 S = 1001, P = 999

PROPERTIES OF MULTIPLICATION AND DIVISION

C-1.4

Properties of Multiplication

Closure Property

If two whole numbers are multiplied, the product is always a whole number.

For example,

$7 \times 3 = 21, \quad 6 \times 8 = 48, \quad 3 \times 0 = 0$

Figure 4.5 shows the closure property. The total number of pencils in 4 pencil stands containing 10 pencils each is $4 \times 10 = 40$. Here, 4 and 10 are whole numbers, so their product 40 is also a whole number.

Fig. 4.5

4	×	10 pencils	=	40 pencils
4	×	10	=	40
whole number	×	whole number	=	whole number

Again, $7 \times 8 = 56$ and $3 \times 4 = 12$.

It can be seen that the product of two whole numbers is always a whole number.

If a and b are whole numbers, then their product $a \times b = c$ will always be a whole number. That is, *whole numbers are closed under multiplication.*

Commutative Property

Consider the following examples.

$2 \times 3 = 3 \times 2 = 6$

$8 \times 9 = 9 \times 8 = 72$

$16 \times 4 = 4 \times 16 = 64$

Figure 4.6 shows 45 cubes arranged in a particular order.

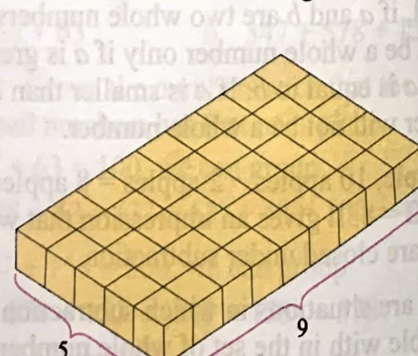


Fig. 4.6

We can say that it has 5 rows of 9 cubes, and the product is $5 \times 9 = 45$.

Or,

we can say that it has 9 rows of 5 cubes, then also the product is $9 \times 5 = 45$.

So, $5 \times 9 = 9 \times 5 = 45$.

Regardless of the order in which whole numbers are multiplied, we will get the same product. Hence, *whole numbers possess the commutative property of multiplication*. In general, $a \times b = b \times a$ for all whole numbers a and b.

Associative Property

Consider the following example.

$(3 \times 4) \times 2 = 3 \times (4 \times 2)$

or, $12 \times 2 = 3 \times 8$

or, $24 = 24$

Consider the cuboid shown in figure 4.7. The front layer has $3 \times 4 = 12$ cubes and there are six such layers.

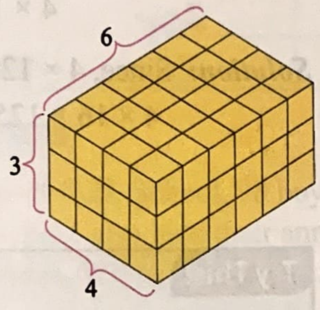


Fig. 4.7

Hence, the total number of cubes in the figure $= 12 \times 6 = 72$ cubes, i.e., $(3 \times 4) \times 6 = 72$.

Look at figure 4.7 again. The top layer has $4 \times 6 = 24$ cubes. For three layers, there are $3 \times 24 = 72$ cubes,

i.e., $3 \times (4 \times 6) = 72$

Hence, $(3 \times 4) \times 6 = 3 \times (4 \times 6)$

or, $12 \times 6 = 3 \times 24$

or, $72 = 72$

If a, b, and c are whole numbers, then

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

Thus, *whole numbers possess the associative property of multiplication*.

Multiplicative Identity

If 10 apples each are given to 5 children, the total number of apples given away $= 10 \times 5 = 50$ apples. If we give 10 apples to one child, the number of apples given away will be $10 \times 1 = 10$. That is, the number of apples remains the same. Thus, *when you multiply any whole number by 1, the answer is the whole number itself*. For example,

$$10 \times 1 = 1 \times 10 = 10$$

$$672 \times 1 = 1 \times 672 = 672$$

When any whole number a is multiplied by 1, the product is the same whole number a,

i.e., $a \times 1 = 1 \times a = a$.

Hence, *1 is called the multiplicative identity for whole numbers*.

Property of Zero

If we give zero chocolates each to 5 children, the number of chocolates given away will be zero,

i.e., $0 \times 5 = 0$.

