WHOLE NUMBERS

2.1 INTRODUCTION TO WHOLE NUMBERS

The number '0' together with the counting numbers (or natural numbers) gives us the numbers 0, 1, 2, 3, 4, 5, 6, 7, 8, 9..., which are called *whole numbers*.

Every natural number is also a whole number. '0' is the smallest whole number and there is no largest whole number.

EXAMPLE 1 : *The smallest whole number is*

(*a*) 0 (*b*) 1 (*c*) *cannot be said* (*d*) 2

SOLUTION : **0** is the smallest whole number.
So, the option **(*a*)** is correct, which is the required answer,
i.e. answer(***a***).

2.2 NUMBER LINE

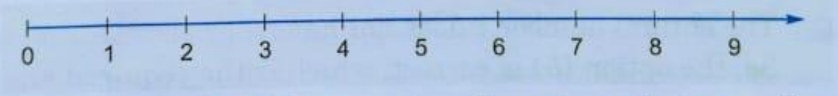
The following number line represents a *whole number line* on which whole numbers are represented.

The distance between two points (labelled 0 and 1) is called *unit distance*.

> **NOTE**
> 1. **'0'** is the only whole number which is not a natural number.
> 2. **'0'** does not have a predecessor whole number.

Comparing Two Whole Numbers

Look at the following figure of a whole number line :

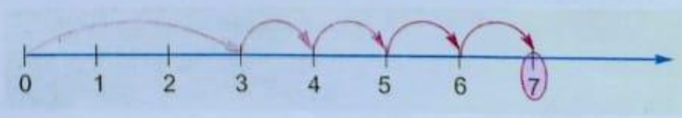


Does it help you to notice that the greater of any two whole numbers is the one which lies to the right on the line and the other on the left is the smaller number ? Since 5 is to the right of 3, we can say that 5 is greater than 3. Since 7 is to the left of 9, we can say that 7 is less than 9.

2.2.1 ADDITION ON A NUMBER LINE

Addition of whole numbers can be shown on a number line.

Let us see the addition of 3 and 4.



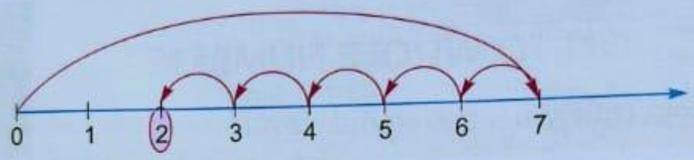
The point at the tip of the leftmost arrow is 3. Start from 3. Since we add 4 to this number, we make 4 jumps to the right, *i.e.*, from 3 to 4, 4 to 5, 5 to 6 and 6 to 7 as shown above. The tip of the rightmost arrow in the fourth jump is at 7.

Hence, sum of 3 and 4 is 7, *i.e.*, 3 + 4 = **7**.

2.2.2 SUBTRACTION ON A NUMBER LINE

The subtraction of two whole numbers can also be shown on a number line.

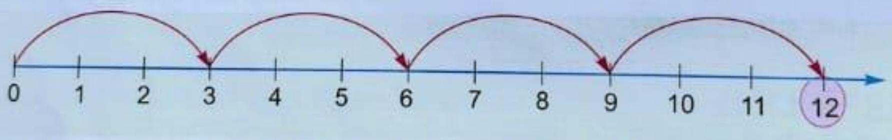
Let us find 7 – 5.



The point at the tip of the longest arrow is 7. Start from 7. Since 5 is being subtracted, move towards left with onejump of 1 unit. Make 5 such jumps. We reach at the point 2. Hence, 7 – 5 = **2**.

2.2.3 MULTIPLICATION ON A NUMBER LINE

We now show the multiplication of whole numbers on the number line.
Let us find 3 × 4.



Start from 0, move 3 units at a time to the right. Make 4 such moves.
Where do you reach ? You will reach at 12. Hence, 3 × 4 = **12**.

EXAMPLE 2 : *The whole number, which is not a natural number, is*
(a) 0 *(b) 1* *(c) 2* *(d) 3*

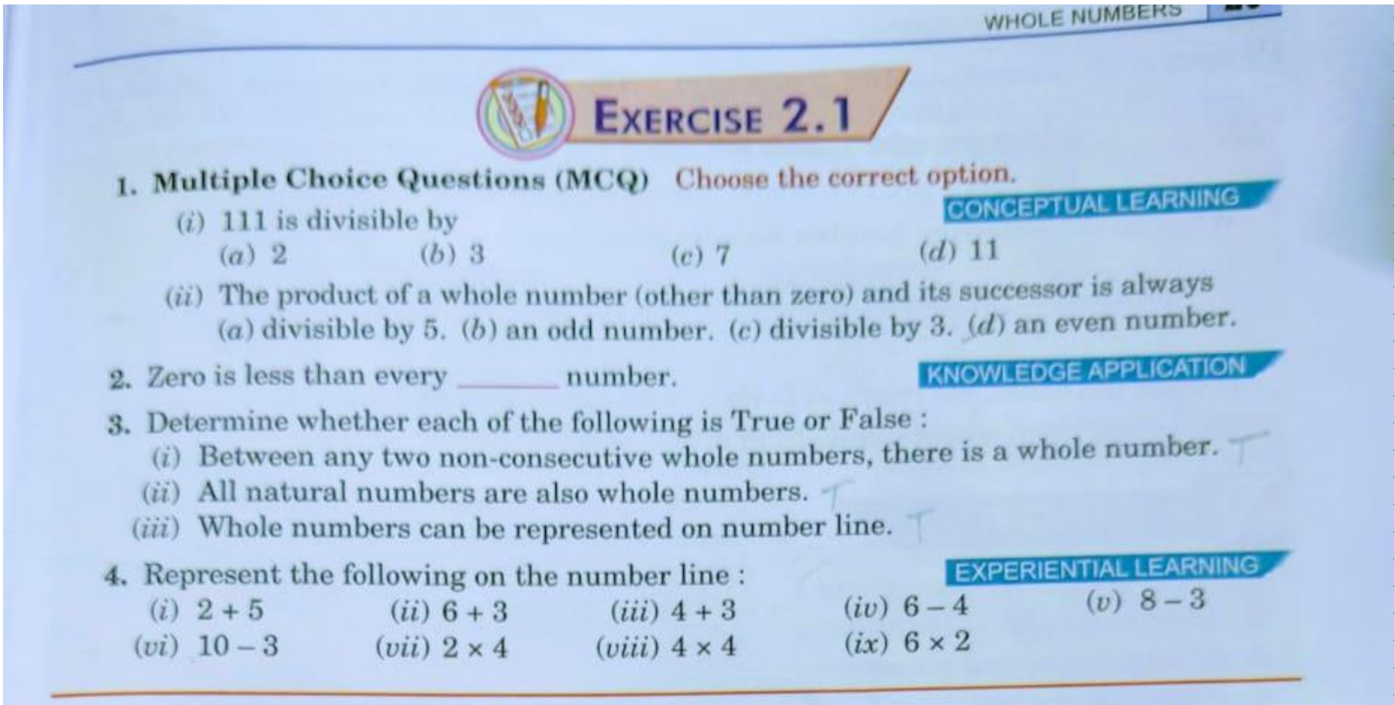
SOLUTION : **0** is the only whole number, which is not a natural number. So, the option ***(a)*** is correct, which is the required answer.

EXAMPLE 3 : *The natural number ________ has no predecessor as natural number.*
(a) 0 *(b) 1* *(c) 2* *(d) 3*

SOLUTION : The natural number **1** does not have a predecessor as natural number. So, the option ***(b)*** is correct, which is the required answer.

EXAMPLE 4 : *Determine whether each of the following is True or False.*
(i) 0, 1, 2, 3, 4, ... are natural numbers.
(ii) 1, 2, 3, 4, 5, ... are not whole numbers.

