

Master Lesson Plan

For

Whole Numbers

Board	Standard	Subject	Chapter	Language	Reference Link	Creation date
CBSE	STD VI	Mathematics	Whole Numbers	English	Whole Numbers	2019-03-01 12:15:08

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Whole Numbers

1. MS_Objectives_Whole Numbers

Notes to the teacher:

This asset lays down the proposed plan for transacting this chapter. It states the asset objectives of the MLP. This asset is for teacher's reference and need not be taught to the students.

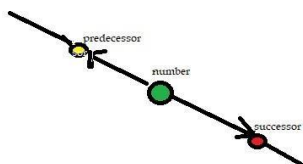
Students will be able to:

- 1) To identify zero by recalling the concept of Predecessor and Successor.
- 2) To show zero is also a number of the set whole numbers.
- 3) To define and describe the number line and its basic operations.
- 4) To determine the number line operations through fun based activity.
- 5) To correlate the objects related with number line.
- 6) To solve the different types of questions using the concept of predecessor, successor and number line.
- 7) To explain the properties of whole numbers with suitable examples.
- 8) To determine the commutative and associative property of addition.
- 9) To solve the questions using the properties of Addition.
- 10) To recall the properties of whole number, the operation multiplication, the closure property for Division by Zero.
- 11) To check the commutative and Associative Property for multiplication through an activity.
- 12) To solve the problems using properties of whole numbers.
- 13) To practice tolerance, love and kindness adjusting to all kind of people.
- 14) To describe the concept of distributive property through example.
- 15) To determine the distributive property of multiplication over addition on Whole numbers.
- 16) To take delight in learning about the Interesting question on division by zero.
- 17) To explain the Identity Property of Zero and One through examples.
- 18) To solve the different types of questions using the properties of Whole numbers.
- 19) To have the advantage of distributive property with the numbers in a calendar.
- 20) To identify the different number patterns in whole numbers.
- 21) To classify the short cut methods of arithmetic operations.
- 22) To get a taste of Happy Numbers.
- 23) To identify the pattern and solve the problems.
- 24) To explain through examples that the properties of whole numbers are not true for subtraction and division.

Time to teach	Asset Type	Theme	SubTheme
2 Minutes	Main Script	Whole Numbers	

2. IQ_Whole Numbers_Introduction of Zero

For a given number, number + 1 is known as **successor** and number - 1 is called the **predecessor**.



original image (girijashankaran@gmail.com)

In the above figure, the green colour denotes any number for which the Predecessor and Successor are identified.

Example: Let the number be 2000. Successor $2000 + 1 = 2001$, Predecessor $2000 - 1 = 1999$

1. Do you know the successor of the smallest 3 digit number?
2. What would be the predecessor of the largest four digit number?
3. Does the least natural number has predecessor?
4. What would be the successor and predecessor of 1?
5. Every whole number has a successor. True or False. Justify.

Answer:

1. 101
2. 9998
3. No (The least or smallest natural number is 1)
4. The successor of 1 is 2. The Predecessor of 1 is 0.
5. True, any whole number + 1 is the successor of the number.

Hence when "Zero" is added to the set of Natural Numbers the set is named as "Whole Numbers".

Time to teach	Asset Type	Theme	SubTheme
5 Minutes	Inquisitive Questions	Whole Numbers	Does 1 have a succesor and a predecessor?

3. SA_Predecessor of 1

Aim: To introduce the number Zero

Setting of Activity: Classroom

Type of Activity: Demonstration by Teacher to students- Group Activity Materials: 5 pens.

How to introduce zero?

Dialogue between the Teacher and the students

Teacher gets 5 pens from the children. She keeps it on the table.

Teacher: (Pointing one student asks) how many pens are there?

Student: 5 pens are there.

Teacher: Teacher removes one pen and asks another student how many are there?

Student: There are 4 pens on the table. (Teacher explains $5 - 1 = 4$) Teacher: I remove one more pen .How many are left now?

Student: 3 pens are there (Teacher explains $4 - 1 = 3$)

(Teacher repeats the process till there is one pen on the table.)

Teacher: There is only one pen on the table. I remove that pen also. What is remaining on the table?

Student: No. Nothing on the table.

Teacher: How do we say nothing?

Student: Empty.

Teacher: Empty means "Zero" We introduce Zero as a number when there is no pen.

Teacher: So when this Zero is added to Natural Numbers this becomes Whole Numbers.

Hence 0 is used to denote the absence of an object.

Conclusion: The concept of Zero is introduced.

Time to teach	Asset Type	Theme	SubTheme
5 Minutes	Suggested Activity	Whole Numbers	Does 1 have a successor and a predecessor?

4. MS_Number Line And Its Basic Operations

How to draw a number line?

- Draw a line.
- Mark a point on the line and label it as 0.
- Mark a second point taking unit distance from zero on the line to the right of 0 and label it as 1.
- Mark a point to the right of 1 at a unit distance on the line. Label this as 2.

- Continue as before and mark numbers up to 15.
- This line is called number line.



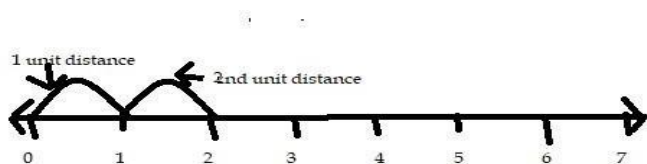
Original (girijashankeran@gmail.com)

How to represent numbers on number line?

Suppose the number is 2.

We have to measure from 0. We know distance between 0 and 1 is one unit distance and the distance between 1 and 2 is one unit distance. Therefore 2 is at two unit distances from 0.

We measure the distance as follows:



Instead of saying measuring unit distance we also say make jumps from 0. Every jump should cover one unit distance.

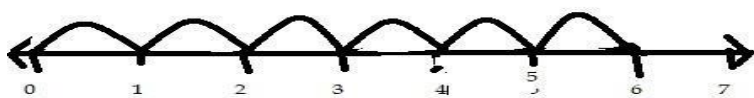
How to jump?

If we have + sign then we jump towards right.

If we have – sign then we jump towards left.

Represent 6 on the number line.

Ans: Make 6 jumps from 0.



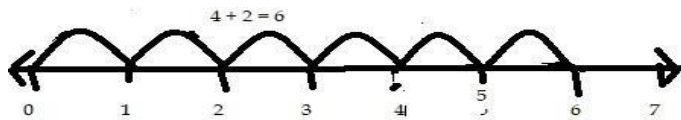
Basic Operations on Number Line:

Addition on number line to add $4 + 2$.

First make 4 jumps from 0 to represent 4.

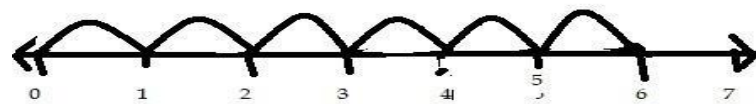
Since the next is $+2$ make 2 jumps from 4 towards right.

From the figure it is clear that $4 + 2 = 6$.

