



Sri Sathya Sai
VIDYA VAHINI
श्री सत्यसाई विद्या वाहिनी

Master Lesson Plan

for

01 - Whole Number (ପୂର୍ଣ୍ଣ ସଂଖ୍ୟା)

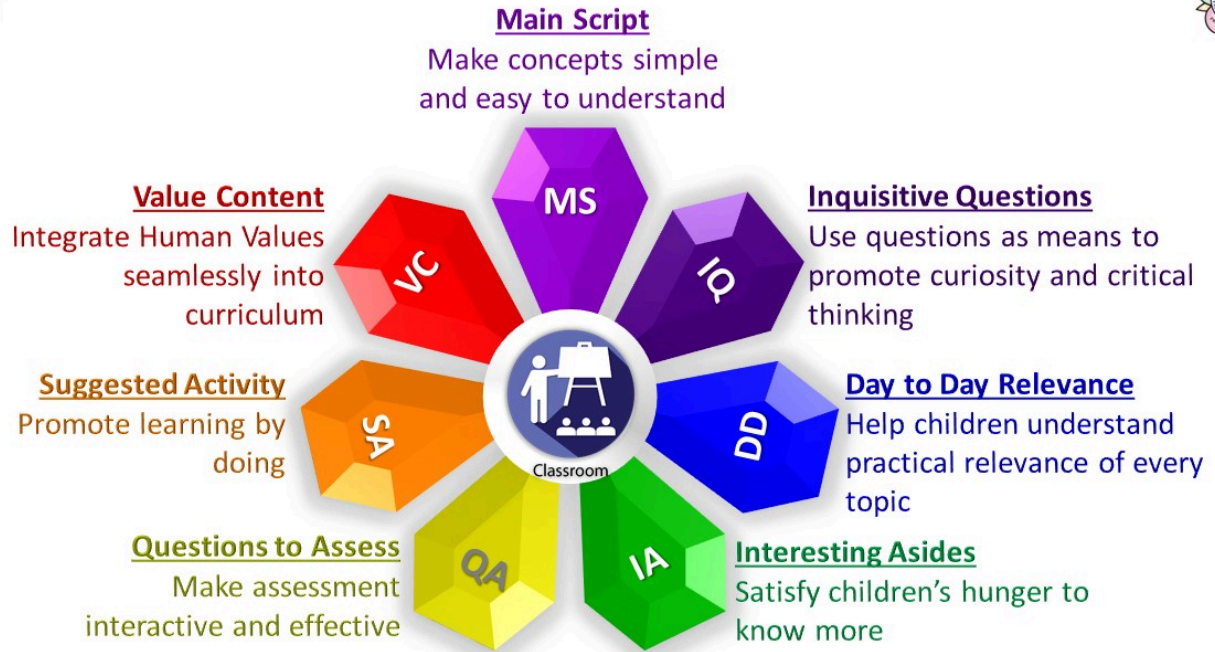
Board	Standard	Subject	Chapter	Language	Creation date
Odisha (English)	STD VII	Mathemat ics	01 - Whole Number (ପୂର୍ଣ୍ଣ ସଂଖ୍ୟା)	English	26-03-2024 22:18:23

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Master Lesson Plan (MLP) - Covers the entire chapter with the help of these 7 asset types



For more information on how to use the lesson plan effectively, please scroll to the guidelines at the end of this document.

MS_Objectives_Integers

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 the teacher's reference and need not be taught to the students.

Students will be able to

- correlate integers in real-life situations
- recall integers and their properties
- solve questions related to addition and subtraction of integers
- solve problems on addition of integers through an activity
- identify the additive identity for integers
- identify the closure property of addition and subtraction of integers
- locate the integers from the given number line
- identify commutative property for addition and subtraction of integers
- relate integers with the calendar
- identify the associative property for addition and subtraction of integers
- solve the problems on addition of integers
- identify the product of positive and negative integers
- identify distributive property of multiplication over addition and subtraction
- illustrate the properties of multiplication of integers
- choose good friends to lead a good life
- write as integers while dividing positive and negative integers
- illustrate multiplication in easy ways
- solve the questions given on properties of integers

Time to teach	Asset type	Theme	Sub Theme
3 minutes	Main Script	Integers	Addition & Subtraction of integers on number line

MS_Introduction To Integers

Asset

for

MS_Introduction To Integers

Introduction to Integers

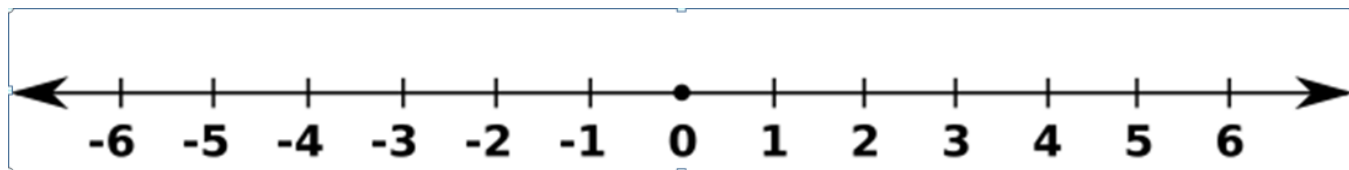
An integer is a whole number which is positive, negative or zero

The set of integers consists of zero (0), the natural numbers (1, 2, 3, ...), also called counting numbers, and their additive inverses (i.e. -1, -2, -3, ...).

So integers can be negative (-1, -2, -3, -4...), positive(1, 2, 3, 4,...) or zero(0)

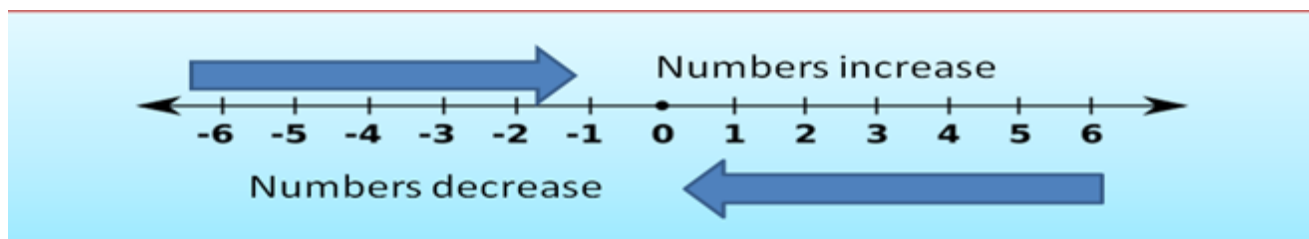
Integers = {-5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5,.....}

Integers on the number line can be represented as follows:-



A Number Line is very useful for working with directed numbers, Integers. On a number line, numbers to the right are bigger.

Numbers to the left are less than the ones on the right.



For example: 6 is bigger than 3, but -6 is smaller than 3.

We say that 6 is greater than 3, and we write this as $6 > 3$.

However, -6 is less than 3, and we write this as $-6 < 3$ Examples : $2 < 4$, $8 > 5$, $-4 < -1$, $-2 > -6$

Numbers to the right are bigger, numbers to the left are smaller.

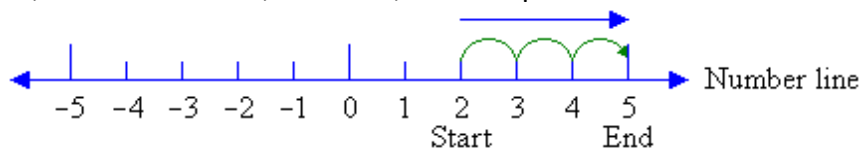
Addition and Subtraction of Integers

Addition of Positive Integers

Consider the addition of $2 + 3$.

The plus sign, $+$, tells us to face the positive direction.

So, to evaluate $2 + 3$, start at 2, face the positive direction and move 3 units forwards.

