# I B PATEL ENGLISH SCHOOL
# (PRIMARY SECTION)

## CLASS – 6

## SUBJECT - MATHS

## CHAPTER – 1

# KNOWING NUMBERS

# Numbers are used for counting

- We represent infinite objects around us using the set of 26 letters ( { A-Z} ) , we can use the words formed out of alphabets in representing any object that we desire, and hence it becomes handy to represent.
- Numbers are used to represent quantities, but in mathematics they have more structure.

# NATURAL NUMBERS

- These are the Numbers that we all know, like One, Two and Three ,…. etc!
- They are **represented** by symbols 1,2,3 ,… etc.
- But more importantly they can be **ordered** .

# DISCIPLINING NUMBERS

- See this messy picture of undisciplined numbers .

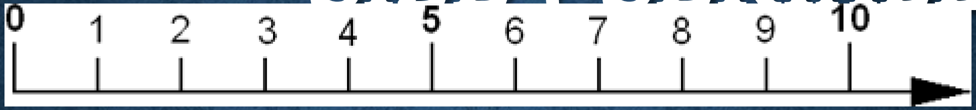
# HOW DO WE BRING ORDER TO THE NUMBERS ?

**Solution :** One way to do that is to arrange them in a number line .

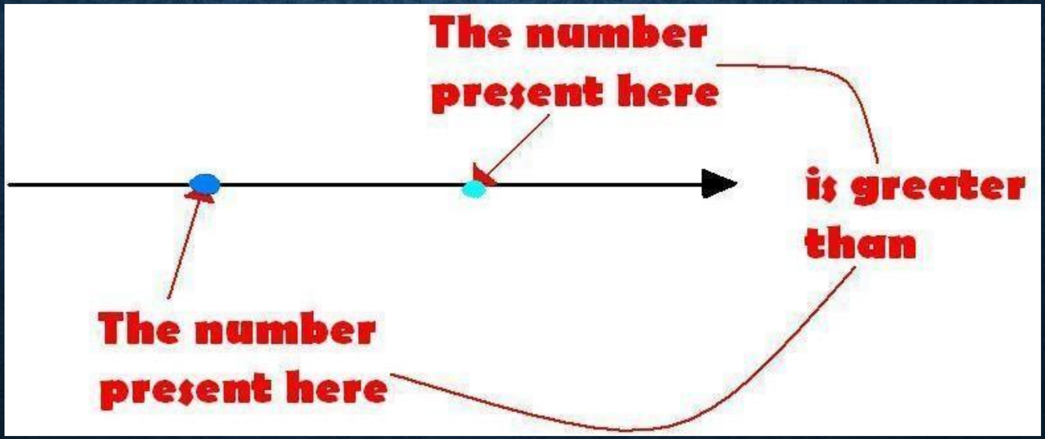
# COMPARING NUMBERS ( POSITIVE )

- Notice that any two natural numbers can be **compared**, i.e. given two natural numbers that are not equal, one is larger than the other.
- For example, Take 11 and 5. We can say that 11 is greater than 5 and 5 is less than 11 .
- The symbol used to represent **greater than** is ‘>’ and the symbol used for **less than** is ‘<’.
- The above example can be stated as ‘11>5’ or ‘5<11’ in terms of symbolic notation .

# ARRANGING POSITIVE NUMBERS BASED UPON THEIR SIZE ( SERIALLY )




- The magnitude of the numbers **increase** as one goes to the right of the number line !



# NEGATIVE NUMBERS

- **Negative** numbers are numbers marked with **'-'** sign . They are -1,-2,-3 … etc.
- They play an important role in representing **loss** or often , they act as an opposite of **positive numbers**.

# COMPARING NEGATIVE NUMBERS

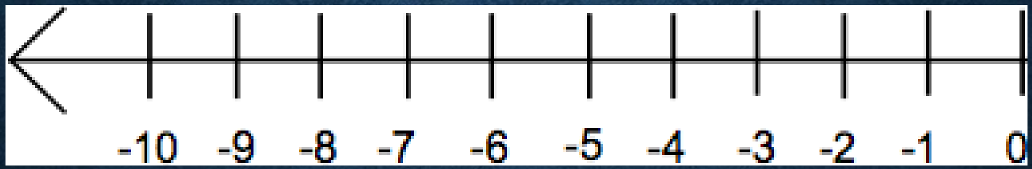
- In the same way we compared two positive numbers using “<”  and “>” we can compare the negative numbers using the same signs .