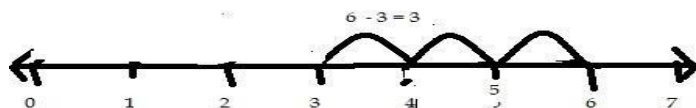


Subtraction on number line to find $6 - 3$.

First make 6 jumps from 0 to represent 6.



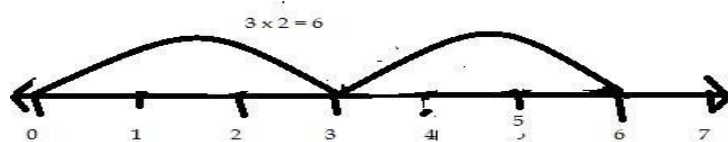
From 6, make 3 jumps towards left.



Now, $6 - 3 = 3$.

Multiplication on number line To find 3×2 .

3×2 means you have to make 3 jumps and do it two times.



From the figure it is clear that 3×2 gives 6.

All above images are original (girijashankaran@gmail.com)

Time to teach	Asset Type	Theme	SubTheme
15 Minutes	Main Script	Whole Numbers	Addition on a number line

5. SA_Number Line Activity

Aim: To introduce number line and perform operations using a simple fun based activity

Setting of activity: Classroom

Type of activity: Group

Material Required: Flash cards each containing a number from 0 to 10

Procedure

Step 1: Teacher draws a line on the floor.

Step 2: Distribute the cards to 11 students and make the students sit on the line at equal distance.

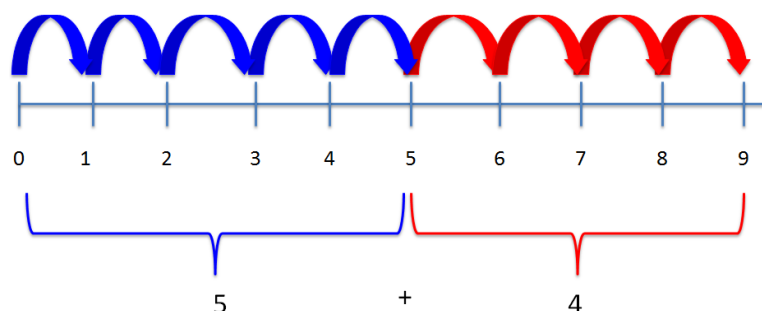
Step 3: Call each student and give them an expression involving single addition or subtraction or multiplication.

Step 4: Ask them to give the answer by doing jumps on the number line.

Example

Hopping on the Number Line

How $5 + 4$ is done is explained



Students are encouraged to predict sums, minus and multiplication.

Instructional Plan

Tell the students that they will find sums using the number line.

Demonstrate with a counter how a hop of 5 is taken on the number line.

Encourage students to count aloud as the hop is made.

3) Then make a hop of 4, starting at the place the counter landed.

4) Describe the moves this way: If you take a hop of 5 spaces and then a hop of 4 spaces, you land on 9.

Highlight the fact that, spaces are counted, not points on the number line.

Write any 2 problems each on Addition, Subtraction and Multiplication. (Preferably numbers should be small) Ask them to find the answer on number line by drawing hops (jumps).

Conclusion - Students will be able to use the number line effectively and they learn to perform Arithmetic operations on number line.

All images Original (girijashankaran@gmail.com)

Time to teach	Asset Type	Theme	SubTheme
20 Minutes	Suggested Activity	Whole Numbers	Multiplication on a number line

6. DD_Application of Number lines in daily life

Every day we come across measurements using rulers, inch tape, meter scale etc. All of these represent number line.

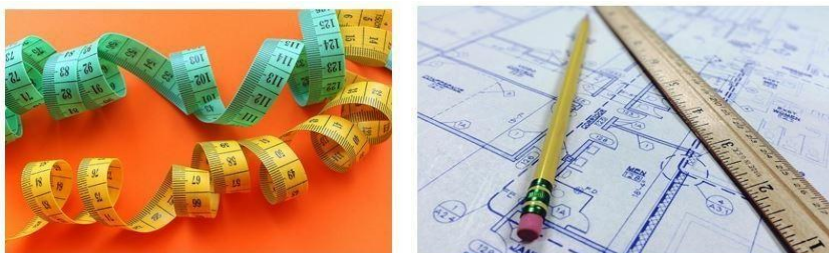
When you buy a cloth in a textile, the salesman uses a measuring tape to measure the cloth and cuts it.

Engineers use the measurement tapes to calculate the area of the road or building in order to get the right structures.

Examples: The tailors use the inch tapes to get the measurement of the person's hands, leg, neck, hip etc. for stitching the cloth to their exact fit.

Meter Scales are used in Textile Shops for measuring the Cloth.

The following are the sources for the images in the same order



Measuring Tape - <https://pixabay.com/en/measurement-krawiecka-meter-3176115/>

Measuring Tape - <https://pixabay.com/en/alphabet-word-images-construction-1296137/>

Measuring Tape - <https://pixabay.com/en/blueprint-ruler-architecture-964629>

Time to teach	Asset Type	Theme	SubTheme
5 Minutes	Day-to-day Relevance	Whole Numbers	Addition on a number line

7. QA_Assessments on Number Line

Answer the Questions:

I) Which is the smallest whole number?

II) Say True or False

- (a) The smallest natural number is Zero
- (b) 400 is the predecessor of 399.
- (c) Zero is the smallest whole number.
- (d) 600 is the successor of 599.
- (e) All natural numbers are whole numbers.
- (f) All whole numbers are natural numbers.
- (g) The predecessor of a two digit number is never a single digit number.
- (h) 1 is the smallest whole number.
- (i) The natural number 1 has no predecessor.
- (j) The whole number 1 has no predecessor.
- (k) The whole number 13 lies between 11 and 12.
- (l) The whole number 0 has no predecessor.
- (m) The successor of a two digit number is always a two digit number.

III Using number line find the answer to the following:

- 1. Add $7 + 5$ using number line.
- 2. Subtract the smallest even natural number from the biggest single digit number using number line.
- 3. Multiply the even prime number by 3 using number line.

IV Using Number Line answer the following questions:

a)

Question - There are 6 birds sitting on the fence, 2 more join them. Place them on the line.
How many birds are on the fence?



b)

Question - If we stand on 4, how many jumps are there to 15? (count forwards). If I have 16 apples and my friends eat 6, how many are left? (count backwards).



c) What is $160 - 16$?

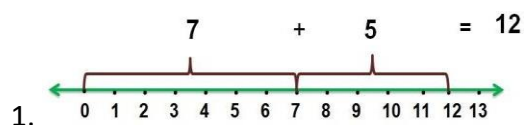
Answers:

I. 0.

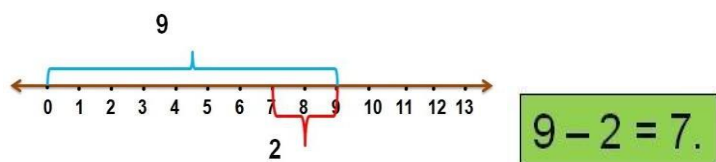
II a. False.(b) False (c) True (d) True (e) True (f) False (g) False (h) False (i) True (j) False (k)

False (l) True (m) False

III



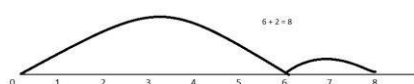
2. (2 is the smallest even natural number.)