If we give 3 chocolates each to zero children, then also the number of chocolates given away will be zero as we have not given anything to anyone. Hence, $3 \times 0 = 0$.

Now, $5 \times 0 = 0 \times 5 = 0$,

$3 \times 0 = 0 \times 3 = 0$,

$27 \times 0 = 0 \times 27 = 0$.

Thus, *when any whole number a is multiplied by zero, the product is zero*,

i.e., $a \times 0 = 0 \times a = 0$.

Properties of Division

Closure Property

Look at these examples:

$$6 \div 3 = 2, \quad 6 \div 4 = 1\frac{1}{2}, \quad 6 \div 7 = \frac{6}{7}.$$

The quotients $1\frac{1}{2}$ and $\frac{6}{7}$ are not whole numbers.

If a and b are whole numbers, then the quotient $a \div b$ need not always be a whole number.

So, *whole numbers are not closed under division*.

Commutative Property

Observe that

$$6 \div 3 = 2 \text{ is not the same as } 3 \div 6 = \frac{1}{2}.$$

If a and b are whole numbers, then

$$a \div b \neq b \div a.$$

So, *the commutative property does not hold true for division of whole numbers*.

Associative Property

$(81 \div 9) \div 3 = 3$ and $81 \div (9 \div 3) = 27$

So, $(81 \div 9) \div 3$ is not equal to $81 \div (9 \div 3)$.

Hence, the *associative property does not apply to the division of whole numbers*.

If a, b, and c are whole numbers, then

$$(a \div b) \div c \neq a \div (b \div c).$$

Special Properties

1. *Whenever a whole number is divided by 1, we get the same whole number as the answer.*
   For example,
   $6 \div 1 = 6, \quad 8 \div 1 = 8.$

   If 6 sweets are divided between 2 children, we have $6 \div 2 = 3$. Each child gets 3 sweets. If 6 sweets are divided among 3 children, then $6 \div 3 = 2$. Each child gets 2 sweets in this case. If 6 sweets are given to one child, then $6 \div 1 = 6$. The child gets 6 sweets. So, when we divide by taking 1 as the divisor, the quotient (answer) is the same as the dividend.

   Hence, $a \div 1 = a$.

2. *If zero is divided by any whole number, the result will always be zero.* For example,
   $0 \div 3 = 0, \quad 0 \div 8 = 0, \quad 0 \div 726 = 0.$

   If there are zero chocolates or no chocolates in a packet and we divide it into equal parts, each part will still have only zero chocolates.
   So, $0 \div a = 0$.

3. *Division of a whole number by zero is meaningless and is not allowed.*
   For example, to speak of dividing 12 oranges between zero students is meaningless.

Example 2: Show that:
$$(63 + 49) + 37 = 63 + (49 + 37).$$

Solution: $(63 + 49) + 37 = 112 + 37 = 149,$
and $63 + (49 + 37) = 63 + 86 = 149,$
$\therefore$ $(63 + 49) + 37 = 63 + (49 + 37)$

Example 3: Solve by suitable rearrangement.
$$32 \times 25$$

Solution: 32 is equal to 8×4.
So, $32 \times 25 = 8 \times 4 \times 25 = 8 \times (4 \times 25)$
$= 8 \times 100 = 800$

Example 4: Simplify using associative property of multiplication.
$$4 \times 16 \times 125$$

Solution: Since, $4 \times 125 = 500$, we have
$4 \times 16 \times 125 = 16 \times 4 \times 125$
$= 16 \times (4 \times 125)$
$= 16 \times 500 = 8000$

Try This!

Multiply by suitable rearrangement.

a. $4 \times 24 \times 25$ b. $75 \times 36 \times 8$

Remember

- Closure, commutativity, and associativity hold true for multiplication of whole numbers.
- Closure, commutativity, and associativity do not hold true for division of whole numbers.