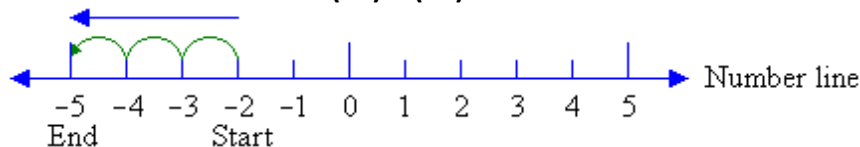


$$\therefore 2 + 3 = 5$$

Positive integers can be added like natural numbers.

Addition of Negative Integers

Consider the addition of $(-2) + (-3)$.

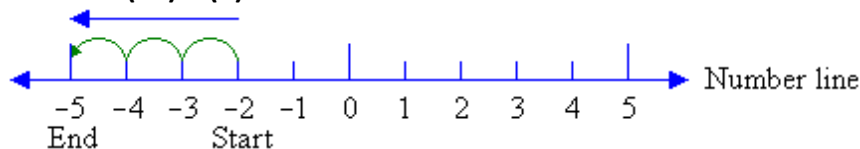


The plus sign, $+$, tells us to face the positive direction.

So, to evaluate $(-2) + (-3)$, start at -2 , face the positive direction and move 3 units backwards.

$$\therefore (-2) + (-3) = -5$$

Consider $(-2) - (3)$.



The minus sign, $-$, tells us to face the negative direction.

So, to evaluate $(-2) - (3)$, start at -2 , face the negative direction and move 3 units forwards.

$$\therefore (-2) - (3) = -5$$

Adding a [negative integer](#) is the same as subtracting a [positive integer](#).

$$\begin{aligned}\therefore (-2) + (-3) &= -2 + -3 \\ &= -2 - 3 \\ &= -5\end{aligned}$$

Negative integers are added like natural numbers; but with a minus sign, $-$, in front of the sum.

Example :

Find the value of:

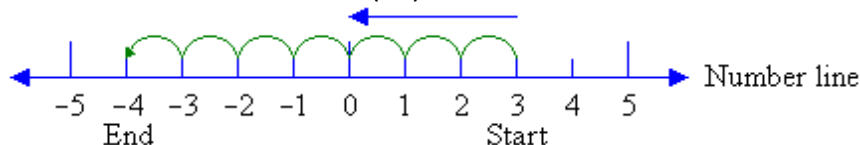
- $-3 - 1$
- $-3 - 5$
- $-4 - 6$

Solution:

- $-3 - 1 = -4$ {Add 3 and 1 and place a $-$ sign in front of the sum}
- $-3 - 5 = -8$ {Add 3 and 5 and place a $-$ sign in front of the sum}
- $-4 - 6 = -10$ {Add 4 and 6 and place a $-$ sign in front of the sum}

Addition of a Positive Integer and a Negative Integer

Consider the addition of $3 + (-7)$.



The plus sign, $+$, tells us to face the positive direction.

So, to evaluate $3 + (-7)$, start at 3, face the positive direction and move 7 units backwards.

$$\therefore 3 + (-7) = -4$$

$3 + (-7)$ is often written as $3 - 7$.

To find the value of $3 - 7$, first ignore the signs and subtract the smaller number, 3, from the larger number, 7,

and put the sign, $-$, of the larger number, 7, in front of the difference.

$3 - 7 = -4$ (Subtract 3 from 7 and place a $-$ sign in front of the difference)

Example :

Find the value of:

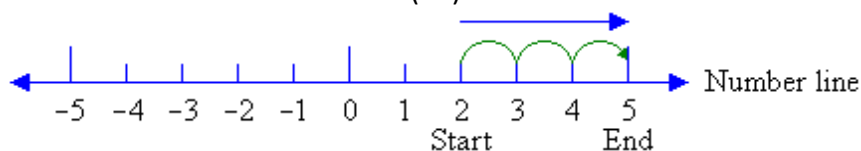
- $2 - 8$
- $-7 + 2$
- $-4 + 6$

Solution:

- a. $2 - 8 = -6$ {Subtract 2 from 8 and place a $-$ sign in front of the difference}
- b. $-7 + 2 = -5$ {Subtract 2 from 7 and place a $-$ sign in front of the difference}
- c. $-4 + 6 = 2$ {Subtract 4 from 6 and ignore the $+$ sign in front of the difference}

Subtracting a Negative Integer from a Positive Integer

Consider the subtraction of $2 - (-3)$.



The minus sign, $-$, tells us to face the negative direction.

So, to evaluate $2 - (-3)$, start at 2, face the negative direction and move 3 units backwards.

$$\therefore 2 - (-3) = 5$$

To subtract a [negative integer](#), add its opposite which is a [positive integer](#).

Example :

Find the value of:

- a. $7 - (-4)$
- b. $6 - (-8)$
- c. $3 - (-9)$

Solution:

a. $7 - (-4) = 7 + 4$
 $= 11$

b. $6 - (-8) = 6 + 8$
 $= 14$

c. $3 - (-9) = 3 + 9$
 $= 12$

If two minus signs are side by side, then the two minus signs become a plus sign (i.e. a positive).

Time to teach	Asset type	Theme	Sub Theme
10 minutes	Main Script	Integers	Integers on number line

DD_Integers in Real Life

Introduction to Integers

The numbers +1, +2, +3,....., are called positive integers.

The numbers -1, -2, -3,....., are called negative integers. Zero is neither negative nor positive.

The positive and negative integers together with 0 are integers, denoted by Z or I.

Thus $Z = \{...-3, -2, -1, 0, 1, 2, 3,.....\}$ is the set of integers.

Directed numbers are numbers which have both size and direction.

Directed number need not be an integer only. . . 100, -8.5, 26 etc.

When the directed number is a whole number, then it is called an integer.

Comprehension of Integers is absolutely essential in Mathematics.

In our daily life, we come across many situations.

Some examples of in the real world are:

Integers in Measuring Temperature

Example:

On 15th of March 2019

Minimum Temperature at Pahalgam (Kashmir): -1°C

Maximum temperature at Pahalgam (Kashmir): 8°C



When the temperature is **above zero**, it shows **positive numbers**.

When the temperature is **below zero**, it shows **negative numbers**.

a) 10 degrees above zero is a positive integer.

-5 degrees below zero is a negative integer.

Integers in Measuring Height

b) +4000 meters above sea level on a mountain is a positive integer.

- 550 meters below sea level is a negative integer.

When the altitude is **above Mean Sea Level (MSL)**, it shows **positive numbers**.

When the altitude is **below Mean Sea Level (MSL)**, it shows **negative numbers**.

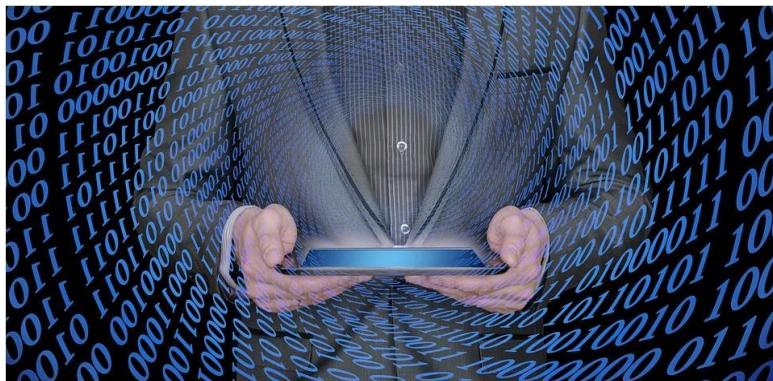


Kuttanad (Kerala) altitude: -2 meters

Komic (Himachal Pradesh) altitude: 4570 meters

Practical Uses of Integers

Integers in Computer



Integers are used in computer programming and coding, where things must be on or off, that is, 1 or 0.

We call this “binary” because everything a computer does can be turned into a sequence of ones and zeroes.

In real life integers play an **important role** in calculating our daily activities.

Integers is not a topic to study, it **works in real life situations**.