3) $2 \times 3 = 6$

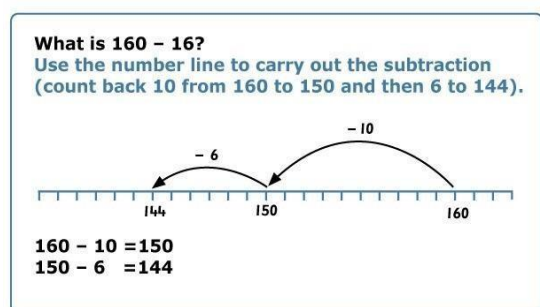


IV a)



b) 11 jumps and 10 apples.

c)



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Time to teach	Asset Type	Theme	SubTheme
20 Minutes	Assessments	Whole Numbers	Subtraction on a number line

8. MS_Properties of Whole Numbers-Addition

Closure property of whole numbers under addition

1) $2 + 4 = 6$ 2) $20 + 9 = 29$ 3) $0 + 2 = 2$

Here the sum of 2 whole numbers is found. Sum of these whole numbers is also a whole number.

Therefore, sum of whole numbers is also a whole number.

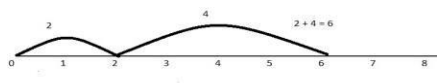
So, we say whole numbers are closed under addition.

This is called closure property with respect to addition

Consider $2 + 4$.

On the number line, the whole numbers lie on the right side of 0.

Now to add $2 + 4$, first we take 2 jumps towards right and reach 2, and then take 4 jumps towards right and reach 6, a whole number.



Commutative property

Teacher introduces commutative property by asking the following question.

Ex: 1

You and your brother visit a restaurant and both of you order sandwich and noodles. You first eat noodles followed by sandwich but your brother first finishes off sandwich and then eats noodles. Finally, both of you had the same food but in different order. It does not make any difference in the order you both ate the food.

Suppose on the other hand, you are starting for school and putting on your shoes and socks. You first wear your socks and then your shoes.

One day for a change, could you change the order?

Well, it is impossible.

In hotel, we are able to change the order **but** with shoes and socks we are not able to change the order.

If the order can be changed and the answer remains the same, then this property is known as commutative property.

Ex: 2

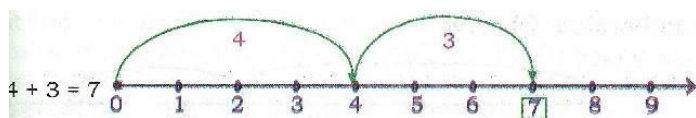
Now let us look at two whole numbers say 4 and 3.

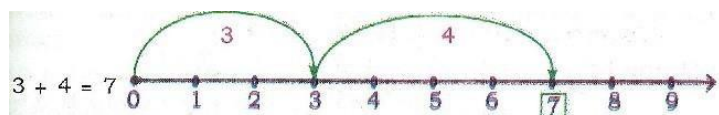
Let us add 4 and 3.

One person may do $4 + 3$, and the other may do $3 + 4$. Is there any difference? No. Both will get the same answer 7 i.e. $4 + 3 = 3 + 4 = 7$

Addition of whole numbers can be done in any order.

This example can be shown by representing in the number line.





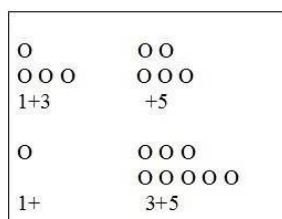
In general the sum remains same though the numbers are interchanged. This property is true for all the whole numbers. This property is called commutative property with respect to addition.

This is written as $a + b = b + a$ for all whole numbers a & b .

Associative property

Ex1:

Suppose, I have 3 whole numbers 1, 3, 5. What do I get if I first add them as $(1 + 3) + 5$ and then add them as $1 + (3 + 5)$.



$$(1+3)+5 = 4 + 5 = 9 \quad 1 + (3+5) = 1 + 8 = 9$$

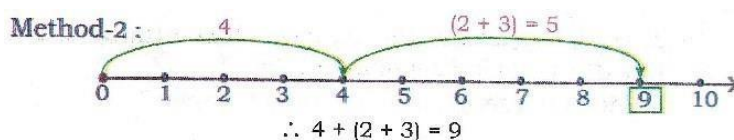
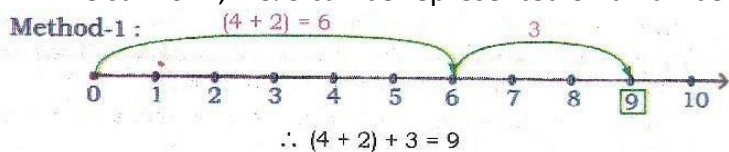
$$\text{i.e. } (1+3)+5 = 1+(3+5)$$

The way we associate the number does not change the value.

In general, if a, b, c are any three whole numbers, then $a+(b+c) = (a+b)+c$. This property of whole numbers is called associative property of addition.

Ex:2

The sum of 4, 2 & 3 can be represented on a number line in 2 different methods.



$$\text{Hence } (4 + 2) + 3 = 4 + (2 + 3)$$

$$\begin{array}{rcl} 6 + 3 & = & 4 + 5 \\ 9 & = & 9 \end{array}$$

All images Original (girijashankaran@gmail.com)

Time to teach	Asset Type	Theme	SubTheme
30 Minutes	Main Script	Whole Numbers	Commutative property under addition &

multiplication

9. SA_Verification of Commutativity and Associativity for Addition of Whole Numbers

Aim: To verify Commutative and Associative properties of addition.

Type of Activity: Group.

Setting of Activity: Classroom.

Materials required: 9 pens.

Procedure:

Commutative Property

Step 1: Take 3 pens and place it on the table.

Step 2: Take 4 more pens and add them with the 3 pens which is there already on the Table.

Step 3 : Total no of pens is 7. Again reverse the process of counting taking 4 pens first and then 3. Now also the sum is 7. Hence the commutative property is verified. $(3 + 4) = (4 + 3)$ i.e. $(a + b) = (b + a)$

Associative Property for Addition

Step 1: First take 2 pens and keep it on the table. Write on the board 2.

Step 2: Take 3 pens and add them to the other 2 pens. Write $(2 + 3)$.

Step 3: Now take them together and show them to the students. Ask how many pens are there. The answer must be 5.

Step 4: Now add 4 pens to the group and ask the students how many. The answer must be 9.

Write on the board $(2 + 3) + 4 = 9$.

Step 5: Now keep 2 pens on the table. Write on the board 2.

Step 6: Take in one hand 3 pens and 4 pens in the other hand. Show them to the students and ask them how many. The answer must be 7. Write on the board $(3 + 4)$.

Step 7: Now add these 7 pens to the 2 pens on the table. Take them together ask how many pens. The answer must be 9. Write on the board $2 + (3 + 4)$.