SOLUTION : (*i*) **False**, because 0 cannot be included in natural numbers.
(*ii*) **True**, because whole numbers include 0 also.


WHOLE NUMBERS

EXERCISE 2.1

1. **Multiple Choice Questions (MCQ)** Choose the correct option. CONCEPTUAL LEARNING

(i) 111 is divisible by
(a) 2 (b) 3 (c) 7 (d) 11

(ii) The product of a whole number (other than zero) and its successor is always
(a) divisible by 5. (b) an odd number. (c) divisible by 3. (d) an even number.

2. Zero is less than every ______ number. KNOWLEDGE APPLICATION

3. Determine whether each of the following is True or False :
(i) Between any two non-consecutive whole numbers, there is a whole number.
(ii) All natural numbers are also whole numbers.
(iii) Whole numbers can be represented on number line.

4. Represent the following on the number line : EXPERIENTIAL LEARNING
(i) 2 + 5 (ii) 6 + 3 (iii) 4 + 3 (iv) 6 – 4 (v) 8 – 3
(vi) 10 – 3 (vii) 2 × 4 (viii) 4 × 4 (ix) 6 × 2

1. Multiple Choice Questions (MCQ)

(i) 111 is divisible by
Answer: (b) **3**
Explanation: 1 + 1 + 1 = 3, which is divisible by 3.

(ii) The product of a whole number (other than zero) and its successor is always
Answer: (d) **an even number**
Explanation: One of the two consecutive numbers is always even.

2. Fill in the Blank

Zero is less than every **natural** number.

3. Determine whether the following are True or False:

(i) Between any two non-consecutive whole numbers, there is a whole number.
Answer: True

(ii) All natural numbers are also whole numbers.
Answer: True
(Whole numbers start from 0, natural numbers from 1)

(iii) Whole numbers can be represented on a number line.
Answer: True

4. Represent the following on the number line:

You can draw a straight line with marks from 0 to at least 12 and show jumps for the operations:

(i) 2 + 5 → Start at 2, move 5 steps forward → Land at **7**
(ii) 6 + 3 → Start at 6, move 3 steps forward → Land at **9**
(iii) 4 + 3 → Start at 4, move 3 steps forward → Land at **7**
(iv) 6 - 4 → Start at 6, move 4 steps backward → Land at **2**
(v) 8 - 3 → Start at 8, move 3 steps backward → Land at **5**
(vi) 10 - 3 → Start at 10, move 3 steps backward → Land at **7**
(vii) 2 × 4 → Repeated addition: 2 + 2 + 2 + 2 = **8**
(viii) 4 × 4 → 4 + 4 + 4 + 4 = **16**
(ix) 6 × 2 → 6 + 6 = **12**

Would you like number line diagrams for these too?

4o

You said:

Yes

ChatGPT said:

Here are the number line representations for the given operations:

Addition on a Number Line

1. **2 + 5**
   - Start at **2**.
   - Move **5** steps forward.
   - Land at **7**.
2. **6 + 3**
   - Start at **6**.
   - Move **3** steps forward.
   - Land at **9**.
3. **4 + 3**
   - Start at **4**.
   - Move **3** steps forward.
   - Land at **7**.

Subtraction on a Number Line

4. **6 - 4**
   - Start at **6**.
   - Move **4** steps backward.
   - Land at **2**.
5. **8 - 3**
   - Start at **8**.
   - Move **3** steps backward.
   - Land at **5**.
6. **10 - 3**
   - Start at **10**.
   - Move **3** steps backward.
   - Land at **7**.

Multiplication on a Number Line (Repeated Addition)

7. **2 × 4** (2 groups of 4)
   - Jumps of **2** (4 times): **0 → 2 → 4 → 6 → 8**
8. **4 × 4** (4 groups of 4)
   - Jumps of **4** (4 times): **0 → 4 → 8 → 12 → 16**
9. **6 × 2** (6 groups of 2)
   - Jumps of **6** (2 times): **0 → 6 → 12**

Exercise 2.2

2.3 PROPERTIES OF WHOLE NUMBERS

Operations of whole numbers

Addition (+), subtraction (–), multiplication (×) and division (÷) are the four basic operations of arithmetic. An operation on two numbers is a way of dealing with the numbers to obtain a result.

When we look into various operations on numbers closely, we notice several properties of whole numbers. These properties help us to understand the numbers better. Moreover, they make calculations very simple under certain operations.

2.3.1 PROPERTIES OF ADDITION

Property 1 (Closure Property) : *Addition of whole numbers is a closed operation.*

If a and b are two whole numbers, then $a + b$ is also a whole number.

The sum of two whole numbers is always a whole number.

WORKING RULES

1. *Take the given numbers a and b.*
2. *Find their sum (say $c = a + b$).*
3. *Check if c is also a whole number.*
4. *If c is a whole number, closure property is verified.*

For example :

10	+	8	=	18 (A whole number)
6	+	6	=	12 (A whole number)
0	+	16	=	16 (A whole number)

Property 2 (Commutative Property) : *The addition of two whole numbers is commutative, i.e., changing the order of any two addends (the numbers which are added) does not affect the sum.*

If a and b are two whole numbers, then $a + b = b + a$.

What do the following number line diagrams say ?

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

We can add two whole numbers in either way.

WORKING RULES

1. *Take the given numbers a and b.*
2. *Add a to b and find the answer.*
3. *Add b to a and find the answer.*
4. *If the answers from steps 2 and 3 are same, then whole number addition is commutative.*

For example :

$3 + 2 = 2 + 3 = 5$, $17 + 0 = 0 + 17 = 17$, $39 + 84 = 84 + 39 = 123$, etc.

Property 3 (Associative Property) : *The addition of whole numbers is associative i.e., the sum of any three whole numbers remains same even if we change the grouping.*

If a, b, c are any whole numbers, then $(a + b) + c = a + (b + c)$.

WORKING RULES

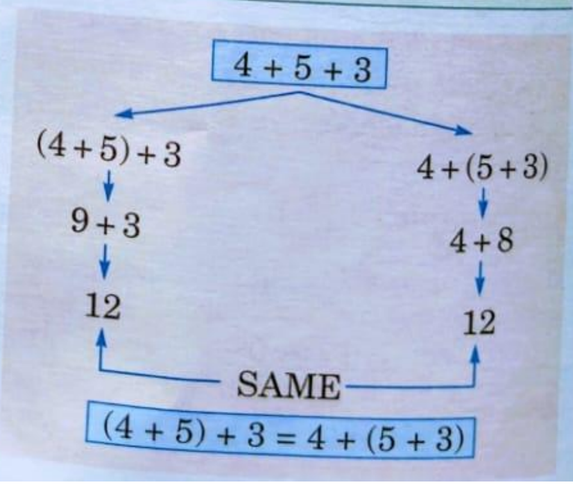
1. *Take the given numbers a, b and c.*
2. (i) *Add a to b and find this result (say d).*
   (ii) *Add this result d to c to get the answer for $(a + b) + c$.*
3. (i) *Add b to c and find this result (say e).*
   (ii) *Add this result e to a to get the answer for $a + (b + c)$.*
4. *If the answers from steps 2 and 3 are same, then the addition of whole numbers is associative.*

For example :

Consider an addition problem 4 + 5 + 3. Should we begin by adding 4 and 5 or 5 and 3 ?

Does it matter which way you do it ?

Thus, from the illustration given at right, we can say that the sum of three whole numbers remains unchanged even if the order in which they are grouped is changed. This is called the **associative property of addition**.



PROPERTY 4 : *Identity for Addition*

How is the collection of whole numbers different from the collection of natural numbers ? It is just the presence of 'zero' in the collection of whole numbers. This number 'zero' has a special role in addition.