Exercise 4 B

02/07/2024

1. Mark whether true or false.
   a. $36 + 64 = 64 + 36$ T ✓ b. $125 \times 8 = 8 \times 125$ T ✓ c. $683 \times 1 = 1 \times 683$ T ✓ d. $100 \div 5 = 5 \div 100$ F

2. Fill in the blanks.
   a. $6 \times$ 1 $= 6$ ✓ b. $481 +$ 0 $= 481$ ✓ c. $9 \times 8 = 8 \times$ 9 ✓
   d. $4 \times$ 0 $= 0$ ✓ e. $5 \times 87 \times 20 =$ 100 $\times 87$ ✓ f. $173 + 54 + 46 = 100 +$ 173 ✓

3. Fill the missing numbers in the blanks, and state the property involved in each case.
   a. $23 + 48 = 48 +$ 23 ✓ b. $2 \times 63 =$ 63 $\times 2$ ✓ c. $(67 + 42) + 38 = 67 + (42 +$ 38 $)$ ✓
   d. $49 + 88 + 51 = 88 +$ 100 ✓ e. $(733 \times 5) \times 2 = 733 \times (5 \times$ 2 $)$ ✓ f. $2 \times 725 \times 5 = 725 \times$ 10 ✓
   g. $867 \times$ 1 $= 867$ ✓ h. $437 +$ 0 $= 437$ ✓ i. $496 \times$ 0 $= 0$ ✓

4. Show that:
   a. $(693 + 432) + 412 = 693 + (432 + 412)$ b. $(85 \times 30) \times 4 = 85 \times (30 \times 4)$
5. Solve the following as fast as you can using the properties of addition and multiplication.
   a. $365 + 94 + 35$ b. $896 + 423 + 104$ c. $379 \times 25 \times 4$ d. $89 \times 125 \times 8$
6. Find the products of the following multiplication using associative property of multiplication.
   a. $4 \times 2518 \times 25$ b. $5 \times 4231 \times 60$ c. $50 \times 8 \times 4 \times 250$ d. $625 \times 1234 \times 8$
7. Write **yes** or **no** in the appropriate boxes. H.W

	Properties	Addition	Subtraction	Multiplication	Division
a.	Closure	yes	yes	yes	yes
b.	Commutative	yes	no	yes	no
c.	Associative	yes	yes	yes	yes
d.	Additive identity	yes	yes	no	yes
e.	Multiplicative identity	no	yes	yes	yes

Application-Based Questions

8. On the annual sports day of G.H. School, 78 boys and 52 girls took part in various sporting activities. On the same day, S.D. School also held their annual sports day. There, 52 boys and 78 girls took part in various sporting activities. Which school had more students participating in the sports day?
9. Sampath and Joginder decided to jog around the school playground. Sampath takes 6 minutes and Joginder takes 8 minutes to jog one complete round of the playground. If Sampath jogged 8 rounds of the playground and Joginder jogged 6 rounds, who jogged for lesser time?

10. Ranjan's photo album has 10 pages with 12 photos on each page whereas Sanjay's photo album has 12 pages with 10 photos on each page. Whose album has more photos?
11. The number of students in the sections A, B, and C of class VI are 49, 38, and 51, respectively. The number of students in the sections A, B, and C of class VII are 51, 49, and 38, respectively. Find the total number of students in class VI and class VII.
12. The number of students in each class of a school is 25. The fees paid by each student is ₹6815 per month. If there are 40 classes in the school, what is the total fee collection in a month?

DISTRIBUTIVE PROPERTY C-1.4

Example 5: A florist arranges 6 gladioli and 7 roses in a bouquet. Raj buys 5 such bouquets for the school annual function. What is the total number of flowers in these 5 bouquets?

Solution: Gladioli in 5 bouquets $= 5 \times 6$ flowers $= 30$ flowers

Roses in 5 bouquets $= 5 \times 7$ flowers $= 35$ flowers

Total number of flowers in 5 bouquets
$= (5 \times 6) + (5 \times 7) = 30 + 35 = 65$ flowers

Another way of solving the problem is as follows.

Flowers in one bouquet:
(gladioli + roses) $= (6 + 7)$ flowers.

Total number of flowers in 5 bouquets
$= 5\,(6 + 7)$ flowers $= 5 \times 13$ flowers
$= 65$ flowers

So, $5(6 + 7) = (5 \times 6) + (5 \times 7)$

or, $5 \times 13 = 30 + 35$

or, $65 = 65$

Hence, we can conclude that if *a*, *b*, and *c* are whole numbers, then

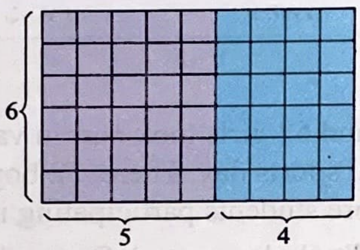
$$a \times (b + c) = a \times b + a \times c$$

This property is called the distributive property of multiplication over addition.