Step 8: Explain, in the second method the pens are associated in a different way from the first but the answers are the same.

Conclusion:

Commutative Property and Associative property of addition is verified.

Time to teach	Asset Type	Theme	SubTheme
10 Minutes	Suggested Activity	Whole Numbers	Commutative property under addition & multiplication

10. QA_Assessment on Properties of Addition

1. Find the sum using closure property:

- a) $1331 + 2104$
- b) $130 + 542 + 316$

2. Complete the following:

- a) $617 + 349 = \underline{\hspace{2cm}} + 617$
- b) $721 + \underline{\hspace{2cm}} = 9,333 + 721$
- c) $4,286 + \underline{\hspace{2cm}} = 4,826$
- d) $872 + (455 + \underline{\hspace{2cm}}) = (872 + 228) + 455$

3. State the properties in each of the following:

$$x + y = y + x \underline{\hspace{2cm}}$$

$$p + (q + r) = (p + q) + r \underline{\hspace{2cm}}$$

4. Verify associative property for the following:

$$832 + 246 + 128$$

$$516 + 484 + 337$$

5. Use suitable order to evaluate:

$$135 + 271 + 129$$

$$434 + 129 + 126$$

Answers:

- 1. (a) 3435
(b) 988
- 2. (a) 349
(b) 9,333
(c) 0
(d) 228
- 3. (a) Commutative property for addition
(b) Associative property for addition.
- 4. (a) $832 + (246 + 129) = (832 + 246) + 129 = 1207$
(b) $(516 + 484) + 337 = 516 + (484 + 337) = 1337$
- 5. (a) $135 + (271 + 129) = 135 + 400 = 535$
(b) $(434 + 126) + 129 = 560 + 129 = 689$

Time to teach	Asset Type	Theme	SubTheme
10 Minutes	Assessments	Whole Numbers	Commutative property under addition & multiplication

11. Properties of Whole Numbers -Multiplication and Division by Zero

Multiplication of whole numbers is closed.

Ex 1

1) $3 \times 4 = 12$ 2) $0 \times 8 = 0$

In the above examples, you can see that the product obtained by multiplication of whole numbers is also a whole number. In fact product of whole numbers is always a whole number.

In general, if a & b are whole numbers, then their product ab is also a whole number.

Ex: 2

Consider 2 whole numbers 5 and 3.

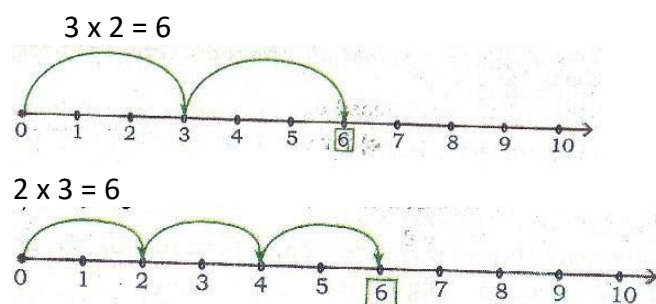
Let us multiply 5 and 3.

Again, one person may do 5×3 , and the other may do 3×5 . Is there any difference?

No. Both will get 15.

Multiplication of whole numbers can be done in any order

Ex 3:



We can see that $3 \times 2 = 2 \times 3 = 6$.

From these examples it is clear that the product of given whole numbers remain same though they are multiplied by interchanging. In fact this is true for all whole numbers. This is called commutative property of multiplication

This can be generalized as $a \times b = b \times a$ for all whole numbers a & b

Associative Property

Ex:1

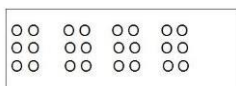
Suppose in a box 2 objects can be arranged in each row. The box has 3 rows. Suppose we have 4 such boxes.

Then how many objects do we have?

Each row has 2 objects and hence the number of objects in a box = $3 \times 2 = 2 \times 3$

(Multiplication is Commutative) = 6.

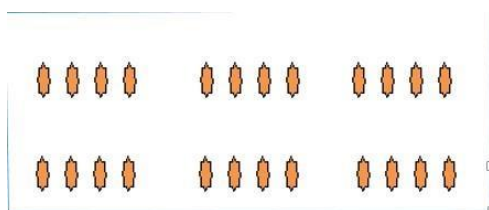
Then the total number of objects in 4 boxes = $4 \times (2 \times 3) = 4 \times 6 = 24$.



Suppose in another box 4 objects can be arranged in each row. The box has 2 rows.

Suppose we have 3 such boxes. Then how many objects do we have?

Then the total number of objects in 3 boxes = $(4 \times 2) \times 3 = 8 \times 3 = 24$.



From the above 2 figures we can see that $4 \times (2 \times 3) = (4 \times 2) \times 3$.

In general, if a, b, c are any three whole numbers, then

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

This property of whole numbers is called associative property for multiplication.

Ex:2

Find $10 \times 7 \times 3$ in two ways.

$$\text{Solution : } (10 \times 7) \times 3 = 70 \times 3 = 210$$

$$10 \times (7 \times 3) = 10 \times 21 = 210$$

From the above examples we can see that though the given whole numbers are multiplied by grouping in different ways the product remains same. This property is called associative property of multiplication.

This can be generalized as $(a \times b) \times c = a \times (b \times c)$ for all whole numbers a, b and c .

Division by zero

Suppose I have 2 pencils and 4 friends and I have decided not to give them the pencils.

Let us now try $2 \div 0$. Now division is repeated subtraction.

$$2 - 0 = 2 \text{ one time}$$

$$2 - 0 = 2 \text{ two times}$$

$$2 - 0 = 2 \text{ three times}$$

$$2 - 0 = 2 \text{ four times}$$

Every time, I am left with 2 pencils. This is true if I have 8 pencils, 20 pencils and so on.

Why is it so?

The reason is division of a whole number by zero is not defined.

All images are Original contribution (girijashankaran@gmail.com)

Time to teach	Asset Type	Theme	SubTheme
15 Minutes	Main Script	Whole Numbers	Closure property under addition & multiplication

12. SA_Verification of Commutative and Associative Property for Multiplication of Whole Numbers

Aim: To verify commutative property using multiplication.

Materials Required: Small cards (Number of cards must be at least 40 for each group.
(Teacher can ask each student to bring 10 cards).

Setting of Activity: Indoor (Classroom)

Type of Activity: Group

Procedure:

Step 1: Divide the class into 4 groups where each group will consist of 4 to 5 students.

Step 2: For each group, assign two distinct whole numbers.

Step 3: On one half of the board draw 20 small squares such that in each row there are 4 squares. On the other half of the board draw 20 small squares such that in each row there are 5 squares.

Step 4: Ask the students to count the squares on both sides. Well the answer must be 20.

Step 5: Explain in the first case, there are 4 square in a row and there are 5 such rows.

Therefore, the number squares = no. of rows x no. of squares = $4 \times 5 = 20$.

In the second case, there are 5 square in a row and there are 4 such rows. Therefore, the number of squares is = no. of rows x no. of squares in each row = $5 \times 4 = 20$.

