Chapter 1

Knowing Our Numbers

Face Value and Place Value

Introduction

We use numbers in our daily life and know many things about numbers.

- They help us to count objects in large numbers and represent them through numerals.
- Numbers help in communication using suitable number names.
- Numbers help us to determine which group of objects is bigger and to arrange them in order.

Face Value and Place Value

Face Value is the actual value of a digit.

For example, the Face value of '5' in 857019 is 5.

The value of a digit based on its position (place) in the given number is the place value of the digit.

Place Value of a digit = Face Value x Position Value

Number	3	6	4	2	9
Face Value	3	6	4	2	9
Position Value	Ten Thousands (10,000)	Thousands (1000)	Hundreds (100)	Tens (10)	Ones (1)
Place value of digit	30000	6000	400	20	9

Expanded form:

The digits of a number expanded into place value form and written in the form of an addition statement.

$36429 = 3 \times 10000 + 6 \times 1000 + 4 \times 100 + 2 \times 10 + 9 \times 1$

Example: What is the digit at the hundreds place of 62,834?

$62834 = 6 \times 10000 + 2 \times 1000 + 8 \times 100 + 3 \times 10 + 4 \times 1$
Therefore, the digit at hundreds place is 8.

Example: Which digit of the number 42,675 has the same face and place value?

Number	4	2	6	7	5
Face Value	4	2	6	7	5
Position Value	Ten Thousands (10,000)	Thousands (1000)	Hundreds (100)	Tens (10)	Ones (1)
Place value of digit	40000	2000	600	70	5

We see that one's place digit that is 5 has the same face and place value.

NUMERATION SYSTEM

Indian System of Numeration

In Indian number system, ten symbols 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9 are used to write a number.

Each of these ten symbols is called a digit. Out of these digits:
i) 0, 2, 4, 6 and 8 are even numbers
ii) 1, 3, 5, 7 and 9 are odd numbers

According to Indian Numeration System, first comma comes after three digits from the right and the next comma comes after every two digit.

For a given number, we start from the extreme right as Ones, Tens, Hundreds, Thousands, Ten Thousands, Lakhs, Ten Lakhs, etc.

In Indian system to read and write a large number with ease, number is split up into groups or periods.

PERIOD	Place Value	Number	Zeroes
Ones	Ones	1	0
Tens	Tens	10	1

Hundreds	Hundreds	100	2
Thousands	Thousands	1,000	3
	Ten- Thousands	10,000	4
Lakhs	Lakhs	1,00,000	5
	Ten-Lakhs	10,00,000	6
Crores	Crores	1,00,00,000	7
	Ten-Crores	10,00,00,000	8

1. Periods are not written in plural
2. The word 'and' is not used before tens and ones
3. Do not put commas while writing the numeral.
4. While reading a number, all digits in the same period are read together and the name of the period (except the ones) is read along with it.

Example: Write the following in words according to Indian Numeration system

i) 3673458

ii) 945329

PERIOD	**Lakhs**		**Thousands**		**Ones**		
	Ten Lakhs	Lakhs	Ten Thousands	Thousands	Hundreds	Tens	Ones
i)	3	6	7	3	4	5	8
ii)		9	4	5	3	2	9

i) Thirty six lakh seventy three thousand four hundred fifty eight

ii) Nine lakh forty five thousand three hundred twenty nine

Example: Write the numerals and place the commas.
i) Six crores two lakh twenty one thousand two hundred sixty three.
ii) Seven lakh nine thousand nine hundred nineteen

PERIOD	Crores		Lakhs		Thousands		Ones		
	Ten Crores	Crores	Ten Lakhs	Lakhs	Ten Thousands	Thousands	Hundreds	Tens	Ones
i)		6	0	2	2	1	2	6	3
ii)				7	0	9	9	1	9

i) 6,02,21,263

ii) 7,09,919

International System of Numeration

According to International System of Numeration, the first comma is placed after the hundreds place and the next commas are placed after every three digits and this grouping of number is called period.

In International System of Numeration we use ones, tens, hundreds, thousands, millions and billions.