The following table will help you guess the rule :

7	+	0	=	7
5	+	0	=	5
0	+	15	=	15

The result of adding a number to 0 is equal to the number itself. Since zero added to any number does not change the identity of that number, we call **zero** as the identity element with respect to addition. It is also called the additive identity.

i.e., If a is a whole number, then, $a + 0 = 0 + a = a$.

NOTE

1. $4 + 0 = 4$, $0 + 4 = 4$. Therefore, $4 + 0 = 0 + 4 = 4$.
2. $0 + 15 = 15$, $15 + 0 = 15$. Therefore, $0 + 15 = 15 + 0 = 15$.

EXAMPLE 5 : *Fill in the blanks :*

(*i*) 381 + ________ = 427 + 381

(*ii*) 832 + (231 + 927) = ________ + (832 + 927)

SOLUTION : (*i*) 381 + **427** = 427 + 381 (By Commutative Property)

(*ii*) 832 + (231 + 927) = **231** + (832 + 927) (By Associative Property)

EXAMPLE 6 : *Which of the following is true or false ?*

(*i*) *15 + 0 = 15, shows the identity for addition.*

(*ii*) *18 + 36 = 54, shows the closure property.*

SOLUTION : (*i*) **True**, because the number 15 does not change its own identity.

(*ii*) **True**, because it follows that the sum of two whole numbers is always a whole number.

2.3.2 PROPERTIES OF SUBTRACTION

Operations of addition and subtraction are inverse of each other.

PROPERTY 1 (Closure Property) :

We know that addition of whole numbers is a closed operation. The same is not always true for the operation of subtraction.

For example, when we subtract 5 from 10, we get the whole number 5, *i.e.,* 10 – 5 = 5, but 5 – 10 = – 5 is not a whole numbers. If we subtract a whole number from itself, we get the whole number 0. Thus, 17 – 17 = 0.

Thus, *the closure property does not hold good for subtraction of whole numbers.*

If a and b are whole numbers, then $a - b$ is a whole number, when $a > b$ or $a = b$. If $a < b$, then $a - b$ is not a whole number.

The following table will help you understand this property clearly :

5	–	3	=	2 (A whole number)
8	–	8	=	0 (A whole number)
2	–	3	=	– 1 (Not a whole number)

PROPERTY 2 (Commutative Property) :

Does the operation of subtraction obey the commutative law ?

Study the following carefully :

Commute

$4 - 3 = 1$ (A whole number) $\qquad$ $3 - 4 = -1$ (Not a whole number)

Different

Thus, $4 - 3 \neq 3 - 4$.

Thus, *the commutative property does not hold good for subtraction of whole numbers.*

Hence, if a and b are two whole numbers, then in general, $a - b$ is not equal to $b - a$ *i.e.*, $a - b \neq b - a$.

NOTE

We may restate the Commutative property as follows : If a and b are whole numbers and $a \neq b$, then either $a - b$ is a whole number or $b - a$ is a whole number. Both are whole numbers only if $a = b$.

PROPERTY 3 (Associative Property) :

Study the following carefully :

$(5 - 2) - 1$ $\qquad$ $5 - (2 - 1)$

$3 - 1 = 2$ $\qquad$ $5 - 1 = 4$

different

Thus, $(5 - 2) - 1 \neq 5 - (2 - 1)$.

If a, b, c are whole numbers and c is not equal to 0, then $a - (b - c)$ is never equal to $(a - b) - c$.

Thus, the *associative property for subtraction also does not hold for whole numbers.*

PROPERTY 4 : *If 0 is subtracted from a whole number, then the result is the number itself.*

If 0 is subtracted from any whole number, there is no change in the whole number.

The following table will help you understand this property clearly :

5	–	0	=	5 (A whole number)
6	–	0	=	6 (A whole number)
27	–	0	=	27 (A whole number)

NOTE

If any whole number (except 0) is subtracted from zero, then the result is not a whole number.

$0 - 27 = ?$

Not a whole number.

PROPERTY 5 : *If a, b and c are whole numbers such that $a - b = c$, then $b + c = a$.*

The operations of addition and subtraction are inverse of each other. Subtracting 7 from 18 can be considered as to 7 gives 18 *i.e.*,

$18 - 7 = 11 \Rightarrow 7 + 11 = 18$

Similarly : $11 - 3 = 8 \Rightarrow 8 + 3 = 11$

$6 - 3 = 3 \Rightarrow 3 + 3 = 6$

EXAMPLE 7 : *Which of the following is not the identity element for subtraction of whole numbers ?*

(a) 0 (b) 1 (c) Both (a) and (b) (d) All (a), (b) and (c)

SOLUTION : **0**, because for a whole number 'x', $x - 0 \neq 0 - x$.
So, the option **(a)** is correct, which is the required answer,
i.e. answer **(a)**.

2.3.3 PROPERTIES OF MULTIPLICATION

PROPERTY 1 (Closure Property) : *If a and b are whole numbers and $a \times b = c$, then c is also a whole number.*

WORKING RULES

1. *Take the given numbers a and b.*
2. *Find $a \times b$ (say = c).*
3. *Find, whether c is a whole number or not.*
4. *If c obtained in step 3 is a whole number, then the closure property is verified.*

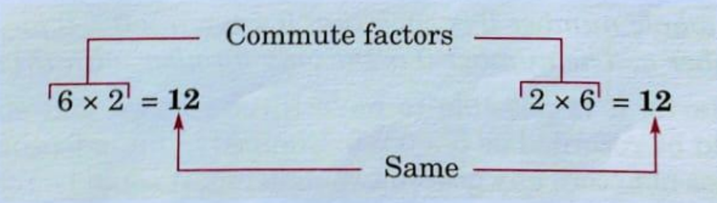
For example :

$$8 \times 3 = 24$$
$$15 \times 120 = 1800$$
$$0 \times 309 = 0$$

In all these multiplications, the multiplication of the two whole numbers results in a whole number *i.e.*, the multiplication of whole numbers is a closed operation. Hence, the closure property of multiplication is *verified*.

PROPERTY 2 (Commutative Property) : *If a and b are whole numbers, then $a \times b = b \times a$.*

Study the following :



So, $6 \times 2 = 2 \times 6$.

Thus, the multiplication is commutative.

For example :

$$\left.\begin{aligned} 9 \times 5 &= 45 \\ 5 \times 9 &= 45 \end{aligned}\right\} \Rightarrow 5 \times 9 = 9 \times 5$$

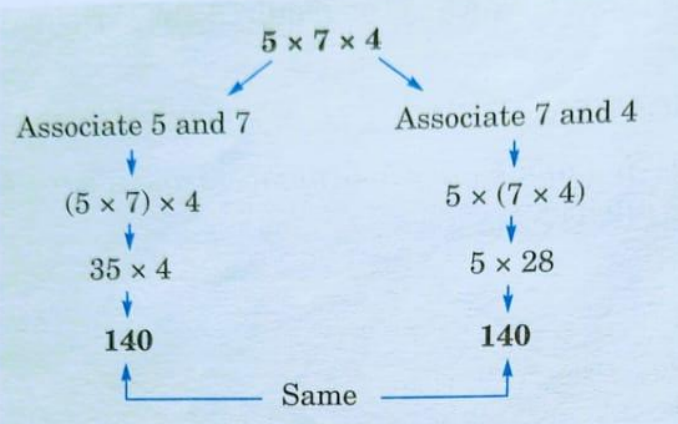
$$\left.\begin{aligned} 18 \times 7 &= 126 \\ 7 \times 18 &= 126 \end{aligned}\right\} \Rightarrow 18 \times 7 = 7 \times 18$$

This is called the *commutative property of multiplication*.

PROPERTY 3 (Associative Property) : *If a, b and c are three whole numbers, then* $(a \times b) \times c = a \times (b \times c)$.

