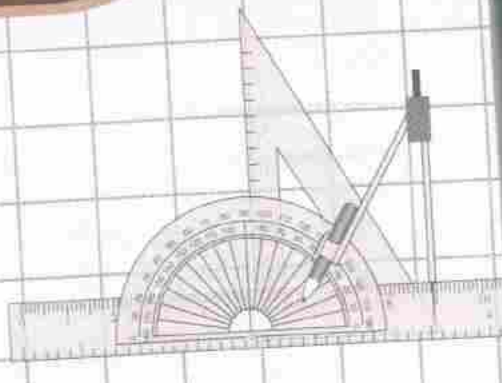
CHAPTER

1



Number Systems

In This Chapter

- Natural Numbers
- Whole Numbers
- International System of Numeration
- Representation of Whole Numbers on Number Line
- Concept of Zero
- Hindu-Arabic System of Numeration
- Approximation

Starter

Numbers are used almost everywhere in our day to day activities. Many Indian mathematicians contributed a lot to the number system. Indian Mathematician Aryabhata introduced zero which is a milestone for number system. Some of the noteworthy Indian mathematicians are Brahmagupta, Mahavira and Ramanujan.

In previous classes, we have studied about counting numbers and their operations. In this chapter, we will recapitulate them and learn about whole numbers.

Try These

1. What is the successor of 9909?
2. What is the predecessor of 92500?
3. Write any five numbers between 3000 and 4000 and arrange them in ascending order.
4. Write any five numbers between 6000 and 7000 and arrange them in descending order
5. Find the next three numbers in the following patterns.
   (i) 8130, 8230, 8330, ____, ____, ____
   (ii) 1359, 1369, 1379, ____, ____, ____
   (iii) 2130, 2120, 2110, ____, ____, ____

Natural Numbers

You may remember the time, when as a little child you began to learn counting. You usually used your fingers to count 1, 2, 3 and so on. These numbers are called **counting numbers** or **natural numbers**.

The smallest natural number is 1. But it is not possible to find the greatest natural number as natural number system has infinite numbers.

The counting numbers 1, 2, 3, ... are called **natural numbers**. The set of natural numbers is denoted by N. Thus,

N = {1, 2, 3, 4, 5, 6, ...}

Quick Tip

The symbols we use to write down numbers are called numerals. For example, we write sixty-five as 65 in Indo-Arabic numerals and as LXV in Roman numerals.

Even numbers

Any natural number which is a multiple of 2 is called an **even number**. The set of even natural numbers is denoted by 'E'. Thus,

E = {2, 4, 6, 8, ...}

Odd numbers

Any natural number which is not a multiple of 2 is called an **odd number**. The set of odd natural numbers is denoted by 'O'. Thus,

O = {1, 3, 5, 7, 9, ...}

Concept of Zero

The concept of zero or '0' is of great importance. Suppose a box of sweets is brought home and soon the sweets are distributed to all until there are no sweets left in the box. We say that there are 'no' sweets in the box or the box contains 'nothing'. To denote this 'nothing', the symbol 0 is used. It is not a part of the natural numbers as it cannot be counted.

Did You Know

The number system as it stands today was developed in India around the 3rd century BC, but the use of zero started around 700 AD. In India the term used for zero was 'shunya'. The Arabs called it 'sifr' which became 'zero' later on.

Whole Numbers

The set of natural numbers along with '0' forms a new set of numbers called **whole numbers**. The smallest whole number is 0 but we cannot find the greatest whole number as whole number system has infinite numbers. The set of whole numbers is denoted by W. Thus,

W = {0, 1, 2, 3, 4, 5, 6, ...}

Quick Tip

If we place zero after any number, the number becomes even.

Hindu-Arabic System of Numeration

The number system we generally use today was originally developed by Indian Mathematicians and later on reached the west through the Arabs. So, this system is called the **Hindu-Arabic System of Numeration** or the **Indian Number System**.

In this system, any number however large can be written by using the numerals 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9. This system involves counting in **tens** and thus is said to be '**to the base ten**'.

10 ones make 1 ten or 10 × 1 = 10
10 tens make 1 hundred or 10 × 10 = 100
10 hundreds make 1 thousand or 10 × 100 = 1000
and so on.

Place value chart

To write numbers in the place value chart, we start from the right as ones place and then proceed to the left as tens place, hundreds place, thousands place and so on.

Did You Know

The ancient Egyptians had carved numbers in stone almost 5000 years ago!

Their number system used the symbols | for 1, ∩ for 10 and 9 for 100.

1	2	3	4	5	10	20	30	100	400
|	||	|||	||| |	||| ||	∩	∩∩	∩∩ ∩	9	99 99

So, 224 would be written as 99 ∩∩ |||
|

and 353 would be written as 99 ∩∩∩ |||
9 ∩∩

Look at the place value chart shown below.

Periods	Crores		Lakhs		Thousands		Ones		
Places	Ten crores (TC)	Crores (C)	Ten lakhs (TL)	Lakhs (L)	Ten thousands (TTh)	Thousands (Th)	Hundreds (H)	Tens (T)	Ones (O)
Numbers (i)					6	3	2	4	9
Numbers (ii)			3	7	0	8	9	2	4
Numbers (iii)	1	6	9	2	4	8	1	0	6

The numbers (given above) will be read as:

(i) Sixty-three thousand two hundred forty-nine
(ii) Thirty-seven lakh eight thousand nine hundred twenty-four
(iii) Sixteen crore ninety-two lakh forty-eight thousand one hundred six

Quick Tip

In the Hindu-Arabic place value chart, the places ones, tens and hundreds together are called ones period.