Positive Numbers	Negative Numbers
Distance above sea level	Distance below sea level
Money deposited in bank	Money withdrawn from bank
Students added to a class	Students leaving a class
Points given for good behaviour	Points taken for bad behaviour
Stock market gains	Stock market losses
Calories consumed in a meal	Calories burnt in exercise
Temperature below zero	Temperature above zero
Increase	Decrease

If there are **sufficient funds**, it represents **positive numbers**.

If money is **overdrawn** from the account, it represents **negative numbers**.

If there is **profit**, we have **positive numbers**. If there is **loss**, we have **negative numbers**.

Calories when **eaten**, it represents **positive numbers**

Calories when **burned**, it represents **negative numbers**

Image Source:

1. **Kuttanad**: <https://www.flickr.com/photos/vishwaant/4610942538> (By vishwaantavk) (CC BY 2.0)

2. **Komic**:

<https://www.flickr.com/photos/indiauntravelling/6899693644/in/photolist-bvGJxf-5Kch7V-bPAC4p-bPABUP-bAFYFL> (By India Untravelled) (CC BY 2.0)

3. **Computer**:

<https://www.maxpixel.net/Kaufmann-Binary-Code-Businessmen-Business-Computer-3762561>

4. Temperature: <https://pxhere.com/en/photo/430431>

Time to teach	Asset type	Theme	Sub Theme
5 minutes	Day-to-day Relevance	Integers	Introducing negative integers

IA_ Integers and Timelines

Asset
for

IA_ Integers and Timelines

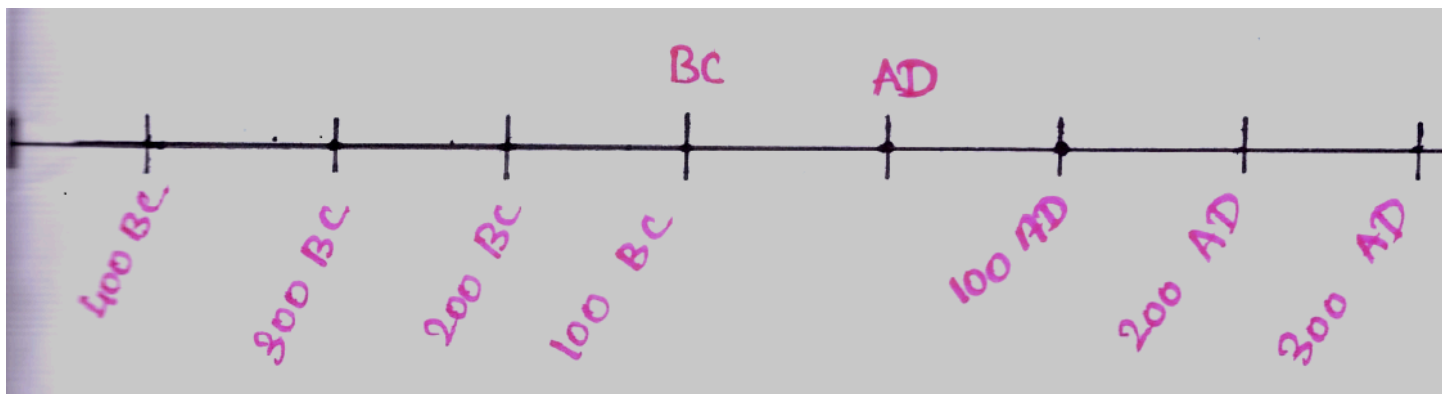
Integers and Timelines

1. Can you relate Mathematics and History? Yes!

Have you heard of A.D and B.C?

A.D and B.C are related to integers.

A.D on a number line as given below represents positive numbers and B.C relates to negative numbers.



2. Calendars have been made since the time of the ancient Egyptians and Sumerians 6000 years ago. Different calendars have different count their years from different dates and have different lengths of months and years. On our calendar, the B.C dates are like negative integers and A.D dates are like positive integers.

One less than -10 is -11.

One year before 10 B.C is 11 B.C.

Which year is it?

1.What year is 100 years before 50 B.C?

Answer : 150 B.C

2.Although you live in the “20 hundreds”, you live in the twenty first century. In which century

was the year 150?

Answer: 2nd century

Time to teach	Asset type	Theme	Sub Theme
5 minutes	Interesting Asides	Integers	Integers on number line

MS_Closure Property of integers under addition and subtraction

Asset

for

MS_Closure Property of integers under addition and subtraction

Closure Property (Addition of Integers)

Integers are closed under addition which means that sum of integers will also give integers.

The property that addition of integers is an integer is called **closure property**.

We say integers are **closed under addition**.

For any two integers a and b, $a + b$ is an integer.

Example 1: Find the sum of given Integers ; $(-8) + 2 = (-6)$

Since (-6) is also an integer we can say that

Integers are closed under addition

Example 2: Find the sum of given Integers ; $15 + (-10) = 5$

Since (5) is also an integer we can say that

Integers are closed under addition

Example 3: Find the sum of given Integers ; $-25 + (-20) = (-45)$

Since (-45) is also an integer we can say that

Integers are closed under addition

Example 4: Find the sum of given Integers ; $7 + 3 = 10$

Since 10 is also an integer we can say that

Integers are closed under addition

For any two integers a and b, $a + b$ is an integer.

Closure Property (Subtraction of Integers)

Integers are closed under Subtraction which means that subtraction of integers will also give

integers.

For any two integers a and b , $a - b$ is an integer.

Example 1: Find the difference of given Integers ; $10 - 5 = 5$

Since 5 is also an integer we can say that

Integers are closed under subtraction

Example 2 : Find the difference of given Integers ; $7 - 20 = -13$

Since (-13) is also an integer we can say that

Integers are closed under subtraction

Example 3: Find the difference of given Integers ; $(-50) - (-20) = (-30)$

Since (-30) is also an integer we can say that

Integers are closed under subtraction

Example 4: Find the difference of given Integers ; $10 - (-3) = 13$

Since 13 is also an integer we can say that

Integers are closed under subtraction

Time to teach	Asset type	Theme	Sub Theme
8 minutes	Main Script	Integers	Properties of Addition & Subtraction of Integers

MS_Additive Identity of integers

Additive Identity of Integers

Here, we learn about a special property satisfied by the number " zero "

When we add 0 to any of the integers, say 'a', we get

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

So, 0 is the additive identity for integers.

For example:

- $2 + 3 = 5$
- $3 + 4 = 6$
- $2 + (-3) = -1$
- $2 + (-9) = -7$

Here, we observe that when a number (any) is added to any other number, the number loses its identity and a new number is formed.

. 2 added a negative or a positive number does not remain 2 anymore. It gives rise to a new number, as seen above.

But if you add 2 to 0, 2 does not lose its identity but remains as 2 itself.

$$(-7) + 0 = -7$$

$$0 + (-45) = -45$$

If we add 0 to the given number, it does not change the identity of the number, , the number retains its identity.

Therefore, the number " zero " is referred to as " additive identity " .

In general, **for any integer a,**

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

Time to teach	Asset type	Theme	Sub Theme
3 minutes	Main Script	Integers	Additive Identity

SA_Activity on addition of Integers

Activity to find the sum of integers

Aim: To compute the sum of integers to solve a puzzle

Materials required: Scale, pencil, paper, eraser, activity sheet with drawing

Setting of Activity: Indoor

Type of activity: Experiment by students

Individual activity

Instructions to the teacher

The teacher to inform the students prior to the day of the experiment regarding the materials to be brought on the day of the activity.

The teacher to ask each student to bring their own material.

