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# Numbers and Numeration



## Learning Objectives

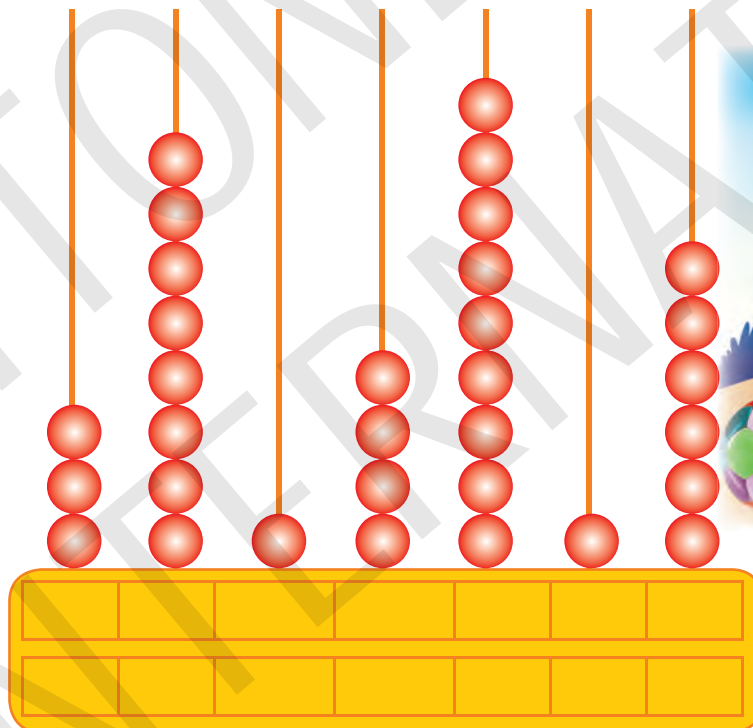
At the end of this lesson, students will be able to:

- Develop a proper understanding of the Indian and International Number Systems.
- Compare the place value of different numbers upto 9 digits.
- Write the short and expanded form of the numbers.



## Warm-Up

Observe the abacus given below and write down the digits with their place value.



Digits:

Place Value:



## Teacher's Note:

Ask the students about the largest seven-digit numbers, which is read as ninety-nine lakh, ninety-nine thousand, nine hundred and ninety-nine.





In the previous class, we have studied upto 7-digit numbers.

Let's see the Indian place value chart given below.

TL	L	T-Th	Th	H	T	O
9	9	9	9	9	9	9

So, the largest 7-digit number is 9999999.



### Extension of Numbers



Let's learn 8-digit and 9-digit numbers.

### Indian Place Value Chart

Crores		Lakhs		Thousands			Ones	
TC	C	TL	L	T-Th	Th	H	T	O
Ten Crores 100000000	Crores 10000000	Ten Lakhs 1000000	Lakhs 100000	Ten Thousands 10000	Thousands 1000	Hundreds 100	Tens 10	Ones 1

Place Value		TC	C	TL	L	T-Th	Th	H	T	O
8-Digit	Smallest		1	0	0	0	0	0	0	0
	Largest		9	9	9	9	9	9	9	9
9-Digit	Smallest	1	0	0	0	0	0	0	0	0
	Largest	9	9	9	9	9	9	9	9	9

From the above place value chart,



Smallest 8-digit number is, 10000000

This is read as one crore.



Largest 8-digit number is 99999999. This is read as,

Nine crore ninety-nine lakh ninety nine thousand nine hundred ninety nine.



Smallest 9-digit number is 100000000.

This is read as,  
Ten Crores.



Largest 9-digit number is 999999999.

This is read as,  
Ninety-nine crore ninety-nine thousand nine hundred ninety-nine.

### Solved Examples

**Example 1** : Rewrite the following numbers using commas, in the Indian Number System.

(a) 27645089

(b) 201457892

(c) 7349562

(d) 8300596

**Solution** :

**Indian Place Value Chart**

Crores		Lakhs		Thousands			Ones	
TC	C	TL	L	T-Th	Th	H	T	O

$$(a) 27645089 = 2,76,45,089$$

$$(b) 201457892 = 20,14,57,892$$

$$(c) 7349562 = 73,49,562$$

$$(d) 8300596 = 83,00,596$$

**Example 2** : Write 28,64,02,542 in expanded form.



**Solution** : We can expand the given number in any of the following three ways.

(i) 2 ten crores + 8 crores + 6 ten lakhs + 4 lakhs + 2 thousands + 5 hundreds + 4 tens + 2 ones