Place value and face value

The **place value** of a digit in a number is the product of the digit and its place in the numeration system.

The **face value** of a digit in a number is the digit itself, regardless of the place it occupies in the number.

With the help of the place value system, we know that the value of a digit (symbol) varies as per its position in a given number.

For example,

(i) The place value of 8 in the numbers 82, 815, 18235 and 89354, will be 80, 800, 8000 and 80000 respectively. Though, the face value of 8 will always be 8.
(ii) In the number 2459, the place value of 5 will be 5 × 10, that is, 50 while in the number 5692, the place value of 5 will be 5 × 1000, that is, 5000. However, in both the cases, the face value of 5 will be 5 only.

Quick Tip

Zero always has the same place value and face value, that is, '0', wherever it may be positioned in the number.

Solved Examples

Example 1: Write the following numbers.

(i) All even numbers between 52391 and 52406
(ii) All odd numbers between 34268 and 34288

Solution:

(i) Even numbers between 52391 and 52406 are 52392, 52394, 52396, 52398, 52400, 52402 and 52404.
(ii) Odd numbers between 34268 and 34288 are 34269, 34271, 34273, 34275, 34277, 34279, 34281, 34283, 34285, 34287.

Example 2: Write the following numbers in words.

(i) 34691
(ii) 668031
(iii) 4790860
(iv) 312589609

Solution:

(i) Thirty-four thousand six hundred ninety-one
(ii) Six lakh sixty-eight thousand thirty-one
(iii) Forty-seven lakh ninety thousand eight hundred sixty
(iv) Thirty-one crore twenty-five lakh eighty-nine thousand six hundred nine

Example 3: Write the following numbers in numerals.

(i) Sixty thousand eight

(ii) Ninety-six lakh two thousand five hundred sixty-six

(iii) Twenty-nine lakh fifty-three thousand nine

(iv) Seven crore six lakh five

Solution:

(i) 60008 (ii) 9602566

(iii) 2953009 (iv) 70600005

Example 4: Write the place value of the encircled digits.

(i) 5(2)3791 (ii) 3(7)62831

(iii) (4)8026378 (iv) 91(8)638251

Solution:

(i) The place value of 2 will be
$2 \times 10000 = 20000$

(ii) The place value of 7 will be
$7 \times 100000 = 700000$

(iii) The place value of 4 will be
$4 \times 10000000 = 40000000$

(iv) The place value of 8 will be
$8 \times 1000000 = 8000000$

Example 5: Find the sum and difference between the place values of 7 in each of the following numbers.

(i) 273876 (ii) 73859721

Solution:

(i) The place value of the two seven's are
$7 \times 10000 = 70000$ and $7 \times 10 = 70$
The sum will be $70000 + 70 = 70070$
The difference will be $70000 - 70 = 69930$

(ii) The place value of the two seven's are
$7 \times 10000000 = 70000000$ and $7 \times 100 = 700$
The sum will be
$70000000 + 700 = 70000700$
The difference will be
$70000000 - 700 = 69999300$

Exercise 1.1

1. Write the smallest:
   (i) natural number. (ii) whole number.
2. Write the even numbers between:
   (i) 4689 and 4699
   (ii) 35810 and 35822
   (iii) 226915 and 226923
   (iv) 516792361 and 516792368
3. Write the odd numbers between:
   (i) 22301 and 22315
   (ii) 512468 and 512481
   (iii) 2661255 and 2661263
   (iv) 80235961 and 80235972
4. Write the following in words.
   (i) 3380216 (ii) 1234563
   (iii) 51892036 (iv) 336123480
5. Write the following numbers in numerals.
   (i) Five lakh four thousand nine hundred and fifty-four
   (ii) Sixty-six lakh fifty-eight thousand three hundred and seven
   (iii) Four crore thirty-two thousand six hundred and forty-one
   (iv) Seventy-one crore fifty-three lakh and seventy-one
6. Write the place value of the encircled digits.
   (i) 11(5)9678 (ii) (6)832591
   (iii) (3)3124680 (iv) 50(2)96126
   (v) 312698(7)32 (vi) (9)86847340
7. Find the sum of the place values of 6 in the following numbers.
   (i) 263856 (ii) 6126507
   (iii) 17625360 (iv) 65041625
8. Find the difference between the place values of 3 in the following numbers.
   (i) 538136 (ii) 3016398
   (iii) 13753091 (iv) 36192583
9. Find the product of the place value and face value of the digit 5 in the number 51692.
10. Find the difference between the place value and the face value of the digit 8 in the number 238569.

Expanded form and short form

In the expanded form, the number is expressed as the sum of the place values of its digits. The number 34296 is written in the short (standard) form. The expanded form of the same number will be:

$34296 = 3 \times 10000 + 4 \times 1000 + 2 \times 100 + 9 \times 10 + 6 \times 1 = 30000 + 4000 + 200 + 90 + 6$

The expanded form of the number 406905 will be

$406905 = 4 \times 100000 + 0 \times 10000 + 6 \times 1000 + 9 \times 100 + 0 \times 10 + 5 \times 1$
$= 400000 + 0 + 6000 + 900 + 0 + 5$
$= 400000 + 6000 + 900 + 5$

Forming numbers with given digits

We can form numbers with given digits either by repeating the digits or without repeating them.