For example, $7 \times (8 + 3) = 7 \times 8 + 7 \times 3$.

You can see that multiplication is distributed between 8 and 3 when the sign is one of addition.

Let us look at another example.



6 rows of 5 squares + 6 rows of 4 squares

$= 5 \times 6 + 4 \times 6$

$= 30 + 24$

$= 54$ squares

This is also equal to 6 rows of 9 squares

i.e., $6 \times 9 = 54$ squares.

Or, $6 \times (5 + 4) = 54$ squares

So, $5 \times 6 + 4 \times 6 = 6(5 + 4)$

Example 6: There are 7 plates. Six biscuits are placed on each plate. If 4 biscuits are taken away from each plate, how many biscuits are left on the plates? Write the mathematical statement.

Solution: Biscuits on 7 plates $= 7 \times 6 = 42$

Biscuits taken away from 7 plates $= 7 \times 4 = 28$

Biscuits remaining $= 7 \times 6 - 7 \times 4$

$= 42 - 28 = 14$ biscuits

Alternative Method:

Biscuits left on one plate

$= (6 - 4)$ biscuits

Biscuits left on 7 plates

$= 7\,(6 - 4)$ biscuits $= 7 \times 2$ biscuits

$= 14$ biscuits

So, the mathematical statement is

$$7 \times (6 - 4) = 7 \times 6 - 7 \times 4$$

So in this case, multiplication is distributive over subtraction also.

If a, b, and c are whole numbers, then $a \times (b - c) = a \times b - a \times c$ *if and only if b is greater than c.*

Because if *c* is greater than *b*, then $(b - c)$ does not exist in whole numbers.

Example 7: Solve the following using the distributive property.

a. $15 \times 99 = 15\,(100 - 1) = 1500 - 15 = 1485$

b. $35 \times 105 = 35\,(100 + 5) = 3500 + 175 = 3675$

c. $27 \times 765 + 73 \times 765 = 765\,(27 + 73)$
$= 765\,(100) = 76500$

d. $1054 \times 138 - 1054 \times 38$
$= 1054\,(138 - 38) = 1054\,(100) = 105400$

04/07/2024

Exercise 4 C

1. Mark whether true or false.

240 192 48

a. $8\,(7 + 3) = 8 \times 7 + 8 \times 3$ T

b. $12\,(16 + 4) = 12 \times 16 + 12 \times 4$ T

c. $14\,(5 + 2) = 14 \times 5 + 14 \times 2$ T

d. $9\,(8 - 3) = 9 \times 8 - 9 \times 3$ T

2. Fill in the blanks.

a. $18 \times 6 + 18 \times 7 = 18\,(6 +$ 7 $)$

b. $16 \times 9 + 16 \times 6 = 16\,($ 9 $+ 6)$

c. $7 \times 6 - 7 \times 3 =$ 7 $(6 - 3)$

d. $6 \times 7 - 6 \times 2 = 6\,($ 7 $- 2)$

3. Solve using the distributive property.

a. 8×107

b. 18×95

c. 996×16

d. 1020×35

e. $23 \times 9 + 23 \times 1$

f. $15 \times 12 - 5 \times 12$

g. $96 \times 73 - 94 \times 73$

h. $697 \times 8 + 697 \times 2$

Application-Based Questions

4. In a class there are 23 boys and 18 girls. How many students will there be in 6 such classes? Write the mathematical statement. 6[23+18]
5. There are 9 sweets on a plate; 3 of the sweets are *rosogullas* and the remaining are *burfees*. How many *burfees* will there be on 7 such plates? Write the mathematical statement. 7(9-3)
6. Shashi invited 9 friends to her home on her birthday. She had prepared return gifts for each of them using 7 colourful hair bands and 9 beautiful hair clips. Find the number of items that she had to buy in total. Write a mathematical statement for this. (7+9)9

PATTERNS

C-1.2

A regular, consistent, and discernible way of occurrence or arrangement of things following a rule or rules is called a ***pattern***. Patterns can be observed in nature and in man-made objects. Patterns of ripples formed on sand dunes due to the movement of air is an example of a natural pattern. The regular repetition of shapes and figures on wallpapers is an example of man-made pattern.