- But there is a principle to be followed while comparing them. “The **larger** the **negative** number the **smaller** , is its **size**” .

- For example, **-11** is **less than -5** and **-100 less than -10** .

# ARRANGING THE NEGATIVE NUMBERS SERIALLY BASED ON THEIR SIZES

- As we arranged the positive numbers serially on a line, we can do the same with negative numbers . It appears something as :



# MATHEMATICAL OPPOSITES

- When you are walking 10 feet forward, you say " I am moving 10 feet forward", when you are moving 10 feet backward, you say "I am moving 10 feet backward". The distance remains the same, but only the direction changes.

- Mathematics has this set of opposites , which are often used to convey this sense . Those are "+" and "-" .
- If you are going forward say 10 feet you use, "+10 feet " and when you are going backward you use "-10 feet " . Similarly when the temperature is increasing you use "+" and when decreasing you use " –".
- All such opposites like Loss and Gain, Increase and Decrease , Forward and Backward are addressed using "+" and "-".

# ZERO : THE NUMBER WITH NO SIGN

- We have stated two sets of numbers, positive and negative, so far. What about a situation when a neither number is neither positive nor negative , when the number is neither big nor small ?

- It is the number Zero ( denoted by 0 ) . Zero ( Invented by Aryabhatta ) changed the fate of mathematics. Its neither large nor small, neither positive nor negative, its like equator of the earth .

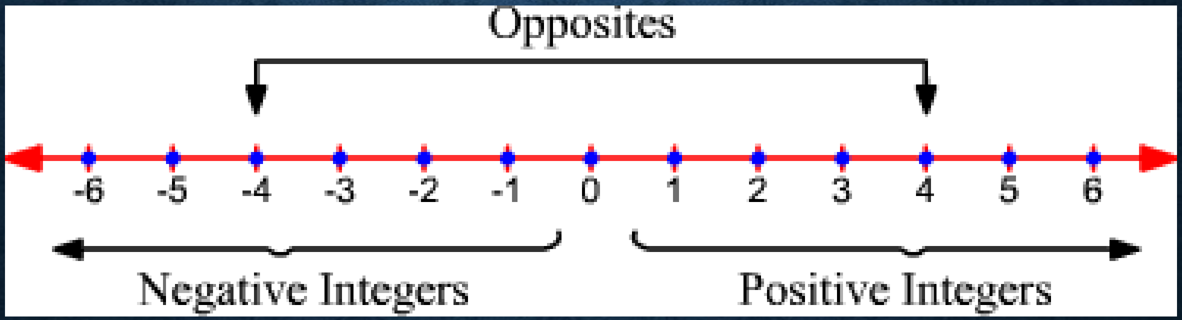
- Why the number zero is very important ? Ans : We need something to start. If we are walking forward, 10 feet, we need to have a starting point , from which we measure the 10 feet. That starting point is called **Zero** in mathematics from which we construct negative and positive numbers .

# SPECIAL PROPERTY OF ZERO

- **Zero** is **less than** all **positive** integers, and **greater than** all **negative** integers .
- For constructing number line, this is enough, and we will deal the special properties of zero, in upcoming slides !

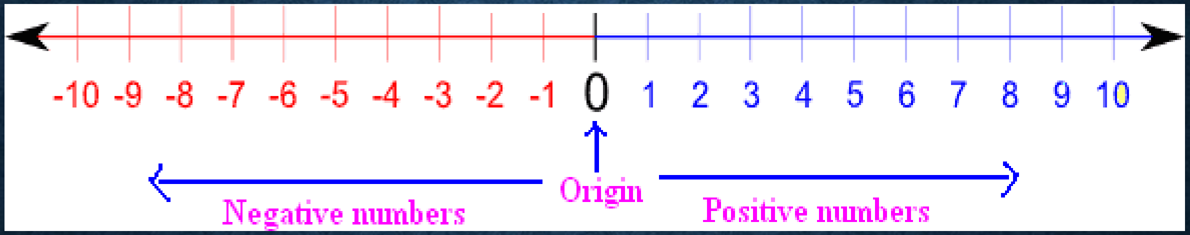
# WHAT IS A NUMBER LINE ?

