

1

Knowing Our Numbers

Learning Outcomes



After studying this chapter, you will be able to:

- consolidate the sense of numberness up to 5 digits.
 - Numbers, Numerals and Digits
 - Face value, Place value, Reading and writing numbers, Standard form, Expanded form
 - Comparing and ordering numbers (The use of symbols $>$, $=$ and $<$)
 - Building numbers
 - Estimation
 - Brackets
- extend your study to large numbers up to 8 digits.
 - Numeration: (a) Indian System (b) International System
- solve daily life problems involving number operations.
- study large Roman numerals.

You are familiar with numbers and have learnt writing and reading numbers up to 5 digits in earlier classes. We will revise the same briefly here.

WE LIVE WITH NUMBERS

Ravi is 25 years old. Vatican City, where the Pope lives, has a population of 840. The river Ganga is 2,525 kilometres long. Sachin Tendulkar has scored most runs, 15,921, in Test Cricket. All of these statements use numbers. Numbers are an integral part of our life.

The numbers 1, 2, 3, 4, ... are called **counting numbers**. They are used to count objects/items. The set of counting numbers has no end. It is **infinite**.



Numeral

The symbol for writing a number is called a **numeral**. For example, 4 is a numeral for the number four.

Writing and Reading Numbers

There are two ways to write a number, the **Hindu-Arabic System** and the **International System**. In the Hindu-Arabic system, the numbers 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9 are called **digits**. These are used to write the numbers. The numbers we use are made up of one or more digits.

PLACE VALUE AND FACE VALUE

- Every digit has two values – the **place value** and the **face value**. The face value of a digit does not change, while the place value depends upon the position of the digit in the number.

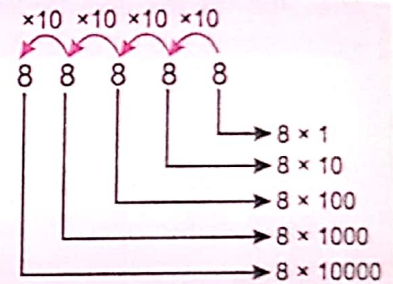
For example, in the number 2,837,
 the face value of 2 is 2, while its place value is 2000.
 the face value of 8 is 8, while its place value is 800.
 the face value of 3 is 3, while its place value is 30.
 the face value and place value of 7 are both 7.

The face value and the place value of ones digit are always equal.



- The place or position in a number of any of the digits 1, 2, 3, 4, 5, 6, 7, 8 and 9 determines the value of the number.

A digit is multiplied by 10, i.e., it becomes **ten times** and is moved one place **towards the left** in a number.



PLACE VALUE CHART

Sachin Tendulkar has scored a total of 18,426 runs in ODIs. This number can be represented in a place value chart as under:

Second Period		First Period		
Thousands		Ones		
Ten Thousands TTh	Thousands Th	Hundreds H	Tens T	Ones O
1	8	4	2	6

It is written as 18,426 and read as **eighteen thousand four hundred twenty-six**.

Note the following points:

- The place value chart has been divided into two groups called **periods**. Each period and each place has a name. The **ones period** has 3 places—**hundreds, tens and ones**. The **thousands period** has 2 places—**ten thousands and thousands**.

While writing a number without using a chart as done above, we use a **comma** to separate one period from the other.

- The digit '0' is used to show that a place or position in a number is empty. Thus, zero keeps the other digits in their proper places.

The number shown in the place value chart on the right is 53,087 and is read as **fifty-three thousand eighty-seven**.

TTh	Th	H	T	O
5	3	0	8	7

STANDARD AND EXPANDED FORM

Standard Form

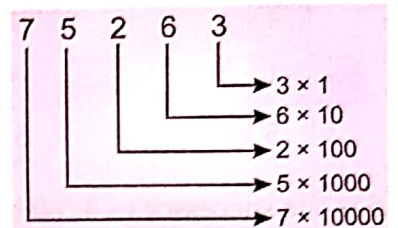
A number when written in numerals, separated by commas, is said to be written in its **standard form**.

Expanded Form

We may write a number, say, 75,263 using the place value of each digit in the following form:

$$70,000 + 5,000 + 200 + 60 + 3$$

This is called the **expanded form** of 75,263.



Example 1

Write each of the following numbers in word form and read them aloud.

- (a) 2,018 (b) 60,229 (c) 89,005 (d) 70,308

Solution

- (a) Two thousand eighteen (b) Sixty thousand two hundred twenty-nine
(c) Eighty-nine thousand five (d) Seventy thousand three hundred eight

Example 2

Write each of the following number names as numerals.

- (a) Two thousand five hundred seventeen
(b) Five thousand two hundred eighty
(c) Seventeen thousand four hundred one
(d) Sixty thousand nineteen

Solution

- (a) 2,517 (b) 5,280 (c) 17,401 (d) 60,019

Example 3

Write the number 'Ninety-six thousand two hundred seven' in

- (a) Place value chart (b) Standard form (c) Expanded form

Solution

- (a) Place value chart:

TTh	Th	H	T	O
9	6	2	0	7

- (b) **Standard form:** 96,207

- (c) **Expanded form:** $90,000 + 6,000 + 200 + 0 + 7$

or simply, $90,000 + 6,000 + 200 + 7$

Omitting 0, as it does not add to the value.



Self Practice 1A

- Write each of the following numbers in place value chart and in word form. Read them aloud.
(a) 23,758 (b) 70,509 (c) 86,002 (d) 90,018
- Write the following numbers in the place value chart, standard form and expanded form.
(a) Fourteen thousand seven hundred thirty-six (b) Twenty thousand nine hundred forty-five
(c) Eighty-four thousand eighteen (d) Fifty-five thousand five
- Write the place value of the coloured digit in each of the following numbers.
(a) 56,718 (b) 34,650 (c) 89,206 (d) 90,632

SUCCESSOR AND PREDECESSOR

Successor

Observe the following sums.

$$\begin{array}{r} 4 \\ + 1 \\ \hline 5 \end{array}$$

$$\begin{array}{r} 59 \\ + 1 \\ \hline 60 \end{array}$$

$$\begin{array}{r} 738 \\ + 1 \\ \hline 739 \end{array}$$

$$\begin{array}{r} 5899 \\ + 1 \\ \hline 5900 \end{array}$$

$$\begin{array}{r} 83624 \\ + 1 \\ \hline 83625 \end{array}$$

5 is the successor of 4; 60 is the successor of 59; 739 is the successor of 738; 5,900 is the successor of 5,899 and 83,625 is the successor of 83,624.

The successor of a given number is a number obtained by adding 1 to it.

Predecessor

Observe the following subtractions.

$$\begin{array}{r} 9 \\ - 1 \\ \hline 8 \end{array}$$

$$\begin{array}{r} 85 \\ - 1 \\ \hline 84 \end{array}$$

$$\begin{array}{r} 650 \\ - 1 \\ \hline 649 \end{array}$$

$$\begin{array}{r} 4317 \\ - 1 \\ \hline 4316 \end{array}$$

$$\begin{array}{r} 70600 \\ - 1 \\ \hline 70599 \end{array}$$

8 is the predecessor of 9; 84 is the predecessor of 85; 649 is the predecessor of 650; 4,316 is the predecessor of 4,317 and 70,599 is the predecessor of 70,600.

The predecessor of a given number is obtained by subtracting 1 from it.

COMPARING NUMBERS

Study the following examples.

Case 1: Comparing Numbers with Unequal Number of Digits

Example 4

The area of Manipur is 22,327 sq km while that of Goa is 3,702 sq km. Which state has more area?

Solution

Writing the numbers 22,327 and 3,702 in the place value chart, we have

TTh	Th	H	T	O
2	2	3	2	7
	3	7	0	2

The number 22,327 has 5 digits, while the number 3,702 has 4 digits.

So, $22,327 > 3,702$.

Thus, Manipur has a larger area than Goa.

Rule 1 *If two numbers contain unequal number of digits, then the number having more number of digits is greater than the number having lesser number of digits.*

Case 2: Comparing Numbers with Equal Number of Digits

Example 5

Uttarakhand has an area of 53,484 sq km and Jharkhand has an area of 79,714 sq km. Which state is bigger?

