KNOWING OUR NUMBERS

PREDECESSOR-SUCCESSOR OF A NUMBER

Predecessor is 1 less than the given number.

For Ex. : Predecessor of 59028 is 59027.

Successor is 1 more than the given number.

Successor of 9999 is 10000.

COMPARISON OF NUMBERS

(a) Greater number has more number of digits.

(b) To compare two numbers having same number of digits, start comparing from the leftmost position. If the leftmost digits are equal, move to the next digits.

Ex. Which is greater of 270346 and 48356?

Sol. 270346 has 6 digits

48356 has 5 digits

6 digits are more than 5 digits

∴ 270346 is greater than 48356

Greater number has more number of digits.

Ex. Find the greatest and the smallest numbers from the following group of numbers :

23787, 6895, 24569, 24659

Sol. Greatest number : 24659

Smallest number : 6895

ASCENDING AND DESCENDING ORDER

Ascending order - arrangement of numbers from smallest to largest

Descending order - arrangement of numbers from largest to smallest

Ex. Arrange the following number in ascending order :

257536, 38952, 385081, 365062

Sol. The smallest number is 38952. Other numbers greater than 38952, in order are 257536, 365062 and 385081.

∴ The numbers in ascending order are :

38952, 257536, 365062, 385081

Ex. Arrange the following numbers in descending order :

19710, 887151, 453212, 925473

Sol. The greatest number is 925473. Other numbers smaller than 925473 in order are 887151, 453212 and 19710.

∴ The numbers in descending order are :

925473, 887151, 453212, 19710

USE OF COMMAS

While reading and writing large numbers, it creates confusion as there are many digits in a number. To avoid making mistakes, we use commas to divide the number into different periods. We can divide a number into different periods by using either the Indian system of numeration or the International system of numeration. But first let us learn about place value.

PLACE VALUE

The basis of the number system is place value. It is this place value which gives value to the number.

- **Definition :**

Face value of a digit in a numeral is the value of the digit itself at whatever place it may be.

Place value of a digit in a given number is the value of the digit because of the place or the position of the digit in the number.

Place-value of a digit = Face-value of the digit × value of the place

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 its place value changes according to its position and number.

Number	Digit	Face Value	Place Value
53,694	5	5	50,000
	3	3	3,000
	6	6	600
	9	9	90
	4	4	4

Expanded form of a Number :

If we express a given number as the sum of its place value, it is called its expanded form.

Ex. Express

(i) 3,64,029

(ii) 2,75,00,386 in expanded form.

Sol. Place value of 3 = 3 × 100000

Place value of 6 = 6 × 10000

Place value of 4 = 4 × 1000

Place value of 0 = 0 × 100

Place value of 2 = 2 × 10

Place value of 9 = 9 × 1

∴ The expanded from of 3,64,029 is

3 × 100000 + 6 × 10000 + 4 × 1000 + 0 × 100 + 2 × 100 + 9 × 1

INTERNATIONAL SYSTEM OF NUMBERS

Billions			Milllions			Thousands			Ones		
Hundred Billion	Ten Billion	One Billion	Hundred Million	Ten Million	One Million	Hundred Thousand	Ten Thousand	One Thousand	One Hundred	Ten	One
100,000,000,000 12 Digits	10,000,000,000 11 Digits	1,000,000,000 10 Digits	100,000,000 9 Digits	10,000,000 8 Digits	1,000,000 7 Digit	100,000 6 Digits	10,000 5 Digits	1,000 4 Digits	100 3 Digit	10 2 Digit	1 1 Digit

Reading and Writing of Numbers :

In Indian System of numbers, we divide the given number into periods starting from the right. The first period called units period consists of 3 digits while each of the next periods called thousands period, lakhs period, crores period respectively consists of 2 digits.

Each period is separated by a comma (,).

In International System of Numbers we make groups of 3 digits starting from right and separate each group by using a comma (,).

Now consider the six digit number 764325. In the Indian system, the number 7 is in the place of lakh and therefore the number is named as seven lakh sixty-four thousand three hundred twenty-five. It is written as 7,64,325. In the International system, this numebr is named as seven hundred sixty-four thousand three hundred twenty-five and is written as 764,325. The first three digits form the right-hand side are considered as ones, i.e., 325 ones and the next three digits to the left of the digit 3 are considered as thousands, i.e. 764 thousands.

Ex. Write the name of the numbers according to Indian system of numeration.
(a) 1275834 (b) 30870209

Sol. (a) 12,75,834 = Twelve lakh seventy five thousand eight hundred thirty four
(b) 3,08,70,209 = Three crore eight lakh seventy thousand two hundred nine

Ex. Write the name of the number according to International system of numeration.
(a) 7452283 (b) 48049831 (c) 699985102

Sol. (a) 7452283 = 7,452,283 = Seven million four hundred fifty two thousand two hundred thirty three.
(b) 48049831 = 48,049,831 = Forty eight million forty nine thousand eight hundred thirty one.
(c) 699985102 = 699,985,102 = Six hundred ninety nine million nine hundred eighty five thousand one hundred two.

MAKING NUMBERS

(a) Making number without repetition of digits : In case of non-repetition of digits, it is better if we start making the number from left.

Ex. Write the greatest and the smallest 5-digit numbers by using each of digits 8, 4, 7, 0, 2 only one.