Step 6: Write on the board $4 \times 5 = 5 \times 4$.



Step 7: Ask the students to verify their multiplication.

Associative Property

The same Activity can be verified for Associativity also.

Each group will be given whole numbers between 1 to 6. {Example (1,2,6), (2,3,4), (3,4,1), (2,4,6), (2,5,3)} Verify the Associative property for multiplication of Whole numbers by considering any three whole numbers.

Conclusion: Commutative property and Associative property for multiplication of whole numbers is verified.

All images are original contribution by (girijashankeran@gmail.com)

Time to teach	Asset Type	Theme	SubTheme
15 Minutes	Suggested Activity	Whole Numbers	Associative property under addition &

multiplication

13. QA_Questions on Properties of Whole numbers-Multiplication

Solve the following by suitable arrangement using the properties of Multiplication.

I. (a) $2 \times 1768 \times 50$. (Hint - $(2 \times 50) \times 1768 = 100 \times 1768$)

(b) $4 \times 166 \times 25$.

(c) $8 \times 291 \times 125$.

(d) $625 \times 279 \times 16$.

(e) $285 \times 5 \times 60$.

(f) $125 \times 40 \times 8 \times 25$. Hint $(125 \times 8) \times (40 \times 25)$

II. Find the product of the following:

(a) $8 \times 15 \times 125$.

(b) $250 \times 17 \times 4$.

(c) $842 + 1246 + 158$.

(d) $496 + 502 + 254$.

(e) $914 + 412 + 86$.

Answers:

I. (a) 1,76,800 (b) 16,600 (c) 2,91,000 (d) 27,90,000 (e) 85,500 (f) $(125 \times 8) \times (40 \times 25) = 10,00,000$

II. (a) 15000 (b) 17000 (c) 2246 (d) 1252 (e) 1412

Time to teach	Asset Type	Theme	SubTheme
10 Minutes	Assessments	Whole Numbers	Commutative property under addition & multiplication

14. VC_Truth and Commutative Property

Unity in the midst of diversity

We just learned that any two whole numbers can be added or multiplied in any order and the resultant values in both cases will be same though they look different physically.

For e.g. In case of addition, $4+5 = 9$ and $5+4=9$.

In case of Multiplication, $5 \times 4=20$ and $4 \times 5=20$. In other words, the sum or the product of two whole numbers remains the same even if the order of whole numbers is changed.

Similarly, people around us may be different physically or intellectually. Someone may be tall or someone may be short. Someone may be dark & someone may be fair. There may be different food habits, different religions and different cultures. We may all speak several different languages. But, we all are human beings first. We all share same emotions and aspirations.

So, in reality the union of all kinds of people constitutes life. Hence, it becomes very important that we show tolerance, love and kindness to all, help each other and bring peace and joy.

Song:

We shall give to all we meet loving kindness

Helping in the hour of need bringing light, peace and joy

We are brothers sisters all in loving kindness
Sharing with our fellowmen, we are one small world

Song link: <http://sssbpt.org/audio/EHV/Track2.mp3>

Time to teach	Value Type	Value Sub Type	Value Attribute
3 Minutes	Peace	Self-Discipline	Songs

15. MS_Distributive property of multiplication over addition of Whole Numbers

Distributive Property of multiplication over addition on whole numbers

Consider the below examples:

Ex 1:

Consider 3 numbers 6, 8 & 9

$$\begin{aligned} \text{Then LHS } 6 \times (8 + 9) &= \text{RHS } (6 \times 8) + (6 \times 9) \\ 6 \times 17 &= 48 + 54 \\ 102 &= 102 \end{aligned}$$

We can see that LHS = RHS

$$6 \times (8 + 9) = (6 \times 8) + (6 \times 9)$$

Ex 2:

Rahim works part time in a bakery. He works 3 hours on Saturday & 4 hours on Sunday. If he earns Rs. 50 for an hour, how much did he earn on those 2 days?

We can calculate this in 2 methods:

Method 1

$$50 \times (3+4) = 50 \times 7 = \text{Rs. } 350$$

Method 2

$$(50 \times 3) + (50 \times 4) = 150 + 200 = \text{Rs. } 350$$

He earned the following on those 2 days = Rs 350

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

This property is called distributive property of multiplication over addition.

Ex3:

Solve using **distributive** property:

$$\begin{aligned} \text{a) Find } 12 \times 35 & \qquad \text{b) } 126 \times 55 + 126 \times 45 \\ = 12 \times (30+5) & \qquad = 126 \times (55+45) \\ = 12 \times 30 + 12 \times 5 & \qquad = 126 \times 100 \\ = 360 + 60 & \qquad = 12600 \\ = 420 & \end{aligned}$$

Time to teach	Asset Type	Theme	SubTheme
10 Minutes	Main Script	Whole Numbers	Distributive property under addition & multiplication

16. SA_Activity -Distributive Property of multiplication over addition on whole numbers

Aim: To verify Distributive Property of multiplication over addition on whole numbers.

Material Needed: 2 sheets, scale, scissor

Setting of the Activity: Indoor (Classroom)

Type of Activity: Individual

Procedure:

Step 1: Take one sheet and divide the sheet into 6 rows and 8 columns. Number the rows and columns as shown below.

1	2	3	4	5	6	7	8
2							
3							
4							
5							
6							

Step 2: Ask them to count the number of boxes in one row. The answer is 8. Then ask them to count the number of rows in one column. The answer must be 6. The total number of boxes = $6 \times 8 = 48$.

Step 3: Repeat step 1 for the second sheet.

Step 4: Cut the second sheet into 2 pieces so that one piece has 6 rows and 5 columns and another piece has 6 rows and 3 columns as shown below.

1	2	3	4	5
2				
3				
4				
5				
6				

1	2	3
2		
3		
4		
5		
6		

Step 5: Ask them to count the number of boxes in the first piece. It has 5 boxes in each row. Therefore the number of boxes in the 1st piece = $6 \times 5 = 30$.

Step 6: Ask them to count the number of boxes in the 2nd. It has 3 boxes in each row. Therefore the number of boxes in the 2nd piece = $6 \times 3 = 18$.

Step 7: Explain the total number of boxes in the sheet = Number of boxes in the 1st piece + Number of boxes in the 2nd piece = $6 \times 5 + 6 \times 3 = 30 + 18 = 48$.

Step 8: Recall the number of boxes in the first sheet = 48.

Step 9: Write on the board $6 \times 8 = 6 \times (5 + 3) = 6 \times 5 + 6 \times 3$

Step 10: Write for any three whole numbers a, b, c, $a \times (b + c) = a \times b + a \times c$ Say this property is called distributive property of multiplication over addition.

Conclusion: Distributive Property of multiplication over addition on whole numbers is verified.