Solution

Writing the numbers 53,484 and 79,714 in the place value chart.

	TTh	Th	H	T	O
$7 > 5$	7	9	7	1	4
	5	3	4	8	4

Since 7 ten thousands is greater than 5 ten thousands, so $79,714 > 53,484$.

Thus, Jharkhand is a bigger state than Uttarakhand.

Example 6

Arunachal Pradesh has an area of 83,743 sq km, while West Bengal has an area of 88,752 sq km. Which state is bigger?

Solution

Think about the numbers 83,743 and 88,752.

	TTh	Th	H	T	O
Same	8	8	7	5	2
	8	3	7	4	3

Different $8 > 3$

1. Both the numbers have equal number of digits.
2. Both have the same digit at the ten thousands place.
3. The digits at thousands place are different. They are 8 and 3. Since $8 > 3$, i.e., 8 thousand $>$ 3 thousand, so $88,752 > 83,743$. Thus, West Bengal is a bigger state than Arunachal Pradesh.

Example 7

Which number is greater: 74,580 or 74,539?

Solution

Arranging the numbers to be compared in the place value chart, we have

TTh	Th	H	T	O
7	4	5	8	0
7	4	5	3	9

Same Different $8 > 3$

Both the numbers have the same digits at TTh, Th and H places but the digit 8 at **tens (T) place** in the first number is greater than 3 at the same place in the second number.

Thus, $74,580 > 74,539$.

Rule 2 To compare the numbers having equal number of digits, start comparing the digits from the leftmost place towards the right till you reach places with two different digits. The number having a greater digit at this place is the greater of the two numbers.



Self Practice 1B

1. Write the successor of each of the following numbers.

- (a) 9,320 (b) 75,439 (c) 80,999 (d) 54,099

2. Write the predecessor of each of the following numbers.

- (a) 6,548 (b) 27,235 (c) 49,700 (d) 85,030

3. Compare the numbers. Use the symbols $>$, $<$ or $=$.

- (a) 9,120 and 19,417 (b) 7,986 and 10,245 (c) 54,738 and 64,520 (d) 15,739 and 15,739
(e) 80,615 and 78,976 (f) 24,865 and 23,938 (g) 61,798 and 61,630 (h) 26,718 and 26,702
(i) 20,019 and 20,019 (j) 43,597 and 43,599 (k) 1,01,011 and 1,01,101 (l) 23,462 and 32,642

ASCENDING AND DESCENDING ORDER

Ascending Order

Look at the following arrangement of numbers.

5, 7, 8, 17, 98, 203, 7,800, 15,920

Do you observe that the numbers go on becoming greater and greater as you move from left to right? The number 5 is the **smallest** of the given numbers and the number 15,920 is the **greatest**.

Numbers are said to be in ascending order, when arranged in increasing order, i.e., from the smallest to the greatest.

Descending Order

Look at the following arrangement of numbers.

50,000, 38,990, 9,865, 6,370, 964, 89, 60

Do you observe that the numbers given above go on decreasing from the greatest to the smallest? The number 50,000 is the **greatest** of the given numbers and 60 is the **smallest** number.

Numbers are said to be in descending order, when arranged in decreasing order, i.e., from the largest to the smallest.

Example 8

Arrange the following numbers in ascending and descending order.

28,975; 49,703; 16,564; 76,800; 5,987; 49,307

Solution

It will be easier to compare the numbers and arrange them as required by putting them in a place value chart as shown on the next page.

TTh	Th	H	T	O	
2	8	9	7	5	
4	9	7	0	3	
1	6	5	6	4	
7	6	8	0	0	← Greatest
	5	9	8	7	← Smallest
4	9	3	0	7	

As you can see, 5,987 is the smallest number and 76,800 is the greatest number. Also, $49,703 > 49,307 > 28,975 > 16,564$.

Here, we have,

Ascending order (From smallest to greatest)

$$5,987 < 16,564 < 28,975 < 49,307 < 49,703 < 76,800$$

Descending order (From greatest to smallest)

$$76,800 > 49,703 > 49,307 > 28,975 > 16,564 > 5,987$$



Self Practice 1C

1. Indicate whether the following numbers are arranged in ascending or descending order by writing **A** or **D** in the box given alongside.

(a) 85,106	63,729	46,987	26,863	26,853	<input type="checkbox"/>
(b) 71,121	49,981	49,891	49,890	49,198	<input type="checkbox"/>
(c) 54,980	80,459	85,490	90,854	95,408	<input type="checkbox"/>
(d) 30,702	32,007	32,700	37,000	37,200	<input type="checkbox"/>

2. Tick (✓) the numeral which represents the greatest number.

53,702 53,027 84,598 71,053 57,032 73,025

3. Tick (✓) the numeral which represents the smallest number.

35,918 59,318 83,519 18,953 95,813

4. Arrange the following numbers in ascending order.

(a) 90,725; 72,590; 52,709; 25,097; 98,061; 27,950 (b) 15,005; 15,015; 15,505; 15,051; 15,550; 15,150

5. Arrange the following numbers in descending order.

(a) 19,284; 48,375; 25,795; 65,722; 83,567; 83,765 (b) 24,569; 24,659; 24,596; 24,645; 24,605; 24,650

6. The areas (in sq km) of the North-Eastern states of India are:

Mizoram 21,081; Assam 78,438; Manipur 22,327; Tripura 10,486; Meghalaya 22,429 and Nagaland 16,579

Arrange the states from the state having the largest area to the state having the least area.

BUILDING NUMBERS

Type I. Building Numbers without Repetition of Digits

Example 9

Build all possible numbers using three digits 5, 8, 3 such that none of the digits is repeated in a number.

Solution

If we have 5 at the hundreds place, then we have either 8 or 3 at the tens place and so the numbers formed are 583 or 538.

If we have 8 at the hundreds place, then we have either 5 or 3 at the tens place and so the numbers formed are 853 or 835.

If we have 3 at the hundreds place, then we have either 8 or 5 at the tens place and so the numbers formed are 385 or 358.

Thus, six numbers can be formed using the digits 5, 8 and 3 which are:

358, 385, 538, 583, 835 and 853.

It becomes easy to get the number by drawing diagram as shown on the right.

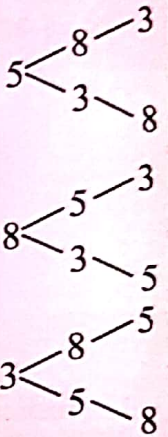
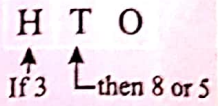
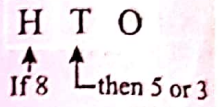
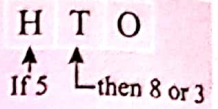
Arranged in **ascending order**, the numbers are:

358, 385, 538, 583, 835 and 853.

In **descending order**, the numbers are:

853, 835, 583, 538, 385 and 358.

The number 853 is the **greatest number** and the number 358 is the **smallest number**.

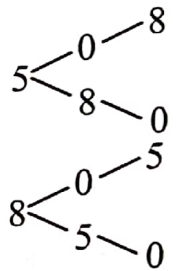


Maths Alert!

If we have 0 as one of the digits, say 0, 8 and 5, then we leave out those numbers which have 0 at the leftmost place, i.e., at the hundreds place and so, the numbers which can be formed using the digits 0, 8 and 5 are:

508, 580, 805 and 850, i.e., four numbers in all.

0
8
5
Meaningless
Leave out.



Example 10

Form the smallest and the greatest numbers using the following digits.

(a) 7, 1, 8, 9

(b) 1, 3, 7, 2, 5

(c) 8, 1, 0, 5, 9

Solution

(a) Smallest number = 1,789

Greatest number = 9,871

(b) Smallest number = 12,357

Greatest number = 75,321

(c) Smallest number = 10,589

Greatest number = 98,510

Note!

We cannot write 0 in the beginning (i.e., at the leftmost place) as by doing so, 01,589 will actually become a 4-digit number, viz., 1,589.

Rule 1 To build the greatest number, arrange the given digits in decreasing order.