OR

(ii)  $2 \times 10,00,00,000 + 8 \times 1,00,00,000 + 6 \times 10,00,000 + 4 \times 1,00,000 + 2 \times 1,000 + 5 \times 100 + 4 \times 10 + 2 \times 1$

OR

(iii)  $20,00,00,000 + 8,00,00,000 + 60,00,000 + 4,00,000 + 2,000 + 500 + 40 + 2$

**Example 3** : Write 78, 05, 62, 158 in expanded form.

**Solution** : We can expand the given number in any of the following three ways:

(i) 7 ten crores + 8 crores + 5 lakhs + 6 ten thousands + 2 thousands + 1 hundreds + 5 tens + 8 ones

OR

(ii)  $7 \times 10,00,00,000 + 8 \times 1,00,00,000 + 5 \times 1,00,000 + 6 \times 10,000 + 2 \times 1,000 + 1 \times 100 + 5 \times 10 + 8 \times 1$

OR

(iii)  $70,00,00,000 + 8,00,00,000 + 5,00,000 + 60,000 + 2,000 + 100 + 50 + 8$



### Quick Tip

As per the Indian numeral system, the first comma is placed after the hundreds place post which they are placed after every two digits. E.g., 1,23,45,67,890.

## Exercise 1.1

1. Write the following numerals using proper commas.

(a) 28764259

(b) 138465002

(c) 94962080

(d) 798962420

(e) 834265210

(f) 91345642

(g) 13465920

(h) 83056900



2. Write the following numerals in expanded form.

- (a) 2,86,54,203      (b) 76,00,42,951      (c) 3,84,60,259  
(d) 4,05,06,429      (e) 21,34,56,701      (f) 81,00,56,159  
(g) 7,01,32,645      (h) 5,99,02,105

3. Write the following in short form.

- (a)  $40,00,00,000 + 3,00,00,000 + 4,000 + 20$ .  
(b)  $8,00,00,000 + 40,000 + 2,000 + 1$   
(c)  $80,00,00,000 + 50,00,000 + 9,000 + 50 + 2$   
(d)  $70,00,00,000 + 4,00,000 + 8,000 + 3$   
(e)  $60,00,00,000 + 2,00,00,000 + 10,00,000 + 2,00,000 + 50,000 + 3,000 + 400 + 90 + 6$   
(f)  $70,00,00,000 + 4,00,00,000 + 4,000 + 400 + 2$



4. Write the following numerals in words.

- (a) 46, 52, 20, 829      (b) 2,00,56,420      (c) 80,00,00,000  
(d) 7,00,00,000      (e) 67,29,02,010      (f) 5,01,52,143  
(g) 36,52,14,729      (h) 1,54,00,140

5. Write the following numbers in figures.

- (a) Six crore seven lakh five thousand three hundred seventeen.  
(b) Ten crore eleven thousand one hundred sixty.  
(c) Five crore five lakh five thousand five hundred five.  
(d) Nine crore fifty.  
(e) Eighty six crore fifty lakh twenty thousand one.  
(f) Nine crore fifty six thousand twelve.

6. Write the place value of the encircled digits.

- (a) 28,00,4(2),076  
(b) 7(2),26,59,089  
(c) (9)8,02,53,183  
(d) 70,28,58,1(0)3  
(e) 21,(7)3,86,211  
(f) 45,3(9),42,159





## International Place Value System

### International Place Value Chart

Millions			Thousands			Ones		
HM	TM	M	H-Th	T-Th	Th	H	T	O
Hundred Millions 100,000,000	Ten Millions 10,000,000	Millions 1,000,000	Hundred Thousands 100,000	Ten Thousands 10,000	Thousands 1000	Hundreds 100	Tens 10	Ones 1



### Remember

- 1 Lakh = 100 Thousands
- 10 Lakhs = 1 Million
- 1 Crore = 10 Millions
- 10 Crores = 100 Millions



### Facts to Know

The International Place Value System is also referred to as the Western Place Value System.



### Think Wisely

Think of three examples from real-life situations where you are using more than four digits, for example, dialling a phone number.

\_\_\_\_\_

### Solved Examples

**Example 1** : Rewrite the following numbers using commas, in the International Number System.

- (a) 29170798      (b) 731460298      (c) 42596405      (d) 198400596





**Solution :** International Place Value Chart

Millions		Thousands			Ones			
HM	TM	M	H-Th	T-Th	Th	H	T	O

(a)  $29170798 = 29,170,798$

(b)  $731460298 = 731,460,298$

(c)  $42596405 = 42,596,405$

(d)  $198400596 = 198,400,596$

**Example 2 :** Write the following numerals in words, using International Number System.

(a) 28,042,579    (b) 102,586,107    (c) 182,542,000    (d) 102,159,120

- Solution :**
- (a) Twenty eight million forty two thousand five hundred seventy nine.
  - (b) One hundred two million five hundred eighty six thousand one hundred seven.
  - (c) One hundred eighty two million five hundred forty two thousand.
  - (d) One hundred two million one hundred fifty nine thousand one hundred twenty.