PERIOD	Place Value	Number	Zeroes
Ones	Ones	1	0
Tens	Tens	10	1
Hundreds	Hundreds	100	2
Thousands	Thousands	1,000	3
	Ten- Thousands	10,000	4
	Hundred-Thousands	100,000	5
Millions	Million	1,000,000	6
	Ten Million	10,000,000	7
	Hundred Million	100,000,000	8
Billions	Billion	1,000,000,000	9
	Ten Billion	10,000,000,000	10
	Hundred Billion	100,000,000,000	11

While reading a number in this system, all digits in the same period are read together and the name of the period (except the ones) is read along with it.

Example: Write the following in words according to International Numeration system

i) 45145879632

ii) 61346987

PERIOD	Billions		Millions			Thousands			Ones		
	Ten Billions	Billions	Hundred	Ten Millions	Millions	Hundred	Ten Thousands	Thousands	Hundreds	Tens	Ones

			Millions			Thousands					
i)	4	5	1	4	5	8	7	9	6	3	2
ii)				6	1	3	4	6	9	8	7

i) Forty five billion one hundred forty five million eight hundred seventy nine thousand six hundred thirty two
ii) Sixty one million three hundred forty six thousand nine hundred eighty seven.

Example: Write the numerals and place the commas.
i) Forty two million two hundred eighty seven thousand four hundred fifty seven
ii) Five million thirty six thousand nine

PERIOD	**Millions**			**Thousands**			**Ones**		
	Hundred Millions	Ten Millions	Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
i)		4	2	2	8	7	4	5	7
ii)			5	0	3	6	0	0	9