Rule 2 To build the smallest number, arrange the given digits in increasing order.

If 0 is one of the digits, put it at the second place from the left.

Type 2. Building Numbers with Repetition of Digits

Rule 1 For greatest number, repeat the greatest digit.

Rule 2 For smallest number, repeat the smallest digit.

Example 11

Using the digits 3, 8, 6 form the smallest and the greatest

(a) 4-digit numbers, (b) 5-digit numbers in which any digit may be repeated.

Solution

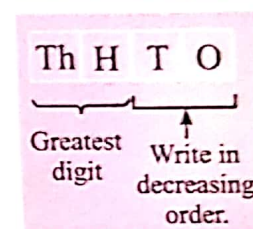
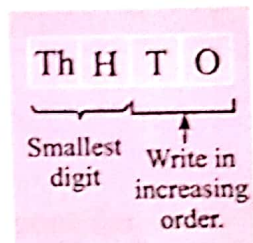
(a) To form a 4-digit number from the given three digits, you will have to repeat a digit twice.

To form the **smallest number**, keep the smallest digit at the thousands place and repeat it at hundreds place. Then, write the remaining digits in increasing order.

Hence, the smallest number formed is 3,368.

To form the **greatest number**, write the greatest digit at the thousands place and repeat it at hundreds place. Then, write the remaining digits in decreasing order.

Hence, the greatest number = 8,863.



(b) To form the greatest 5-digit number, out of three given digits, you will have to repeat the greatest digit **thrice** and for smallest number repeat the smallest digit **thrice**.

Hence, the smallest number = 33,368 and the greatest number = 88,863.

Type 3. Building Numbers with Conditions

Example 12

Write the greatest and the smallest 4-digit numbers, using any four different digits with conditions given below.

(a) Digit 8 is always at ones place.

(b) Digit 3 is always at tens place.

(c) Digit 7 is always at hundreds place.

(d) Digit 2 is always at thousands place.

Solution

(a) Choose from the 10 digits which in ascending order are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 and in descending order are 9, 8, 7, 6, 5, 4, 3, 2, 1, 0. Keep the digit at the indicated place and fill other places with the remaining digits in descending order for writing the greatest number and in ascending order for writing the smallest number.

	Th	H	T	O
Greatest number:	9	7	6	8
Smallest number:	1	0	2	8

Keep 8 at ones place and fill the remaining places by digits in descending and ascending orders respectively.

Cannot keep 0 at the thousands place, so, keep 1 there.

(b) Greatest number:

Th	H	T	O
9	8	3	7

 Keep 3 at tens place. Write the remaining digits in descending order for greatest number and in ascending order for smallest number.

Smallest number:

Th	H	T	O
1	0	3	2

(c) Greatest number:

Th	H	T	O
9	7	8	6

 Keep 7 at hundreds place and write remaining digits in descending order for greatest number and in ascending order for smallest number.

Smallest number:

Th	H	T	O
1	7	0	2

(d) Greatest number:

Th	H	T	O
2	9	8	7

 Keep 2 at the thousands place and fill the remaining places by digits in descending order for greatest number and in ascending order for smallest number.

Smallest number:

Th	H	T	O
2	0	1	3



Self Practice 1D

1. Using the given digits and without repeating any of the digits, make all possible 3-digit numbers.

(a) 2, 4, 6	(b) 7, 3, 9	(c) 8, 0, 1	(d) 0, 6, 9
-------------	-------------	-------------	-------------
2. Using all the given digits and without repeating any of the digits, make the smallest and the greatest number.

(a) 5, 3, 7, 4	(b) 8, 3, 4, 9	(c) 6, 0, 9, 7	(d) 4, 0, 8, 0
(e) 2, 6, 9, 1, 7	(f) 3, 6, 0, 5, 8	(g) 8, 9, 0, 2, 0	(h) 3, 5, 3, 2, 0
3. Make the smallest and the greatest 4-digit number by using any digit twice.

(a) 5, 3, 8	(b) 7, 1, 4	(c) 6, 0, 9	(d) 0, 2, 3
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4. Make the smallest and the greatest 5-digit number by using any digit twice.

(a) 7, 3, 5, 1	(b) 2, 6, 8, 9	(c) 0, 1, 6, 5	(d) 4, 7, 0, 8
----------------	----------------	----------------	----------------
5. Use the digits 5, 9 and 3, at least once, to build the greatest and the smallest 5-digit number.
6. Form the greatest and the smallest 4-digit number using any four different digits with the following conditions. Repetition is not allowed.

(a) Digit 9 is always at ones place.	(b) Digit 5 is always at tens place.
(c) Digit 6 is always at hundreds place.	(d) Digit 8 is always at thousands place.

ESTIMATION AND ROUNDING OFF

There are situations when it is not possible to determine the exact number. For example, in a cricket match being played between two nations, it is not possible to determine precisely the number of people watching the match. We take a guess and give a number which is close to the exact number. This is called **estimation**. We estimate or guess approximate values by **rounding off** the numbers.

General Working Rule:

When rounding, look at the digit to the right of the place to which you are rounding.

- If the digit is 5 or greater, round up.
- If the digit is less than 5, round down.

Thus,

- to round off to the nearest ten, look at the ones digit.
- to round off to the nearest hundred, look at the tens digit.
- to round off to the nearest thousand, look at the hundreds digit.
- to round off to the nearest ten thousand, look at the thousands digit and so on.

Note!

\approx is the symbol of approximation.

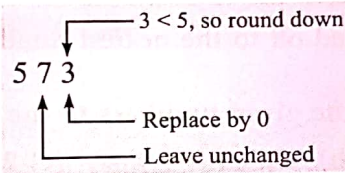
Example 13

Round off each of the following numbers to the nearest ten.

- (a) 573 (b) 635 (c) 807

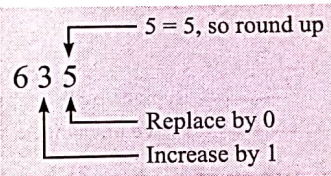
Solution

- (a) The digit at the right of the tens place is 3 (at the ones place), so consider 3.



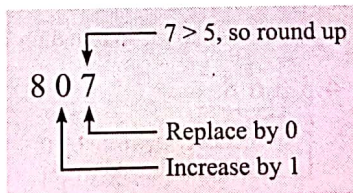
So, 573 rounded off to the nearest ten is 570.

- (b) The digit at the right of the tens place is 5 (at the ones place), so consider 5.



So, 635 rounded off to the nearest ten is 640.

- (c) The digit at the right of the tens place is 7 (at the ones place), so consider 7.



So, 807 rounded off to the nearest ten is 810.

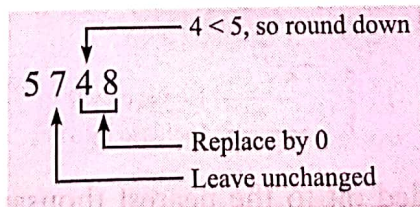
Example 14

Round off each of the following numbers to the nearest hundred.

- (a) 5,748 (b) 6,953 (c) 8,074

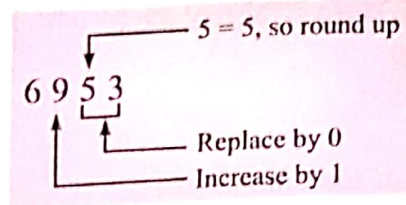
Solution

- (a) The digit at the right of the hundreds place is 4 (at the tens place), so consider 4.



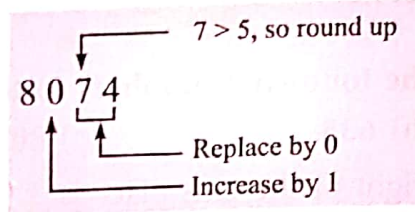
So, 5,748 rounded off to the nearest hundred is 5,700.

(b) The digit at the right of the hundreds place is 5 (at the tens place), so consider 5.



So, 6,953 rounded off to the nearest hundred is 7,000.

(c) The digit at the right of the hundreds place is 7 (at the tens place), so consider 7.



So, 8,074 rounded off to the nearest hundred is 8,100.