**Quick Tip**

As per the International numeral system, the first comma is placed after the hundreds place, post which they are placed after every three digits. E.g., 1,234,567,890

**Exercise 1.2**

1. Write the following numerals using proper commas, in the International Number System.

(a) 710245682

(b) 21246305

(c) 764253402

(d) 28376901

(e) 920457681

(f) 2359462

(g) 1742053

(h) 55551111



2. Write the following numerals in words, using International Number System:

- (a) 456,028,740      (b) 900,000,000      (c) 30,000,000  
(d) 40,670,002      (e) 2,342,112      (f) 70,145,208  
(g) 60,150,400      (h) 120,460,140

3. Write the following numbers in figures, using Western Number System:

- (a) Four hundred million one hundred two thousand eleven.  
(b) Sixty million sixty thousand six hundred sixty.  
(c) Five hundred million two hundred thirty thousand one.  
(d) Seven hundred seventy seven million thirty two.  
(e) Two million eight hundred twenty three thousand three.  
(f) Fifty two million five hundred twelve thousand twelve.



Answer the following.

1. How many:  
(a) Tens make a lakh? \_\_\_\_\_  
(b) Hundreds make a crore? \_\_\_\_\_
2. How many times the digit 4 occur between 1 and 100? \_\_\_\_\_
3. What is the predecessor of the largest 8 - digit number? \_\_\_\_\_
4. Rewrite the numbers in both Indian and International Systems.

Number	Indian System	International System
7577344		
90067		





## Maths Lab Activity

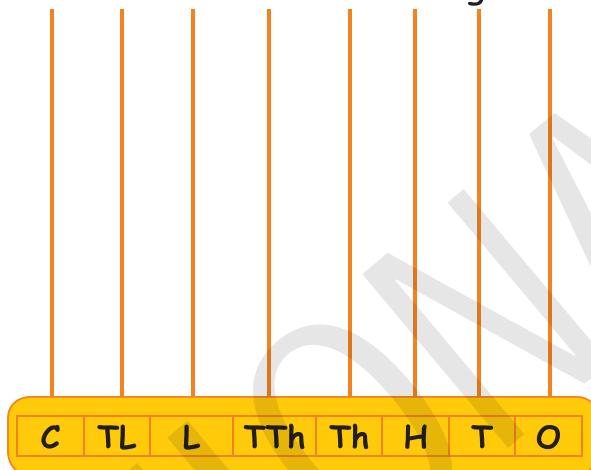
**Materials required:** An abacus with 8 rods and beads of 8 different colours.

### Steps:

- Let us have 8 digits say 3, 9, 5, 1, 7, 4, 2, 6.

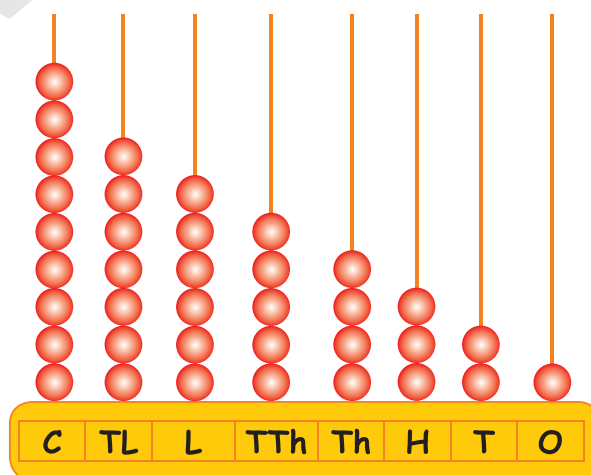
Let us now form the greatest 8-digit number that can be formed using these digits.

- Find the greatest digit ( here it is 9), pick up nine beads and put them in the crores rod.
- Find the second largest digit ( here it is 7), pick up seven beads and put them on the ten lakhs rod.
- Find the third-largest digit ( here it is 6), pick up six beads and put them in the lakhs rod.



- Find the fourth-largest digit ( here it is 5), pick up five beads, and put them in the ten thousand rod.
- Find the fifth-largest digit ( here it is 4 ) and put four beads in the thousands rod.
- Find the sixth-largest digit ( here it is 3 ), pick up three beads and put them in the hundreds rod.