Questions to recall:

1. How will you add integers of same and different signs?

Expected answer:

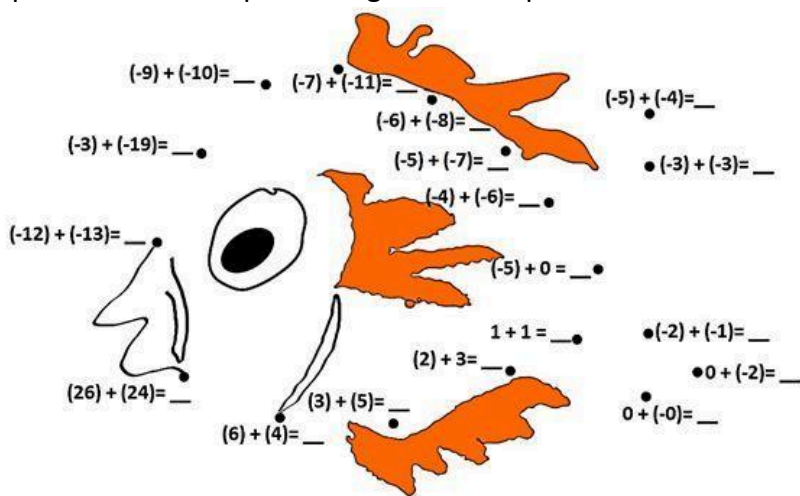
1) Same Signs: When two numbers have the same signs, the numbers are to be added and the sum should have the sign of both numbers.

2) Opposite Signs: When two numbers have opposite signs, the smaller number is to be subtracted from the bigger number and the difference should have the sign of the bigger number.

Procedure:

Step 1: See the given drawing sheet.

Step 2: Observe the questions given in the picture.

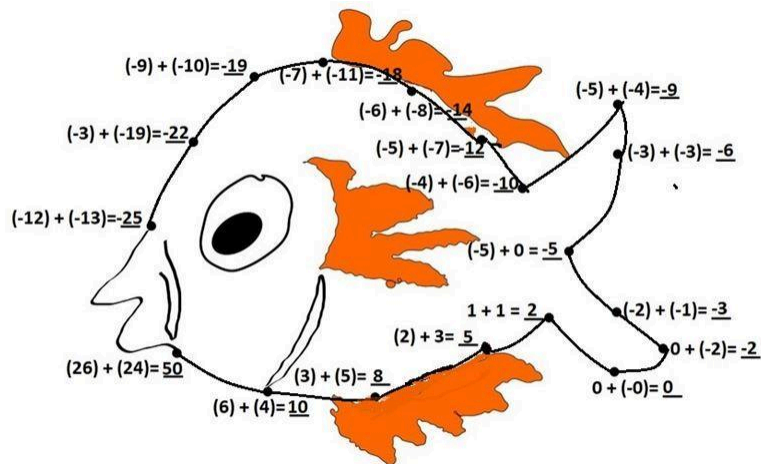


Step 3: Solve the given additional problems.

Step 4: Fill in the blanks.

Step 5: Write the integers in ascending order.

Step 6: Join the dots in ascending order.



These are the dots we get and given in ascending order.

-25, -22, -19, -18, -14, -12, -10, -9, -6, -5, -3, -2, 0, 2, 5, 8, 10, 50

Observation: What figure did you get?

We get an image of a fish by joining the points in ascending order.

Conclusion: Hence we have completed the puzzle by finding the sum of integers.

Fish image - OC - Rajeswari Thiruvapur

Time to teach	Asset type	Theme	Sub Theme
15 minutes	Suggested Activity	Integers	Addition & Subtraction of integers on number line

MS_Commutative Property - Integers

Asset

for

MS_Commutative Property - Integers

Commutative Property (Addition of Integers)

While adding integers even if we change the order of integers, the result remains same.

Addition is Commutative for Integers.

This property is known as commutative property.

For any two integers a and b, $a + b = b + a$

Example 1: Given Integers are (-5), (-7) and their two orders are as follows

Order 1 $(-5) + (-7) = (-12)$

Order 2 $(-7) + (-5) = (-12)$

As, in both the orders the result is same (-12),

So, we can say that Addition is Commutative for Integers.

Example 2: Given Integers are (-23), (-43) and their two orders are as follows

Order 1 $= (-23) + (-43) = (-66)$

Order 2 $= (-43) + (-23) = (-66)$

As, in both the orders the result is same (-66),

So, we can say that Addition is Commutative for Integers.

Consider some integers.

$10 - 5 = 5$ and $5 - 10 = -5$

$10 - (-5) = 15$ and $(-5) - 10 = -15$

$(-10) - 5 = -15$ and $5 - (-10) = 15$

$(-10) - (-5) = -5$ and $(-5) - (-10) = 5$

Clearly one is positive and other is negative.

In general, if a and b are different integers and $a > b$, then $a - b$ is a positive number and $b - a$ is a negative number.

Then $a - b$ is not equal to $b - a$.

So we conclude “subtraction is not commutative for integers”

Numbers	Addition is commutative	Subtraction is commutative
Natural Numbers	Yes	No
Whole Numbers	Yes	No
Integers	Yes	No

Time to teach	Asset type	Theme	Sub Theme
10 minutes	Main Script	Integers	Properties of Addition & Subtraction of Integers

MS_Associative Property of Integers

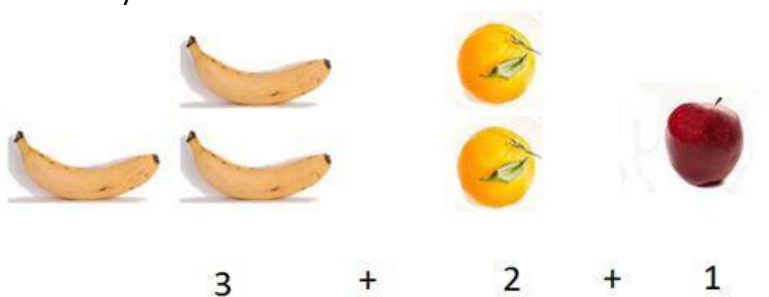
The Associative Property in Addition

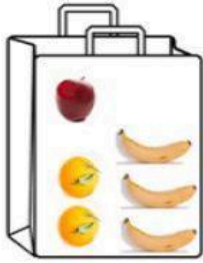
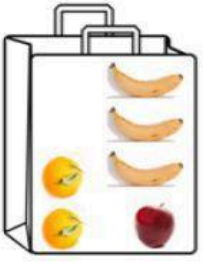
This rule says that the grouping of numbers can be changed but the result will be the same. This rule holds for both addition and multiplication.

If a, b and c are 3 integers, then

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

1) We're going to add $3 + 2 + 1$, associating the numbers (grouping the fruits together) in two different ways.



Adding bananas and oranges first (3 + 2) Then apple 1  Number of fruits $5 + 1 = 6$	Adding apple and oranges first (2 + 1) Then bananas 3  Number of fruits $3 + 3 = 6$
$(3 + 2) + 1 = 3 + (2 + 1)$	

2)

$$(6 + 3) + 4 = 6 + (3 + 4)$$

Just as you saw, regardless of the grouping order, the answer doesn't change.

Example 2: $(2 + 3) + 7 = 2 + (3 + 7)$

$$5 + 7 = 2 + 10$$

$$12 = 12$$

Example 3: $\frac{1}{2} + \left(\frac{3}{7} + \frac{4}{3} \right) = \left(\frac{1}{2} + \frac{3}{7} \right) + \frac{4}{3}$

$$\Rightarrow \frac{1}{2} + \frac{(3 \times 3 + 4 \times 7)}{21} = \left(\frac{1 \times 7 + 3 \times 2}{14} \right) + \frac{4}{3}$$

$$\Rightarrow \frac{1}{2} + \frac{(9 + 28)}{21} = \left(\frac{7 + 6}{14} \right) + \frac{4}{3}$$

$$\Rightarrow \frac{1}{2} + \frac{37}{21} = \frac{13}{14} + \frac{4}{3}$$

$$\Rightarrow \left\{ \frac{(1 \times 21) + (37 \times 2)}{42} \right\} = \frac{(13 \times 3) + (14 \times 4)}{42}$$

$$\Rightarrow \frac{(21 + 74)}{42} = \frac{(39 + 56)}{42}$$

$$\Rightarrow \frac{95}{42} = \frac{95}{42}$$

L.H.S. = R.H.S

Associative property holds good for addition.

