Whole Numbers

Chapter 2

0650CH02

2.1 Introduction

As we know, we use 1, 2, 3, 4,... when we begin to count. They come naturally when we start counting. Hence, mathematicians call the counting numbers as Natural numbers.

Predecessor and successor

Given any natural number, you can add 1 to that number and get the next number i.e. you get its successor.

The successor of 16 is 16 + 1 = 17, that of 19 is 19 +1 = 20 and so on.

The number 16 comes before 17, we say that the predecessor of 17 is 17–1=16, the predecessor of 20 is 20 – 1 = 19, and so on.

The number 3 has a predecessor and a successor. What about 2? The successor is 3 and the predecessor is 1. Does 1 have both a successor and a predecessor?

Try These

1. Write the predecessor and successor of 19; 1997; 12000; 49; 100000.
2. Is there any natural number that has no predecessor?
3. Is there any natural number which has no successor? Is there a last natural number?

We can count the number of children in our school; we can also count the number of people in a city; we can count the number of people in India. The number of people in the whole world can also be counted. We may not be able to count the number of stars in the sky or the number of hair on our heads but if we are able, there would be a number for them also. We can then add one more to such a number and

get a larger number. In that case we can even write the number of hair on two heads taken together.

It is now perhaps obvious that there is no largest number. Apart from these questions shared above, there are many others that can come to our mind when we work with natural numbers. You can think of a few such questions and discuss them with your friends. You may not clearly know the answers to many of them !

2.2 Whole Numbers

We have seen that the number 1 has no predecessor in natural numbers. To the collection of natural numbers we add zero as the predecessor for 1.

> The natural numbers along with zero form the collection of whole numbers.

Try These

1. Are all natural numbers also whole numbers?
2. Are all whole numbers also natural numbers?
3. Which is the greatest whole number?

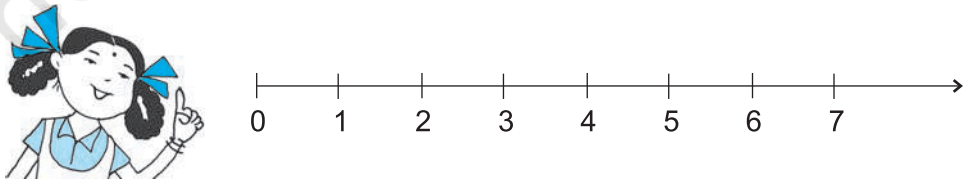
In your previous classes you have learnt to perform all the basic operations like addition, subtraction, multiplication and division on numbers. You also know how to apply them to problems. Let us try them on a number line. Before we proceed, let us find out what a number line is!

2.3 The Number Line

Draw a line. Mark a point on it. Label it 0. Mark a second point to the right of 0. Label it 1.

The distance between these points labelled as 0 and 1 is called unit distance. On this line, mark a point to the right of 1 and at unit distance from 1 and label it 2. In this way go on labelling points at unit distances as 3, 4, 5,... on the line. You can go to any whole number on the right in this manner.

This is a number line for the whole numbers.



What is the distance between the points 2 and 4? Certainly, it is 2 units. Can you tell the distance between the points 2 and 6, between 2 and 7?

On the number line you will see that the number 7 is on the right of 4. This number 7 is greater than 4, i.e. $7 > 4$. The number 8 lies on the right of 6

and 8 > 6. These observations help us to say that, out of any two whole numbers, the number on the right of the other number is the greater number. We can also say that whole number on left is the smaller number.

For example, 4 < 9; 4 is on the left of 9. Similarly, 12 > 5; 12 is to the right of 5.

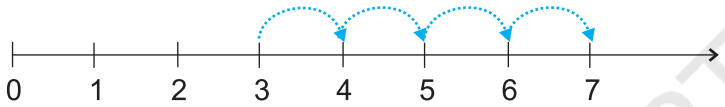
What can you say about 10 and 20?

Mark 30, 12, 18 on the number line. Which number is at the farthest left? Can you say from 1005 and 9756, which number would be on the right relative to the other number.

Place the successor of 12 and the predecessor of 7 on the number line.

Addition on the number line

Addition of whole numbers can be shown on the number line. Let us see the addition of 3 and 4.



Start from 3. Since we add 4 to this number so we make 4 jumps to the right; from 3 to 4, 4 to 5, 5 to 6 and 6 to 7 as shown above. The tip of the last arrow in the fourth jump is at 7.

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

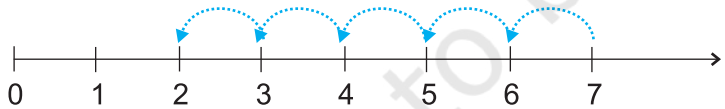
Try These

Find 4 + 5; 2 + 6; 3 + 5 and 1+6 using the number line.

Subtraction on the number line

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

Let us find 7 – 5.



Start from 7. Since 5 is being subtracted, so move towards left with 1 jump of 1 unit. Make 5 such jumps. We reach the point 2. We get 7 – 5 = 2.

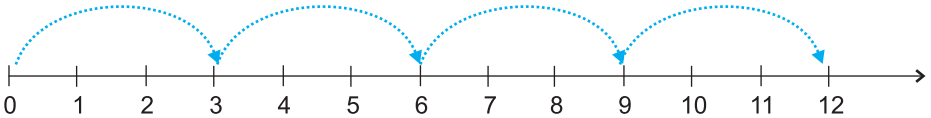
Try These

Find 8 – 3; 6 – 2; 9 – 6 using the number line.

Multiplication on the number line

We now see the multiplication of whole numbers on the number line.

Let us find 4 × 3.



Start from 0, move 3 units at a time to the right, make such 4 moves. Where do you reach? You will reach 12. So, we say, $3 \times 4 = 12$.

Try These

Find 2×6; 3×3; 4×2 using the number line.

EXERCISE 2.1

1. Write the next three natural numbers after 10999.
2. Write the three whole numbers occurring just before 10001.
3. Which is the smallest whole number?
4. How many whole numbers are there between 32 and 53?
5. Write the successor of :

   (a) 2440701 (b) 100199 (c) 1099999 (d) 2345670
6. Write the predecessor of :

   (a) 94 (b) 10000 (c) 208090 (d) 7654321
7. In each of the following pairs of numbers, state which whole number is on the left of the other number on the number line. Also write them with the appropriate sign (>, <) between them.

   (a) 530, 503 (b) 370, 307 (c) 98765, 56789 (d) 9830415, 10023001
8. Which of the following statements are true (T) and which are false (F) ?

   (a) Zero is the smallest natural number. (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.

What have we discussed?

1. The numbers 1, 2, 3,... which we use for counting are known as natural numbers.
2. If you add 1 to a natural number, we get its successor. If you subtract 1 from a natural number, you get its predecessor.

3. Every natural number has a successor. Every natural number except 1 has a predecessor.
4. If we add the number zero to the collection of natural numbers, we get the collection of whole numbers. Thus, the numbers 0, 1, 2, 3,... form the collection of whole numbers.
5. Every whole number has a successor. Every whole number except zero has a predecessor.
6. All natural numbers are whole numbers, but all whole numbers are not natural numbers.
7. We take a line, mark a point on it and label it 0. We then mark out points to the right of 0, at equal intervals. Label them as 1, 2, 3,.... Thus, we have a number line with the whole numbers represented on it. We can easily perform the number operations of addition, subtraction and multiplication on the number line.
8. Addition corresponds to moving to the right on the number line, whereas subtraction corresponds to moving to the left. Multiplication corresponds to making jumps of equal distance starting from zero.