The common value of the product is denoted by $a \times b \times c$.

Observe the following pattern :



NOTE

We can use this property in making multiplication of three or more whole numbers simpler.

Similarly, we have $(23 \times 30) \times 89 = 23 \times (30 \times 89) = 61410$.

For example : We have to multiply 8, 987 and 25.

It would be easier to multiply first 8 and 25 and then multiply the product by 987. Thus, we have $8 \times 987 \times 25 = (8 \times 25) \times 987 = 200 \times 987 = 197400$.

PROPERTY 4 (Identity for Multiplication) : *The whole number 1 is such that* $1 \times a = a \times 1 = a$ *for every whole number a.*

The number 1 is the only number having this property.

Look at these multiplications :

$$5 \times 1 = 5 \;\Rightarrow\; 1 \times 5 = 5, \quad 17 \times 1 = 17 \;\Rightarrow\; 1 \times 17 = 17$$

The result of multiplying a number by 1 is equal to the number itself. We say that 1 is the *identity element* with respect to multiplication. It is also called the *multiplicative identity*.

For example : $16 \times 1 = 16$, $10 \times 1 = 10$, $81 \times 1 = 81$, etc.

PROPERTY 5 : *The whole number 0 is such that* $0 \times a = a \times 0 = 0$ *for every whole number a. The number 0 is the only number with this property.*

In a game of darts, it is possible to have three throws and still not scored any point. This could be recorded as $3 \times 0 = 0$. Similarly, if in a football league match, a certain team does not score any goal in two matches, it could be recorded as $2 \times 0 = 0$.

Since the order in which we multiply any two numbers does not affect the product, we can write $2 \times 0 = 0 \times 2 = 0$ and $3 \times 0 = 0 \times 3 = 0$.

Thus, from the above discussion, we conclude that *the product of any number and zero is zero*.

For example :

$$0 \times 3092 = 0$$
$$0 \times 10000 = 0$$
$$0 \times 893792 = 0$$

Think a Little and Say

What is the identity element with respect to the multiplication for zero ?
Think about the following :

$$0 \times 0 = 0$$
$$0 \times 1 = 0$$

PROPERTY 6 (Distributive Property) :

(*i*) *If a, b and c are three whole numbers, then*

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

or

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

If instead of two numbers, we have the addition of three or more numbers, then this property also holds *i.e.*,

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

and $(a + b + c + d) \times p = a \times p + b \times p + c \times p + d \times p$

For example :

Tanya works part time in an ice-cream parlour. She works 3 hours on Wednesday and 5 hours on Thursday. If she earns ₹ 30 an hour, how much does she earn for these two days ?

We can solve this problem in the following two ways :

$30 \times (3 + 5) = 30 \times 8 = \mathbf{240}$ or $(30 \times 3) + (30 \times 5) = 90 + 150 = \mathbf{240}$

Both the methods give the same number **240**.

Hence, $30 \times (3 + 5) = (30 \times 3) + (30 \times 5)$.

It is called *the distributive property of multiplication over addition or simply distributive property.*

(*ii*) *If a, b and c are three whole numbers and b > c, then* $a \times (b - c) = a \times b - a \times c$ *and* $(b - c) \times a = b \times a - c \times a$.

Like addition, the distributive property of multiplication also holds good for subtraction.

For example : $5 \times (7 - 3) = 5 \times 4 = 20$ or $5 \times 7 - 5 \times 3 = 35 - 15 = 20$

$\therefore \quad 5 \times (7 - 3) = 5 \times 7 - 5 \times 3 = 20.$

PROPERTY 7 : *If a, b and c are whole numbers such that a > b and c is not equal to 0, then* $a \times c > b \times c$.

Consider the whole numbers 8, 5 and 12, such that 8 > 5 and 12 is a number other than 0. If we multiply both 8 and 5 by 12, we have $8 \times 12 = 96$ and $5 \times 12 = 60$. Clearly 96 > 60

EXAMPLE 8 : *$(4 \times 5) \times 8$ = ________ $\times (5 \times 8)$.*

SOLUTION : Using associative property for multiplication,

$$(4 \times 5) \times 8 = \mathbf{4} \times (5 \times 8) \Rightarrow 160 = 160$$

$\therefore$ **4** is the required answer.

EXAMPLE 9 : *Raj distributes 8 boxes of sweets. Each box comprises 6 chocolates and 10 candies. No. of sweets in the 8 boxes is*

(a) 48 *(b) 80* *(c) 128* *(d) 32*

SOLUTION : Chocolates in 8 boxes = $8 \times 6 = 48$

Candies in 8 boxes = $8 \times 10 = 80$

Total = 128

$\therefore$ Total no. of sweets in 8 boxes = **128**

So, the option **(*c*)** is correct, which is the required answer, *i.e.* answer(***c***).

2.3.4 PROPERTIES OF DIVISION

PROPERTY 1 : *If a and b are whole numbers, then a ÷ b may or may not represent a whole number.*

Does the closure property hold for division in whole numbers ?

Study the following carefully :

$$8 \div 4 = 2$$
$$0 \div 4 = 0$$
$$8 \div 3 = \frac{8}{3}$$

We see that 8 ÷ 3, *i.e.* $\frac{8}{3}$ is not a whole number.

Hence, *the closure property does not hold good for the division of whole numbers.*

For example :

(*i*) 6 ÷ 3 = 2 (A whole number)

(*ii*) 4 ÷ 2 = 2 (A whole number)

(*iii*) $2 \div 9 = \frac{2}{9}$ (Not a whole number)

PROPERTY 2 : *The quotient of a whole number and another non-zero whole number changes if the dividend and the divisor interchange their places.*

For example :

(*i*) 16 ÷ 2 = 8 (A whole number)

$2 \div 16 = \frac{2}{16}$ (Not a whole number)

Thus, 16 ÷ 2 ≠ 2 ÷ 16.

(*ii*) 2 ÷ 1 = 2

$1 \div 2 = \frac{1}{2}$

Thus, 2 ÷ 1 ≠ 1 ÷ 2.

Hence, *the division in whole numbers is not commutative.*

PROPERTY 3 : *If 'a' is a whole number, then a ÷ 1 = a.*

For example :

(*i*) 6 ÷ 1 = 6 (A whole number) (*ii*) 2 ÷ 1 = 2 (A whole number)

(*iii*) 1 ÷ 1 = 1 (A whole number)

PROPERTY 4 : *If 'a' is a non-zero whole number, then a ÷ a = 1.*

For example :

(*i*) 3 ÷ 3 = 1 (A whole number) (*ii*) 2 ÷ 2 = 1 (A whole number)

(*iii*) 4 ÷ 4 = 1 (A whole number)

PROPERTY 5 : *If zero is divided by any whole number except zero, the quotient is zero.*

For example :

(*i*) 0 ÷ 2 = 0

(*ii*) 0 ÷ 4 = 0

(*iii*) 0 ÷ 8 = 0

NOTE

Division by zero is not defined.

PROPERTY 6 : *If three whole numbers are taken in a particular order and the quotient of the first and the second is divided by the third, then the result is not the same if the first is divided by the quotient of the second and the third.*

For example : $(16 \div 8) \div 2 = 2 \div 2 = 1$

$16 \div (8 \div 2) = 16 \div 4 = 4$

Therefore, $(16 \div 8) \div 2 \neq 16 \div (8 \div 2)$.

Hence, *the division of whole numbers is not associative as well.*

PROPERTY 7 : *Operations of multiplication and division are inverse of each other.*

For example : $6 \div 2 = 3$ and $3 \times 2 = 6$

$6 \div 3 = 2$ and $3 \times 2 = 6$

Study the following facts carefully :

Multiplication fact	Corresponding division fact
$10 \times 2 = 20$	$20 \div 2 = 10$, $20 \div 10 = 2$
$5 \times 6 = 30$	$30 \div 6 = 5$, $30 \div 5 = 6$
$4 \times 6 = 24$	$24 \div 6 = 4$, $24 \div 4 = 6$

NOTE

One single multiplication fact gives two division facts.