The Associative Property in Subtraction:

Let's look at another example. Let's subtract $10 - 5 - 3$:

$$(10 - 5) - 3 = 5 - 3 = 2$$

$$10 - (5 - 3) = 10 - 2 = 8$$

Changing the way of associating the numbers in subtraction changes the answer.

Associative property does not hold good for subtraction.

Image source:

- **Bag:** <https://pixabay.com/vectors/bag-paper-bag-white-shopping-303576/>
- **Banana:**

- **Orange:** <https://www.pexels.com/photo/yellow-banana-fruit-on-white-surface-1166648/>
- **Apple:** <https://www.pexels.com/photo/photo-of-sliced-orange-citrus-fruits-2090903/>
- <https://www.flickr.com/photos/30478819@N08/33340501178/in/photolist-MXb2Dj-D6QvUe-2bms68z-RAmc3T-26dHNMS-22gzU9b-eM1mhP-VQCKcG-25Esvv1-29psJvy-dPcqJ1-2aj9Hm2-XAxBLd-2ec2Mdy-22NTQhn-2fdi9uq-2caNCxT-29piUNL-UHWhn4-2avqwfg-24V1aFv-9XqZ43-YuVY7s-Xy2uE3-PKXv1Q-XNT7yC-N8MveD-SWDqjf-RvqPv5-2aTBwMQ-SKZGMd-zHuRoM-24txKZM-GYnJw5-An1Q92-SNbMrd-2dvW7mR-2dxvEdz-2cyhcd9-2eUHWo8-RjNqZp-RA84ED-Sfgmtm> (BY Marco Verch Professional Photographer)

Time to teach	Asset type	Theme	Sub Theme
10 minutes	Main Script	Integers	Properties of Addition & Subtraction of Integers

QA_Questions on addition of integers

- **Fill in the blanks:**

A) The set of negative numbers together with the set of whole numbers is called,

_____.

- a) Natural numbers
- b) Decimals
- c) Fractions
- d) Integers

B) The number 0 is _____

- a) Positive
- b) Negative
- c) Neither negative nor positive
- d) Both negative and positive

C) Smallest positive integer is _____

- a) 1
- b) 2
- c) 0
- d) -2

D) The greatest negative integer is _____

- a) 0
- b) -1
- c) -2
- d) -10

E) The sum of an integer and its additive inverse is _____

- a) -1
- b) 0
- c) 1
- d) -2

F) The successor of -28 is _____

- a) -27
- b) -29
- c) 28

d) 26

G) The value of $-8 + 3$ is _____

- a) 5
- b) -5
- c) -11
- d) 11

Answer: A. Integer, B. Neither negative nor positive, C.1, D. -1, E. 0, F. -27, G. -5

2) In a quiz competition, the points scored by two teams are as follows. Find out which team performed better.

A	B	C	D	E	F
TEAMS	Points scored in different rounds				
	Round 1	Round 2	Round 3	Round 4	Round 5
A	-5	8	15	-9	3
B	-3	10	20	-8	-4

Answer: Points scored by A = $(-5) + 8 + 15 + (-9) + 3 = 26 - 14 = 12$

Points scored by B = $(-3) + 10 + 20 + (-8) + (-4) = (-15) + 30 = 15$

So, Team B performed better than Team A

3) State whether the following statements are true or false.

- $23 - (-21) = 23 + 21$
- $23 + (-21) < (-23) + 21$
- $(-5) + (-6) + (-7) > 7 - 77$
- $(-100) + (99) + (-1) = 97 - 99 + 4$
- $56 - (49 - 7) < (56 - 49) - (-7)$
- $13 - 31 > 3 - 13 - 31$

Answer- 1) T 2) F 3) T 4) F 5) F 6) T

4) Fill in the blanks to make the following statements true:

- $(-5) + (-8) = \underline{\hspace{1cm}} + (-5)$
- $-59 + \underline{\hspace{1cm}} = 0$
- $[13 + (-12)] + (\underline{\hspace{1cm}}) = 13 + [(-12) + (-7)]$

Answer: (1) (-8) , (2) 59 , (3) -7

Time to teach	Asset type	Theme	Sub Theme
15 minutes	Questions to Assess	Integers	Addition & Subtraction of integers on number line

MS_Multiplication of Integers

Asset

for

MS_Multiplication of Integers

1. Multiplication of a positive and a negative integer

Multiplication is nothing but repeated addition.

For example: $3 \times (-4) = (-4) + (-4) + (-4) = -12$

$4 \times (-5) = (-5) + (-5) + (-5) + (-5) = -20$

Consider $12 \times (-2) = -24$

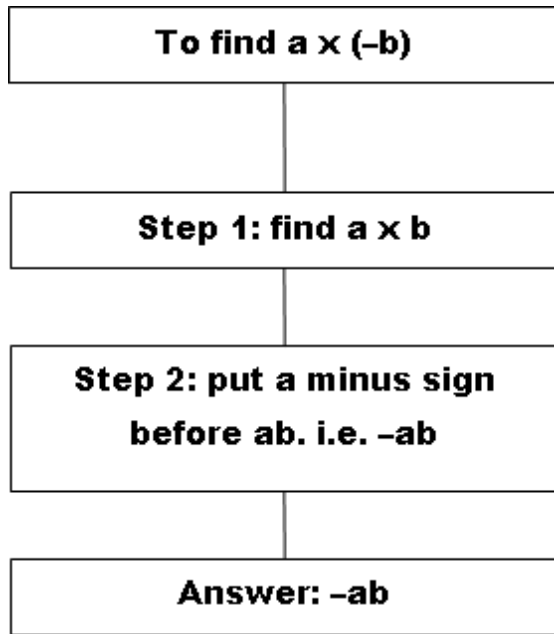
$(-12) \times 2 = -24$

So, when we multiply a positive integer and a negative integer we always get a negative integer.

If a and b are two integers, then $(a \times b)$ is the product of two integers.

For example, values of a and b are given and the product of given integers are:

a	b	a x b
-4	5	-20
10	-5	-50
-23	2	-46



The rule is the same for $(-a) \times b$;

$$(-7) \times 4 = -28$$

$$(-a) \times b = -ab$$

So, when we multiply a positive integer and a negative integer, we always get a negative integer.

That is $(+) \times (-) = (-) \times (+) = \text{negative sign}(-)$.

If a and b are integers, then, $(a) \times (-b) = (-a) \times b = -(axb)$

Multiplication of two negative integers

Here we have two negative numbers.

Find the product:

$$(-2) \times (-3) = 6.$$

$$(-9) \times (-5) = 45$$

When we multiply two integers with the **same signs**, the result is always **positive**.

If a and b are integers, then $(-a) \times (-b) = ab$

Multiplication of three or more negative integers

Now consider three negative integers,

Find $(-a) \times (-b) \times (-c)$

$(-a) \times (-b)$ is positive.

Positive $\times (-c)$ is negative.

Therefore, $(-a) \times (-b) \times (-c)$ is negative.

Consider $(-a) \times (-b) \times (-c) \times (-d)$

$(-a) \times (-b) \times (-c)$ is negative

Negative $\times (-d)$ is positive

Therefore, $(-a) \times (-b) \times (-c) \times (-d)$ is positive.

Let us summarize these results

Integers	Sign of the product	Number of minus sign	Number of minus sign Even/odd
$(-a) \times b$	Negative	1	Odd
$(-a) \times (-b)$	Positive	2	Even
$(-a) \times (-b) \times (-c)$	Negative	3	Odd
$(-a) \times (-b) \times (-c) \times (-d)$	Positive	4	Even
$(-a) \times (-b) \times (-c) \times (-d) \times (-e)$	Negative	5	Odd

So $(-2) \times 3 = -6$

$(-3) \times (-4) = 12$

$(-1) \times (-3) \times (-5) = -15$

General rule is when we multiply negative numbers and positive numbers, multiply the numbers and find the number of minus signs. If odd, put a minus sign. If even, do not put minus sign.