Example 15

Round off each of the given numbers to the nearest thousand.

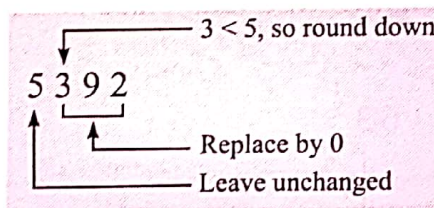
(a) 5,392

(b) 43,568

(c) 29,732

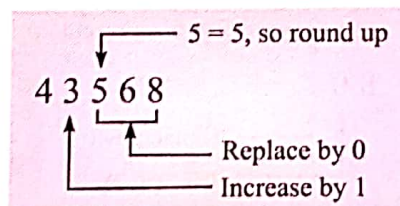
Solution

(a) The digit at the right of the thousands place is 3 (at the hundreds place), so consider 3.



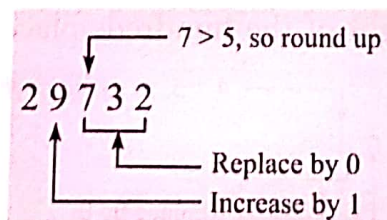
So, 5,392 rounded off to the nearest thousand is 5,000.

(b) The digit at the right of the thousands place is 5 (at the hundreds place), so consider 5.



So, 43,568 rounded off to the nearest thousand is 44,000.

(c) The digit at the right of the thousands place is 7 (at the hundreds place), so consider 7.



So, 29,732 rounded off to the nearest thousand is 30,000.



Self Practice 1E

1. Round off to the nearest ten.

- | | | | | |
|-----------|-----------|------------|------------|------------|
| (a) 57 | (b) 84 | (c) 935 | (d) 869 | (e) 4539 |
| (f) 8,894 | (g) 6,397 | (h) 82,035 | (i) 71,298 | (j) 20,193 |

2. Round off to the nearest hundred.

- | | | | | |
|------------|------------|------------|------------|------------|
| (a) 624 | (b) 136 | (c) 2,095 | (d) 4,053 | (e) 5,974 |
| (f) 20,809 | (g) 18,994 | (h) 79,992 | (i) 69,925 | (j) 12,950 |

3. Round off to the nearest thousand.

- | | | | | |
|------------|------------|------------|------------|------------|
| (a) 3,725 | (b) 6,498 | (c) 9,516 | (d) 5,946 | (e) 21,586 |
| (f) 69,927 | (g) 80,279 | (h) 25,806 | (i) 79,634 | (j) 40,389 |

ESTIMATING SUMS AND DIFFERENCES

Method

Step 1. Round off the given numbers to the **highest** place value of the given numbers, e.g., to the nearest hundred, if the given numbers contain 3 digits.

If the given numbers do not contain equal number of digits, then consider the smaller number, e.g., if the given numbers are 4372 and 895, then consider 895, i.e., round off the given numbers to the nearest 100.

Step 2. Now, add or subtract the rounded off numbers as required.

Example 16

Estimate:

- (a) $539 + 863$ (b) $6,475 - 3,728$ (c) $804 + 29,358$ (d) $829 - 94$

Solution

(a) Both are 3-digit numbers, so we round off to the nearest hundred.

$$\begin{array}{l} 539 \\ \uparrow \\ \quad 3 < 5 \end{array} \xrightarrow[\text{hundred}]{\text{rounded off to the nearest}} 500$$

$$\begin{array}{l} 863 \\ \uparrow \\ \quad 6 > 5 \end{array} \xrightarrow[\text{hundred}]{\text{rounded off to the nearest}} 900$$

$$\therefore \text{Estimated sum} = 500 + 900 = 1,400.$$

(b) Both are 4-digit numbers, so we round off to the nearest thousand.

$$\begin{array}{l} 6,475 \\ \uparrow \\ \quad 4 < 5 \end{array} \xrightarrow[\text{thousand}]{\text{rounded off to the nearest}} 6,000$$

$$\begin{array}{l} 3,728 \\ \uparrow \\ \quad 7 > 5 \end{array} \xrightarrow[\text{thousand}]{\text{rounded off to the nearest}} 4,000$$

$$\therefore \text{Estimated difference} = 6,000 - 4,000 = 2,000.$$

(c) The smaller number is a 3-digit number, so we round off to the nearest hundred.

$$\begin{array}{l} 804 \xrightarrow[\text{hundred}]{\text{rounded off to the nearest}} 800 \\ \uparrow \\ 0 < 5 \end{array}$$

$$\begin{array}{l} 29,358 \xrightarrow[\text{hundred}]{\text{rounded off to the nearest}} 29400 \\ \uparrow \\ 5 = 5 \end{array}$$

\therefore Estimated sum = $800 + 29,400 = 30,200$.

(d) The smaller number is a 2-digit number, so we round off to the nearest ten.

$$\begin{array}{l} 829 \xrightarrow[\text{ten}]{\text{rounded off to the nearest}} 830 \\ \uparrow \\ 9 > 5 \end{array}$$

$$\begin{array}{l} 94 \xrightarrow[\text{ten}]{\text{rounded off to the nearest}} 90 \\ \uparrow \\ 4 < 5 \end{array}$$

\therefore Estimated difference = $830 - 90 = 740$.

Example 17

Estimate each sum or difference by rounding off to the place value indicated.

(a) $6,328 + 8,527$; thousands

(b) $23,126 + 18,722 + 35,690$; thousands

(c) $86,327 - 54,931$; ten thousands.

Solution

(a) $6,328$ rounded off to the nearest thousand = $6,000$

Round down

$8,527$ rounded off to the nearest thousand = $9,000$

Round up

\therefore Estimated sum = $6,000 + 9,000 = 15,000$.

(b) $23,126$ rounded off to the nearest thousand = $23,000$

Round down

$18,722$ rounded off to the nearest thousand = $19,000$

Round up

$35,690$ rounded off to the nearest thousand = $36,000$

Round up

\therefore Estimated sum = $23,000 + 19,000 + 36,000 = 78,000$.

(c) $86,327$ rounded off to the nearest ten thousand = $90,000$

Round up

$54,931$ rounded off to the nearest ten thousand = $50,000$

Round down

\therefore Estimated difference = $90,000 - 50,000 = 40,000$.

ESTIMATING PRODUCTS

Method

Step 1. Round off each of the given factors to its **greatest** place.

Thus, if a factor is a 2-digit number, round it off to the nearest ten and if it is a 3-digit factor, then round it off to the nearest hundred.

Step 2. Multiply the rounded off factors.

Example 18

Estimate the following products.

(a) 76×7

(b) $24 \times 2,705$

(a) 76 is rounded off to 80 (round off to tens).

7 is not rounded off.

\therefore Estimated product = $80 \times 7 = 560$.

(b) 24 is rounded off to 20 .

$2,705$ is rounded off to $3,000$.

\therefore Estimated product = $20 \times 3,000 = 60,000$.



Maths Alert!

Do not round off any 1-digit factor.

Round down to tens

Round up to thousands

ESTIMATING QUOTIENTS

It is easier to estimate a quotient by using **compatible numbers** close to the divisor and the dividend, *i.e.*, choosing a pair of numbers that are easier to divide mentally.

For example, to estimate $458 \div 93$, we may use $450 \div 90$.

Example 19 Find the estimated quotient for each of the following.

(a) $87 \div 8$ (b) $173 \div 14$ (c) $869 \div 26$

(d) $77,893 \div 6$ (e) $29,509 \div 294$

Solution

(a) $87 \div 8 \Rightarrow 80 \div 8 = 10$.

80 and 8 are compatible numbers.

\therefore Estimated quotient = 10.

(b) $173 \div 14 \Rightarrow 180 \div 15 = 12$.

180 and 15 are compatible numbers close to 173 and 14 respectively.

\therefore Estimated quotient = 12.

(c) $869 \div 26 \Rightarrow 900 \div 30 = 30$

Compatible numbers close to 869 and 26 are 900 and 30 respectively.

\therefore Estimated quotient = 30.

(d) $77,893 \div 6 \Rightarrow 78,000 \div 6 = 13,000$.