For example, if we have to form all possible 2-digit numbers using the digits 8 and 6, where repetition of digits is allowed, then the possible numbers are

86, 68, 88 and 66

If we have to form all possible 3-digit numbers using the digits 4, 7 and 9 where repetition of digits is not allowed, then the possible numbers are

479, 497, 749, 794, 947 and 974

Similarly, if we have to form all possible 3-digit numbers using the digits 5, 0 and 1 where repetition of digits is not allowed, then the possible numbers are

105, 150, 501 and 510

Remember that a number cannot start with '0'. Hence, the numbers 015 and 051 are not 3-digit numbers.

Solved Examples

Example 6: Write the following numbers in expanded form.

(i) 2567192 (ii) 51096231

Solution:

(i) $2567192 = 2 \times 1000000 + 5 \times 100000 + 6 \times 10000 + 7 \times 1000 + 1 \times 100 + 9 \times 10 + 2 \times 1$
$= 2000000 + 500000 + 60000 + 7000 + 100 + 90 + 2$

(ii) $51096231 = 5 \times 10000000 + 1 \times 1000000 + 0 \times 100000 + 9 \times 10000 + 6 \times 1000 + 2 \times 100 + 3 \times 10 + 1$
$= 50000000 + 1000000 + 0 + 90000 + 6000 + 200 + 30 + 1$
$= 50000000 + 1000000 + 90000 + 6000 + 200 + 30 + 1$

Example 7: Write the following numbers in standard form.

(i) $60000000 + 400000 + 5000 + 100 + 30 + 6$

(ii) $500000 + 30000 + 9000 + 400 + 50 + 4$

Solution:

(i) $60000000 + 400000 + 5000 + 100 + 30 + 6$
$= 60405136$
Note that the digit '0' lies in the ten lakhs and ten thousands place here.

(ii) $500000 + 30000 + 9000 + 400 + 50 + 4$
$= 539454$

Example 8: Write the following numbers in the standard and expanded form.

(i) Fifty-nine thousand seven hundred forty-eight

(ii) Seven crore twenty-one lakh five thousand two

Solution:

(i) **Standard form:** 59748
Expanded form: $5 \times 10000 + 9 \times 1000 + 7 \times 100 + 4 \times 10 + 8 \times 1$

(ii) **Standard form:** 72105002
Expanded form: $7 \times 10000000 + 2 \times 1000000 + 1 \times 100000 + 5 \times 1000 + 2 \times 1$
$= 70000000 + 2000000 + 100000 + 5000 + 2$

Example 9: Write all possible 2-digit numbers that can be formed by using the digit 5, 7 and 8 where repetition of digits is allowed.

Solution: Using the digits 5 and 7, we can form the numbers 57, 75, 55 and 77.

Using the digits 7 and 8, we can form the numbers 78, 87, 77 and 88.

Using the digits 5 and 8, we can form the numbers 58, 85, 55 and 88.

As the numbers 55, 77 and 88 can be formed only once, all possible 2-digit numbers that can be formed will be 57, 75, 55, 77, 78, 87, 58, 85 and 88.

Example 10: Write all the possible 3-digit numbers that can be formed by using the digits 3, 1 and 6 where repetition of digits is not allowed. Identify the greatest and the smallest numbers formed.

Solution: Using the digits 3, 1 and 6 only once, we can form the following 3-digit numbers 136, 163, 316, 361, 631, 613.

Here, the greatest number is 631 and the smallest number is 136.

Example 11: Write the smallest 6-digit number using all six different digits.

Solution: Since the smallest number is to be formed, we will use the digits 0, 1, 2, 3, 4 and 5.

The number cannot start with '0', so the required number will be 102345.

Example 12: Write the greatest 5-digit number using 5 different digits where:

(i) 8 lies at the tens place.

(ii) 4 lies at the thousands place.

Solution:

(i) Greatest 5-digit number with 8 at tens place will be 97685.

(ii) Greatest 5-digit number with 4 at thousands place will be 94876.

Exercise 1.2

1. Write the following numbers in expanded form.
   (i) 529381 (ii) 2376124
   (iii) 80529612 (iv) 715209354
2. Write the following numbers in standard form.
   (i) 600000 + 40000 + 3000 + 900 + 20 + 1
   (ii) 1000000 + 500000 + 30000 + 6000 + 500 + 90 + 6
   (iii) 50000000 + 800000 + 9000 + 200 + 60 + 3
   (iv) 700000000 + 4000000 + 50000 + 6000 + 200 + 50 +9
3. Write the following numbers in standard form and expanded form.
   (i) Fifteen lakh twenty-eight thousand six hundred and nine
   (ii) Thirty-six lakh three thousand four hundred and eighty-eight
   (iii) Seven crore five lakh ninety-six thousand two hundred and eleven
   (iv) Twenty-four crore fifty-six lakh three hundred and fifty-seven
4. Write all possible 2-digit numbers that can be formed by using the following digits (repetition of digits is allowed).
   (i) 6, 2 and 4 (ii) 9, 3 and 7
   (iii) 1, 5 and 8 (iv) 2, 6 and 9
5. Write all possible 3-digit numbers that can be formed by using the following digits (repetition of digits is not allowed).
   (i) 2, 5 and 7 (ii) 3, 6 and 8
   (iii) 2, 0 and 9 (iv) 6, 9 and 0
   Identify the greatest and the smallest numbers in each of the above.
6. Write the smallest 6-digit number using 3 different digits.
7. Write the greatest 7-digit number using 4 different digits.
8. Write the smallest 5-digit number using 5 different digits where 6 lies at the hundreds place.
9. Write the greatest 8-digit number using 4 different digits where 7 lies at the thousands place.
10. Write the smallest 9-digit number using 6 different digits where 2 lies at the lakhs place.