- **Number Line** is nothing but the collection of '**Positive**' and '**Negative**' numbers arranged serially according to their **sizes** with **zero** as center .



# SPLITTING THE NUMBER LINE !

- We can see the number line described above is formed by joining **positive** number line and **negative** number line with zero in the middle and can be decomposed into negative and positive numbers , as follows :




# INTEGERS

- Integers are the collection of positive and negative numbers along with zero. The whole set is denoted by using $\mathbb{Z}$.

- $\mathbb{Z}$ = { .....,-5,-4,-3,-2,-1,0,1,2,3,4,5,.... }.

- The positive integers are represented using $\mathbb{Z}^+$

- The negative integers are represented using $\mathbb{Z}^-$

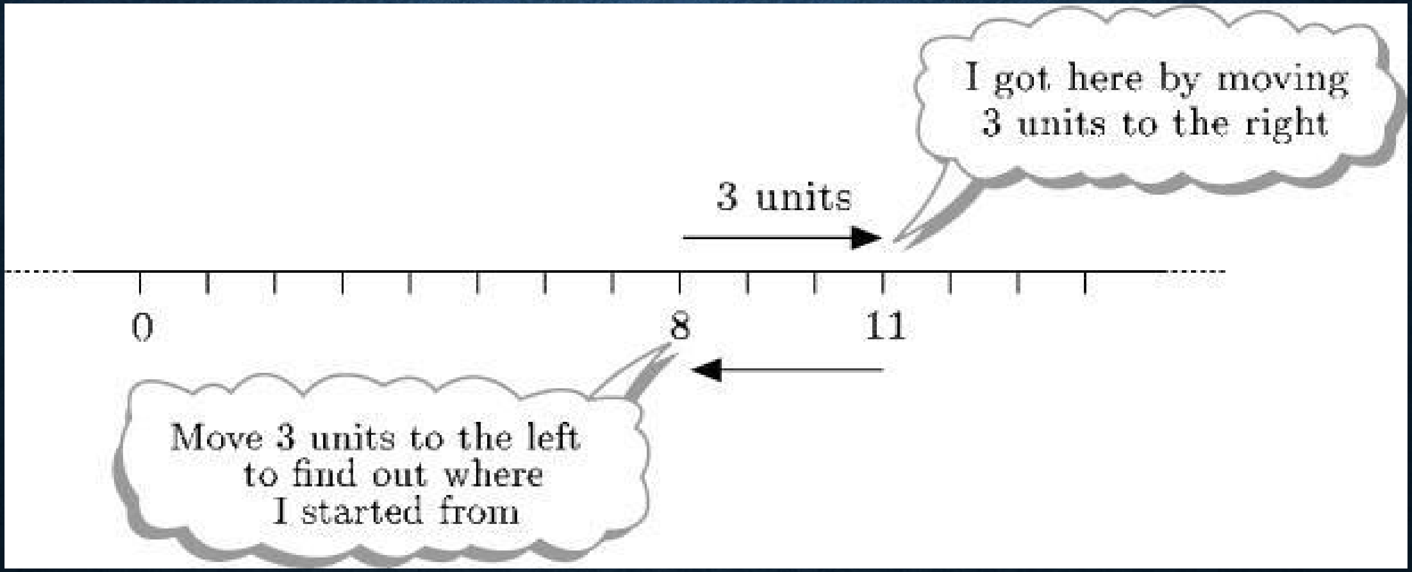
# HOW FAR WE UNDERSTOOD THE CONCEPT ?

We introduced '+' and '-' and also '0'. Now its time to have small activity. Assign these signs to the quantities below :

- Degrees Below Thermometer ( Sign :__________) .
- An elevator going up ( Sign :_____________) .
- Walking forward 10 feet ( Sign :____10 feet ) .
- Walking backward 10 feet ( Sign :____10 feet ) .
- No movement, neither forward nor backward (  _____).
- Neither hot nor cold milk (_____) .