But when a whole number is not divided by another whole number completely, then some remainder is obtained.

For example :

If 24 is divided by 5, then quotient is 4 and remainder is 4. Obviously, we have, $24 = 5 \times 4 + 4$.

In general, we can say that

Dividend = (Divisor × Quotient) + Remainder

EXAMPLE 10 : *When a whole number is divided by ________ , the quotient is the number itself*

SOLUTION : **1**, because $\frac{a}{1} = a$.

EXAMPLE 11 : *Division is the inverse of*

(*a*) *subtraction* (*b*) *addition* (*c*) *multiplication* (*d*) *None*

SOLUTION : $\frac{a}{b} = a \div b = a \times \left(\frac{1}{b}\right)$

i.e. Division is the inverse of multiplication.

So, the option **(*c*)** is correct, which is the required answer, *i.e.* answer(***c***).

EXAMPLE 12 : *On dividing 15990 by 290, the remainder is 40. The quotient is*

(*a*) *65* (*b*) *55* (*c*) *45* (*d*) *80*

SOLUTION : As we know that,

Dividend = (Divisor × Quotient) + Remainder

$\Rightarrow$ 15990 = (290 × Quotient) + 40

$\Rightarrow$ $\text{Quotient} = \frac{15990 - 40}{290} = \frac{15950}{290} = \mathbf{55}$

So, the option **(*b*)** is correct, which is the required answer, *i.e.* answer(***b***).

EXERCISE 2.2

1. Multiple Choice Questions (MCQ) Choose the correct option.

CONCEPTUAL LEARNING

(*i*) Which of the following shows the commutative property for addition of whole nubmers ?

(*a*) $-3+4=4-3$ (*b*) $0+1=1+2$ (*c*) $2+3=4+1$ (*d*) $5+3=3+5$

(*ii*) If $a \div 6 = 1$, then $a =$

(*a*) 1 (*b*) 0 (*c*) 6 (*d*) $\frac{1}{6}$

2. Fill in the blanks :

KNOWLEDGE APPLICATION

(*i*) $325 \times 0 =$ ________ (*ii*) $1560 \times 15 = 15 \times$ ________

(*iii*) $1 \times$ ________ $= 9999$ (*iv*) ________ $- 0 = 6363$

(*v*) ________ $\div 1 = 2799$ (*vi*) $2133 \div 2133 =$ ________

3. Which is not possible ?

(*i*) A whole number is divided by zero. (*ii*) Zero is divided by a whole number.

4. Is the product of 0 and a whole number, a whole number ?

5. Is the product of a whole number and 1, a whole number ?

6. Verify the closure property of addition of whole numbers for :

(*i*) $7+8$ (*ii*) $3+14$ (*iii*) $19+0$ (*iv*) $0+0$

7. Verify the associative property of addition for the following numbers :

(*i*) 3, 5, 7 (*ii*) 2, 4, 6

8. If $a = 256$ and $b = 175$, show that $a - b \neq b - a$.

9. If $a = 12$, $b = 8$ and $c = 5$, show that $a - (b - c) \neq (a - b) - c$.

10. Verify that $b + c = a$ if $a - b = c$, for :

(*i*) $a = 5, b = 3$ (*ii*) $a = 23, b = 9$

11. Verify the commutative property for the multiplication of the following whole numbers:

(*i*) 30, 14 (*ii*) 7, 35 (*iii*) 0, 54

EXPERIENTIAL LEARNING

12. Verify the associative property for the multiplication of the following whole numbers :

(*i*) 3, 5, 7 (*ii*) 4, 5, 0 (*iii*) 13, 11, 12

13. If $a = 4$, $b = 3$ and $c = 6$, find the following :

(*i*) $a \times (b + c)$ (*ii*) $ab + ac$

14. If $a = 8$, $b = 5$ and $c = 2$, find the following :

(*i*) $a \times (b - c)$ (*ii*) $ab - ac$

15. If $a = 3$, $b = 5$ and $c = 10$, verify :

(*i*) $a \times (b + c) = ab + ac$ (*ii*) $a \times (b - c) = ab - ac$

16. If $a = 84$ and $b = 4$, verify whether $a \div b \neq b \div a$.

17. If $a = 24$, $b = 4$ and $c = 2$, verify whether $(a \div b) \div c = a \div (b \div c)$.

18. If $a = 64$, $b = 8$ and $c = 4$, verify that $(a \div b) \div c \neq a \div (b \div c)$.

19. Divide and check using relation, dividend = (divisor × quotient) + remainder :

(*i*) $456 \div 17$ (*ii*) $259 \div 13$

20. Verify that $b \times c = a$ if $a \div b = c$, for :

(*i*) $a = 56, b = 7$ (*ii*) $a = 156, b = 13$

CONCEPTUAL LEARNING

1. MCQ: Choose the correct option

(i) Which shows the commutative property for addition of whole numbers?
Answer: (d) **5 + 3 = 3 + 5**

(ii) If a ÷ 6 = 1, then a =
Answer: (c) **6**

---

2. Fill in the blanks

(i) 325 × 0 = **0**
(ii) 1560 × 15 = 15 × **1560**
(iii) 1 × **9999** = 9999
(iv) **6363** − 0 = 6363
(v) **2799** ÷ 1 = 2799
(vi) 2133 ÷ 2133 = **1**

---

3. Which is not possible?

Answer: (i) A whole number is divided by zero — **Not possible**
(ii) Zero is divided by a whole number — **Possible**

---

4. Is the product of 0 and a whole number, a whole number?

Answer: Yes

---

5. Is the product of a whole number and 1, a whole number?

Answer: Yes

---

6. Verify the closure property of addition of whole numbers

Closure property: The sum of two whole numbers is a whole number.
(i) 7 + 8 = **15** → whole number
(ii) 3 + 14 = **17** → whole number
(iii) 19 + 0 = **19** → whole number
(iv) 0 + 0 = **0** → whole number

Verified

7. Verify associative property of addition

Associative: (a + b) + c = a + (b + c)

(i) 3, 5, 7
(3 + 5) + 7 = 8 + 7 = **15**
3 + (5 + 7) = 3 + 12 = **15**

(ii) 2, 4, 6
(2 + 4) + 6 = 6 + 6 = **12**
2 + (4 + 6) = 2 + 10 = **12**

Verified

---

8. Show that a - b ≠ b - a, where a = 256, b = 175

a − b = 256 − 175 = **81**
b − a = 175 − 256 = **Not a whole number**
Verified: a − b ≠ b − a

---

9. Show that a − (b − c) ≠ (a − b) − c for a = 12, b = 8, c = 5

a − (b − c) = 12 − (8 − 5) = 12 − 3 = **9**
(a − b) − c = (12 − 8) − 5 = 4 − 5 = **Not a whole number**
Verified

---

10. Verify b + c = a if a − b = c

(i) a = 5, b = 3 → c = a − b = 2
→ b + c = 3 + 2 = **5 = a** ✔

(ii) a = 23, b = 9 → c = 14
→ b + c = 9 + 14 = **23 = a** ✔

Verified

---

11. Verify commutative property for multiplication

(i) 30 × 14 = **420**, 14 × 30 = **420** ✔
(ii) 7 × 35 = **245**, 35 × 7 = **245** ✔
(iii) 0 × 54 = **0**, 54 × 0 = **0** ✔