International System of Numeration

In this system, the groups are made with periods as shown below:

Periods	Billions			Millions			Thousands			Ones		
Places	Hundred billions (HB)	Ten billions (TB)	Billions (HB)	Hundred millions (HM)	Ten millions (TM)	Millions (M)	Hundred thousands (HTh)	Ten thousands (TTh)	Thousands (Th)	Hundreds (H)	Tens (T)	Ones (O)
Numbers (i)						8	9	1	3	7	6	4
(ii)				7	4	5	3	2	9	8	0	1
(iii)		2	4	8	9	0	2	0	9	3	1	5

The numbers (given above) will be read as:

(i) Eight million nine hundred thirteen thousand seven hundred sixty-four

(ii) Seven hundred forty-five million three hundred twenty nine thousand eight hundred one

(iii) Twenty-four billion eight hundred ninety million two hundred nine thousand three hundred fifteen

When we look at the two systems of numeration closely, we see that

One lakh	=	Hundred thousands	=	100000
Ten lakhs	=	One million	=	1000000
One crore	=	Ten millions	=	10000000
Ten Crores	=	Hundred millions	=	100000000
1 billion	=	1000 millions		

The main difference between the two systems of numeration is in the placing of the commas.

- In the Indian system, the first comma is put after the hundreds place (3 places from the right). Then the comma comes after 2 more places (5 places from the right), that is, after ten thousand and again after 2 more places (7 places from right), that is, after ten lakh.
- In the International system, the commas are put after regular intervals of 3 places, that is, after 3 places from the right, 6 places from the right and then after 9 places if needed.

Let us write the number 67852194 in words in both the number systems.

Indian System: Putting the commas first, we get 6,78,52,194. Now, we can write the number as Six crore seventy-eight lakh fifty-two thousand one hundred ninety-four.

International System: Putting the commas first, we get 67,852,194. Now, we can write the number as Sixty-seven million eight hundred fifty-two thousand one hundred ninety-four.

Quick Tip

In both the systems, that is, Indian system and International system, numbers up to 99,999 are written and read in the same way.

Approximation

In many situations of day-to-day life, we find that exact numbers are not required. For example, when we say that for the cricket match between India and Pakistan there were 35,000 spectators in the stadium, we mean an approximate number. The number of spectators could be 34,000 or 36,000 or near about.

There are many such occasions in day-to-day life where we give an estimate of a number. This we do by rounding off numbers to the nearest ten or hundred or thousand or lakh and so on as the case may be.

1. **To the nearest ten:** For this we will look at the digit at the ones place.

   If this digit is less than 5, keep the digit at tens place as it is and write 0 at the ones place. For example, numbers like 42, 212, 763, 1094 and 5131 will be rounded off to 40, 210, 760, 1090 and 5130 respectively.

   If this digit is 5 or more than 5, add 1 to the digit at tens place and write 0 at the ones place. For example, numbers like 77, 516, 189, 725 and 1348 will be rounded off to 80, 520, 190, 730 and 1350 respectively.

2. **To the nearest hundred:** For this we will look at the digit at the tens place.

   If this digit is 5 or more than 5, add 1 to the digit at hundreds place and write 0 at the tens and ones place. If this digit is less than 5, keep the digit at hundreds place as it is and write 0 at the tens and ones place. For example, numbers like 3215, 7540, 4088 and 1987 will be rounded off to 3200, 7500, 4100 and 2000 respectively.

3. **To the nearest thousand:** For this we will look at the digit at the hundreds place.

   Rounding off to the nearest ten thousand and lakh is done in the similar way.

Exercise 1.3

1. Write the following numerals with appropriate commas.
   (i) Twenty lakh eighty-six thousand four hundred fifty-six
   (ii) Three crore four lakh twenty thousand five hundred sixty-nine
   (iii) Eleven crore fifty-two lakh three thousand forty-eight
   (iv) Seventy-five lakh sixteen thousand two hundred seven
   (v) Twenty-two crore forty lakh nineteen thousand five hundred sixty-one
   (vi) Twelve million three hundred seventy-one thousand six hundred nine
   (vii) Two hundred seventeen million four hundred thousand two hundred seventy-eight
   (viii) Forty-eight million four hundred eleven thousand nine hundred eighty-eight
   (ix) Three hundred twenty-two million nine hundred ninety-nine
   (x) Ninety-nine million six hundred fifty-two thousand fifty-nine

2. Write the following numerals in words in both the Indian and International number systems.
   (i) 743891658 (ii) 450952318
   (iii) 123456789 (iv) 550066888
   (v) 212100212 (vi) 398039800
   (vii) 236000632 (viii) 100000010
   (ix) 454574545 (x) 999909999

3. Fill in the blanks.
   (i) 1 crore = __________ lakh
   (ii) 1 million = __________ lakh
   (iii) 10 million = __________ crore
   (iv) 100 million = __________ lakh

4. Round off the following numbers to the nearest tens, hundreds and thousands and complete the table.

	Number	Round off to tens	Round off to hundreds	Round off to thousands
(i)	7618	7620	7600	8000
(ii)	5019			
(iii)	2347			
(iv)	6666			
(v)	8463			
(vi)	5249			
(vii)	7324			
(viii)	3969			
(ix)	1459			
(x)	4738			

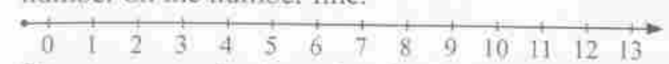
5. Write any five 3-digit numbers which when rounded off to the nearest hundred give 500.
6. Write any five 4-digit numbers which when rounded off to the nearest thousand give 3000.
7. Write any five 5-digit numbers which when rounded off to the nearest ten thousand give 20000.