# OPERATIONS ON NUMBER LINE

- **Traversing on number line :** If we want to go from 8 to 11, we need to take 3 steps forward, and when we want to come back from 11 to 8 we need to take 3 steps backwards .

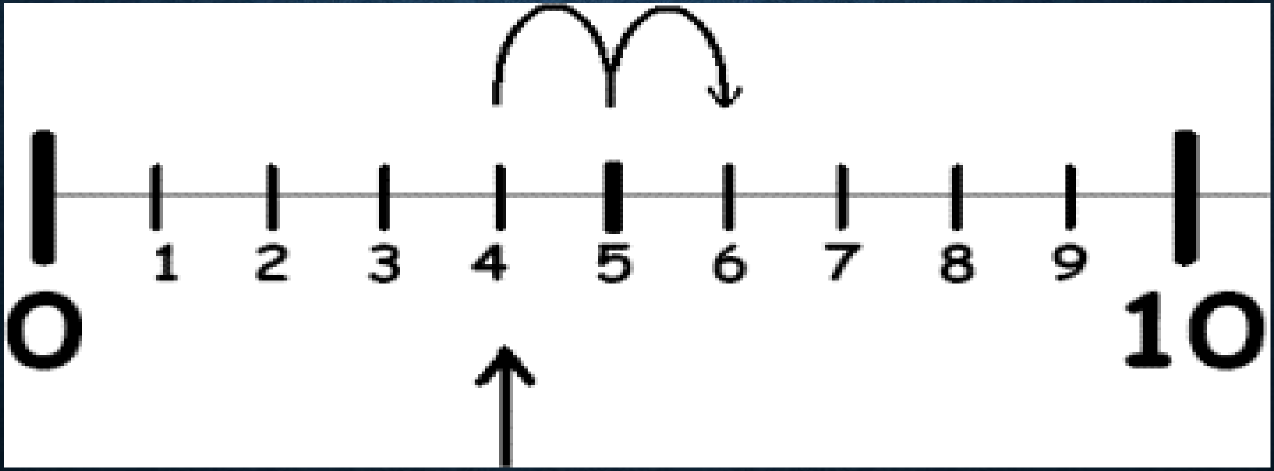


# OPERATIONS ON NUMBER LINE : ADDITION AND SUBTRACTION

- This brings us to naturally introduce two important operations on integers .
- They are **ADDITION** and **SUBTRACTION** .
- **Addition** always involves moving towards the **right** on the number line and **subtraction** involves moving towards the **left** on the number line .

# ADDIT ION

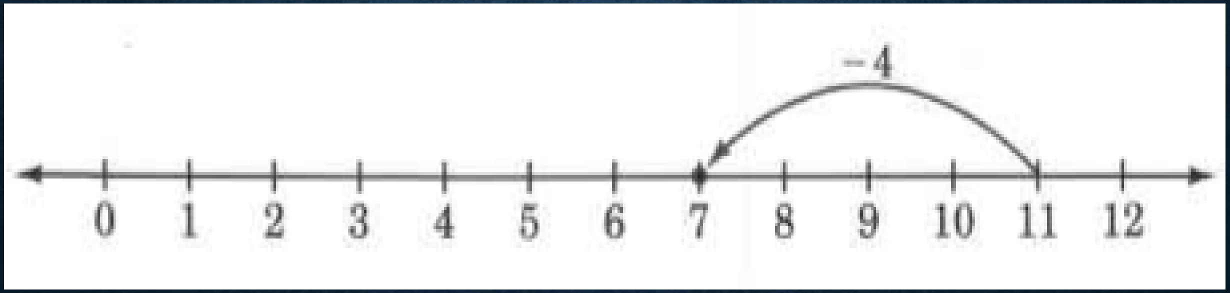
- If you want to add 2 numbers ( **'x'** and **'y'** ) , then you need to stand on **'x'** and move **'y'** times to the **right of** **'x'** . The number you reach after moving **'y'** times to the right of **'x'** is **'x+y'.**
- For example, if you want to add **4+2** , stand on **4** and move **2** times towards the **right** to reach **6** . Its illustrated as :