Compatible number close to 77,893 is 78,000.

\therefore Estimated quotient = 13,000.

(e) $29,509 \div 294 \Rightarrow 30,000 \div 300 = 100$.

Compatible numbers close to 29,509 and 294 are 30,000 and 300 respectively.

\therefore Estimated quotient = 100.

Note that the compatible numbers used to estimate a quotient are not necessarily found by rounding off. Instead, we look for numbers that are easy to divide mentally.



Self Practice 1F

1. Estimate the sum.

(a) $68 + 53$ (b) $466 + 325$ (c) $8,379 + 264$ (d) $1,693 + 4,509$ (e) $27,619 + 53,987$

2. Estimate the difference.

(a) $898 - 345$ (b) $839 - 48$ (c) $362 - 279$ (d) $5,718 - 2,014$ (e) $73,284 - 39,541$

3. Estimate the product.

(a) 68×7 (b) 523×16 (c) 517×68 (d) 74×87 (e) 408×189

4. Estimate the quotient.

(a) $123 \div 8$ (b) $157 \div 19$ (c) $958 \div 49$ (d) $7,982 \div 1,728$ (e) $17,869 \div 8,759$

5. Estimate by rounding off to the place value indicated.

(a) $7,680 + 4,293$; thousands (b) $58,734 - 14,695$; ten thousands

EXTENSION TO LARGE NUMBERS (INTRODUCING 6-DIGIT, 7-DIGIT AND 8-DIGIT NUMBERS)

6-Digit Numbers

We know that,

$$9 + 1 = 10; \quad 99 + 1 = 100; \quad 999 + 1 = 1,000; \quad 9,999 + 1 = 10,000.$$

10,000 is the smallest 5-digit number. The greatest 5-digit number is 99,999.

99,999
+ 1
1,00,000

← This is the smallest 6-digit number and is read as 'One lakh'.

We write a 6-digit number in the place value chart as under:

Lakhs	Thousands		Ones			
	L	TTh	Th	H	T	O
2	5	3	7	9	4	

2,53,794 →

The number is read as 'Two lakh fifty-three thousand seven hundred ninety-four'.

Similarly, 8,20,713 is read as 'Eight lakh twenty thousand seven hundred thirteen'.

4,03,508 is read as 'Four lakh three thousand five hundred eight'.

7-Digit Numbers

The greatest 6-digit number is 9,99,999. If you add 1 to it, you will get a 7-digit number.

9,99,999
+ 1
10,00,000

← This is the smallest 7-digit number and is read as 'Ten lakh'.

We write a 7-digit number in the place value chart as under:

Lakhs		Thousands		Ones		
TL	L	TTh	Th	H	T	O
2	9	6	4	8	5	3

29,64,853 →

The number is read as 'Twenty-nine lakh sixty-four thousand eight hundred fifty-three'.

Similarly, 70,16,069 is read as 'Seventy lakh sixteen thousand sixty-nine'.

61,09,250 is read as 'Sixty-one lakh nine thousand two hundred fifty'.

8-Digit Numbers

The greatest 7-digit number is 99,99,999. If you add 1 to it, you will get an 8-digit number.

99,99,999
+ 1
1,00,00,000

← This is the smallest 8-digit number and is read as 'One crore'.

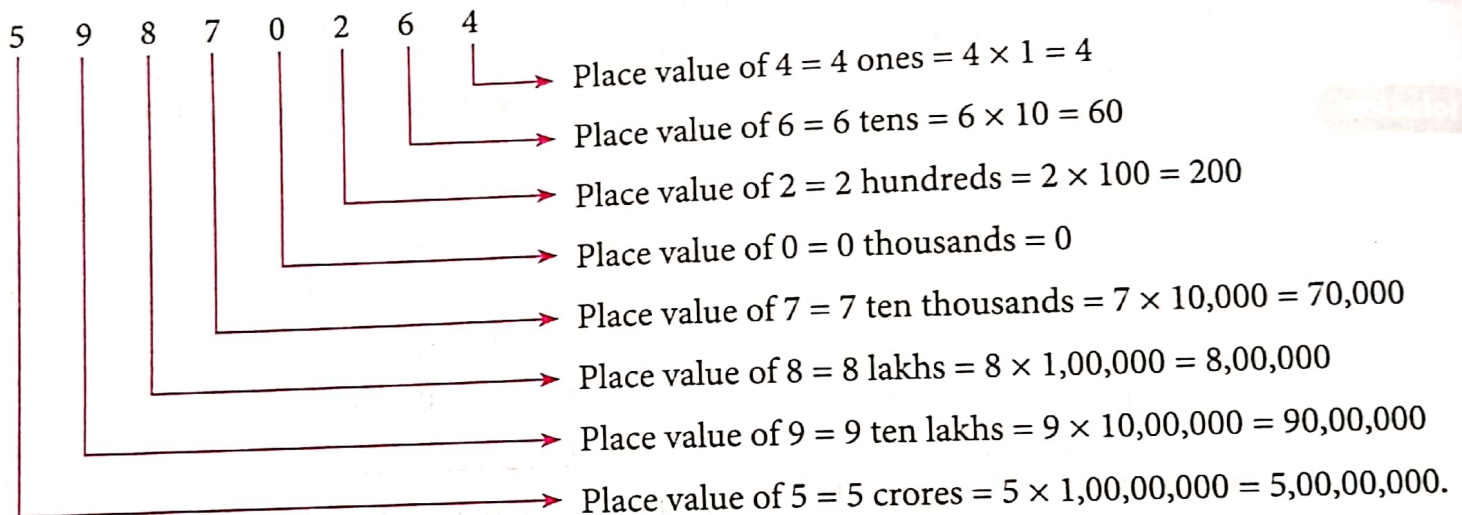
EXTENDING THE CONCEPTS OF PLACE VALUE, EXPANDED FORM AND COMPARISON OF NUMBERS TO LARGE NUMBERS

Place Value and Expanded Form

Let us take the number 5,98,70,264. We have,

C	TL	L	TTh	Th	H	T	O
5	9	8	7	0	2	6	4

Place Value



Standard form: 5,98,70,264

Expanded form: $5,00,00,000 + 90,00,000 + 8,00,000 + 70,000 + 200 + 60 + 4$

Word form: Five crore ninety-eight lakh seventy thousand two hundred sixty-four.



Self Practice 1H

1. Write the place value of 8 in each of the following numerals.

(a) 58,397

(b) 9,83,721

(c) 48,59,326

(d) 83,70,925

(e) 8,73,21,009

(f) 6,90,57,812

2. Write the place value of all the digits in the following numbers.

(a) 29,75,384

(b) 6,72,35,489

3. Write the following numbers in place value chart. Write them in standard form and read them aloud. Write their expanded form.

(a) 725964

(b) 2649837

(c) 50960714

4. Find the difference of the place values of two sevens in 37,29,718.

5. Find the product of the face value and the place value of 8 in the numeral 5,00,80,764.

Comparing and Ordering Large Numbers

Rule A number having more digits is greater than a number having lesser number of digits.

Example 21 Which is greater?

(a) 3789612 or 987920

(b) 83570106 or 9289264

Solution

(a) $3789612 > 987920$
 (7-digit number) (6-digit number)

(b) $83570106 > 9289264$
 (8-digit number) (7-digit number)

Example 22

Compare and write $<$, $>$ or $=$ for the following numbers.

(a) 4,07,64,388 and 4,07,61,935

(b) 9,03,78,251 and 9,03,78,251

Solution

(a)
$$\begin{array}{ccccccc} 4 & 0 & 7 & 6 & 4 & 3 & 8 & 8 \\ 4 & 0 & 7 & 6 & 1 & 9 & 3 & 5 \end{array}$$

 Same \rightarrow Different ($4 > 1$)
 \therefore 4 thousand $>$ 1 thousand

Thus, 4,07,64,388 $>$ 4,07,61,935 or we can write 4,07,61,935 $<$ 4,07,64,388.

(b) $9\ 0\ 3\ 7\ 8\ 2\ 5\ 1$

$9\ 0\ 3\ 7\ 8\ 2\ 5\ 1$

Same digits

Starting from the leftmost place, we find that all digits in the two numbers are the same. So, the two numbers are equal.