i) 42,287,457

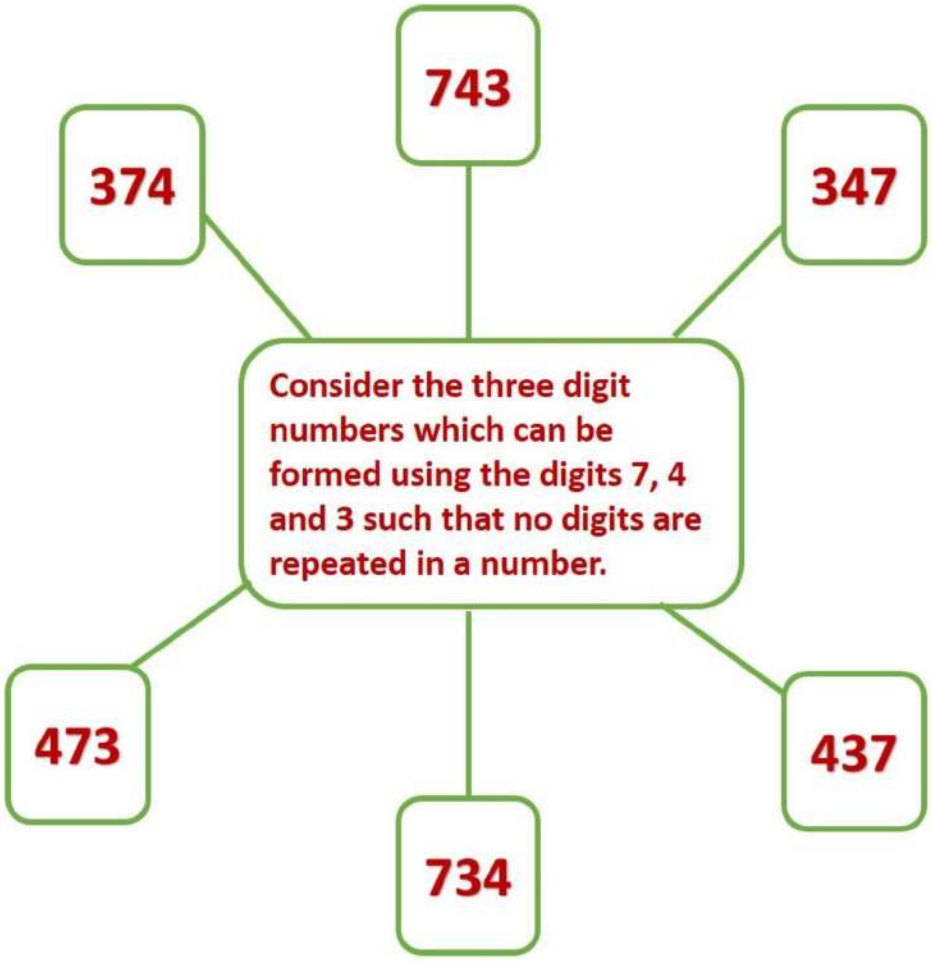
ii) 5,036,009

Making Numbers

Using a few single digits, a variety of numbers can be formed by arranging the digits in different orders. To make a new number from existing, we shift places of digits.

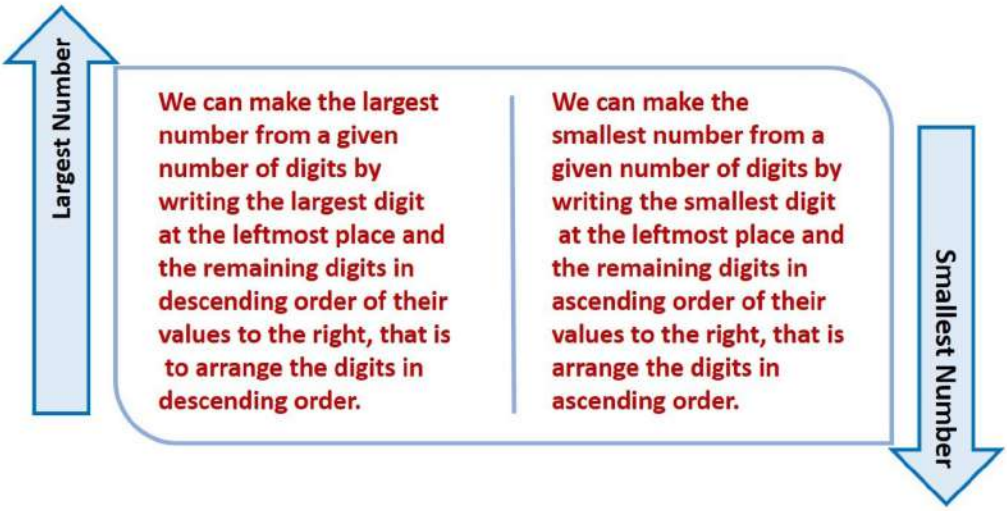
Suppose, we have two digits 2 and 5. How many numbers can be formed using the digits 2 and 5?

- **If digits are not repeated, the numbers formed are: 25 and 52**
- **If we repeat the digits then numbers formed are: 25, 52, 22 and 55**



Now, which number is the smallest and which is the largest?

The smallest number is 346 and the largest number is 643.



Example: Use the given digits without repetition and make the largest and the smallest number

i) 5, 4, 3, 7

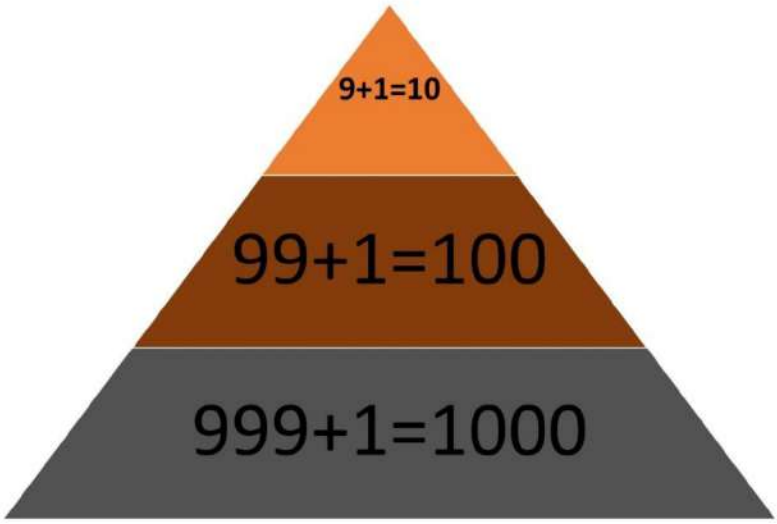
- To get the largest number we will arrange the digits in descending order. i.e. 7, 5, 4, 3. Therefore, the largest number is 7543.
- Now, to get the smallest number, we will arrange the given digits in ascending order .i.e. 3, 4, 5, 7. Therefore, the smallest number is 3457.