Verified

---

12. Verify associative property for multiplication

(i) 3, 5, 7
(3 × 5) × 7 = 15 × 7 = **105**
3 × (5 × 7) = 3 × 35 = **105** ✔

(ii) 4, 5, 0
(4 × 5) × 0 = 20 × 0 = **0**
4 × (5 × 0) = 4 × 0 = **0** ✔

(iii) 13, 11, 12
(13 × 11) × 12 = 143 × 12 = **1716**
13 × (11 × 12) = 13 × 132 = **1716** ✔

Verified

---

13. a = 4, b = 3, c = 6

(i) a × (b + c) = 4 × (3 + 6) = 4 × 9 = **36**
(ii) ab + ac = 4×3 + 4×6 = 12 + 24 = **36** ✔

---

14. a = 8, b = 5, c = 2

(i) a × (b − c) = 8 × (5 − 2) = 8 × 3 = **24**
(ii) ab − ac = 8×5 − 8×2 = 40 − 16 = **24** ✔

---

15. a = 3, b = 5, c = 10

(i) a × (b + c) = 3 × (5 + 10) = 3 × 15 = **45**
ab + ac = 3×5 + 3×10 = 15 + 30 = **45** ✔

(ii) a × (b − c) = 3 × (5 − 10) = 3 × (−5) = **−15**
ab − ac = 3×5 − 3×10 = 15 − 30 = **−15** ✔

---

16. a = 84, b = 4

a ÷ b = 84 ÷ 4 = **21**
b ÷ a = 4 ÷ 84 = **Not a whole number**
Verified: a ÷ b ≠ b ÷ a

17. a = 24, b = 4, c = 2

(a ÷ b) ÷ c = (24 ÷ 4) ÷ 2 = 6 ÷ 2 = **3**
a ÷ (b ÷ c) = 24 ÷ (4 ÷ 2) = 24 ÷ 2 = **12**
Not equal

18. a = 64, b = 8, c = 4

(a ÷ b) ÷ c = (64 ÷ 8) ÷ 4 = 8 ÷ 4 = **2**
a ÷ (b ÷ c) = 64 ÷ (8 ÷ 4) = 64 ÷ 2 = **32**
Not equal

19. Divide and check using: Dividend = Divisor × Quotient + Remainder

(i) 456 ÷ 17
→ Quotient = **26**, Remainder = **14**
Check: 17 × 26 + 14 = 442 + 14 = **456** ✔

(ii) 259 ÷ 13
→ Quotient = **19**, Remainder = **12**
Check: 13 × 19 + 12 = 247 + 12 = **259** ✔

20. Verify b × c = a if a ÷ b = c

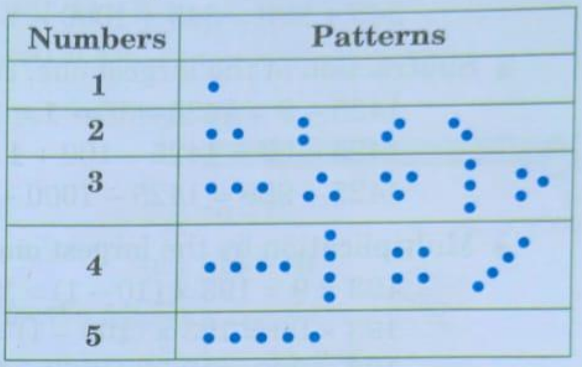
(i) a = 56, b = 7 → a ÷ b = 8
→ b × c = 7 × 8 = **56 = a** ✔

(ii) a = 156, b = 13 → a ÷ b = 12
→ b × c = 13 × 12 = **156 = a** ✔

2.4 PATTERNS IN WHOLE NUMBERS

Now, we shall learn how to arrange whole numbers in elementary shapes made up of dots. The shapes may be a line, a rectangle, a square, or a triangle. Every number should be arranged in one of these shapes. No other shape is allowed.

Let us try to represent different numbers, say 1 to 5, with the help of the patterns given at right :



2.4.1 RECTANGULAR NUMBERS

Numbers which can be split into two numbers such that both the numbers are greater than 1 are called rectangular numbers.

In rectangle, we take the number of rows smaller than the number of columns. Also, we should have more than one row in a rectangle.

For example :

$6 = 2 \times 3$ or 3×2

$10 = 2 \times 5$ or 5×2

$12 = 3 \times 4$ or 4×3 or 2×6 or 6×2

2.4.2 SQUARE NUMBERS

When a number is multiplied by itself, it gives a square number. In this case, the numbers of rows and columns are equal.

For example :

$1 \times 1 = 1$

$2 \times 2 = 4$

$3 \times 3 = 9$

$4 \times 4 = 16$

Remember

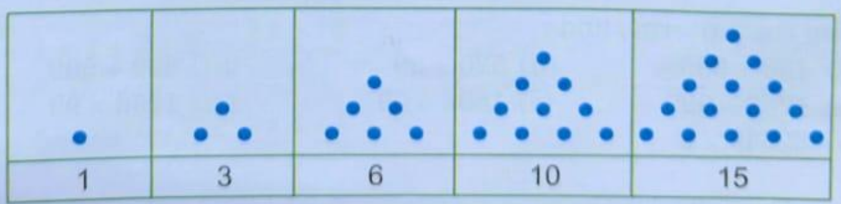
Every square number is also a rectangular number (except 1).

2.4.3 TRIANGULAR NUMBERS

Some numbers can also be arranged as triangles. These are called triangular numbers.

The triangle should be a right-angled triangle and its two sides must be equal. The number of dots in the rows starting from the bottom rows should be like 4, 3, 2, 1. The top row should always have 1 dot.

For example :



Here, the first triangular number is 1.
The second triangular number is 3 *i.e.*, 1 + 2.
The third triangular number is 6 *i.e.*, 1 + 2 + 3.
The fourth triangular number is 10 *i.e.*, 1 + 2 + 3 + 4 and so on.

2.4.4 SOME PATTERNS IN OPERATIONS OF WHOLE NUMBERS

- Addition of the largest one, two, three-digit numbers :

$345 + 9 = 345 + 10 - 1 = 355 - 1 = 354$

$345 + 99 = 345 + 100 - 1 = 445 - 1 = 444$

$345 + 999 = 345 + 1000 - 1 = 1345 - 1 = 1344$

- Subtraction of the largest one, two, three-digit numbers :

$1425 - 9 = 1425 - 10 + 1 = 1415 + 1 = 1416$

$1425 - 99 = 1425 - 100 + 1 = 1325 + 1 = 1326$

$1425 - 999 = 1425 - 1000 + 1 = 425 + 1 = 426$

- Multiplication by the largest one, two, three-digit numbers :

$193 \times 9 = 193 \times (10 - 1) = 1930 - 193 = 1737$

$193 \times 99 = 193 \times (100 - 1) = 19300 - 193 = 19107$

$193 \times 999 = 193 \times (1000 - 1) = 193000 - 193 = 192807$

EXAMPLE 13 : *Study the following pattern :*

$1 + 3 = 2 \times 2,\ 1 + 3 + 5 = 3 \times 3,\ 1 + 3 + 5 + 7 = 4 \times 4$

By observing the above pattern, the value of $1 + 3 + 5 + 7 + 9 + 11$ *is*

(a) 49 (b) 36 (c) 64 (d) 25

SOLUTION : $1 + 3 + 5 + 7 + 9 + 11 = 6 \times 6 = \mathbf{36}$

So, the option **(*b*)** is correct, which is the required answer.