Representation of Whole Numbers on Number Line

In this section, let us learn how to represent whole numbers on a number line.

Draw a line and mark a point on it. Label it as 0. Mark another point to the right of 0 and label it as 1. The distance between 0 and 1 is called the **unit distance**. On the right of the point labelled 1, mark another point such that the distance between 1 and this new point is the same as between 0 and 1. Label this point as 2.

In the same way, mark points 3, 4, 5, 6 and so on. We can mark points to represent any and every whole number on the number line.



The arrow marked on the given right-side of the number line indicates that the whole numbers continue upto infinity.

Successor of a whole number

The **successor** of a whole number is the number that we get by adding one to the given number. For example, the successor of 1 is 2, the successor of 9 is 10 and the successor of 0 is 1.

The successor of a whole number lies to its immediate right on the number line.

Predecessor of a whole number

The **predecessor** of a whole number is the number that we get by subtracting one from the given number.

For example, the predecessor of 6 is 5, the predecessor of 2 is 1 and the predecessor of 1 is 0.

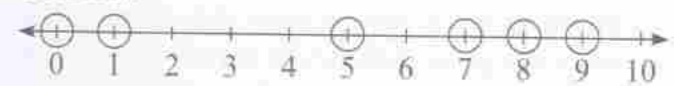
Zero is the smallest whole number. So, there is no whole number which is the predecessor of 0.

The predecessor of a whole number lies to its immediate left on the number line.

Solved Examples

Example 13: Draw a number line and mark the whole numbers 1, 5, 0, 7, 8 and 9 on it.

Solution:



Example 14: Write the successor and the predecessor of each of the following numbers.

(i) 3569 (ii) 75000 (iii) 1 lakh

Solution:

(i) Successor of 3569 is 3569 + 1 = 3570
Predecessor of 3569 is 3569 – 1 = 3568

(ii) Successor of 75000 is 75000 + 1 = 75001
Predecessor of 75000 is 75000 – 1 = 74999

(iii) Successor of 1 lakh (100000) is 100000 + 1 = 100001
Predecessor of 1 lakh is 100000 – 1 = 99999

Example 15: Write the successor of the following numbers.

(i) 96389 (ii) 458610
(iii) 9999999 (iv) 5 crore

Solution:

(i) Successor of 96389 is 96389 + 1 = 96390

(ii) The successor of 458610 is
458610 + 1 = 458611

(iii) The successor of 9999999 is
9999999 + 1 = 10000000

(iv) The successor of 5 crore is
50000000 + 1 = 50000001

Example 16: Write the predecessor of the following numbers.

(i) 10000 (ii) 238691
(iii) 9999999 (iv) 9 crore

Solution:

(i) The predecessor of 10000 is
10000 – 1 = 9999

(ii) The predecessor of 238691 is
238691 – 1 = 238690

(iii) The predecessor of 9999999 is
9999999 – 1 = 9999998

(iv) The predecessor of 9 crore is
90000000 – 1 = 89999999

Example 17: Write three consecutive numbers succeeding 58923.

Solution: To find the consecutive numbers succeeding 58923, let us find the successor of 58923.
It is 58923 + 1 = 58924

Now, the successor of 58924 is 58924 + 1 = 58925 and the successor of 58925 is 58925 + 1 = 58926.

Hence, the three consecutive numbers succeeding 58923 are 58924, 58925 and 58926.

Example 18: Write three consecutive numbers preceding 23698.

Solution: To find the consecutive numbers preceding 23698, let us find the predecessor of 23698.

It is 23698 – 1 = 23697

Now, the predecessor of 23697 is 23697 – 1 = 23696 and the predecessor of 23696 is 23696 – 1 = 23695.

Hence, the three consecutive numbers preceding 23698 are 23697, 23696 and 23695.

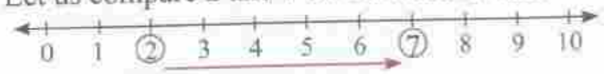
Comparison of whole numbers

Comparison of two whole numbers is very simple. If the two given whole numbers are small, they can be compared by representing them on the number line.

Every number that lies on the right side of a number on the number line is greater than that number.

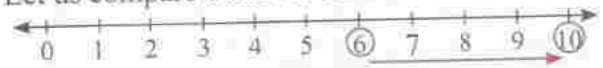
For example,

(i) Let us compare 2 and 7 on the number line.



As 7 lies to the right of 2, so, 7 > 2.

(ii) Let us compare 6 and 10 on the number line.

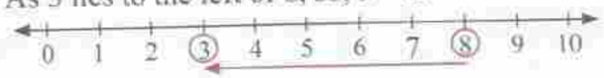


As 10 lies to the right of 6, so, 10 > 6.

Similarly, every number that lies on the left side of a number on the number line is less than that number.

For example,

(i) As 3 lies to the left of 8, so, 3 < 8.



(ii) Also, as 4 lies to the left of 9, so, 4 < 9.

However, when large numbers are to be compared, it is not possible to represent them on the number line. For comparing such numbers, we use the following rules:

Rule 1

The number having more number of digits is the greater number.

For example, if we have to compare 7394 and 10685, we see that 10685 > 7394.