Let us see some special cases:

$(-1) \times (-3) \times 0 = 0$

$(-1) \times (-3) \times (-5) \times 0 = 0$

Any integer multiplied by 0 is only 0.

Time to teach	Asset type	Theme	Sub Theme
15 minutes	Main Script	Integers	Multiplication of Integers and its properties

MS_Properties of Integers under multiplication

Asset

for

MS_Properties of Integers under multiplication

Properties of Multiplication of Integers

1. Closure under Multiplication

We know how to multiply two positive numbers, three positive numbers, one positive and one negative number, two positive and one negative number, two negative numbers, three negative numbers etc.

Consider, $2 \times 3 = 6$,

$$(-1) \times (-3) = 3,$$

$$(-4) \times (-2) \times 5 = 40.$$

So product of two integers is an integer. In general,

If a and b are integers, then a x b is also an integer

So, we say integers are closed under multiplication.

2. Commutativity of Multiplication

Consider, $2 \times 4 = 8$

and $4 \times 2 = 8$.

$$(-1) \times (-3) = 3$$

$$\text{and } (-3) \times (-1) = 3$$

Therefore, multiplication is commutative for integers.

For any two integers a and b, $a \times b = b \times a$.

3. Multiplication by Zero

We know that when multiplying zero with any number we get zero.

$$2 \times 0 = 0,$$

$$(-3) \times 0 = 0$$

For any integer a,

$$a \times 0 = 0 \times a = 0$$

4. Multiplicative Identity Now let us look at tables

$1 \times 2 = 2$	$1 \times 3 = 3$	$1 \times 4 = 4$	$1 \times 5 = 5$
$2 \times 2 = 4$	$2 \times 3 = 6$	$2 \times 4 = 8$	$2 \times 5 = 10$
$3 \times 2 = 6$	$3 \times 3 = 9$	$3 \times 4 = 12$	$3 \times 5 = 15$

When we see the first row, we notice that one multiplied with 2, 3, 4 and 5 gives 2, 3, 4 and 5.

$$45 \times 1 = 45$$

$$(-1) \times 1 = -1$$

For any integer a,

$$a \times 1 = 1 \times a = a$$

Note: 0 is the additive identity, whereas, 1 is the **multiplicative identity** for integers.

When we multiply any integer by (-1),

for example,

$$(-4) \times (-1) = 4$$

$$4 \times (-1) = -4$$

So, we get additive inverse of the integer when we multiply by (-1)

$$\text{Hence, } a \times (-1) = (-1) \times a = -a$$

5. Associativity for Multiplication

$$\text{Consider } 2 \times (3 \times 5) = 2 \times 15 = 30$$

$$\text{and } (2 \times 3) \times 5 = 6 \times 5 = 30$$

$$\text{So, } 2 \times (3 \times 5) = (2 \times 3) \times 5$$

Also,

$$(-5) \times (7 \times (-3)) \text{ and } ((-5) \times 7) \times (-3)?$$

$$(-5) \times \{7 \times (-3)\} = (-5) \times (-21) = 105$$

$$\{(-5) \times (7)\} \times (-3) = (-35) \times (-3) = 105$$

$$\text{Therefore, } (-5) \times \{7 \times (-3)\} = \{(-5) \times (7)\} \times (-3)$$

This is true for any three integers.

$$\text{For any three integers a, b, c, } a \times (b \times c) = (a \times b) \times c$$

This property is called associative property for multiplication of integers.

Let us compare the properties of addition and multiplication

Properties	Addition	Multiplication
Closure Property	$a + b$ is an integer. Addition is closed	$a \times b$ is an integer. Multiplication is closed
Commutative Property	$a + b = b + a$. Addition is commutative	$a \times b = b \times a$. Multiplication is commutative
Identity Property	$a + 0 = a$ 0(Zero) is the identity for addition	$a \times 1 = a$. 1(one) is the identity for multiplication
Associative Property	$a + (b + c) = (a + b) + c$. Addition is associative	$a \times (b \times c) = (a \times b) \times c$. Multiplication is associative

Time to teach	Asset type	Theme	Sub Theme
15 minutes	Main Script	Integers	Multiplication of Integers and its properties

MS_Distributive Property of Integers

Asset

for

MS_Distributive Property of Integers

Now let us take combination of two operations, done over two elements, namely addition and multiplication.

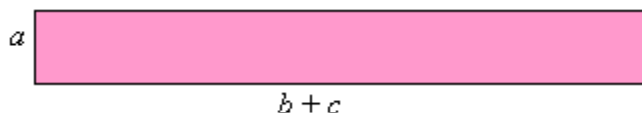
For e g $2(3+4) = 14 = (2 \times 3) + (2 \times 4) = 6 + 8 = 14$

distributive property

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

Consider the expression $a(b + c)$.

This expression represents the area of a rectangle of length $b + c$ and width a . So, this expression can be represented as:



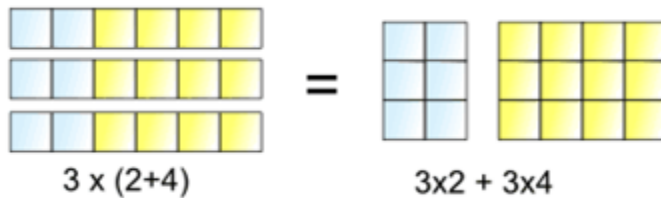
This can be split up into two parts as follows:



Now, the sum of the areas of the rectangles = $ab + ac$.

This suggests that: $a(b+c) = ab + ac$

This is called the Distributive Law. i.e. we can distribute the integers in two different ways and it does not make a difference.



3 lots of (2+4) is the same as 3 lots of 2 plus 3 lots of 4

Distributive property of multiplication over addition

Consider 1) $2 \times (3 + 1) = 2 \times 4 = 8$

$$2 \times 3 + 2 \times 1 = 6 + 2 = 8$$

So we have, $2 \times (3 + 1) = 2 \times 3 + 2 \times 1$

$$2) 7 \times (3 + 0) = 7 \times 3 = 21$$

$$7 \times 3 + 7 \times 0 = 21 + 0 = 21$$

Therefore, $7 \times (3 + 0) = 7 \times 3 + 7 \times 0$

$$3) (-8) \times (6 + (-5)) = (-8) \times 1 = -8$$

$$(-8) \times 6 + (-8) \times (-5) = (-48) + 40 = -8$$

Therefore, $(-8) \times (6 + (-5)) = (-8) \times 6 + (-8) \times (-5)$, So

In general,

For any three integers a, b, c

$$\mathbf{a \times (b + c) = a \times b + a \times c}$$

Here, we distribute integers in two different ways. This property of integers is called distributive property.

Here, both the operations, namely, addition and multiplication are involved.

More explicitly we say that it is distributive over addition.

Distributive property of multiplication over subtraction

Now consider

$$1) 3 \times (4 - 7) = 3 \times (-3) = -9$$

$$3 \times 4 - 3 \times 7 = 12 - 21 = -9$$

$$\text{So, } 3 \times (4 - 7) = 3 \times 4 - 3 \times 7$$

$$2) (-4) \times \{ (-2) - (-6) \} = (-4) \times \{ -2 + 6 \} = (-4) \times 4 = -16$$

$$(-4) \times (-2) - (-4) \times (-6) = 8 - 24 = -16$$

$$\text{So, } (-4) \times \{ (-2) - (-6) \} = (-4) \times (-2) - (-4) \times (-6)$$

Hence, in general, for any three integers a, b and c,

$$\mathbf{a \times (b - c) = a \times b - a \times c}$$

This property is known as distributive property of multiplication over subtraction.