Thus, 9,03,78,251 = 9,03,78,251.

Example 23

Write the following numbers in ascending and descending order.

(a) 95,10,328; 63,79,852; 2,69,578 and 2,38,00,199

(b) 3,80,122; 4,95,01,275; 4,95,08,396 and 93,20,008

Solution

(a) It is easier to compare by arranging the given numbers in a place value chart.

C	TL	L	TTh	Th	H	T	O
	9	5	1	0	3	2	8
	6	3	7	9	8	5	2
		2	6	9	5	7	8
2	3	8	0	0	1	9	9

You can observe that 2,69,578 containing the least number of digits (six) is the smallest number and the number 2,38,00,199 containing the most number of digits (eight) is the largest number.

Also, since among the remaining two 7-digit numbers,

95,10,328 $>$ 63,79,852 (Since in the leftmost TL position $9 > 6$.)

Hence, the given numbers in ascending order are:

$$2,69,578 < 63,79,852 < 95,10,328 < 2,38,00,199$$

In descending order, the numbers are:

$$2,38,00,199 > 95,10,328 > 63,79,852 > 2,69,578$$

(b) Writing the numbers in the place value chart, we have,

C	TL	L	TTh	Th	H	T	O
		3	8	0	1	2	2
				1	2	7	5
4	9	5	0	8	3	9	6
4	9	5	0		0	0	8
	9	3	2	0			

Same ←

8 > 1

From the place value chart you can easily observe that 93,20,008 (7-digit number) is greater than 3,80,122 (6-digit number).

Also, among the 8-digit numbers, first 4 places have the same digits but at the 5th place, $8 > 1$, so $4,95,08,396 > 4,95,01,275$.

Hence, we have,

$$3,80,122 < 93,20,008 < 4,95,01,275 < 4,95,08,396 \text{ (Ascending order) and } 4,95,08,396 > 4,95,01,275 > 93,20,008 > 3,80,122 \text{ (Descending order).}$$



Self Practice 11

1. Compare and put $<$, $>$ or $=$ in the given boxes.

(a) $8,27,314$ $98,026$

(b) $7,14,586$ $7,14,895$

(c) $2,59,630$ $2,59,630$

(d) $81,20,719$ $8,12,719$

(e) $35,07,648$ $39,07,648$

(f) $29,44,807$ $29,44,827$

(g) $1,46,53,740$ $1,56,55,230$

(h) $9,80,65,817$ $9,80,56,936$

2. Order the numbers from the least to the greatest.

(a) $32,58,403$; $1,59,860$; $49,00,718$; $32,57,964$

(b) $6,37,09,625$; $97,55,602$; $9,20,09,817$; $6,99,00,001$

3. Order the numbers from the greatest to the least.

(a) $17,30,619$; $1,27,59,201$; $3,18,47,409$; $7,30,897$

(b) $64,207$; $99,27,106$; $6,42,079$; $1,00,00,704$

4. The population of five countries are as follows:

Australia 2,46,98,000; Egypt 9,39,43,000; France 6,49,86,000; Germany 8,11,33,000; South Africa 5,54,32,000

Rank these countries in the order, from the least populated to the most densely populated.

PROBLEMS BASED ON REAL LIFE SITUATIONS INVOLVING NUMBER OPERATIONS

Example 24

Sameer opened a bank account with a deposit of ₹ 15,000. In the following months, he deposited ₹ 9,568, ₹ 18,795 and ₹ 6,249. How much did he deposit in all?

Solution

$$\begin{aligned} \text{Total deposit} &= ₹ 15,000 + ₹ 9,568 + ₹ 18,795 + ₹ 6,249 \\ &= ₹ 49,612 \end{aligned}$$

Working

$$\begin{array}{r} 15,000 \\ 9,568 \\ 18,795 \\ + 6,249 \\ \hline 49,612 \end{array}$$

Example 25

As per census 2011, the population of Arunachal Pradesh is 13,83,727 and that of Nagaland is 19,78,502. Which state has a greater population and by how much?

Solution

	TL	L	TTh	Th	H	T	O
Arunachal Pradesh →	1	3	8	3	7	2	7
Nagaland →	1	9	7	8	5	0	2

Same $9 > 3$

It is clear from the place value chart that $19,78,502 > 13,83,727$.

Thus, Nagaland is more populated.

Also, the population of Nagaland exceeds that of Arunachal Pradesh by 5,94,775 (Five lakh ninety-four thousand seven hundred seventy-five).

Working

$$\begin{array}{r} 1978502 \\ - 1383727 \\ \hline 594775 \end{array}$$

Example 26

A trader is able to sell 986 cycles in a year, each cycle being sold for ₹ 3,675. What is his total annual income? State in words also.

Solution

Selling price of one cycle = ₹ 3,675

$$\begin{aligned} \therefore \text{Total selling price} &= ₹ (986 \times 3,675) \\ &= ₹ 36,23,550 \end{aligned}$$

Working

$$\begin{array}{r} 3675 \\ \times 986 \\ \hline 22050 \\ 29400 \\ 33075 \\ \hline 3623550 \end{array}$$

Thus, the trader's total annual income was thirty-six lakh twenty-three thousand five hundred fifty rupees.

Example 27

A company's total profit of ₹ 1,75,93,275 is shared equally among 235 shareholders. How much does each shareholder receive? State the amount in words.

Solution

$$\begin{aligned} \text{Amount received by each shareholder} &= ₹ (1,75,93,275 \div 235) \\ &= ₹ 74,865 \end{aligned}$$

Working

$$\begin{array}{r} 74865 \\ 235 \overline{) 17593275} \\ \underline{- 1645} \\ 1143 \\ \underline{- 940} \\ 2032 \\ \underline{- 1880} \\ 1527 \\ \underline{- 1410} \\ 1175 \\ \underline{- 1175} \\ 0 \end{array}$$

Thus, each shareholder will receive seventy-four thousand eight hundred sixty-five rupees.

Example 28

A student multiplied 6,937 by 64 instead of multiplying by 46. By how much was his answer greater than the correct answer?

Solution

$$\begin{aligned} 6,937 \times 64 &= 4,43,968 \text{ (Wrong answer)} \\ 6,937 \times 46 &= 3,19,102 \text{ (Correct answer)} \end{aligned}$$

Working

$\begin{array}{r} 6937 \\ \times 64 \\ \hline 27748 \\ 41622 \\ \hline 443968 \end{array}$	$\begin{array}{r} 6937 \\ \times 46 \\ \hline 41622 \\ 27748 \\ \hline 319102 \end{array}$	$\begin{array}{r} 443968 \\ - 319102 \\ \hline 124866 \end{array}$
--	--	--

$$\begin{aligned} \therefore \text{Required difference} &= 4,43,968 - 3,19,102 \\ &= 1,24,866. \end{aligned}$$

Example 29

1 m 95 cm cloth is required to stitch a shirt. How many shirts can be stitched out of 46 m cloth? How much cloth will remain unused?

Solution

First change the length of cloth into cm. Recall that 1 m = 100 cm.

$$\text{Total cloth available} = 46 \text{ m} = 46 \times 100 \text{ cm} = 4600 \text{ cm}$$

$$\text{Cloth required to stitch one shirt} = 1 \text{ m } 95 \text{ cm}$$

$$= 100 \text{ cm} + 95 \text{ cm} = 195 \text{ cm}$$

\therefore Number of shirts which can be stitched

$$\text{out of the given length of cloth} = \frac{\text{Total cloth available}}{\text{Cloth required to stitch one shirt}}$$

$$= \frac{4600 \text{ cm}}{195 \text{ cm}} = 23 \frac{115}{195}$$

Working

$$\begin{array}{r} 23 \\ 195 \overline{) 4600} \\ \underline{- 390} \\ 700 \\ \underline{- 585} \\ 115 \end{array}$$

Thus, 23 shirts can be stitched and 115 cm, i.e., 1 m 15 cm cloth will remain unused.