EXERCISE 2.3

1. Represent the following numbers as rectangles : KNOWLEDGE APPLICATION

   (*i*) 6 (*ii*) 10 (*iii*) 12
   (*iv*) 14 (*v*) 18 (*vi*) 15

2. Represent the following numbers as squares :

   (*i*) 4 (*ii*) 9 (*iii*) 16
   (*iv*) 81 (*v*) 144 (*vi*) 12100

3. Represent the following numbers as triangles :

   (*i*) 6 (*ii*) 10 (*iii*) 21
   (*iv*) 28 (*v*) 36

4. Using the patterns, find : CRITICAL THINKING

   (*i*) 436 + 999 (*ii*) 526 + 99 (*iii*) 829 + 999
   (*iv*) 1256 – 999 (*v*) 1892 – 99 (*vi*) 1256 × 99
   (*vii*) 62939 × 9

Exercise 2.3

1. Representing Numbers as Rectangles

A **rectangle** has different possible length-width pairs. Represent each number as a product of two factors:

- **6** → 2×3
- **10** → 2×5
- **12** → 3×4 or 2×6
- **14** → 2×7
- **18** → 3×6 or 2×9
- **15** → **2.**

2. Representing Numbers as Squares:

A **square number** is the product of a number multiplied by itself:

- **4** → 2×2
- **9** → 3×3
- **16** → 4×4
- **81** → 9×9
- **144** → 12×12
- **12100** → 110×110

3. Representing Numbers as Triangles:

A **triangular number** follows the formula $T_n=n(n+1)/2$:

- **6** → $T_3=3+2+1$
- **10** → $T_4=4+3+2+1$
- **21** → $T_6=6+5+4+3+2+1$
- **28** → $T_7=7+6+5+4+3+2+1$
- **36** → $T_8=8+7+6+5+4+3+2+1$

4. Pattern-Based Calculations

Using number patterns for simplification:

- **(i) 436 + 999** = 436+(1000−1)=1436−1=1435
- **(ii) 526 + 99** = 526+(100−1)=626−1=625
- **(iii) 829 + 999** = 829+(1000−1)=1829−1=1828
- **(iv) 1256 - 999** = 1256−(1000−1)=256+1=257
- **(v) 1892 - 99** = 1892−(100−1)=1792+1=1793
- **(vi) 1256 × 99** = 1256×(100−1)=125600−1256=124344
- **(vii) 62939 × 9** = 62939×(10−1)=629390−62939=566451

MISCELLANEOUS EXERCISE

1. Represent the following on the number line : EXPERIENTIAL LEARNING

   (i) $8 + 6$ (ii) $12 - 7$ (iii) $11 - 9$ (iv) $14 - 2$

   (v) 3×2 (vi) 3×4 (vii) 5×4

2. Verify the closure property of addition in whole numbers for : KNOWLEDGE APPLICATION

   (i) $3 + 7$ (ii) $9 + 5$ (iii) $10 + 0$

   (iv) $16 + 0$ (v) $235 + 1$ (vi) $518 + 86$

3. Verify the associative property of addition for the following numbers :

   (i) 0, 8, 11 (ii) 58, 68, 5 (iii) 165, 32, 308

   (iv) 1235, 568, 0

4. If $a = 13$ and $b = 17$, verify the commutative property for multiplication such that $a \times b = b \times a$. CONCEPTUAL LEARNING

5. If $a = 35$, $b = 11$ and $c = 23$, verify the associative property for multiplication such that $(a \times b) \times c = a \times (b \times c)$. CONCEPTUAL LEARNING

6. Verify the distributive property for multiplication of the following : CONCEPTUAL LEARNING

   (i) $a \times (b + c)$ and (ii) $a \times (b - c)$, where $a = 28$, $b = 15$, $c = 12$.

7. If $a = 108$, $b = 9$ and $c = 3$, verify whether $(a \div b) \div c = a \div (b \div c)$.

8. If $a = 112$, $b = 56$ and $c = 98$, show that $a \times (b + c) = ab + ac$.

9. Is -5 a multiplicative inverse of $\frac{1}{5}$?

10. Is 2 an additive inverse of -2 ?

11. If $a = 8$ and $b = 5$, show that $a - b \neq b - a$.

CRITICAL THINKING

12. Study the following pattern :

$$1 \times 1 + 2 \times 2 = \frac{2 \times 3 \times 5}{6}$$

$$1 \times 1 + 2 \times 2 + 3 \times 3 = \frac{3 \times 4 \times 7}{6}$$

$$1 \times 1 + 2 \times 2 + 3 \times 3 + 4 \times 4 = \frac{4 \times 5 \times 9}{6}$$

By observing the above pattern, write next two steps.

1. Representing on the Number Line

To represent these on a number line, follow these steps:

- **(i) 8 + 6** → Start at **8**, move **6** steps forward → **Result: 14**
- **(ii) 12 - 7** → Start at **12**, move **7** steps backward → **Result: 5**
- **(iii) 11 - 9** → Start at **11**, move **9** steps backward → **Result: 2**
- **(iv) 14 - 2** → Start at **14**, move **2** steps backward → **Result: 12**
- **(v) 3 × 2** → Start at **0**, move in steps of **3**, two times → **Result: 6**
- **(vi) 3 × 4** → Start at **0**, move in steps of **3**, four times → **Result: 12**
- **(vii) 5 × 4** → Start at **0**, move in steps of **5**, four times → **Result: 20**

---

2. Closure Property of Addition in Whole Numbers

Closure property states that the sum of two whole numbers is always a whole number.

- **(i) 3 + 7 = 10** (Whole number ✅)
- **(ii) 9 + 5 = 14** (Whole number ✅)
- **(iii) 10 + 0 = 10** (Whole number ✅)
- **(iv) 16 + 0 = 16** (Whole number ✅)
- **(v) 235 + 1 = 236** (Whole number ✅)
- **(vi) 518 + 86 = 604** (Whole number ✅)

Since all sums are whole numbers, **closure property holds true**.

---

3. Associative Property of Addition

Associative property states that for any whole numbers **a, b, c**:

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

- **(i) (0 + 8) + 11 = 8 + 11 = 19**
  0 + (8 + 11) = 0 + 19 = 19 ✅
- **(ii) (58 + 68) + 5 = 126 + 5 = 131**
  58 + (68 + 5) = 58 + 73 = 131 ✅
- **(iii) (165 + 32) + 308 = 197 + 308 = 505**
  165 + (32 + 308) = 165 + 340 = 505 ✅
- **(iv) (1235 + 568) + 0 = 1803 + 0 = 1803**
  1235 + (568 + 0) = 1235 + 568 = 1803 ✅

Associative property verified!

---

4. Commutative Property of Multiplication

Commutative property states:

$a \times b = b \times a$

For **a = 13, b = 17**:

$13 \times 17 = 221$
$17 \times 13 = 221$

✅**Property holds true**.

---

5. Associative Property of Multiplication

Associative property states:

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

For **a = 35, b = 11, c = 23**:

$(35 \times 11) \times 23 = 385 \times 23 = 8855$
$35 \times (11 \times 23) = 35 \times 253 = 88555$

✅**Property holds true**.

---

6. Distributive Property

Distributive property states:

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

For **a = 28, b = 15, c = 12**:

$28 \times (15 + 12) = 28 \times 27 = 756$
$(28 \times 15) + (28 \times 12) = 420 + 336 = 756$

✅**Distributive property holds**.

---

7. Division Associativity

We check:

$(a \div b) \div c = a \div (b \div c)$

For **a = 108, b = 9, c = 3**:

$(108 \div 9) \div 3 = 12 \div 3 = 4$
$108 \div (9 \div 3) = 108 \div 3 = 36$

❌**Not equal! Associative property does not hold for division.**

---

8. Distributive Property in Multiplication

Check:

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

For **a = 112, b = 56, c = 98**:

$112 \times (56+98) = 112 \times 154 = 17248$
$(112 \times 56) + (112 \times 98) = 6272 + 10976 = 17248$

✅**Property holds true**.

---

9. Multiplicative Inverse Check

A **multiplicative inverse** of **x** is **1/x**.

For **-5** and **1/5**:

$-5 \times 1/5 = -1$

❌**Not 1, so -5 is NOT the multiplicative inverse of 1/5.**

---

10. Additive Inverse Check

An **additive inverse** of **x** is **-x**.