Time to teach	Asset type	Theme	Sub Theme
12 minutes	Main Script	Integers	Multiplication of Integers and its properties

MS_Making Multiplication Easier

Asset

for

MS_Making Multiplication Easier

Distributive property is useful when multiplying two big numbers.
Let us see some examples.

Consider the following:

Example 1:

$$15 \times 11 .$$

$$\begin{aligned} 15 \times 11 &= 15 \times (10 + 1) = 15 \times 10 + 15 \times 1 \\ &= 150 + 15 \\ &= 165 \end{aligned}$$

Example 2:

$$(-12) \times 104$$

$$\begin{aligned} (-12) \times 104 &= (-12) \times (100 + 4) \\ &= (-12) \times 100 + (-12) \times 4 \\ &= (-1200) + (-48) \\ &= -1248 \end{aligned}$$

Example 3

$$12 \times 105$$

We choose 105 to split. It is closer to 100. We express $105 = 100 + 5$.

$$\begin{aligned} 12 \times 105 &= 12 \times (100 + 5) \\ &= 1200 + 60 = 1260 \end{aligned}$$

Example 4:

$$(-2) \times 98$$

We choose 98 to split. It is closer to 100. We express $98 = 100 - 2$.

$$\begin{aligned} (-2) \times 98 &= (-2) \times (100 - 2) \\ &= (-2) \times 100 + (-2) \times (-2) = -200 + 4 = -196 \end{aligned}$$

Example 5:

$$(-2) \times 67$$

We choose 67 to split. It is closer to 70. We express $67 = 70 - 3$.

$$(-2) \times 67 = (-2) \times (70 - 3)$$

$$= (-2) \times 70 - (-2) \times 3 = -140 - (-6) = -134$$

- We always split the large number.
- In splitting we follow either addition or subtraction
- If the number (assume the number is positive) is closer to multiples of 10 or 100 or 1000, according to the value choose addition or subtraction
- We find that the properties of multiplication make our multiplication simpler and easier.

Time to teach	Asset type	Theme	Sub Theme
10 minutes	Main Script	Integers	Multiplication of Integers and its properties

MS_Division of Integers

Division of Integers:

We know that,

If a and b are integers, and $a \times b = n$,

$n \div a = b$ and $n \div b = a$

We know if a is an integer, then $1 \times a = a$.

Then $a \div 1 = a$ and $a \div a = 1$

So we say 1 and a are divisors of ' a '

Let us compare the properties of 0 (zero) and 1

Zero(0)	One(1)
Additive Identity	Multiplicative Identity
$a + 0 = a$	$a \times 1 = a$
When 1 is added, we get $a + 1$	When 0 is multiplied, we get 0

Let us consider some examples:

1) When we divide an integer by another integer (provided $a \div b = c$ is an integer),

- $14 \div 2 = 7$
- $(-24) \div 2 = -12$
- $44 \div (-2) = -22$
- $(-56) \div (-8) = 7$

So we conclude

1. If both a and b are integers of same sign, then $a \div b$ is positive
2. If one of them is positive and the other is negative, then $a \div b$ is negative

2. Let us check whether division of integers is an integer.

Consider $56 \div 8 = 7$, an integer.

Consider $35 \div 8 = 35/8$ is not an integer.

So division of an integer by an integer need not be an integer.

Therefore, integers are not closed under division

3. Consider $(-9) \div 3 = -3$

$$3 \div (-9) = -\frac{1}{3}$$

Therefore $(-9) \div 3 \neq 3 \div (-9)$

So Division is not commutative.

4. We cannot divide an integer by zero. It is not permissible.

Therefore $5 \div 0$, $12 \div 0$, $(-15) \div 0$ are not allowed.

Let us compare multiplication and division

Let us recall $a \times 0 = 0$, and $0 \times a = 0$.

But $0 \div a$ is 0 where a is not zero and

$a \div 0$ is not permissible.

Also $a \times 1 = a$ and $1 \times a = a$

But only $a \div 1 = a$

We have

If a is any integer, then

$$0 \div a = 0$$

$$a \div 1 = a$$

Let us assume, $a \div b$ is an integer.

a	b	$a \times b$	$a \div b$
Positive	Positive	Positive	Positive
Positive	Negative	Negative	Negative
Negative	Positive	Negative	Negative
Negative	Negative	Positive	Positive

So in multiplication and division we get the same signs in the answer.

Let us look at $6 \div (-2) = -3$ and $(-6) \div 2 = -3$

From the above table if one of them is positive and the other is negative, the answer is negative.

From the example we see the answers are the same.

If a and b are positive integers, then $a \div (-b) = (-a) \div b$

Let us look at $6 \div 2 = 3$ and $(-6) \div (-2) = 3$

From the above table if both are positive, the answer is positive.

If both are negative, the answer is negative.

In general,

If a and b are positive integers, then

$$\mathbf{a \div b = (-a) \div (-b)}$$

Addition is associative and Multiplication is associative.

Is it true for division?

$$20 \div (10 \div 2) = 20 \div 5 = 4$$

$$(20 \div 10) \div 2 = 2 \div 2 = 1$$

$$20 \div (10 \div 2) \neq (20 \div 10) \div 2$$

Division of integers is not associative.

Time to teach	Asset type	Theme	Sub Theme
10 minutes	Main Script	Integers	Division of Integers & its properties

QA_Questions on Integers

Asset

for

QA_Questions on Integers

A. Fill in the blanks:

- i) $(-19) + 5 = 5 + \underline{\hspace{2cm}}$
- ii) $12 + \underline{\hspace{2cm}} = (-7) + 12$
- iii) $7 \times (-6) = (-6) \times \underline{\hspace{2cm}}$
- iv) $(-115) \times \underline{\hspace{2cm}} = (-10) \times (-115)$
- v) $\underline{\hspace{2cm}} \times 25 = 25 \times (-9)$
- vi) $(-12) \times 18 = \underline{\hspace{2cm}} \times (-12)$

Ans: i. (-19) , ii. (-7) , iii. 7 , iv. (-10) , v. (-9) vi. 18

B. Match the following:

- i) $(-7) \times 9 = 9 \times (-7)$ (a) Property of multiplicative identity
- ii) $6 + [3 + (-2)] = [6 + 3] + (-2)$ (b) Commutative property of multiplication
- iii) $(-7) \times 1 = -7$ (c) Associative property of addition

Ans: i. b, ii. c, iii. a

C. Verify the following:

- i) $23 \times [7 + (-2)] = (23 \times 7) + (23 \times (-2))$
- ii) $14 \times [(-2) + (-4)] = [14 \times (-2)] + [14 \times (-4)]$

Ans: i). $23 \times [7-2] = 23 \times 5 = 115$
 $(23 \times 7) + (23 \times (-2)) = 161 - 46 = 115$
Hence verified.
ii) $14 \times [(-2) + (-4)] = 14 \times (-6) = -84$
 $[14 \times (-2)] + [14 \times (-4)] = (-28) + (-56) = -84$
Hence verified.

D. What will be the sign of the product if we multiply together:

- i) 3 negative integers and 2 positive integers?

ii) 4 negative integers and 4 positive integers?

Ans: i) (-) .ii) (+)

E. Find the product using suitable properties:

i) $(-5) \times (3) + (-5) \times 2$

ii) $8694 \times 1 + 99 \times 8694$

Ans: i) $(-5) \times [3+2] = (-5) \times 5 = -25$

ii) $8694 \times (1+99) = 8694 \times 100 = 869400$

F. Verify and name the property used:

i) $(-210) \times (-347) = (-347) \times (-210)$

ii) $(-25 \times 4) \times (-252) = -25 \times [4 \times (-252)]$

iii) $(-194) \times 143 + (-194) \times 57 = (-194) \times [143 + 57]$

Ans: i) Commutative property of multiplication

ii) Associative property of multiplication

iii) Distributive property of multiplication over addition

G. State whether the following statements are true or false.

i) $0 \div -2 = -20$ _____

ii) $(-1) \div (-18) = -1$ _____

iii) $18 \div (-18) = -1$ _____

iv) $(-18) \div (-18) = -1$ _____

v) $(-18) \div 1 = (-18)$ _____

Ans: i) F ii) F iii) T iv) F v) T

Time to teach	Asset type	Theme	Sub Theme
12 minutes	Questions to Assess	Integers	Multiplication of Integers and its properties

VC_Good Friends - Good Life

Asset

for

VC_Good Friends - Good Life

We have learned that the collection of numbers..., $-4, -3, -2, -1, 0, 1, 2, 3, 4, \dots$ called *integers*.