Time to teach	Asset Type	Theme	SubTheme
10 Minutes	Suggested Activity	Whole Numbers	Distributive property under addition &

multiplication

17. IA_An Interesting Question-Division by Zero



https://commons.wikimedia.org/wiki/File:Srinivasa_Ramanujan_-_OPC_-_1.jpg

Ramanujan, the great Mathematician of our country was a student in Town High School, Kumbakonam in Tamilnadu. While he was studying in the 7th class, one day his teacher said that a number divided by itself always gives one. Ramanujan asked the teacher whether it was true in the case of zero also. Imagine how Ramanujan would have surprised the teacher and the class!

In view of this great Mathematician "Srinivasa Ramanujam", 22nd December is celebrated as National Mathematics Day.

Time to teach	Asset Type	Theme	SubTheme
5 Minutes	Interesting Asides	Whole Numbers	Division by zero

18. MS_Identity Property - Addition and Multiplication

Identity for addition

Let the teacher show 2 pens to kids. Suppose she adds one more pen. It is $2 + 1 = 3$. Now she says she is going to add 0 pens to the 3 pens. Now, let her ask after adding 0 pens, how many she has. It is only 3 as nothing is added. So, adding 0 to a number does not change the value. For example,

$$7 + 0 = 7$$

$$5 + 0 = 5$$

$$0 + 15 = 15$$

$$0 + 26 = 26$$

$$0 + \dots = \dots$$

.....

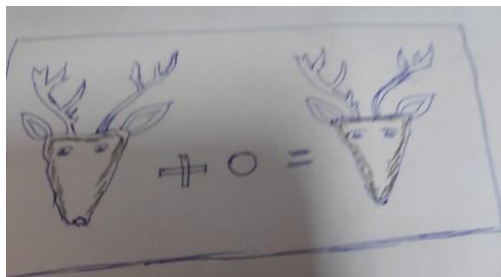
.....

Adding 0 does not change the value.

So, zero has a special property: If a is any whole number, then $a + 0 = 0 + a$.

Only zero has this property and no other number has it.

Because of the special property, zero has a special name “Additive Identity”.



Identity for multiplication

Write on the board

$$2 \times 3 = 6$$

$$2 \times 5 = 10 \quad 2 \times 1 = 2$$

$$2 \times 6 = 12.$$

Let the kids compare the values. Only in the case 2×1 , the value remains the same and in all other we have different values.

Let us change the number.

$$7 \times 2 = 14$$

$$7 \times 1 = 7$$

$$7 \times 3 = 21$$

$$7 \times 8 = 56.$$

Again let the kids compare the values. Only in the case 7×1 , the value remains the same and in all other we have different values.

Look at some more examples:

$$1 \times 15 = 15$$

$$1 \times 25 = 25$$

$$1 \times 35 = 35$$

$$1 \times 5 = 5$$

So 1 has a special property: If a is any whole number, then $a \times 1 = 1 \times a = a$.

Only 1 has this property and no other number has it.

Because of the special property, one (1) has a special name “Multiplicative Identity”.

Properties of zero (0) and (1)

Property of zero (0)

It is additive identity.

If any number is multiplied by 0 then we get only 0, $a \times 0 = 0$.

It has no predecessor in whole numbers and it is not a member in natural numbers.

Property of one (1)

It is multiplicative identity.

It has no predecessor in natural numbers but has predecessor in whole numbers.

Let us look at number 1.

The teacher again asks what happens when 1 is multiplied with any number.

Ans: Multiplying by 1 results in the same whole number. Hence '1' is called as
"Multiplicative Identity".

All images original (girijashankaran@gmail.com)

Time to teach	Asset Type	Theme	SubTheme
10 Minutes	Main Script	Whole Numbers	1- Identity for multiplication

19. QA_Exercise on Properties of Whole numbers

I) Fill in the blanks so that each of the following is true statement. Give the properties exhibited by them.

- a) $100+305 = \underline{\hspace{1cm}} + 100$
- b) $419+0 = \underline{\hspace{1cm}}$
- c) $29+(100+12) = (29+100)+ \underline{\hspace{1cm}}$
- d) $16 \times (72+84) = (16 \times 72) + \underline{\hspace{1cm}}$
- e) $100 \times \underline{\hspace{1cm}} = 100$
- f) $12 \times \underline{\hspace{1cm}} = 15 \times 12$

II. Find the value of the following using suitable property of whole numbers.

- a) $54279 \times 92 + 8 \times 54279$.
- b) 258×1008 .

III. Answer the multiple choice questions.

- i) $100 \times 0 =$
 a) 0 (b) 1 (c) 10 (d) None
- ii) If the product of two whole numbers is 1, which statement given below is true?
 a) Any one of the number is 1 (b) Both numbers are 1 (c) Commutative property of multiplication (d) Multiplicative identity
- iii) Which of the following will not represent zero?
 a) 1×0 (b) 0×5 (c) $0 / 2$ (d) $0 + 1$
- iv) Which of the following statements follow identity property of whole numbers?
 a) $34 + 58 = 58 + 34$ b) $108 + 3 = 111$ is a whole number
 c) $999 \times 1 = 999$ d) $2 + (1 + 25) = (2 + 1) + 25$

IV. Find the product with suitable arrangement.

- $20 \times 1024 \times 50$
- $25 \times 1665 \times 4$.
- $8 \times 2019 \times 125$.
- $297 \times 17 + 297 \times 3$.
- $54279 \times 92 + 8 \times 54279$.
- 258×1008

V) Match the following

1)	$425 \times 136 = 425 \times (6+30+100)$	a)	Commutativity under Multiplication
2)	$2 \times 49 \times 50 = 2 \times 50 \times 49$	b)	Commutativity under addition
3)	$80 + 2005 + 20 = 80 + 20 + 2005$	c)	Distributivity of multiplication over addition

Answers

I) a) 305 (Commutative Property on Addition)

b) 419 (Identity Property on Addition)

c) 12 (Associative Property on Addition)

d) 16×84 (Distributive Property)

e) 1 (Multiplicative Identity)

f) 15 (Commutative Property on Multiplication)

II (a). 54,27,900 (b) 2,60,064

III. i) a (ii) b (iii) d (iv) c (Identity for multiplication)

IV. a) $(20 \times 50) \times 1024 = 1,024,000$ b) $(4 \times 25) \times 1665 = 166,500$ c) $(8 \times 125) \times 2019 = 2,019,000$ d) $297 \times (17 + 3) = 5,940$ (Using Distributive property)e) $54,279 \times (92 + 8) = 54,27,900$ f) $258 \times (1000 + 8) = 2,58,000 + 2,064 = 2,60,064$

V (1) c (2) a (3) b

Time to teach	Asset Type	Theme	SubTheme
20 Minutes	Assessments	Whole Numbers	Distributive property under addition & multiplication

20. IA_Sum of digits in a Calendar grid-using Distributive Property

Sum of any 4×4 grid in a calendar is always the sum of the first and the last number multiplied by 8.