- Find the seventh-largest digit ( here it is 2), pick up two beads and put them in the tens rod.
- Find the eighth largest digit ( here it is 1) and put one bead in the ones rod. The greatest number formed is: 9, 76, 54, 321.



- Form the smallest 8-digit number from the given digits by reversing the direction.



# 2



## Roman Numbers



### Learning Objectives

At the end of this lesson, students will be able to:

- Write Roman numbers upto 1000.
- Know the multiplication, addition and subtraction rules, for writing Roman Numbers.



### Warm-Up

Priyank's teacher has given the task of completing the following table. She has filled some missing numbers but couldn't complete the table. Help her to complete the entire table.

Numbers	Roman Numbers
1	I
2	II
3	
4	IV
5	V
6	
7	VII
8	
9	IX
10	X

Numbers	Roman Numbers
11	XI
12	XII
13	
14	XIV
15	XV
16	XVI
	XVII
18	XVIII
19	XIX
20	XX

Numbers	Roman Numbers
	XXX
40	XL
50	
	LX
70	LXX
80	
90	XC
	C



### Teacher's Note:

Assist the students in filling the missing numbers. Further, inform them not to forget that Roman numerals have no zeros.



As we know, there are seven distinct symbols used by Romans to form Roman Numbers.

These are given below:

Roman Symbols	I	V	X	L	C	D	M
Numbers	1	5	10	50	100	500	1000

In the class IV, we have studied about Roman numbers upto 100. Now, in this class, we shall extend our learning.

### Writing Roman Numbers for Hindu-Arabic Numerals

Hindu-Arabic Numerals	Roman Numerals	Hindu-Arabic Numerals	Roman Numerals
1	I	100	C
5	V	101	CI
10	X	105	CV
20	XX	110	CX
30	XXX	150	CL
45	XLV	180	CLXXX
50	L	200	CC
60	LX	248	CCXLVIII
90	XC	400	CD
450	CDL	900	CM
500	D	1009	MIX
559	DLIX	1200	MCC
600	DC	1450	MCDL
740	DCCXL	3000	MMM





### Facts to Know

While the fourth Roman numeral is written as IV, most clocks in the world have it IIII instead of IV. Among the most famous clocks, which depicted four as IIII, is the Clock Tower of the Washington's old post office.



### Rules For Writing Roman Numbers

#### 1. Multiplication Rule:

Repetition of roman numbers means addition.



### Remember

- (i) Only symbols I, X, C and M can be repeated.
- (ii) Symbols V, L and D cannot be repeated.
- (iii) No symbol is repeated more than 3 times.

Examples	:	II	=	$1 \times 2$	=	2
		III	=	$1 \times 3$	=	3
		XX	=	$10 \times 2$	=	20
		XXX	=	$10 \times 3$	=	30
		CC	=	$100 \times 2$	=	200
		CCC	=	$100 \times 3$	=	300
		MM	=	$1000 \times 2$	=	2000
		MMM	=	$1000 \times 3$	=	3000

#### 2. Addition Rule:

When a smaller number is written to the right of a larger number, then the smaller number is added to the larger number.

Examples	:	XII	=	$10 + 1 + 1 = 12$
		XVI	=	$10 + 5 + 1 = 16$
		CVIII	=	$100 + 5 + 1 + 1 + 1 = 108$
		CXX	=	$100 + 10 + 10 = 120$
		DXX	=	$500 + 10 + 10 = 520$



$$DCCLXI = 500 + 100 + 100 + 50 + 10 + 1 = 761$$

$$MDCLXXIII = 1000 + 500 + 100 + 50 + 10 + 10 + 1 + 1 + 1 = 1673$$

$$MDC = 1000 + 500 + 100 = 1600$$

### 3. Subtraction Rule:

When a smaller number is written to the left of a larger number, then the smaller number is subtracted from the larger number.



#### Quick Tip

- (i) Symbols V, L and D are never subtracted.
- (ii) Symbol I can only be subtracted once from V and X
- (iii) Symbol X can only be subtracted once from L and C.
- (iv) Symbol C can only be subtracted once from D and M.

Examples :

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



#### Solved Examples

Example 1 : Multiply the following.

