

## Vision Empower & XRCVC

Teacher Instruction KIT

# Integers

Syllabus: Karnataka State Board

Subject: Mathematics

Grade: 6

Textbook Name: Math Text cum workbook

Chapter Number & Name: 6. Integers

## 1. OVERVIEW

### 1.1 OBJECTIVE AND PREREQUISITES

#### Objective

- Introduction to Integers.
- Representation of integers on a number line.
- Ordering of integers.
- Addition of integers using a number line.
- Subtraction of integers with the help of a number line.

#### Prerequisite Concept

- Whole numbers, integers, number line of integers  
*TIK\_MATH\_G6\_CH1\_Wholenumbers*

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*Kindly Note: Activities marked with \* are mandatory*

#### LEARN

KEY POINTS

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## 2. LEARN

### 2.1 KEY POINTS

- The collection of numbers...,  $-4$ ,  $-3$ ,  $-2$ ,  $-1$ ,  $0$ ,  $1$ ,  $2$ ,  $3$ ,  $4$ , ... is called integers. So,  $-1$ ,  $-2$ ,  $-3$ ,  $-4$  called negative numbers are negative integers and  $1$ ,  $2$ ,  $3$ ,  $4$ ,... called positive numbers are the positive integers.
- Numbers such as  $3$  and  $-3$ ,  $2$  and  $-2$  when added to each other give the sum zero. They are called additive inverses of each other.

### 2.2 LEARN MORE

## 3 ENGAGE

### 3.1 INTEREST GENERATION ACTIVITY

#### Activity 1: Temperature

*Materials Required:* None

*Prerequisites:* None

#### *Activity Flow*

*The temperature is always either over 0 or below 0. An example would be at night it could be  $-2$  degrees and halfway through the day, it might be  $+23$  degrees.*

- *Give the following information to the students.*
- *Here are some temperatures from around the world, taken on the same day*  
*Delhi: 14 degree celsius*  
*Kingston: 26 degree celsius*  
*Landon: 4 degree celsius*  
*Moscow:  $-12$  degree celsius*  
*New York:  $-1$  degree celsius*
- *Ask the following questions:*
  1. *Which city is colder, Moscow or New york.*
  2. *How much colder in New York than London?*
  3. *Which is colder,  $-6$  degree Celsius or  $-10$  degree celsius*
- *Explain to the students, we measure the temperature using a thermometer. At night, we feel colder than in the morning. It's because of the temperature difference.*

- *If the temperature is above 30 degree Celsius, we all feel warm. If it's more than 40 degree celsius we feel hot. Similarly, if the temperature goes down, we feel colder.*

### 3.2 CONCEPT INTRODUCTION ACTIVITIES

#### **Introduction to integers**

##### **Activity 2: Introduction to integers**

*Materials required:* Geometry kit, Parchment paper, tactile ruler, dice, pawns (seeds).

Stick a dice with a circular bindi on three sides and with a triangular bindi on the remaining three sides, tactile diagram of number line of integers.

*Prerequisites:* Number line for the whole numbers.

#### *Activity Flow*

- *Ask the students what they know about whole numbers. Also, ask them to draw a number line for the whole numbers.*
- *Ask the following questions.*
  1. *Radha wants to buy a Taylor frame which costs 150 rupees. But she has only 115 rupees. How much should she borrow from her friend?*  
*Answer: 35 rupees.*
  2. *Madhu bought a stylus which costs 30 rupees and pays only 12 rupees. Then how much does she have to pay the shopkeeper?*  
*Answer: 18*
- *Make a group of two students and ask one of the students to draw a number line for whole numbers on parchment paper using a tactile ruler.*
- *Zero will be the initial point. Let each of them roll a dice alternatively. Suppose if the child gets the circular bindi on the dice then they have to move their pawn(seed) one step forward and if they get triangular bindi then they have to move one step backwards from the present position on the number line.*
- *When a child is at position zero on a number line and if they get triangle shape on dice, they have to move one step backwards. Ask them what will they do?*
- *For which, they should move their pawns backwards from zero in order.*
- *And a negative sign along with the numbers on the left side of zero. This indicates that numbers with a negative sign are less than zero. These are called negative numbers.*
- *Similarly, explain the amount borrowed in the first two examples are examples of the negative numbers.*

*The whole numbers with negative numbers will be the integers. I.e. Collection of positive and negative numbers, including zero, are said to be integers.*

##### **Activity 3: Representation of integers on a number line.**

*Materials Required:* Taylor frame.

*Prerequisites:* Introduction to integers.

### Activity Flow

- Ask them to write a number line for integers on a Taylor frame.
- Let them mark the point zero and numbers on the right side of zero are positive numbers and numbers on the left of zero are negative numbers.
- Ask the students to solve the following questions on the Taylor frame. So, they have to take out the corresponding numbers on the number line on Taylor frame.
  - a. 5 steps to the left of zero.
  - b. 7 steps to the right of zero.
  - c. 6 steps to the right of zero.
  - d. 8 steps to the left of zero.
  - e. 7 degrees below zero.