For **2 and -2**:

$2 + (-2) = 0$

✅**Yes, 2 is the additive inverse of -2.**

---

11. Subtraction is Not Commutative

To verify:

$a - b \neq b - a$

For **a = 8, b = 5**:

$8 - 5 = 3$
$5 - 8 = -3$

✅**Not equal, so subtraction is NOT commutative.**

---

12. Pattern Observation

Given pattern:

$1^2+2^2=2×3×5/6$
$1^2+2^2+3^2=3×4×7/6$
$1^2+2^2+3^2+4^2=4×5×9/6$

Observing the pattern, the general form is:

$1^2+2^2+...+n^2=n(n+1)(2n+1)/6$

Next two steps:

$1^2+2^2+3^2+4^2+5^2=5×6×11/ 6 \ =55$

$1^2+2^2+3^2+4^2+5^2+6^2=6×7×13/6=91$

ASSERTION AND REASON

In each of the following questions, an Assertion (A) and a corresponding Reason (R) supporting it is given.

Study both the statements and state which of the following is correct.

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true, but R is false.

(d) A is false, but R is true.

1. **Assertion (A) :** If the product of two whole numbers is zero, then atleast one of them must be zero. c
   Reason (R) : Zero is called the multiplicative identity for whole numbers.
2. **Assertion (A) :** -5 lies to the right of -8 on the number line.
   Reason (R) : Farther a number from zero on the left, smaller is its value. b
3. **Assertion (A) :** Any non-zero whole number divided by itself gives the quotient 1.
   Reason (R) : $24 \div 24 = 1$ a
4. **Assertion (A) :** The product of any number and one is zero.
   Reason (R) : $472 \times 1 = 472$ d

Things to Remember :

1. The number '0' together with the natural numbers are called whole numbers. 0, 1, 2, 3, 4, 5, ... are whole numbers.
2. '0' is the smallest whole number.
3. '0' does not have a predecessor whole number.
4. Every natural number is also a whole number.
5. **Properties of Addition of whole numbers :**
   (i) *Closure property* : Addition of whole numbers is a closed operation.
   (ii) *Commutative property* : If a and b are two whole numbers, then $a + b = b + a$.
   (iii) *Associative property* : If a, b, c are any whole numbers, then $a + (b + c) = (a + b) + c$
   (iv) *Additive identity* : Zero is the additive identity for whole numbers.
6. **Properties of Subtraction of whole numbers :**
   (i) *Closure property* : The closure property does not hold good for subtraction of whole numbers.
   (ii) *Commutative property* : The commutative property does not hold good for subtraction of whole numbers *i.e.* if a and b are two whole numbers, then in general, $a - b \neq b - a$.
   (iii) *Associative property* : The associative property does not hold good for subtraction of whole numbers. *i.e.* if a, b, c are whole numbers and $c \neq 0$, then $a - (b - c) \neq (a - b) - c$.
   (iv) If 0 is subtracted from a whole number, then the result is the number itself.
   (v) If a, b, c are whole numbers such that $a - b = c$, then $b + c = a$

7. **Properties of Multiplication of whole numbers :**
   (*i*) *Closure property* : If a and b are whole numbers and $a \times b = c$, then c is also a whole number.
   (*ii*) *Commutative property* : If a and b are whole numbers, then $a \times b = b \times a$.
   (*iii*) *Associative property* : If a, b and c are three whole numbers, then $a \times (b \times c) = (a \times b) \times c$.
   (*iv*) *Multiplicative identity* : 0 is the multiplicative identity for whole numbers.
   (*v*) *Distributive property* : If a, b and c are three whole numbers, then
   $a \times (b + c) = a \times b + a \times c$ or $(b + c) \times a = b \times a + c \times a$
   $a \times (b - c) = a \times b - a \times c$ or $(b - c) \times a = b \times a - c \times a$
8. **Properties of Division of whole numbers :**
   (*i*) If a and b are whole numbers, then $a \div b$ may or may not represent a whole number.
   (*ii*) If 'a' is a whole number, then $a \div 1 = a$.
   (*iii*) If a is a whole number, then $a \div a = 1$.
   (*iv*) If zero is divided by any whole number except zero, the quotient is zero.
9. **Dividend = (Divisor × Quotient) + Remainder.**

CHAPTER TEST 2

1. Which of the following is correct ?
   (*a*) $(20 \div 5) \div 4 = 20 \div (5 \div 4)$
   (*b*) $(20 \div 4) \div 5 = 20 \div (4 \div 5)$
   (*c*) $(20 \div 5) \div 4 \neq 20 \div (5 \div 4)$
   (*d*) All of the above
2. Write the smallest natural number and the smallest whole number.
3. Find the value of $5 \times 12 \times 8 \times 0 \times 10$.
4. Study the following pattern :
   $$1 = \frac{1 \times 2}{2}, 1 + 2 = \frac{2 \times 3}{2}, 1 + 2 + 3 = \frac{3 \times 4}{2}$$
   By observing the above pattern, find the value of $1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10$.
5. If $a = 5$, $b = 2$ and $c = 4$, then find the value of $a \times (b + c)$.
6. If $a = 28$, $b = 19$ and $c = 5$, then verify that $a \times (b \times c) = (a \times b) \times c$.
7. If $a = 115$ and $b = 98$, then show that $a - b \neq b - a$.
8. If $a = 20$, $b = 5$ and $c = 2$, find $(a \div b) \div c$.
9. Fill in the blanks :
   (*i*) $689 \times 0 =$ ______
   (*ii*) $4584 \div 4584 =$ ______
   (*iii*) $6258 \times 69 = 69 \times$ ______
   (*iv*) $1 \times$ ______ $= 99999$
10. Verify that $b \times c = a$ if $a \div b = c$, for $a = 50$ and $b = 10$.

Chapter test 2

1. **Which of the following is correct?**
    - Option **(c)**

    $(20\div5)\div4=(4)\div4=1$
    $20\div5\div4=4\div4=1$
    Since both sides are equal, option **(c) is correct**.

2. **Write the smallest natural number and the smallest whole number.**
    - The **smallest natural number** is **1**.
    - The **smallest whole number** is **0**.
3. **Find the value of $5\times12\times8\times0\times10$.**
    - Any number multiplied by **0** results in **0**.
    - So, the answer is **0**.
4. **Study the given pattern:**
    - 1=(1x2)/2, 1+2=(2x3)/2 , 1+2+3= (3x4)/2 etc.
    - The sum of the first n natural numbers is given by the formula:

      $S_n=n(n+1)/2$

    - **For n=10,**

      S_{10}= [10 x (10+1)] / 2 = 10×11/2= 110/2 = 55

    - So, the sum is **55.**
5.
6. **If c=28,b=19 and a=5, verify that $a\times(b+c)=(a\times b)+(a\times c)$.**
    - LHS:

      $5\times(19+28)=5\times47=235$

    - RHS:

      $(5\times19)+(5\times28)=95+140=235$

    - Since LHS = RHS, the property is verified.
7. **If a=115 and b=98 , then verify that $a\times b=b\times a$.**
    - LHS: $115\times98=11270$
    - RHS: $98\times115=11270$
    - Since LHS = RHS, the property is verified.
8. **If a=20, b=5 and c=2, find $(a+b)\times c$.**
    - $(20+5)\times2=25\times2=50$
    - Answer: **50**.
9. **Fill in the blanks:**
    - (i) $689\times0=0$
    - (ii) $6258\times69=69\times6258$ (Commutative Property)
    - (iii) $4584\div4584=1$
    - (iv) $1\times99999=99999$.
10. **Verify that $b\times c=a$ if $a=b\times c$ for $5\times2=10$**
    $5\times2=10$ 5 holds true. Hence, verification is complete.