ii) 1, 4, 9, 2

- To get the largest number we will arrange the digits in descending order. i.e. 9, 4, 2, 1. Therefore, the largest number is 9421.
- Now, to get the smallest number, we will arrange the given digits in ascending order .i.e. 1, 2, 4, 9. Therefore, the smallest number is 1249

Knowing more about Numbers

Look at the pattern:



Greatest single digit number + 1 = smallest 2 digit number
Greatest 2 digit number + 1 = smallest 3 digit number
Greatest 3 digit number + 1 = smallest 4 digit number
Greatest 4 digit number + 1 = smallest 5 digit number

Comparing Numbers

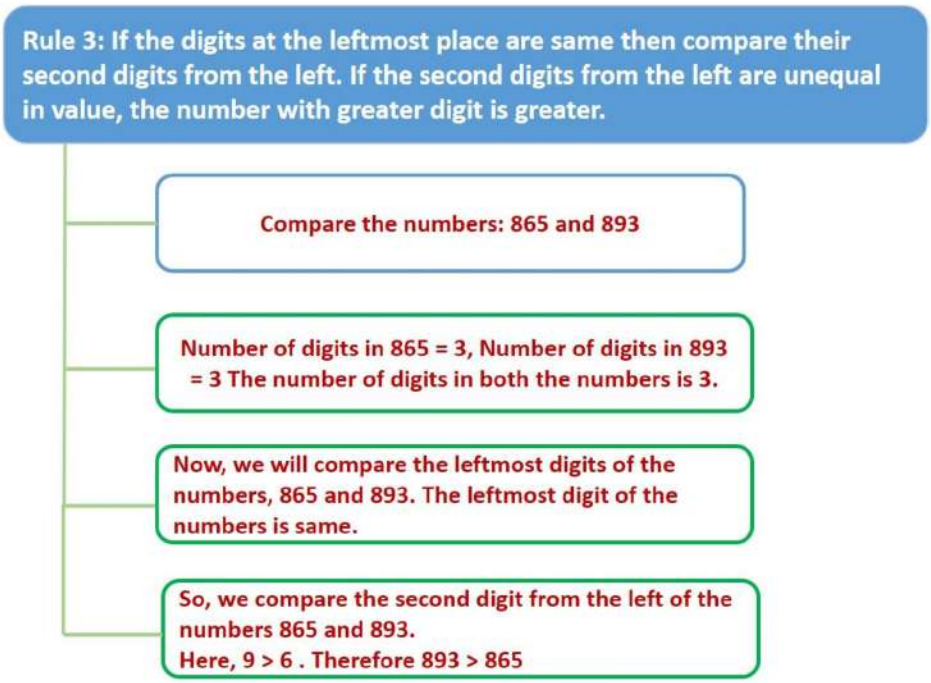
When we are comparing two numbers we have to remember the following rules:

Rule 1: If the number of digits in the given numbers is not same then the number with greater number of digits is greater.

- Compare the numbers: 6535 and 250
- Number of digits in 6535 = 4
  Number of digits in 250 = 3
- So, 6535 > 250
  as the number with more digits is greater.

Rule 2: If the number of digits in the given numbers are same then, compare the digits at the leftmost place of both the numbers. The number with larger digit will be greater than the number with smaller digit

- Compare the numbers: 23 and 32
- Number of digits in 23 = 2, Number of digits in 32 = 2
  The number of digits in both the numbers is 2.
- So, we will compare the leftmost digit of the two numbers, 23 and 32 .
  Now, 3 > 2. Therefore, 32 > 23 .