When you multiply two integers with the **same signs**, the result is always **positive**.
Similarly, when you multiply two integers with **different signs**, the result is always **negative**.

Note that a positive integer when multiplied with another positive integer results in much more positivity. On the other hand, when a positive integer is multiplied with a negative integer, results in more negativity.

Similarly in real life, if we bring good people together, more good will spread everywhere. If good people mingle with not so good people, more often than not, things will get worse. Irrespective of the best intentions and number of good people, a few bad people can spoil the whole lot of good people. It is like a few weeds spoiling a whole beautiful garden or a slice of Lemon spoiling a whole pot of pure milk.

“For the one whose association improves, everything indeed improves. Everything indeed gets ruined, for the one who gets into bad or harmful associations.”

-Dada Bhagawan, an Indian saint

Friendship multiplies the good of life and divides the evil. - Baltasar Gracian, a 16Th Century Spanish - Poet Philosopher

So, Children, we should always be selective about the associations we develop with others. We should always choose good & positive people for our associations so that we & our associates/friends mutually benefit by it & others around are benefitted too. Spread of goodness all around is always welcome rather than negativity.

Time to teach	Asset type	Value	Sub Value
3 minutes	Value Content	Truth	Discrimination

MS_Summary_Integers

Summary of Integers

- (a) Integers are closed for both addition and subtraction

That is, $a + b$ and $a - b$ are again integers, where a and b are any integers.

1. (b) Addition is commutative for integers, i.e., $a + b = b + a$ for all integers a and b .
2. (c) Addition is associative for integers, i.e., $(a + b) + c = a + (b + c)$ for all integers a , b and c .
3. (d) Integer 0 is the identity under addition. That is, $a + 0 = 0 + a = a$ for every integer a .
4. (e) We studied, how integers could be multiplied and found that the product of a positive and a negative integer is a negative integer, whereas the product of two negative integers is a

positive integer. For example, $-2 \times 7 = -14$ and $-3 \times -8 = 24$.

1. (f) Product of the even number of negative integers is positive, whereas the product of the odd number of negative integers is negative.
2. (g) Integers show some properties under multiplication.
 1. Integers are closed under multiplication. That is, $a \times b$ is an integer for any two integers a and b .
 2. Multiplication is commutative for integers. That is, $a \times b = b \times a$ for any integers a and b .
 3. The integer 1 is the identity under multiplication, i.e., $1 \times a = a \times 1 = a$ for any integer a .
 4. Multiplication is associative for integers, i.e., $(a \times b) \times c = a \times (b \times c)$ for any three integers a , b and c .
- (h) Under addition and multiplication, integers show a property called distributive property. That is, $a \times (b + c) = a \times b + a \times c$ for any three integers a , b and c .
- (i) We also learnt how to divide integers. We found that,
 1. When a positive integer is divided by a negative integer, the quotient obtained is a negative integer and vice-versa.
 2. Division of a negative integer by another negative integer gives a positive integer as quotient.
- (j) For any integer a , we have
 1. $a \div 0$ is not defined
 2. $a \div 1 = a$

Time to teach	Asset type	Theme	Sub Theme
5 minutes	Main Script	Integers	Addition & Subtraction of

			integers on number line
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Master Lesson Plan

Seven Asset Methodology for MLP

What is the purpose of this Master lesson Plan?	This Master Lesson Plan (MLP) prepared by Sri Sathya Sai Vidya Vahini (SSSVV), covers the entire chapter for the given board. The MLP for the chapter given in the textbook is broken down into smaller modules known as assets. Any chapter can be taught using the 7 asset types in SSSVV methodology. Several different assets together complete the entire chapter. Depending on the requirement, each asset is supported by teaching aids such as animated presentation, audio, video, and learning aids such as worksheets. The MLP is for the teacher's preparation and the teaching aids are for use in the classroom.
How to use it?	You can prepare for your class with this MLP by following 3 simple steps: 1. Read your textbook; 2. Go through the information given in the assets (document & multimedia); 3. Prepare your teaching notes. Great! Now you are ready to transact the chapter.
Duration	Kindly note the duration given for each asset. Due care has been taken in planning the assets, to ensure the chapter is completed within the time specified by the Board. Note: Preparation time is not included in the asset duration. The teaching time depends on the duration of the teaching aids and is not impacted by the length of the MLP.
What is a 'Main Script' (MS) Asset?	The Main Script asset is there for explaining the main concepts of the chapter clearly. The information given in the textbook is simplified, organised and structured to give more clarity. Additionally, you may find a video or mnemonics or a graphic organiser to deepen the understanding of the concept.
How to teach using the MS asset?	Please use the blackboard, slides and interaction to develop the concept.
What is an 'Inquisitive Questions' (IQ) asset?	The Inquisitive Questions asset uses questions to promote higher order thinking like the n^{th} why, what-if, new perspectives, cause-effect, and others, creating curiosity.
How to teach using the IQ asset?	You may use the questions to connect with the students, encourage exploration to engage them in the learning process. You may allow multiple responses and instead of rejecting any of the responses, ask why, before revealing the suggested answer or hints.
What is a 'Day to day Relevance' (DD) Asset?	The Day to Day Relevance asset helps students understand the practical relevance of every topic, making them eager participants in the classroom. If students connect the concepts to their environment, they would learn meaningfully without dislike or simply memorizing for exams.

How to teach using the DD asset?	You may use the asset by asking questions about their experience and use it to establish why they are learning the topic. If necessary you may substitute with a recent or local example.
What is an 'Interesting Aside' (IA) asset?	The Interesting Aside asset uses attention grabbing titbits or anecdotes to bring joy and satisfy the child's hunger to know more. This is a quick/short asset intended to bring attention back to the main concept being taught.
How to teach using the IA asset?	You may use this asset to give a piece of interesting information relevant to the topic, without prolonged explanation/discussion. You may suggest appropriate books for further reading.
What is a 'Suggested Activity' (SA) Asset?	The Suggested Activity asset provides a detailed step by step procedure for the teacher to conduct a hands-on activity. This promotes Activity Based Learning.
How to teach using the SA asset?	You may use this asset to energise your students to learn by doing simple, fun-filled activities based on the topic. The asset includes - preparation, activity, and follow-up. You may engage the students in the preparation and follow-up stages to develop collaboration and responsibility. You could try it once, yourself, before the actual delivery to be more comfortable with it. Note: The duration mentioned in the asset is usually for the activity part only.
What is a 'Value Content' (VC) Asset?	The Value Content asset integrates Universal Human Values (such as empathy, inclusivity, respect for nature that translates into responsible behaviour) seamlessly into the curriculum, as the "End of education is character".
How to teach using the VC asset?	You may use this asset to engage with the students to bring out their innate values and connect with the intrinsic values in the topic/concept. The asset includes pointers on the specific pedagogical technique followed.
What is a 'Questions to Assess' (QA) asset?	The Questions to Assess asset uses an interactive approach to check learning of different types of learners, and provides feedback to the teacher for appropriate action. The questions cater to all the levels of Bloom's Taxonomy. Questions from 'Apply' level and above enable students to reflect on their learning.
How to teach using the QA asset?	You may go through the slides to understand its flow and know when to click for the answer (slides include suggested answers). While presenting in the class, you may display the question and encourage multiple responses, before revealing the answer. In some cases, this asset may include extra questions/worksheet that can be given as homework.