Example

3	4	5	6
10	11	12	13
17	18	19	20
24	25	26	27

Here the sum of the digits in the grid = sum of the first and the last number $\times 8$

Clockwise Diagonal Anticlockwise Diagonal

 $= (3 + 27) \times 8$ $(6 + 24) \times 8 = 240$ $= 30 \times 8 = 240$

In general if any pair is taken in this way $(a + a') \times 8$ or $(b + b') \times 8$ or $(e + e') \times 8$ etc., then also it will give the total sum of 4×4 grid.

a	b	c	d
---	---	---	---

e	g	h'	f'
f	h	g'	e'
d'	c'	b'	a'

Time to teach	Asset Type	Theme	SubTheme
5 Minutes	Interesting Asides	Whole Numbers	Distributive property under addition & multiplication

21. MS_Number Patterns

We consider the following elementary shapes:

- a line
- a rectangle
- a square
- a triangle

We arrange the elementary shapes using dots.

How many dots do we need for a line?

1, 2, 3, 4?

With one dot we cannot represent anything.

•

With two dots what can we represent?

• •

They represent a line. The dots should be evenly placed.

Three dots are used to represent a line and a triangle.

• • • •
 • •

Now let us represent every number in one of the elementary shapes.

Take number 2

• •

2 can be arranged as a line

Take Number 3. It can be arranged as a line and a triangle.

• • • •
 • •

Take number 4.

• • • • • • ■ ■
 • • ■ ■

4 can be arranged as a line, a square and rectangle.

Take number 6. It can be arranged as a Line and a Triangle.



What are triangular numbers? Why are they called triangular numbers?

A **triangular number** or **triangle number** counts objects arranged in an equilateral triangle.

Each subsequent **number** in the sequence adds a new row of dots to the triangle.

While arranging numbers in the form of a triangle, note that triangle should have its two sides equal and always one dot at the top. Number of dots in the row starting from the bottom to top should be like 4,3,2,1

Number 3	
Number 6	
Number 10	

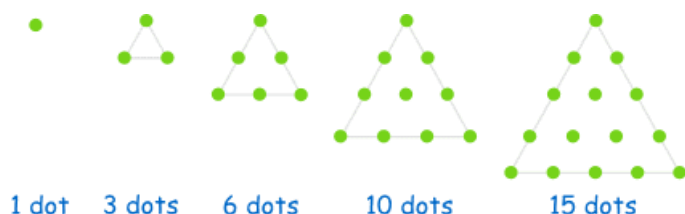
All the above images are original (girijashankaran@gmail.com)

This is the Triangular Number Sequence:

1, 3, 6, 10, 15, 21, 28, 36, 45, ...

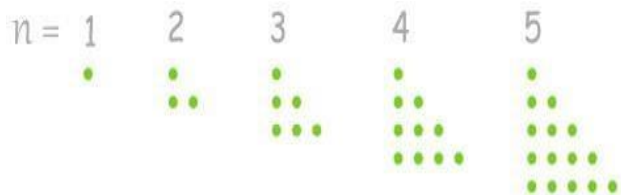
This sequence is generated from a pattern of dots which form a triangle.

By adding another row of dots and counting all the dots we can find the next number of the sequence:

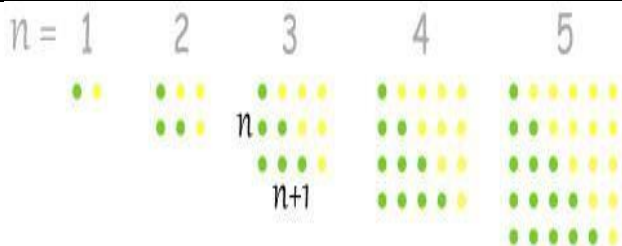


A rule can be created to calculate any triangular number as given below:

First, rearrange the dots (and give each pattern a number n), like this:



Then double the number of dots, and form them into a rectangle:



Hence, every number can be arranged in any of these shapes
Every whole number can be arranged as a straight line except 0 and 1.

Time to teach	Asset Type	Theme	SubTheme
15 Minutes	Main Script	Whole Numbers	Commutative property under addition & multiplication

22. MS_Short Cut Methods to Compute Arithmetic Operations

Mathematics teaches shortcut methods to compute arithmetic operation easily.
To add, subtract and multiply, 9, 99, 999, 9999 etc.

Pattern 1

See the number $127 + 999$.

We can add but we have a simple method to do this.

We know $999 = 1000 - 1$.

We know it is easy to add and multiply 10, 100, 1000, etc.

$$127 + 999 = 127 + 1000 - 1 = 1127 - 1 = 1126$$

Suppose we want to subtract 99 from 243.

$$\begin{aligned} 243 - 99 &= 243 - (100 - 1) \\ &= 243 - 100 + 1 \\ &= 143 + 1 \\ &= 144 \end{aligned}$$

Pattern 2

Suppose we want to multiply 127 and 999.

$$127 \times 999 = 127 \times (1000 - 1) = 127000 - 127 = 126873.$$

Suppose we want to multiply

$$24 \times 9 = 24 \times (10 - 1)$$

$$24 \times 99 = 24 \times (100 - 1)$$

$$24 \times 999 = 24 \times (1000 - 1)$$

Pattern 3

To multiply a number by 5 or 25 or 125

Represent 5 as $10/2$.

Represent 25 as $100/4$.

Represent 125 as $1000/8$.

$$123 \times 5 = 123 \times \frac{10}{2} = \frac{1230}{2} = 615$$

$$354 \times 25 = 354 \times \frac{100}{4} = \frac{35400}{4} = 8850$$

$$297 \times 125 = 297 \times \frac{1000}{8} = \frac{297000}{8} = 37125$$

In general when you deal with large number, try to express one of them as multiple of 10, 100 and so on.

Look at the problem:

Find 456×15

Now 15 is half of 30 and 30 is a multiple of 10.

$$456 \times 15 = 456 \times \frac{30}{2} = \frac{13680}{2} = 6840$$

Look at another problem:

Find 873×35

Now 35 is half of 70 and 70 is a multiple of 10

$$873 \times 35 = 873 \times \frac{70}{2} = \frac{61110}{2} = 30555$$

Pattern 4

37 is a special number. If 37 is multiplied by multiples of 3, we get the following:

$$37 \times 3 = 111 \qquad 37 \times 18 = 666$$

$$37 \times 6 = 222 \qquad 37 \times 21 = 777$$

$$37 \times 9 = 333 \qquad 37 \times 24 = 888$$

$$37 \times 12 = 444 \qquad 37 \times 27 = 999$$

$$37 \times 15 = 555$$

Hence by using different patterns, the problems can be solved easily.

Time to teach	Asset Type	Theme	SubTheme
20 Minutes	Main Script	Whole Numbers	Commutative property under addition & multiplication

23. IA_Happy Numbers

Happy Numbers

After all that, it's a relief to turn to something more cheerful!

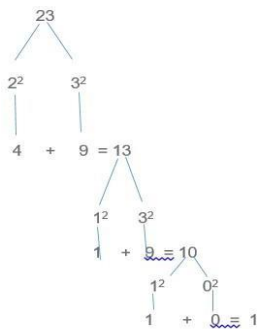
Take the sum of the squares of the digits of a natural number.

If iterating this operation eventually leads to 1, then it is a happy number.

For example, 23 is happy number.