If the first digits, as well as the second digits from the left of the given numbers, are same, then we compare their third digits and continue until we come across unequal digits at corresponding places.

Example: Compare the following numbers

i) 300456 and 1253

Number of digits in $300456 = 6$

Number of digits in $1253 = 4$

So, $300456 > 1253$ as the number with more digits is greater.

ii) 5648 and 3977

Number of digits in $5648 = 4$

Number of digits in $3977 = 4$

The number of digits in both numbers is 4. So, we will compare the leftmost digit of the two numbers, 5648 and 3977

Now, $5 > 3$

Therefore, $5648 > 3977$

iii) 9,85,210 and 9,62,107

Number of digits in $9,85,210 = 6$

Number of digits in $9,62,107 = 6$

- The number of digits in both numbers is 6. Now, we will compare the leftmost digit of the numbers, 9,85,210 and 9,62,107. Clearly, the leftmost digit of the numbers is the same.
- We have to compare the second digit from the left of the numbers, 9,85,210 and 9,62,107
- Now, $8 > 6$. Therefore $9,85,210 > 9,62,107$

iv) 34,213 and 34,267

Number of digits in $34,213 = 5$

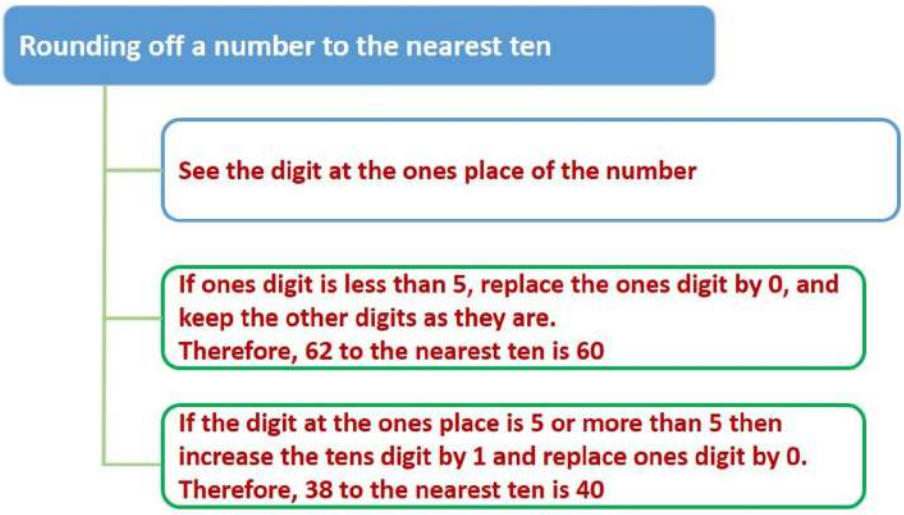
Number of digits in $34,267 = 5$

- The number of digits in both numbers is 5. Now, we will compare the leftmost digit of the numbers, 34,213 and 34,267. Clearly, the leftmost digit that is 3, of the numbers is the same.
- We have to compare the second digit from the left of the numbers 34,213 and 34,267. The second digit .i.e.4 from the left of the numbers is also the same.
- Now comparing the third digit from the left of the numbers 34,213 and 34,267. The third digit. i.e., 2 from the left of the numbers is also the same.
- Comparing the fourth digit from the left of the numbers 34,213 and 34,267. Now, 6

Estimation

Estimation gives an idea of the quantity. Estimation means judging approximate size, cost, population, etc. Estimation is done when the accurate measure of large quantities is difficult or impossible to measure.

Estimation also means rounding off numbers to the nearest ten, hundred or thousand, etc.



Example: Round off each of the following to the nearest ten

i) 57

The digit at ones place = 7

Now, 7> 5. So we will increase the tens digit by 1

The digit at tens place will become (5 + 1 = 6) and the digit at ones place is replaced by 0.