Also, if we have to compare 5689178 and 100050360, we see that 100050360 has 9 digits and 5689178 has only 7 digits.

So, 100050360 > 5689178

Rule 2

If the numbers to be compared have the same number of digits, then the number having the greater digit at the highest place is the greater number.

For example, let us compare 378592 and 569128. We see that both numbers have 6 digits each. 378592 has digit 3 in the highest place (which is the lakhs place) and 569128 has digit 5 in the highest place.

So, 378592 < 569128

Rule 3

If the numbers to be compared have the same number of digits and also have the same digit in the highest place, then the number having the greater digit at the second highest place will be the greater number and so on.

For example,

(i) Let us compare 76492 and 78354. We see that both numbers have 5 digits each. Also, both numbers have the same digit, that is, 7 in the highest place. However, 76492 has digit 6 in the second highest place while the number 78354 has digit 8 in the second highest place.
So, 76492 < 78354

(ii) Also, let us compare 59632 and 59963. We see that both numbers have 5 digits each. Also, the digits in the highest and second highest places are the same.

5 9 6 3 2   5 9 9 6 3
Same
Same
6 < 9

So, 59632 < 59963

Quick Tips

- The numbers written in order, from the smallest to the greatest, are said to be in ascending order.
- The numbers written in order, from the greatest to the smallest, are said to be in descending order.

SOLVED EXAMPLES

Example 19: Compare the following numbers.

(i) 769524 and 1092603
(ii) 549316 and 843201
(iii) 6385411 and 6372491

Solution:

(i) Number of digits in 769524 is 6.
Number of digits in 1092603 is 7.
So, 1092603 > 769524

(ii) Number of digits in 549316 is 6.
Number of digits in 843201 is 6.
But the digits at the highest place are different.
As 5 < 8, so, 549316 < 843201

(iii) 6 3 8 5 4 1 1   6 3 7 2 4 9 1 (Same number of digits)
Same
Same
8 > 7

So, 6385411 > 6372491

Example 20: Write the following numbers in ascending and descending order.

2359, 10386, 35681, 446258

Solution:

Number of digits in 2359 is 4.
Number of digits in 10386 is 5.
Number of digits in 35681 is 5.
Number of digits in 446256 is 6.
So, 2359 < 10386, 2359 < 35681 and 2359 < 446256
Also, 446256 > 2359 and 446256 > 10386.
Let us compare (1)0386 and (3)5681
As, 1 < 3 so 10386 < 35681
Putting the numbers in ascending order, we get
2359 < 10386 < 35681 < 446256
Putting the numbers in descending order, we get
446256 > 35681 > 10386 > 2359

Operations on whole numbers

In this section, we will learn four basic operations (that is, addition, subtraction, multiplication and division) involving whole numbers.

Addition of whole numbers

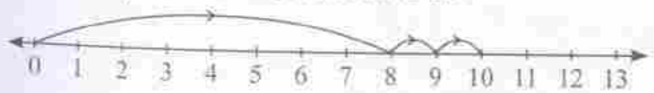
Let us add 5 and 3 on the number line.

Since, we have to add 3 to 5, we will start at 5 and take 3 steps ahead. We will reach 8.

Thus, 5 + 3 = 8

Similarly, let us add 8 and 2 on the number line.

Now, we have to add 2 to 8. We will start at 8 and take 2 steps ahead. We will reach 10.

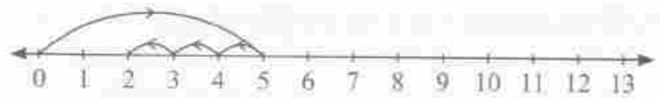


Thus, 8 + 2 = 10

Subtraction of whole numbers

Let us subtract 3 from 5 on the number line.

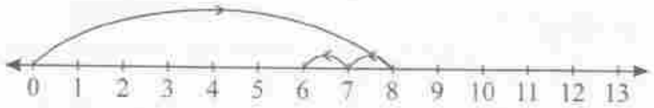
Since we have to subtract 3 from 5, we will start at 5 and take 3 steps back. We will reach 2.



Thus, 5 – 3 = 2

Similarly, let us subtract 2 from 8 on the number line.

Now, we have to subtract 2 from 8. So, we will start at 8 and take 2 steps back. We will reach 6.



Thus, 8 – 2 = 6

Multiplication of whole numbers

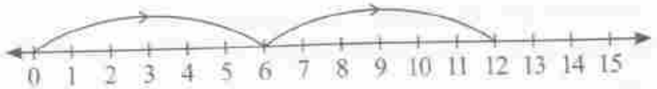
Let us multiply 3 and 5 on the number line.

For 3 × 5, we will start from 0 and move 3 units at a time. We will do this five times, as we know multiplication is a repeated addition.

We reach at 15. Thus, 3 × 5 = 15.

Similarly, let us multiply 6 and 2 on the number line.

For 6 × 2, starting from 0 we move 6 units at a time. We do this twice and we see that we reach 12.



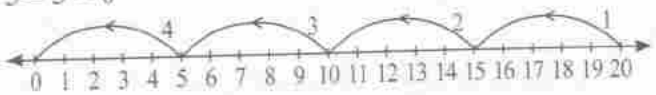
Thus, 6 × 2 = 12

Division of whole numbers

We know division is a repeated subtraction.

If we want to divide 20 sweets among 5 children, we subtract 5 from 20 to get 15, again subtract 5 from 15 to get 10, from 10 we subtract 5 to get 5 and from 5 we subtract 5 again to get 0. Here, we did subtraction 4 times.