- (i) VI × V    (ii) II × IV    (iii) VIII × X    (iv) XII × V    (v) XX × C

Solution : (i) VI × V

$$\text{Hindu-Arabic Numeral of VI} = 6$$

$$\text{Hindu-Arabic Numeral of V} = 5$$

$$\begin{aligned} \therefore VI \times V &= 6 \times 5 \\ &= 30 \end{aligned}$$

(ii) II × IV

$$\text{Hindu-Arabic Numeral of II} = 2$$

$$\text{Hindu-Arabic Numeral of IV} = 4$$

$$\begin{aligned} \therefore II \times IV &= 2 \times 4 \\ &= 8 \end{aligned}$$



(iii)  $VIII \times X$

Hindu-Arabic Numeral of VIII = 8

Hindu-Arabic Numeral of X = 10

$$\begin{aligned}\therefore VIII \times X &= 8 \times 10 \\ &= 80\end{aligned}$$

(iv)  $XII \times V$

Hindu-Arabic Numeral of XII = 12

Hindu-Arabic Numeral of V = 5

$$\begin{aligned}\therefore XII \times V &= 12 \times 5 \\ &= 60\end{aligned}$$

(v)  $XX \times C$

Hindu-Arabic Numeral of XX = 20

Hindu-Arabic Numeral of C = 100

$$\begin{aligned}\therefore XX \times C &= 20 \times 100 \\ &= 2000\end{aligned}$$



## Exercise 2.1

1. Write the Roman numbers for the following numerals.

(a) 82

(b) 121

(c) 645

(d) 426

(e) 580

(f) 269

(g) 1302

(h) 2076

(i) 1045

(j) 1500

(k) 1872

(l) 2242

(m) 1400

(n) 3000

(o) 488

2. Write the Hindu-Arabic Numbers for the following Roman numerals.

(a) XXXVI

(b) XLVI

(c) XCVIII

(d) DCC

(e) MCXI

(f) DCX

(g) CDXLIX

(h) CCCXX

(i) MMMCC

(j) DLV

(k) LXIX

(l) MMCCC

(m) MCD

(n) CCC

(o) MX



3. Which of the following are meaningless?

- (a) IIC                      (b) CXL                      (c) DVLV  
 (d) CCC                      (e) MMVVII                  (f) MCDIV

4. Compare ( $>$ ,  $<$ ,  $=$ ) the following Roman numbers.

- (a) XCIV  XCVI      (b) CXL  CLX      (c) DC  CD  
 (d) MCC  CML      (e) CCXX  CXX      (f) MC  CD

5. Multiply the following.

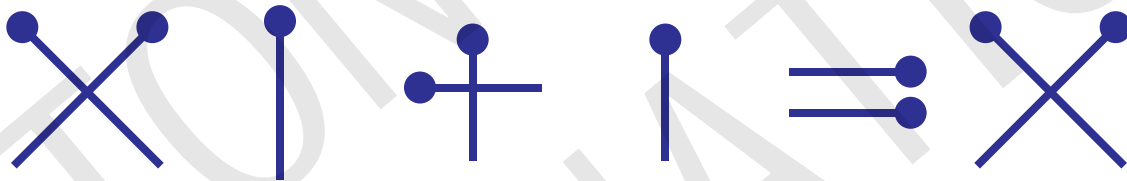
- (a) VII  $\times$  X                      (b) IX  $\times$  II                      (c) XXI  $\times$  III  
 (d) XIX  $\times$  V                      (e) XX  $\times$  II                      (f) XV  $\times$  D  
 (g) XXII  $\times$  IX                      (h) CC  $\times$  XII                      (i) XIX  $\times$  XVII  
 (j) LX  $\times$  XL



*Think Wisely*

Correct this Roman-number sentence in two ways.

- a. By moving one stick  
 b. By removing one stick



*Mental Maths*

Write T for True Statements and F for False Statements.

- (a) No roman symbol is repeated more than three times.                      (   )  
 (b) The symbol V is always subtracted.                      (   )  
 (c) 900 can also be written as CM.                      (   )  
 (d) C can be repeated at most three times.                      (   )  
 (e) The roman symbol for 500 is M.                      (   )





## Maths Lab Activity

**Materials required:** A blank Bingo card and a colour pencil.

### Steps:

1. Each student takes out Bingo card.
2. Teacher asks the students to write any 25 Roman numerals (from 1 to 40) on the card.
3. Students can write Roman numerals of their own choice.

B	I	N	G	O
XXII	XIX	XLIV	XXXIX	IX
XLIII	XII	XXIV	IV	XVIII
XLVII	XXI	X	XXXII	XXVII
XXX	XLII	XXXVII	XXV	XL
XV	XXXIV	XXXVIII	XXXV	XXIX

4. The teacher reads out any 25 numbers in a random order with uniform interval.
5. The students then try to look for the number on their Bingo card. If they find it, they cross off that square.
6. The student with maximum number of crossed squares is the winner.