The required rounded number = 60

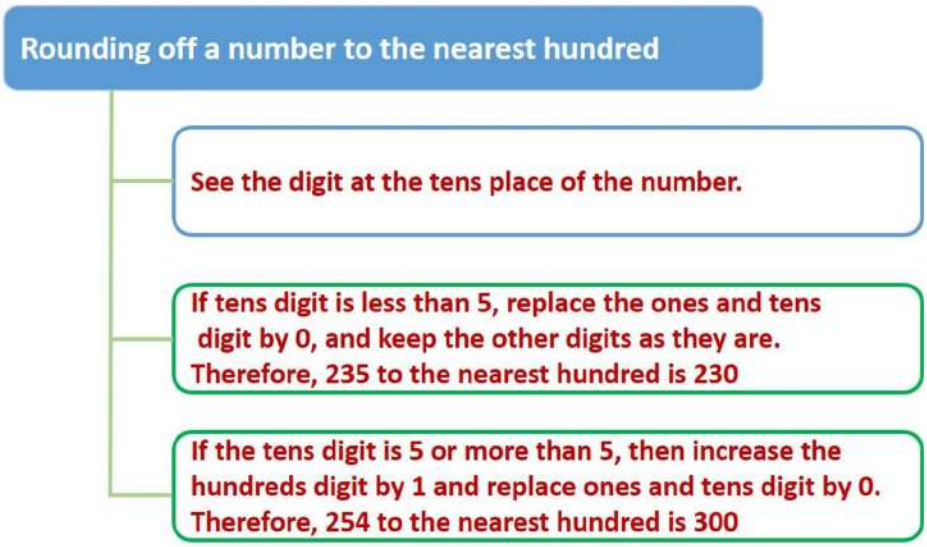
ii) 354

Digit at ones place = 4

Now, 4 < 5.

So, we will replace the ones digit by 0 and keep the other digits same.

The required rounded number = 350



Example: Round off each of the following to the nearest hundred

i) 1564

The digit at tens place= 6

Now, $6 > 5$.So, we will increase the hundreds digit by 1

The digit at hundreds place will become $(5 + 1 = 6)$

Replace the ones and tens digit by 0

The required rounded number = 1600

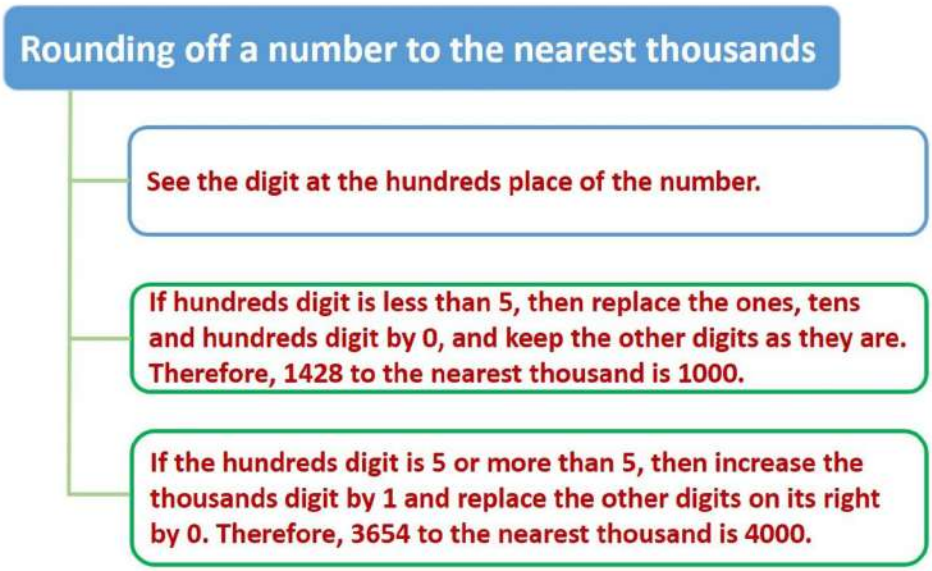
ii) 65438

The digit at tens place = 3

Now, $3 < 5$.

So, we will replace the ones and tens digit by 0 and keep the other digits same.