Therefore, 20 – 5 = 15, 15 – 5 = 10, 10 – 5 = 5, 5 – 5 = 0



Thus, 20 ÷ 5 = 4

Solved Examples

Example 21: Add the following whole numbers using number line.

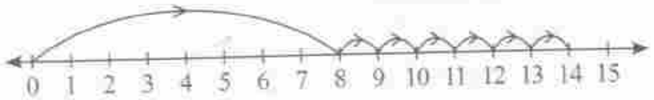
(i) 4 + 5 (ii) 8 + 6

Solution:

(i) Start from 4 and take 5 steps ahead.

Thus, 4 + 5 = 9

(ii) Start from 8 and take 6 steps ahead.



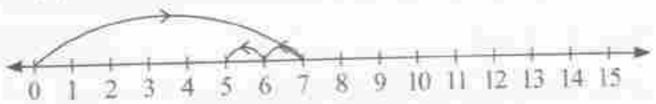
Thus, 8 + 6 = 14

Example 22: Subtract the following whole numbers using number line.

(i) 7 – 2 (ii) 11 – 5

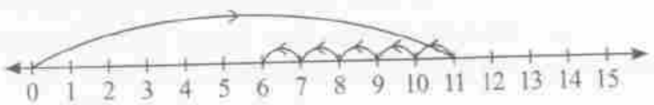
Solution:

(i) Start from 7 and take 2 steps back.



Thus, 7 – 2 = 5

(ii) Start from 11 and take 5 steps back.



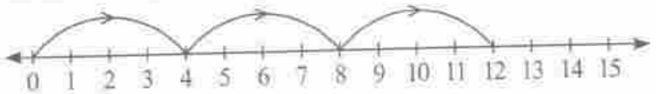
Thus, 11 – 5 = 6

Example 23: Multiply the following whole numbers using number line.

(i) 4 × 3 (ii) 7 × 2

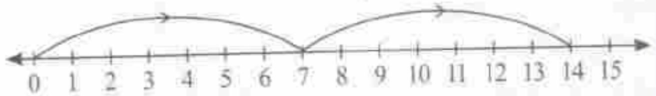
Solution:

(i) Start from 0, move 4 units at a time and do this 3 times.



Thus, 4 × 3 = 12

(ii) Start from 0, move 7 units at a time and do this twice.



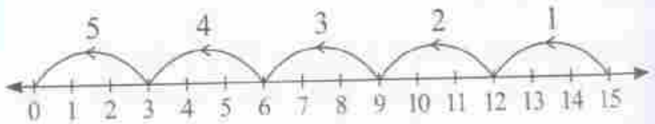
Thus, 7 × 2 = 14

Example 24: Divide the following whole numbers using number line.

(i) 15 ÷ 3 (ii) 12 ÷ 4

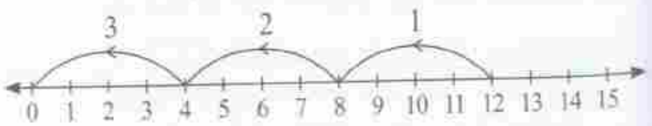
Solution:

(i) Start from 15, move 3 units at a time and do this until you reach at 0.



Thus, 15 ÷ 3 = 5

(ii) Start from 12, move 4 units at a time and do this until you reach at 0.



Thus, 12 ÷ 4 = 3

Exercise 1.4

1. Draw a number line and mark the whole numbers 3, 2, 9 and 6 on it.

2. Write the successor of the following numbers.

(i) 225690 (ii) 5192381
(iii) 61257160 (iv) 9999989

3. Write the predecessor of the following numbers.

(i) 669859 (ii) 1819250
(iii) 99999999 (iv) 100000000

4. Write four consecutive numbers succeeding the following numbers.

(i) 28917 (ii) 561281
(iii) 3859218 (iv) 6671589

5. Write four consecutive numbers preceding the following numbers.

(i) 56891 (ii) 232563
(iii) 5584321 (iv) 7095832

6. Fill in the box with <, > or =.

(i)	681357	☐	681537
(ii)	63894	☐	63893 + 1
(iii)	589632 + 1	☐	589634 – 1
(iv)	3398520	☐	3398502
(v)	723589 + 10	☐	723600
(vi)	889569 + 100	☐	889338 + 100

7. Identify the smallest number from the following.

(i) 513280, 312508, 701582, 282107
(ii) 7792531, 9712135, 3517925, 2519768
(iii) 50145316, 51041361, 50013158, 58015176

8. Arrange the following numbers in descending order.

(i) 56935, 56539, 93565, 93655
(ii) 8125967, 8152679, 5168932, 5168392

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

(i) The predecessor of 25986 is the same as the successor of 25884.
(ii) The number 4879352 lies between 4879356 and 4879360.
(iii) The smallest natural number and the smallest whole number are the same.
(iv) The predecessor of 360915 is less than 360910.