Example 30

How many packing cases containing mangoes and weighing 5 kg 750 g each can be loaded in a luggage van with carrying capacity of 700 kg?

Solution

First, change the weights into same unit, *i.e.*, gram. Recall that 1 kg = 1000 g.

Loading capacity of van = 700 kg = 700×1000 g = 700000 g

Weight of 1 packing case = 5 kg 750 g = 5000 g + 750 g = 5750 g

\therefore Number of packing cases

$$\begin{aligned} \text{that can be loaded in the van} &= \frac{700000 \text{ g}}{5750 \text{ g}} \\ &= \frac{70000}{575} = 121 \frac{425}{575} \end{aligned}$$

Thus, 121 packing cases can be loaded in the luggage van.

Working

$$\begin{array}{r} 121 \\ 575 \overline{) 70000} \\ \underline{-575} \\ 1250 \\ \underline{-1150} \\ 1000 \\ \underline{-575} \\ 425 \end{array}$$

Example 31

A vessel contains 10 L and 500 mL of lemonade. How many glasses, each of 175 mL capacity, will it be able to fill?

Solution

Change the terms into same units. Recall that, 1L = 1000 mL.

Total volume of lemonade in the vessel = 10 L 500 mL

$$= (10 \times 1000 + 500) \text{ mL} = 10,500 \text{ mL}$$

Capacity of 1 glass = 175 mL

$$\begin{aligned} \therefore \text{Number of glasses which can be filled} & \\ \text{with the lemonade from the vessel} &= \frac{\text{Lemonade in the vessel}}{\text{Capacity of one glass}} \\ &= \frac{10500 \text{ mL}}{175 \text{ mL}} = 60. \end{aligned}$$

Working

$$\begin{array}{r} 60 \\ 175 \overline{) 10500} \\ \underline{-10500} \\ 0 \end{array}$$

Thus, 60 glasses can be filled from the vessel.

**Self Practice 1J**

- Rahul rode his motorbike 25,750 km in the first year, 20,675 km in the second year and 23,928 km in the third year. How many kilometres in all, he rode in the 3 years?
- Priyanka opened a bank account with a deposit of ₹ 10,000. In the following months, she deposited ₹ 8,425, ₹ 19,766 and ₹ 15,238. She did not make any withdrawals. How much was the final balance in her account?
- Arun received a gratuity of ₹ 18,60,750 on his retirement. He bought a car for ₹ 3,25,000, invested ₹ 2,70,000 in mutual funds and deposited the remaining amount in fixed deposit in a bank. How much money did he put in fixed deposit?
- As per 2011 census, West Bengal has a total population of 9,12,76,115. Out of this 4,68,09,027 are males. What is the female population of this state? Write your answer in standard form and word form. Write its expanded form. Also, round off your answer to the nearest ten thousand.
- 20 cricket players receive an award money, each of ₹ 8,75,000, for winning a Test series. How much is the total amount of money awarded?
- A builder sold 16 flats at ₹ 55,66,800 per flat. How much money did he receive in all from this sale?

7. An amount of ₹ 9,15,750 is shared equally among 185 people. How much does each person receive?
8. A company's yearly profit of rupees nine crore is shared equally among its 500 shareholders. How much does each shareholder receive?
9. There is 15 L of soup in a pot. Surbhi serves 400 mL in each bowl. If she fills 28 bowls, how much soup is left in the pot?
10. Anushka wants to frame a rectangular picture that is 1 m 70 cm by 90 cm. Anushka has 500 cm of wood to use for a frame. Does Anushka have enough wood to frame the picture?
11. In mid-day meals in a school, 56 kg of rice was consumed daily by students. If each student got 35 g of rice, determine the number of students in the school.
12. A box contains two lakh fifty thousand seven hundred tablets. If each tablet weighs 15 mg, find the total weight of all the tablets in kilograms.
13. Australia has a coastline of 25,760 km and Canada has a coastline of 2,02,080 km. Which country has a longer coastline and by how much?
14. A box contains 80 packets of biscuits each weighing 125 g. How many such boxes can be loaded in a van, which can carry a maximum load of 800 kg?
15. List these states in descending order according to their population figures (as per census 2011).
Tamil Nadu 7,21,47,030; Rajasthan 6,85,48,437; West Bengal 9,12,76,115; Karnataka 3,09,66,657

THE INTERNATIONAL SYSTEM OF NUMERATION

In the International system, starting from the right, the groups or periods are called **ones, thousands, millions, billions, trillions, etc.**

The places in different periods are as under:

Ones: Ones, tens, hundreds

Thousands: Thousands, ten thousands, hundred thousands

Millions: Millions, ten millions, hundred millions

Billions: Billions, ten billions, hundred billions

Periods Places	Billions			Millions			Thousands			Ones		
	Hundred Billions HB	Ten Billions TB	Billions B	Hundred Millions HM	Ten Millions TM (C)	Millions M (TL)	Hundred Thousands HTh (L)	Ten Thousands TTh	Thousands Th	Hundreds H	Tens T	Ones O
								7	8	0	3	5
							5	0	9	2	7	6
						6	1	8	3	5	4	1
					2	9	7	6	4	1	8	5

Here, we will limit our study up to millions only.


Rule To write a numeral in the International system, the commas are inserted after every third digit from right to left, but we read the numeral from left to right.

Thus, the numerals shown in the chart on the previous page would be written and read as follows:

78,035 : Seventy-eight thousand thirty-five

509,276 : Five hundred nine thousand two hundred seventy-six

6,183,541 : Six million one hundred eighty-three thousand five hundred forty-one.

 Commas are inserted after every 3rd digit from right to left.

29,764,185 : Twenty-nine million seven hundred sixty-four thousand, one hundred eighty-five.

In **Hindu-Arabic system**, the above numbers are written and read as follows:

78,035 : Seventy-eight thousand thirty-five

5,09,276 : Five lakh nine thousand two hundred seventy-six.

61,83,541 : Sixty-one lakh eighty-three thousand five hundred forty-one.

2,97,64,185 : Two crore ninety-seven lakh sixty-four thousand one hundred eighty-five.



Maths Alert!

We do not read as one hundred **and** eighty-three thousand or five hundred **and** forty-one. The word 'and' is not used.



Self Practice 1K

1. How would you read each of the following numerals?

- (a) 4,863,000 (b) 56,317,900 (c) 8,406,008 (d) 75,219,038
(e) 92,594,168 (f) 50,000,003

2. Insert commas suitably and write the name according to the International system of numeration.

- (a) 5390721 (b) 69345071 (c) 80374629 (d) 2003798
(e) 792035 (f) 87200965

3. Write the numerals for each of the following numbers. Write them in the place value chart.

- (a) Three hundred fifty-seven thousand two hundred nineteen
(b) Four million one hundred seventy thousand fifty-five
(c) Sixty-seven million nine hundred thousand four hundred ninety-one
(d) Nine million one hundred nine thousand seven hundred five
(e) Seven hundred thousand
(f) Fifty-eight million
(g) Six million five hundred thousand seven

4. Write the following in standard form.

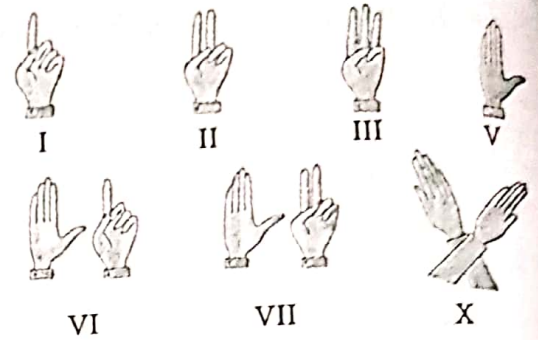
- (a) $5 \times 100,000 + 7 \times 10,000 + 8 \times 1,000 + 3 \times 100 + 9 \times 10 + 2$
(b) $7 \times 1,000,000 + 4 \times 100,000 + 4 \times 10,000 + 5 \times 1,000 + 3 \times 100 + 8 \times 10 + 6 \times 1$
(c) $8 \times 10,000,000 + 3 \times 1,000,000 + 7 \times 100,000 + 5 \times 10,000 + 2 \times 1,000 + 9 \times 100 + 1 \times 10 + 6$

5. Write the following in expanded form.

- (a) 735,448 (b) 2,634,789 (c) 9,050,254

ROMAN NUMERALS

Like our Hindu-Arabic system of numeration, another ancient system of numeration is the Roman system. The Romans used a different set of symbols as their numerals. The figure given on the right shows how the Romans might have developed their number symbols.