# SUBTRACTION

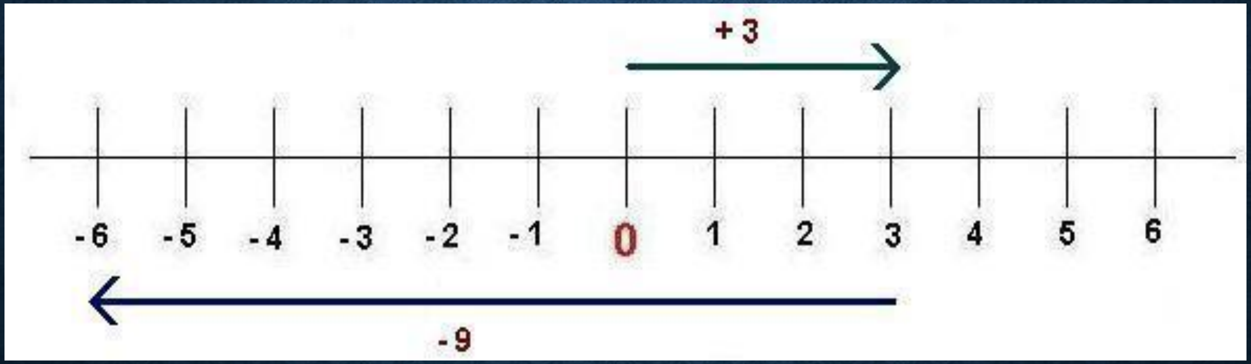
- If you want to subtract a number **'y'** from **'x'** , then you need to stand on **'x'** and move **'y'** times to the left of the **'x'** and then you reach some number which is **'x-y'.**

- For example if you want to find **'11-4'**, stand on **'11'** and move **'4'** times to the left of **'11'**, and you get **'7'** . Hence **'11-7=4'.**



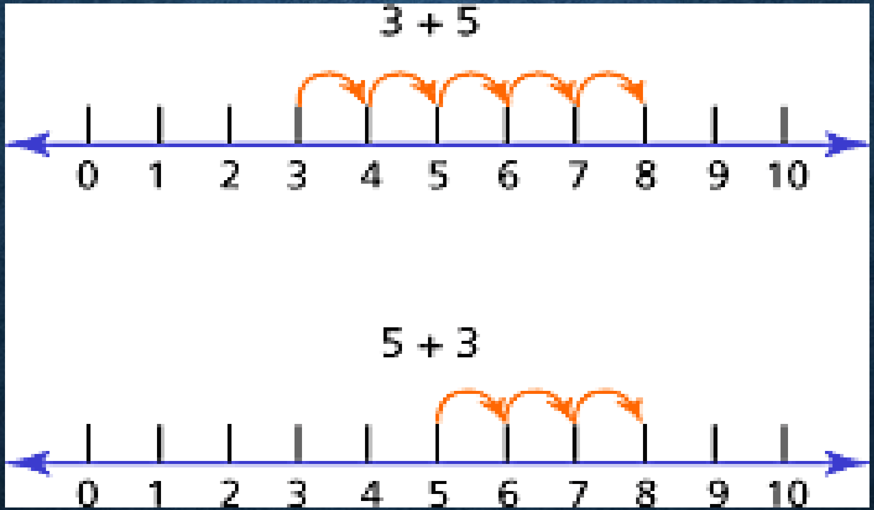
# YET ANOTHER EXAMPLE

- Now try doing the subtraction 3-9 . Stand on 3 and then move 9 times to the left of 3 , you reach '-6' which is depicted as follows :