10. Add the following whole numbers using number line.

(i) 7 + 2 (ii) 9 + 4

11. Subtract the following whole numbers using number line.

(i) 6 – 2 (ii) 9 – 4

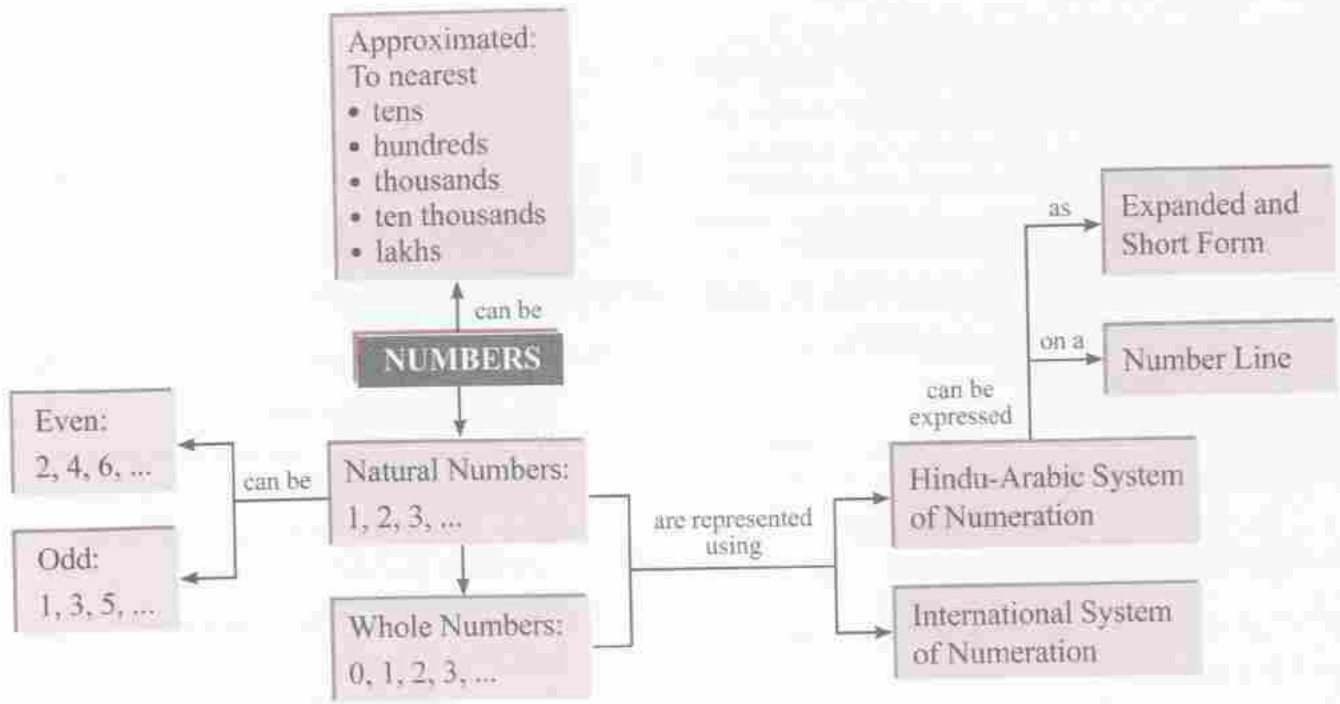
12. Multiply the following whole numbers using number line.

(i) 2 × 5 (ii) 4 × 4

13. Divide the following whole numbers using number line.

(i) 8 ÷ 2 (ii) 12 ÷ 3

Quick Recall



Revision Exercise

1. Write the following numerals in words in both the Indian and International number systems.
   (i) 512336
   (ii) 2198357
   (iii) 10589630
2. Write the following in numerals.
   (i) Seven lakh forty-two thousand six hundred four
   (ii) Seven million eight hundred three thousand four hundred fifty-five
   (iii) Twelve crore seven lakh eighty-three thousand seven
3. Find the sum and difference of the place values of '7' in each of the following numbers.
   (i) 719785 (ii) 87157902
4. Write the following in expanded form and short form.
   (i) Two lakh eighty-eight thousand four hundred fifty-nine
   (ii) Seventy lakh five thousand nine hundred eighty-four
   (iii) Sixteen crore twenty-two lakh two hundred eight
5. Write the greatest 5-digit number using four different digits.
6. Write the smallest 7-digit number using three different digits.
7. Write the greatest 9-digit number using five different digits, where 7 lies at the ten lakhs place.
8. Draw a number line and mark the following numbers on it.
   (i) Predecessor of 1 (ii) Successor of 5
9. For the following numbers, write three consecutive succeeding numbers and three consecutive preceding numbers.
   (i) 527914 (ii) 1000100

10. Arrange the following numbers in ascending and descending order.
    (i) 23961, 23619, 32196, 23169
    (ii) 56895, 56986, 58965, 58695
    (iii) 719302, 709352, 719032, 703925
11. Rearrange the digits of the number 58973062 to form the smallest and the greatest 8-digit numbers.
12. Fill in the blanks.
    (i) The greatest 8-digit number is ______.
    (ii) The smallest odd number between 2000 and 3000 is ______.
    (iii) The greatest even number between 4001 and 4051 is ______.
    (iv) There are ______ hundreds in one lakh.
    (v) There are ______ thousands in one lakh.
    (vi) These are ______ lakhs in one crore.
13. Fill in the boxes with <, > or =.
    (i) 5000 + 300 + 80 + 9 ☐ 5839
    (ii) 6685 ☐ 6000 + 600 + 80 + 5
    (iii) 1135678 ☐ 1135786
    (iv) 4592183 ☐ 4592113
    (v) 420093 ☐ 420092 + 1
    (vi) 800000 + 90000 + 3000 + 300 + 50 ☐ 893329 + 1
14. Write any five 6-digit numbers which when rounded off to the nearest lakh give 4,00,000.

Face the Challenge

1. Every natural number is a whole number. Give two examples to support this statement.
2. Complete the adjoining square using whole numbers such that the sum of numbers in every horizontal line, vertical line and every diagonal line is the same.

2	15	16	
9	12		
		7	10
14			17