### Activity 4: Ordering of integers.

*Materials Required:* Taylor frame.

*Prerequisites:* None

### Activity Flow

- Let them write the number line of integers on Taylor frame. Ask them to observe the order in which the numbers are arranged.
- If a movement of only 1 is made to the left, we get the predecessor of a number. And the movement of only 1 is made to the right, we get the successor of a number.
- Ask students the following questions:
  1. Write the next three numbers of 11. Answer: 12, 13 and 14.
  2. Write the previous three numbers of 4. Answer: 3, 2 and 1.
  3. Write the succeeding and preceding number of zero.  
Answer: Succeeding number is 1 and the preceding number is  $-1$ .
  4. What is the previous number of  $-1$ ? Answer:  $-2$ .
  5. What is the succeeding number  $-4$ ? Answer:  $-3$
  6. Which integers lie between 5 and 9? Answer: 6, 7 and 8.
  7. Which integers lie between  $-4$  and  $-11$ ? Answer  $-5, -6, -7, -8, -9, -10$
  8. Are number 12 greater than 8? Answer: yes.
  9. Are numbers  $-2$  less than  $-3$ ? Answer: No.
  10. Number  $-1$  is less than 0? Answer: yes.

Similarly, ask them questions to identify greater and smaller numbers for the negative numbers. Through which the concept of number increases on the left of the number line of integers the value goes on decreasing.

*Example: If we consider a ladder represents a number line of integers, then fix one step as zero, then the steps above this represent positive numbers and the steps below represent negative numbers.*

### **Addition of integers using a number line**

#### **Activity 5: Addition of integers using a number line**

*Materials Required:* Braille cards of the first 15 numbers both positive and negative, Taylor frame.

*Prerequisites:* None

#### *Activity Flow*

*Rules for performing addition and subtraction of integers on a number line are given as follows.*

- 1. The first number in the given expression determines the starting point on a number line.*
- 2. The operator determines the turn towards the right or left from the starting point. i.e If the operator is positive then turn towards the right. If negative, turn towards the left.*
- 3. The second number in the given expression determines whether to move forward or backwards after the turn from the starting point.*

*Do the following activity:*

- *Put all 30 cards having 15 positive and 15 negative numbers in a bag.*
- *Ask each of them to take any two cards and ask them to add those two numbers. Write the answer on the Taylor frame number line of integers.*

#### *Example 1: Addition of $-6$ and $8$*

*Suppose if we get  $-6$  and  $8$ . So, depending on the sign of each number we will decide whether to move forward or backward.  $8$  is a positive number we will move 8 steps forward from the initial point zero. Then from that point will move 6 steps backwards for the number  $-6$ . Then we will arrive at number 2, which will be the answer.*

*Which is the same as first moving 6 steps backwards then from that point moving 8 steps forward will give us the same answer.*

#### *Example 2: Addition of $-5$ and $-7$ .*

*Since, both the numbers have negative signs. We need to move 5 steps backwards from zero on a number line then from that point moving 7 steps backwards again and finally will reach number  $-12$  as an answer.*

- *Similarly, give more examples to work out and show it on Taylor frame.*

- Numbers such as 3 and  $-3$  , 2 and  $-2$  ,  $-5$  and 5 added together will give the sum zero. They are called additive inverses of each other.
- Zero additive identity is  $2+0 = 2 = 0+2$ . We can observe that, if we add zero to any number the answer will be the number itself. Hence, if we add additive inverses then we get zero as the answer which is the same as shifting one of the inverses to the right side of the equal sign.

Note:

1. This activity can be played between two or three groups depending on the strength of the class. Each group should pick two cards and ask them to add those two numbers and they have to keep on adding the next number to the previous sum for every turn. After 10 rounds of playing whichever group has the larger sum will be the winner.
2. Once they are familiar with the game. Then increase the number of cards, may be 50 positive numbers and 50 negative numbers.

### Subtraction of integers using a number line

#### Activity 6: Subtraction of integers using a number line

*Materials Required:* Braille cards of the first 50 numbers both positive and negative, Taylor frame.

*Prerequisites:* None

#### Activity Flow

- Put all 100 cards having 50 positive and 50 negative numbers in a bag.
- Ask each of them to take any two cards and ask them to subtract those two numbers. Write the answer on the Taylor frame having a number line of integers.

*Example 1:* Subtract 9 from 4.

That is,  $9 - 4 = 9 + (-4) = 5$

Ask the students to observe the signs that both number 9 and 4 have. 9 is a positive number. We will move 9 steps forward from the initial point zero. Then from that point will move 4 steps backwards and reach number 5. This will be the answer. Which is the same as first moving 4 steps backwards then from that point moving 9 steps forward then arriving at number 5 which is the same answer.