If we study numbers carefully, we will come across many interesting patterns. Some of these patterns are very obvious and some are very surprising.

Some of the easily detectible ones are:

1. When we add or subtract two odd numbers, we always get an even number.
2. When we add or subtract two even numbers, then also we get an even number.
3. When we add or subtract an even number from an odd number or an odd number from an even number, we always get an odd number.
4. When we multiply two even numbers, we always get an even number.
5. When we multiply two odd numbers, we always get an odd number.
6. When we multiply an odd number by an even number, we always get an even number.

Patterns Formed by Numbers

Observe the following pattern.

1	×	8	+	1	=	9
12	×	8	+	2	=	98
123	×	8	+	3	=	987
1234	×	8	+	4	=	9876

Now, try to write the next 4 steps of this pattern.

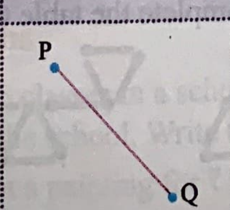
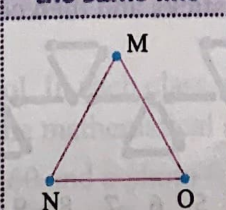
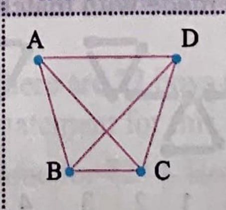
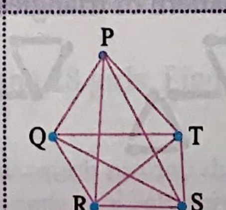
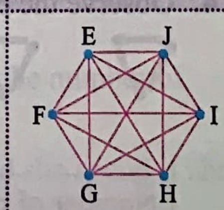
Here is another pattern.

1	×	8	=	8
11	×	88	=	968
111	×	888	=	98568
1111	×	8888	=	9874568
11111	×	88888	=	987634568

Can you write the next 2 steps of this pattern?

Patterns Formed by Line Segments

Consider the number of points and the line segments formed using them.

1 point	two points	3 points with no more than two points on the same line	4 points with no more than two points on the same line	5 points with no more than two points on the same line	6 points with no more than two points on the same line
A.					
0 line segment	1 line segment	3 line segments	6 line segments	10 line segments	15 line segments

There is a pattern emerging from the number of points and the possible line segments that can be drawn using them as shown in the following table.

No. of Points	Pattern	No. of line segments
1	0 = 0	0
2	0 + 1 = 1	1
3	0 + 1 + 2 = 3	3
4	0 + 1 + 2 + 3 = 6	6
5	0 + 1 + 2 + 3 + 4 = 10	10
6	0 + 1 + 2 + 3 + 4 + 5 = 15	15
7	0+1+2+3+4+5+6=	21
8	0+1+2+3+4+5+6+7=	28
9	0+1+2+3+4+5+6+7+8=	36

Using the above pattern, can you fill the remaining three rows?

Exercise 4 D

1. Write the next ~~4~~ 2 rows of each of the following patterns.

a.

1	×	9	+	2	=	11
12	×	9	+	3	=	111
123	×	9	+	4	=	1111
1234	×	9	+	5	=	11111

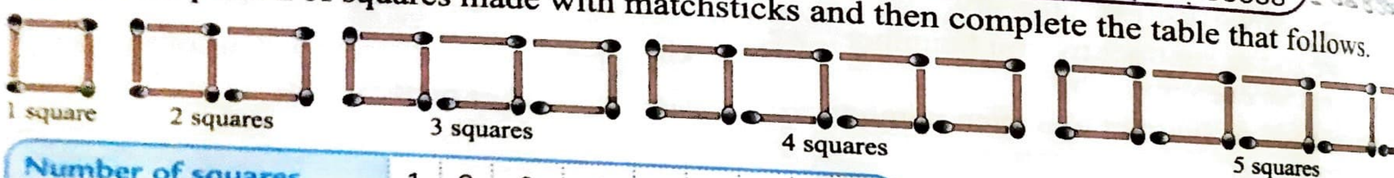
1×9+6 =111111

1×9+7 =1111111

b.