# SOME POINTS TO NOTICE ( REGARDING ADDITION)

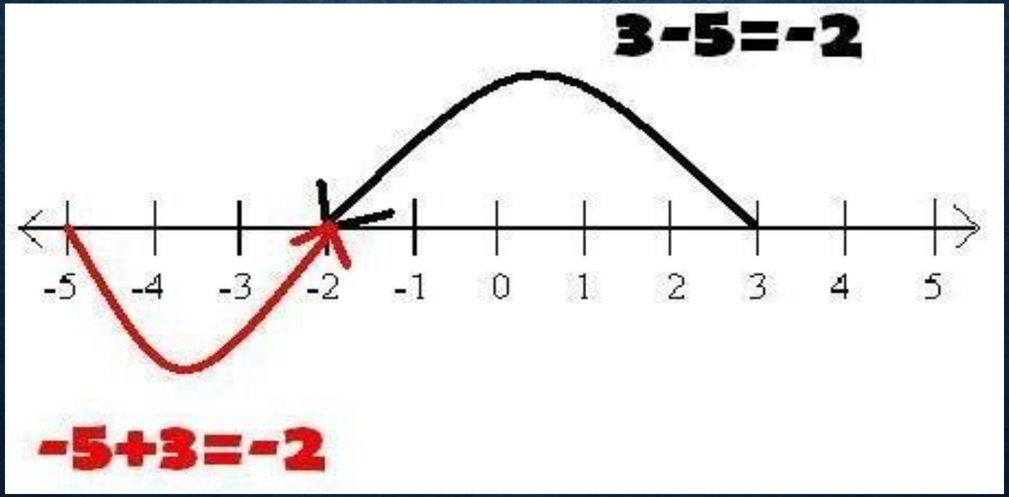
- Taking ‘5’ steps starting at ‘3’ is same as taking ‘3’ steps starting at ‘5’ as we reach ‘8’ . Hence 3+5 = 5+3 = 8 . See this picture :




- It holds true in general, when we add a set of numbers, the order of addition is not important .

- Same thing can be observed regarding subtraction.

- 3-5 = -5+3 . Because ‘3-5’ means , we have to start with ‘3’ and go ‘5’ steps to its **left ( Why left ? )** where we reach ‘-2’ . -5+3 means, we have to start with ‘-5’ and go 3 steps to its **right ( Why right ? )** to reach ‘-2’ . See this :



# MAGICAL NUMBER ZERO (0) .

- Zero can be thought of as a mirror that is placed right at the
centre of the number line .

- Anything added to zero is the number itself . For example, think about zero for some time as nothing. Suppose you have 1 apple with you and I give you nothing, then you still have 1 apple with you ( 0+1=1 ) .

- Let us put in formal language of mathematics . Let us take some number X . We have two rules : X+0= X and X-0=X . X can be any number either positive or negative .

# MIRROR IMAGE OR ADDITIVE INVERSE

- What is additive inverse ? Ans : Additive inverse is nothing but the same considered number , but with an opposite sign . Replace ‘+’ with ‘–’ and ‘–’ with ‘+’ .

- Suppose you have 8 with you , the additive inverse is -8. To reach zero you have to add 8 with its additive inverse . 8+(-8)= 0 . Additive inverse of -8 is 8 .

# SUMMA RY

Types of numbers we have learnt so far :

- Natural Numbers {1,2,3,4,5,…….} .
- Positive numbers {1,2,3,4,5,……..}.
- Negative numbers {-1,-2,-3,-4,-5,…..}.
- Integers { ……,-5,-4,-3,-2,-1,0,1,2,3,4,5,……}.

# POINT TO THINK ABOUT !

- Is there a number that is the largest among all numbers ?

- **Ans:** Let us try to find it out. Recall that if we move to the right of the number line, the number value gets bigger and bigger, and hence we need to find the number present to the rightmost end . Let us start :

  1,2,3,4,5,...10,...99,100,...,1000,...,100000,... 98765543, ....,10000000000,......, 9875451256214..... How far ? We are getting new numbers , but we will never reach the end .

- Hence mathematicians assumed some quantity to be the biggest of all numbers !

# INFINITY , THE BIGGEST OF ALL NUMBERS !

- Infinity is denoted by '∞' and it is **not considered** as a number, because no one knows about its value !

- It's the biggest of all numbers and it's used for representing a large quantity that we can't count ! For example, there are infinite stars in the sky !

- Notice the symbol '∞' itself is suggesting the innumerability! You can start at one point on the symbol and keep on going and going . You don't get an end ! And you will be going on and going on around the loop

This has introduced you to the key concepts in chapter-I , you are now encouraged to read the text book in detail and solve the problems there !

Thank you !