*Example 2:* Subtract  $-11$  from 6 .

That is,

$$6 - (-11) = 6 + 11 = 17$$

Let us now find the value of  $6 - (-11)$  using a number line. We can say that this is the same as  $6 + 11$ , as the additive inverse of  $-11$  is 11 .

(Or)

- Look at the first number(operand) in the given expression, that is positive number 6. Then go to number 6 on a number line then since the operation sign is negative then turn towards the left and see the next number along with sign which is negative 11

then move 11 steps backwards from position 6 then will reach number 17 on a number line.

*Example 3:*

Subtract  $-3$  from  $-10$  .

That is,

$$-10 - (-3) = -10 + 3 = -7$$

- Let us now find the value of  $-10 - (-3)$  on a number line. We can say that this is the same as  $-10 + (3)$  , as the additive inverse of  $-3$  is  $3$  .  $3$  is a positive number we will move 3 steps forward from the initial point zero. Then from that point, we will move 10 steps backwards and reach number  $-7$  , which is the answer.  
(Or)
- Look at the first number(operand) in the given expression, that is positive number 6. Then go to negative number  $-10$  on a number line then since the operation sign is negative then turn towards the left and see the next number along with sign which is negative 3 then move 3 steps backwards from position  $-10$  then will reach number negative 7 on a number line.
- Similarly, give more examples to work out and show it on Taylor frame.

*Note: This activity can be played between two or three groups depending on the strength of the class. Each group should pick two cards and ask them to subtract the number and they have to keep on adding the previous sum to the next sum for every turn. After 10 rounds of playing whichever group has the larger sum will be the winner.*

*Please Note:*

$-7 + (-5)$  is different from  $-7 - (-5)$  .

So  $-7 + (-5) = -7 - 5 = -12$  and  $-7 - (-5) = -7 + (5) = -7 + 5 = -2$  .

Generally, what is  $-(-5)$  ?

The additive inverse of a negative number is positive which is 5. And  $+(-5)$  is the number itself which is  $-5$ .

### 3.3 LET'S DISCUSS: RELATE TO DAILY LIFE\*

Some of the places where we use integers.

1. The height of a place above sea level is denoted by a positive number. Height becomes lesser and lesser as we go lower and lower. Thus, below the surface of the sea level we can denote the height by a negative number.
2. Temperature above  $0^{\circ}\text{C}$  is denoted a '+' sign and temperature below  $0^{\circ}\text{C}$  is denoted by '-' sign.

## 4 EXERCISES & REINFORCEMENT

### 4.1 PRACTICE PROBLEMS

## Activity 7: Practice and Recall

Materials Required: None

Prerequisites: None

### Activity Flow

1. Represent the following numbers on a number line :
  - a. +5
  - b. -10
  - c. +8
  - d. -1
  - e. -6
2. In each of the following pairs, which number is to the right of the other on the number line?
  - a. 2, 9
  - b. -3, -8
  - c. 0, -1
  - d. -11, 10
  - e. -6, 6
3. Write all the integers between the given pairs.
  - a. 0 and - 7
  - b. -4 and 4
  - c. -8 and -15
  - d. 30 and -2
4. Write four negative integers greater than - 20 .
5. Write four integers less than - 10 .
6. For the following statements, write True (T) or False (F). If the statement is false, correct the statement.
  - a. - 8 is to the right of -10 on a number line.
  - b. -100 is to the right of -50 on a number line.
  - c. The smallest negative integer is - 1 .
  - d. -26 is greater than -25 .
7. Answer the following :
  - a. Which number will we reach if we move 4 numbers to the right of -2 .
  - b. Which number will we reach if we move 5 numbers to the left of 1.
  - c. If we are at -8 on the number line, in which direction should we move to reach -13 ?
  - d. If we are at -6 on the number line, in which direction should we move to reach -1 ?
  - e. reach -1 ?

8. Using the number line write the integer which is :

- a. 3 more than 5
- b. 5 more than  $-5$
- c. 6 less than 2
- d. 3 less than  $-2$

9. Use number line and add the following integers :

- a.  $9 + (-6)$
- b.  $5 + (-11)$
- c.  $(-1) + (-7)$
- d.  $(-5) + 10$

#### 4.2 IMPORTANT GUIDELINES\*

##### **Exercise Reading**

It is very important that the children practice their learnings as well as their Reading. Hence have the children read out the newly learned concepts from their textbooks or other available resources.

##### **Perform Textbook Activity**

It is good practice to have the children perform the textbook activities. Your textbook activities might not be accessible hence go through this resource to learn how to make textbook content accessible

##### **Provide Homework**

To evaluate their understanding and to help the student revise and implement the new learnt concept ensure to provide them with homework. Students should perform one or two of the questions mentioned above or from the textbook exercises with the teacher in Class and the remaining may be given for homework. Also, ensure that the student knows their special skills linked to independently using their accessible books as it will be critical to doing homework independently

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