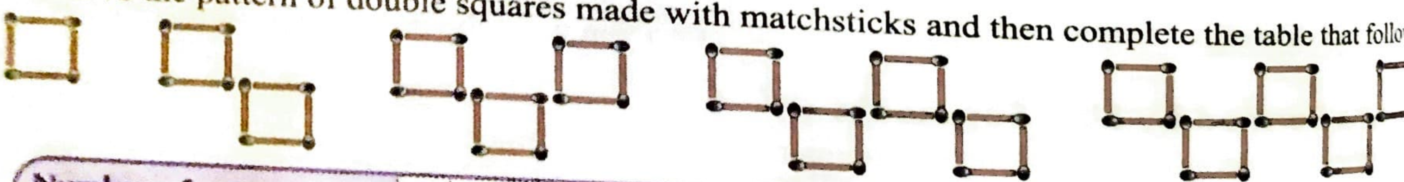
9	×	9	+	7	=	88
98	×	9	+	6	=	888
987	×	9	+	5	=	8888
9876	×	9	+	4	=	88888

2. Observe the pattern of squares made with matchsticks and then complete the table that follows.



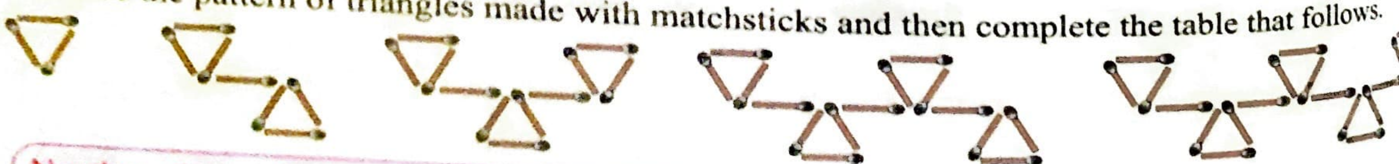
Number of squares	1	2	3	4	5	6	7	8	9
Number of matchsticks	4	7	10	13	16	19	22	25	28

3. Observe the pattern of double squares made with matchsticks and then complete the table that follows.



Number of squares	1	2	3	4	5	6	7	8	9
Number of matchsticks	4	8	12	16	20	24	28	32	36

4. Observe the pattern of triangles made with matchsticks and then complete the table that follows.



Number of triangles in a shape	1	2	3	4	5	6	7	8	9
Number of matchsticks	3	7	11	15	19	23	27	31	35

There is a pattern emerging from the number of points and the possible line segments that can be drawn using them as shown in the following table.

No. of Points	Pattern	No. of line segments
1	0 = 0	0
2	0 + 1 = 1	1
3	0 + 1 + 2 = 3	3
4	0 + 1 + 2 + 3 = 6	6
5	0 + 1 + 2 + 3 + 4 = 10	10
6	0 + 1 + 2 + 3 + 4 + 5 = 15	15
7	0+1+2+3+4+5+6=	21
8	0+1+2+3+4+5+6+7=	28
9	0+1+2+3+4+5+6+7+8=	36

Using the above pattern, can you fill the remaining three rows?

Exercise 4 D

1. Write the next ~~4~~ 2 rows of each of the following patterns.

a.