The first few happy numbers from 1 to 50 are 1, 7, 10, 13, 19, 23, 28, 31, 32, 44, 49.

Example 23 :



Original image

(girijashankaran@gmail.com)



<https://openclipart.org/detail/279689/smiley-face-yellow>

Time to teach	Asset Type	Theme	SubTheme
5 Minutes	Interesting Asides	Whole Numbers	

24. QA_Simplify using Number Pattern Method

1. Find the answers using pattern method:

- $732 \times 5 =$
- $732 \times 15 =$
- $732 \times 25 =$

2. Simplify the answers using pattern method:

- $182 + 9 =$
- $182 - 9 =$
- $182 \times 9 =$

3. The cost of a pen is rupees 25. What is the cost of 437 pens? [Use pattern method].

4) Study the pattern and write the next 2 steps

- $1 \times 1 = 1$
 $11 \times 11 = 121$
 $111 \times 111 = 12321$
- $1 \times 9 + 1 = 10$
 $12 \times 9 + 2 = 110$
 $123 \times 9 + 3 = 1110$

- $123456789 \times 8 + 9 = 987654321$
 $12345678 \times 8 + 8 = 98765432$
 $1234567 \times 8 + 7 = 9876543$
 $123456 \times 8 + 6 = 987654$

- $9876543 \times 9 + 1 = 8,88,88,888$
 $98765 \times 9 + 3 = 8,88,888$

$$987654 \times 9 + 2 = 88,88,888$$

5) Classify the following into square numbers, triangular numbers and rectangular Numbers.

a) 3 b) 81 c) 10 d) 49 e) 15 f) 6 g) 8 h) 64 i) 25

6) Which of the numbers between 1 and 20 can be shown as 2 rectangles?

Answers:

1. a. $732 \times 10/2 = 3660$.

b. $732 \times 30/2 = 10980$.

c. $732 \times 100/4 = 18300$.

2. a. $182 + 10 - 1 = 191$.

b. $182 - 10 + 1 = 173$.

c. $182 \times (10 - 1) = 1820 - 182 = 1638$.

3. Cost of 437 pens is Rs.10925 ($437 \times 25 = 437 \times 100/4$)

4) a. $1111 \times 1111 = 1234321$ and $11111 \times 11111 = 123454321$

b. $1234 \times 9 + 4 = 11110$, $12345 \times 9 + 5 = 111110$

c. $12345 \times 8 + 5 = 98765$, $1234 \times 8 + 4 = 9876$

d. $9876 \times 9 + 4 = 88,888$, $987 \times 9 + 5 = 8,888$

5)

Square Numbers	25,49,64,81
Triangular Numbers	3,10,15
Rectangular Numbers	6,8

6) 12 (2×6 and 3×4), 18 (3×6 and 2×9)

Time to teach	Asset Type	Theme	SubTheme
20 Minutes	Assessments	Whole Numbers	Commutative property under addition & multiplication

25. MS_Extra Concept -Properties of Whole Numbers -Subtraction and Division

Closure Property:

The difference of two whole numbers is not necessarily a whole number. If **a** and **b** are two whole numbers, then **a – b** will be a whole number if and only if **a > b** or **a = b**. Hence, closure property does not hold good for subtraction.

Eg: $19 - 12 = 7$ is a whole number

$12 - 19$ is not a whole number

Commutative Property:

If **a** and **b** are two whole numbers, then **a – b $\neq$ b – a**

Ex: $7 - 3 = 4$ but $3 - 7$ is not defined.

$$7 - 3 \neq 3 - 7$$

Hence, commutative property does not hold good.

Associative property:

If a, b and c are there whole numbers, then $a - (b - c) \neq (a - b) - c$

Ex : $13 - (7 - 5) = 13 - (2) = 11$

$$(13 - 7) - 5 = 6 - 5 = 1$$

$$11 \neq 1$$

Hence, associative property does not hold good.

Are whole numbers closed under division?

Suppose I have 8 mangoes and I say, I want to distribute them equally among 4 people. So we do division and say each gets 2 mangoes.

I can also do this by subtraction.

Let me give 2 mangoes to the 1st person. The remaining mangoes = $8 - 2 = 6$.

From the remaining 6, give 2 mangoes to the 2nd person and the remaining mangoes = $6 - 2 = 4$.

From the remaining 4, give 2 to the 3rd person and the remaining mangoes = $4 - 2 = 2$.

Give the remaining 2 to the last person.

We got the same answer as before. Why? Because, division is repeated subtraction.

Instead of 8 mangoes, if I had started with 7 mangoes, could I have distributed equally to 4 people? The answer is No.

Why because $7/4$ is not a whole number.

Thus whole numbers are not closed under division.

Commutative Property of Division

The commutative property of division says $a \div b \neq b \div a$

$10 \div 2 = 5$ whereas, $2 \div 10 = 1/5$ Hence $5 \neq 1/5$

Therefore commutative property for Division is not true.

Division (Not associative)

Division is probably an example that you know, intuitively, is not associative. The example below should help you see how division is not associative.

$$100 \div 20 \div 5 = 100 \div 20 \div 5$$

$$(100 \div 20) \div 5 \neq 100 \div (20 \div 5)$$

$$(5) \div 5 \neq 100 \div (4)$$

$$1 \neq 25$$

Original image (girijashankaran@gmail.com)

Time to teach	Asset Type	Theme	SubTheme
15 Minutes	Main Script	Whole Numbers	Division by zero

26. MS_Summary_Whole Numbers

Summary

1) Number reduced by 1 is predecessor and number increased by 1 is successor.

Introduction of zero, zero with natural number is the set known as whole numbers.

2) Number line and basic operations on number line.

3) Solve problems on number line and its operations.

4) Properties of Whole Numbers closure, commutative, associative satisfies for addition and multiplication.

Closure property- If 'a' and 'b' are 2 whole numbers then $a + b$ and $a \times b$ are whole numbers.

Commutative Property – If 'a' and 'b' are whole numbers then $a + b = b + a$ and $a \times b = b \times a$

Associative property – If 'a' and 'b' are 2 whole numbers then $a + (b + c) = (a + b) + c$, $a \times (b \times c) = (a \times b) \times c$.

5) Practice questions on properties of whole numbers.

6) Distributive property of multiplication over addition. If 'a', 'b' and 'c' are any 3 whole numbers then $a \times (b + c) = a \times b + a \times c$ and $(a + b) \times c = a \times c + b \times c$

7) Property of 'Zero' and 'One' known as Identity property. If 'a' is any whole number then $a + 0 = a$ and $a \times 1 = a$.

8) Properties of whole numbers is not true for Subtraction and Division and the property of Division by Zero

9) Number Patterns: 1, 3, 6, 10, 15, 21, ... triangular pattern and

10) Short cut methods of multiplication by 9, 99, 999, 5, 25, 125 and problems using short cut method and number patterns.

11) To get the taste of Happy Numbers and sum of the digits in a calendar grid.

12) To practice tolerance, love and kindness by adjusting with the society.

Time to teach	Asset Type	Theme	SubTheme
5 Minutes	Main Script	Whole Numbers	