There are seven basic Roman Numerals.

Roman Symbol	I	V	X	L	C	D	M
Meaning	1	5	10	50	100	500	1000

There is **no symbol for zero** in the Roman system and neither **does it use the concept of place value**. These days the letter 'K' is used as a symbol for 1000. Thus, 5K denotes the number 5000. The following rules are observed in writing numbers in Roman numeral.

Rule 1 When a letter is used more than once, we add its value each time to get the number.

$$\begin{aligned} \text{III} &= 1 + 1 + 1 = 3; \\ \text{XXX} &= 10 + 10 + 10 = 30; \\ \text{CC} &= 100 + 100 = 200; \\ \text{CCC} &= 100 + 100 + 100 = 300; \\ \text{MM} &= 1000 + 1000 = 2000 \end{aligned}$$

Note !

The same symbol is not repeated more than 3 times together.

The symbol V, L and D are never repeated.

Rule 2 When a symbol of smaller value is written to the **right** of a symbol of larger value, its value gets **added** to the value of the larger symbol.

$$\begin{aligned} \text{VI} &= 5 + 1 = 6; \\ \text{XI} &= 10 + 1 = 11; \\ \text{XXXVII} &= 10 + 10 + 10 + 5 + 1 + 1 = 37; \\ \text{LXVI} &= 50 + 10 + 5 + 1 = 66 \end{aligned}$$

Rule 3 When a symbol of smaller value is written to the **left** of a symbol of larger value, the smaller value is **subtracted** from the larger value.

$$\begin{aligned} \text{IV} &= 5 - 1 = 4; \\ \text{IX} &= 10 - 1 = 9; \\ \text{XL} &= 50 - 10 = 40; \\ \text{XC} &= 100 - 10 = 90; \\ \text{CD} &= 500 - 100 = 400; \\ \text{CM} &= 1000 - 100 = 900 \end{aligned}$$



Maths Alert!

- V, L and D are never subtracted.
- I can be subtracted from V and X only once. X can be subtracted from L and C only once. C can be subtracted from D and M once only. Thus, I or V is never written to the left of L or C. L is never written to the left of C.
- With the help of the symbols I, V, X, L, C we can write numbers up to 399.

Thus, we have,

Ones

Hindu-Arabic System	1	2	3	4	5	6	7	8	9
Roman System	I	II	III	IV	V	VI	VII	VIII	IX

Tens

Hindu-Arabic System	10	20	30	40	50	60	70	80	90	100
Roman System	X	XX	XXX	XL	L	LX	LXX	LXXX	XC	C

Example 32

Write a Roman numeral for each of the following.

- (a) 19 (b) 48 (c) 83 (d) 61
 (e) 99 (f) 49 (g) 347 (h) 629

Solution

- (a) $19 = 10 + (10 - 1) = XIX$
 (b) $48 = (50 - 10) + (5 + 1 + 1 + 1) = XLVIII$
 (c) $83 = (50 + 10 + 10 + 10) + (1 + 1 + 1) = LXXXIII$
 (d) $61 = (50 + 10) + 1 = LXI$
 (e) $99 = (100 - 10) + (10 - 1) = XC + IX = XCIX$
 (f) $49 = (50 - 10) + (10 - 1) = XL + IX = XLIX$
 (g) $347 = (100 + 100 + 100) + (50 - 10) + (5 + 1 + 1) = CCCXLVII$
 (h) $629 = 500 + 100 + 10 + 10 + (10 - 1) = DCXXIX$



Maths Alert!

We cannot write $49 = 50 - 1 = IL$, as I cannot be written to the left of L.

Example 33

Write the Hindu-Arabic numeral for each of the following numbers.

- (a) XLIV (b) XXIX (c) LVII (d) LXVIII
 (e) CXXXIX (f) CDXXXI (g) DCXXIX (h) CXXVI

Solution

- (a) $XLIV = XL + IV = (50 - 10) + (5 - 1) = 40 + 4 = 44$
 (b) $XXIX = 10 + 10 + (10 - 1) = 20 + 9 = 29$
 (c) $LVII = 50 + (5 + 2) = 57$
 (d) $LXVIII = 50 + 10 + (5 + 3) = 68$
 (e) $CXXXIX = 100 + 10 + 10 + 10 + (10 - 1) = 139$
 (f) $CDXXXI = (500 - 100) + 10 + 10 + 10 + 1 = 431$
 (g) $DCXXIX = (500 + 100) + 10 + 10 + (10 - 1) = 629$
 (h) $CXXVI = 100 + 10 + 10 + (5 + 1) = 126$



Self Practice 1L

1. Write a Roman numeral for each of the following numbers.

- (a) 14 (b) 21 (c) 39 (d) 45 (e) 65
 (f) 86 (g) 96 (h) 128 (i) 352 (j) 635

2. Write the Hindu-Arabic numeral for each of the following numbers in Roman numerals.

- (a) XLVI (b) LXXVIII (c) XXXIV (d) LIX (e) LXVI
 (f) CCCXLV (g) CLXXIII (h) CCXXX (i) DCCIX (j) CDXXI

USE OF BRACKETS

Look at the following.

(1) Find: 5×8

(2) Find: $5 \times 8 + 3$

The answer to (1) is 40.

In (2) more than one basic operation, multiplication and addition are involved. One of you may give the answer as 43 by multiplying 5 and 8 first and then, adding 3.

$$5 \times 8 + 3 = 40 + 3 = 43.$$

The others may give the answer as 55 by first adding 8 and 3 and then, multiplying by 5.

$$5 \times 8 + 3 = 5 \times 11 = 55$$

Since the problem does not indicate which operation should be done first, therefore, both the answers are possible.

The above ambiguity is removed by making use of grouping symbols, i.e., the symbols which would group the numbers involving a particular operation. The brackets '()' are a type of grouping symbols. Thus, we may write

$$(5 + 3) \times 4 \text{ or } 5 + (3 \times 4)$$

The brackets indicate that the operation inside the brackets should be done first.

$$\text{Thus, } (5 + 3) \times 4 = 8 \times 4 = 32 \text{ and } 5 + (3 \times 4) = 5 + 12 = 17$$

$$\text{Also, } (23 + 7) \div 6 = 30 \div 6 = 5 \text{ and } 17 + (6 \div 2) = 17 + 3 = 20.$$



Self Practice 1M

Solve the following.

1. $6 + (2 \times 5)$

2. $(6 + 4) \times 5$

3. $3 + (6 + 8)$

4. $(10 - 3) + 13$

5. $18 - (3 + 7)$

6. $(8 \times 15) - 20$

7. $27 - (6 \times 4)$

8. $30 - (112 \div 14)$

9. $(35 - 15) \div 4$

10. $80 \div (5 \times 4)$

Mental Maths



- The place value of 7 in 37,205 is _____.
- (a) 1 lakh = _____ thousands (b) 1 million = _____ lakh.
- The numeral for twelve thousand forty-seven is _____.
- Write the standard numeral for $7 \times 1,000 + 3 \times 100 + 9 \times 10 + 5$.
- Write the number 58893270 in both Indian and International systems by dividing into periods and inserting commas at proper places _____, _____.
- What is the product of the face value and place value of 7 in the number 49876? _____.
- The largest 4-digit number using the digits 5, 9, 0, 7 is _____.
- 2,657 when rounded off to the nearest hundred is _____.
- Write the Hindu-Arabic numeral for the number LXXVII. _____.
- The estimated value of the product 57×23 is _____.
- The successor of the number 9,999 is _____.
- The predecessor of 86,100 is _____.
- Multiply the predecessor of 301 by the place value of 5 in 70,953. _____
- Write the smallest 3-digit number with different digits. _____
- The estimated quotient of $67 \div 15$ is _____.