1	×	9	+	2	=	11
12	×	9	+	3	=	111
123	×	9	+	4	=	1111
1234	×	9	+	5	=	11111

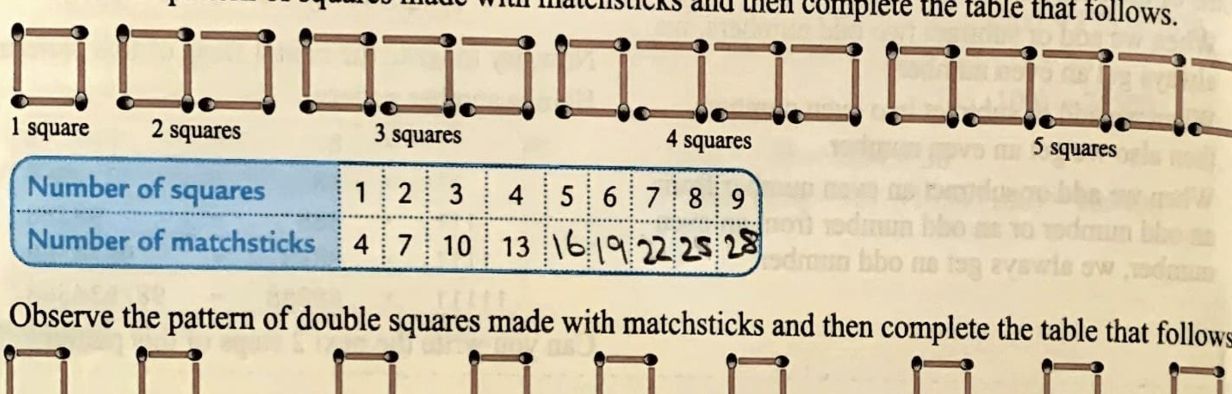
1x9+6 =111111
1x9+7 =1111111

b.

9	×	9	+	7	=	88
98	×	9	+	6	=	888
987	×	9	+	5	=	8888
9876	×	9	+	4	=	88888

98765x9+3 =888888
987654x9+2 =8888888

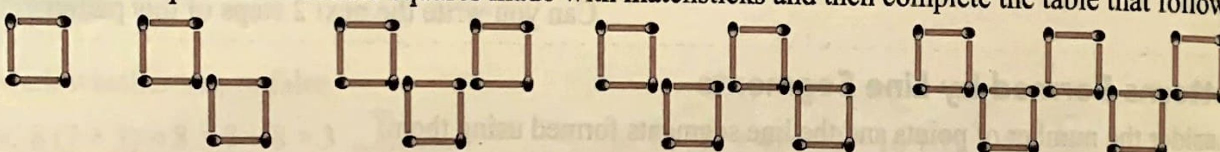
2. Observe the pattern of squares made with matchsticks and then complete the table that follows.



1 square, 2 squares, 3 squares, 4 squares, 5 squares

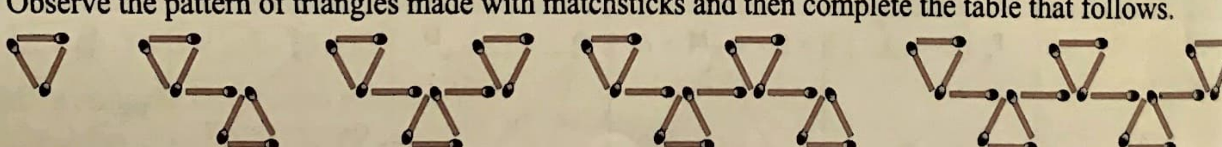
Number of squares	1	2	3	4	5	6	7	8	9
Number of matchsticks	4	7	10	13	16	19	22	25	28

3. Observe the pattern of double squares made with matchsticks and then complete the table that follows.



Number of squares	1	2	3	4	5	6	7	8	9
Number of matchsticks	4	8	12	16	20	24	28	32	36

4. Observe the pattern of triangles made with matchsticks and then complete the table that follows.



Number of triangles in a shape	1	2	3	4	5	6	7	8	9
Number of matchsticks	3	7	11	15	19	23	27	31	35

Chapter Check-Up

SELF ASSESSMENT

Multiple Choice Questions

1. The smallest natural number is:
   a. 1 b. 0 c. 2 d. none of these

2. When 0 is added to any whole number, you will get:
   a. 0 b. 1 c. the same whole number d. neither 0 nor 1

Practice Time

3. Fill in the blanks.
   a. 365 + 0 = 365
   b. 16 + 0 = 16
   c. 90 + 70 + 10 + 8 = 100 + 78
   d. 14 × 45 × 5 = 45 × 70

4. Mark true or false.
   a. (100 + 10) + 5 = 100 + (10 + 5) T
   b. 100 – (10 – 5) = (100 – 10) – 5 F
   c. (72 – 36) – 20 = 72 – (36 – 20) T
   d. (68 × 4) × 20 = 68 × (4 × 20) T
   e. 7(6 – 3) = 7 × 6 – 7 × 3
   f. 20 × 30 = 30 × 20 T
   g. 87 – 41 = 41 – 87 F
   h. 16 × 4 = 4 × 16 T
   i. 480 + 0 = 0 + 480 T
   j. (16 + 7) + 3 = 16 + (7 + 3) T