The required rounded number = 65400



Example: Round off each of the following to the nearest thousand.

i) 83245

Digit at hundreds place = 2

Now, $2 < 5$.So we will replace the ones, tens and hundreds digit by 0 and keep the other digits same.

The required rounded number = 83000

ii) 1754

Digit at hundreds place = 7

Now, $7 > 5$.So, we will increase the thousands digit by 1. The digit at thousands place will become $(1 + 1 = 2)$

Replace the ones, tens and hundreds digit by 0

The required rounded number = 2000

Example: Give a rough estimate (by rounding off to nearest hundreds).

i) 630 + 898 + 4,317

630 rounds off to 600

898 rounds off to 900

4,317 rounds off to 4,300

Estimated Sum = 600 + 900 + 4,300 = 5,800

Example: Estimate the following product (by rounding off to nearest tens).

a) 578 × 161

578 rounds off to 580

161 rounds off to 160

Estimated Product = 580 × 160 = 92800

Using Brackets

Use of brackets allows us to avoid confusion in the problem, where there is more than one number operation.

While using brackets first, turn everything inside the brackets into a single number and then do the operation outside.

Example: Simplify

i) 1356 – (200 + 621)

= 1356 – 821

= 535

ii) 120 + (15 × 13)

= 120 + 195

= 315

Roman Numerals

System of Roman Numerals is one of the earliest systems of writing numerals.

There are seven basic symbols to write any numeral.

Roman Numeral	I	V	X	L	C	D	M
Hindu Arabic Numeral	1	5	10	50	100	500	1000

Rules for Roman Numerals

Rule 1: If a symbol is repeated, its value is added as many times it occurs.

a) A symbol cannot be repeated more than three times.

b) Only I, X, C, and M can be repeated.

c) V, L and D are never repeated.

Example: Write the following in Hindu Arabic numeral

i) $II = 1 + 1 = 2$

ii) $XXX = 10 + 10 + 10 = 30$

iii) $CC = 100 + 100 = 200$

iv) $MM = 1000 + 1000 = 2000$

Rule 2:

If a symbol of smaller value is written to the right of the symbol of greater value, its value gets added to the value of the greater symbol.

Example: Write the following in Hindu Arabic numeral

i) $VI = 5 + 1 = 6$ i

ii) $LXII = 50 + 10 + 1 + 1 = 62$

iii) $MCV = 1000 + 100 + 5 = 1105$

iv) $XXXV = 10 + 10 + 10 + 5 = 35$

v) LXXI = 50 + 10 + 10 + 1 = 71

Rule 3:

If a symbol of smaller value is written to the left of the symbol of greater value, its value gets subtracted from the value of the greater symbol.

a) V, L and D are never subtracted.

b) I can be subtracted from V and X only.

c) X can be subtracted from L and C only.

d) C can be subtracted from D and M only.

Example: Write the following in Hindu Arabic numeral

i) IV = 5 – 1 = 4

ii) XL = 50 – 10 = 40

iii) CD = 500 – 100 = 400

Rule 4:

If a symbol of smaller value is placed between two symbols of larger value, then its value is always subtracted from the value of the symbol immediately following it.

Example: Write the following in Hindu Arabic numeral

i) XIX = 10 + (10 – 1) = 10 + 9 = 19

ii) CXL = 100 + (50 – 10) = 100 + 40 = 140

iii) MCD = 1000 + (500 – 100) = 1000 + 400 = 1400

iv) CCCXIV = 100 + 100 + 100 + 10 + 4 = 314

v) CDXV = 500 – 100 + 10 + 5 = 400 + 10 + 5 = 415

Example: Write the following in Roman numeral

i) 411 = 400 + 10 + 1 = (500-100) + 10 + 1 = CDXI

ii) $265 = 200 + 60 + 5 = (100 + 100) + (50+10) + 5 = \text{CCLXV}$

iii) $501 = 500 + 1 = \text{DI}$

iv) $421 = 400 + 20 + 1 = (500 - 100) + (10 + 10) + 1 = \text{CDXXI}$

v) $753 = 700 + 50 + 3 = (500 + 100 + 100) + 50 + 3 = \text{DCCLIII}$