5. Solve the following.
   a. 69 + 18 + 32 (using the associative property) = 69 + (18 + 32) = 32 + (69 + 18)
   b. 67 × 14 – 65 × 14 (using the distributive property) = 14(67 – 65)

6. Fill in the blanks.
   a. If any two whole numbers are added, the sum obtained is always a whole number. This property is called the Closure property of addition of whole numbers.
   b. If any two whole numbers *a* and *b* are added, a to b or b to a, the answer is always Same. This property is called Commutative property of addition of whole numbers.
   c. If many whole numbers are added, the order in which the grouping is done does not matter, i.e., $(a + b) + c = a + (b + c)$.
      This property is called associative property of addition of whole numbers.
   d. If 0 is added to a number, the sum will remain the same number. Hence it is called the Additive Identity in the whole numbers.
   e. For subtration of whole numbers, $7 - 3 \neq 3 - 7$. Thus, we say that ________ does not hold true for whole numbers.
   f. $(7 - 3) - 2 \neq 7 - (3 - 2)$ so ________ property under ________ does not hold true.

Everyday Maths

1. There are 15 classes in a school. In each class, there are 22 boys and 28 girls. Find the number of students in the school. Write the mathematical statement for this.
2. Neha bought a painting for ₹360 and a photo frame for ₹239. How much money did she spend if she bought 3 paintings and 3 photo frames?

Being Indian

Diwali, the festival of lights, a famous festival of India, symbolizes the spiritual "victory of light over darkness, good over evil, and knowledge over ignorance". People celebrate Diwali with great happiness and joy.

A week before Diwali, a school fair was organised to raise money for charity. There are 60 classes in the school with 40 students in each class.

a. If the cost of a ticket was ₹25 and each student bought a ticket, how much money was collected from the sale of tickets?

b. Do you also help the needy? How?

Higher Order Thinking Skills

1. In the case of subtraction among whole numbers, 12 – 4 = 8. This means that when I subtracted a whole number 4 from a whole number 12, I get an answer equal to 8 which is also a whole number. Then why is the property of closure not true for subtraction? The closure Property is not satisfied
2. In the case of division among whole numbers, 8 ÷ 2 = 4. This means that a whole number 8 when divided by a whole number 2, gives an answer 4 which is also a whole number. Then why do we say that closure property does not hold true for division of whole numbers? Closure Property is not satisfied with division

Mental Maths

PA

1. I am a number between 10 and 20. If you divide 100 or 122 by me, the remainder is 1. What number am I?
2. I am a number between 13 and 20. If you divide 50 or 98 by me, the remainder is 2. What number am I?
3. Soman and Aman have the same number of trees in their orchards. Both of them have planted the trees in the form of rectangles. Soman has 28 trees in a row and has 72 rows of trees. Aman has 72 trees in a row. How many rows of trees does he have?
4. Aamir collected 12089 apples and 3201 pears from his orchard during spring season. Bharat also collected the same number of fruits from his orchard. He collected 3201 apples and the remaining were peaches. How many peaches did he collect?
5. In a pair of identical bouquets, the florist placed 39 roses and 11 gladioli in each. How many flowers did he use in all?

Brain Teaser

C-7.2

Rohit asked his father for a weekly allowance of ₹100. But his father refused to give him any more than ₹50 for a week. Rohit then came up with an interesting suggestion. He asked his father to give him a rupee on the first day of the month and then on each following day give him twice as much amount as he gave Rohit the day before. If Rohit's father agrees to this arrangement, what is the amount that Rohit will receive on the 30th day? How much money do you think his father would have given him at the end of a 30-day month?

BRAHMAGUPTA

C-9.2

Brahmagupta (598 CE – 670 CE), an Indian mathematician and astronomer, is known to have described the fact that subtracting a number from itself results in a zero.

His best-known work, *Brahmasputa Siddhanta*, contains several chapters on mathematical results. He developed methods for calculating the position of heavenly bodies over time and, for the calculation of solar and lunar eclipses.