Sol. For the greatest number, we write the greatest digit 8 in the T-thousands column. Next smaller digit in the thousands column and so on.
∴ The greatest number = 87420.

T - T h	T h	H	T	O
8	7	4	2	0

For the smallest number, we write the smallest digit in the T-thousands column. But here 0 is the smallest digit. 0 is not written on the extreme left of a number. So, we write 2 in the T-thousands column and 0 in the thousands column, Next digit greater than 2 is written in the hundreds column and so on.
∴ The smallest number = 20478

T-Th	Th	H	T	O
2	0	4	7	8

Ex. Make the greatest and the smallest 5-digit numbers using any five different digit with 4 in the tens place.

Sol. First of all write 4 in the tens column. For the greatest number, we write the greatest digit 9 in the T-thousands column, next smaller digit in the thousands column so on.

T-Th	**Th**	**H**	T	**O**
9	8	7	4	6

∴ The greatest number = 98746
For the smallest number also, write 4 in the tens column first of all. Then write 0 in the thousands column. Write 1 in the T-thousands column. Next greater digit in the hundreds column and so on.
∴ The smallest number = 10243

T-Th	**Th**	**H**	T	**O**
1	0	2	4	3

(b) Making number with repetition of digits : In case of repetition of digit, it is better if we start making number from right.

Ex. Write the greatest and smallest numbers of 4 digits using all the digits 8,0,5.

Sol. For greatest number, select the smallest digit 0 and write in the ones column, Next greater digit is written in the tens column. Next greater digits 8 is written in the hundreds column. Since no digit greater than 8 given, so we repeat 8 in the thousands column.

Th	H	T	O
8	8	5	0

Greatest Number

∴ The greatest number = 8850

For smallest number, select the greatest digit 8 and write in the ones column. Next smaller digit in tens column and so on. Repeat the smallest digit in the end. But here 5 is smaller than 8 and then comes 0 which cannot be repeated in the end.

So, we write 5 in the end and repeat 0 in the tens place.

Th	H	T	O
5	0	0	8

Smallest Number

∴ The smallest number = 5008

NOTE :

i. For greatest number, greatest digit is repeated.

ii. For smallest number, smallest digit is repeated.

ESTIMATION IN NUMBER OPERATIONS

You must have come across news headlines involving large numbers. For example, '50,000 people participated in the marathon.' '5 lakh people gathered for a dip in the Ganges.'

We also see and read news about disasters, strikes, bandhas, etc. For example,

'80 crore rupees lost due to the fire.'

'9 lakh people evacuated.'

'The loss due to bandh is 1 crore.'

The numbers mentioned above do not represent the exact number of people or rupees. They are only speaking of a nearest value.

Rounding up off numbers is an approximation. This means that when we speak of 50,000 people, what we really mean is the crowd was between 45,000 and 55,000.

This rounding up helps us to get aproximate answers in addition, subtraction, multiplication and division.

Suppose Rs.3847 and Rs.8348 are the costs of a DVD player and a T.V., respectively. If a friend asked you how much you paid for these two items, you need not to add the correct value of each. You can say that it costs you around Rs.12,000. When we are cooking for a party, the approximate number of people expected for the party, and the approximate quantity of each item required per person are considered. Similarly, the quantity of things to be purchased for a party, the amount of cement to be purchased to construct a wall, the amount of paint to be bought to paint a house are all approximations.

Estimating (Rounding) to the Nearest Ten : To round off a number to the nearest ten consider the ones digit. If the ones digit is 5 or greater than 5, then change the ten's digit to the next higher digit and ones digit to zero. If the ones digit is less than 5, then leave the tens digit unchanged but change the ones digit to zero.

Estimating (Rounding) to the Nearest Hundred : To round off a number to the nearest to the nearest hundred, consider the tens digit. If the ten's digit is 5 or greater than 5, then change the hundreds digit to the next higher digit and tens, ones digits to zeros. If the tens digit is less than 5, then leave the hundreds digit unchanged but change the tens and ones digits to zeros.

Estimating (Rounding) to the nearest Thousand : To round off a number to the nearest thousand, consider the hundreds digit. If this digit is 5 or greater than 5, then change the thousands digit to the next higher digit are change all the other digits before that to zeros. If the hundreds digit is less than 5, then leave the thousands digit unchanged but change all the other digits before that to zero.

Estimation in Sums or Differencess :

Ex. Estimate and compare with the actual sum
(a) 730 + 998 (b) 12904 + 2888

Sol. (a) We round off to the nearest hundred

730 is rounded off to 700

998 is rounded off to 1000

Estimated sum = 1700

$$\begin{array}{r} 700 \\ +1000 \\ \hline 1700 \end{array}$$

Actual sum = 730 + 998 = 1728

$$\begin{array}{r} 730 \\ +998 \\ \hline 1728 \end{array}$$

Estimation is quite reasonable,

(b) We round off to the nearest tousand
12904 is rounded off to 13000
2888 is rounded off to 3000
Estimation is quite reasonble

$$\begin{array}{r} 13000 \\ +3000 \\ \hline 16000 \end{array}$$

Actual sum = 12904 + 2888 = 15792

Estimation is quite reasonable

$$\begin{array}{r} 12904 \\ +2888 \\ \hline 15792 \end{array}$$

Ex. Give a rough estimate and also a close estimate of 439 + 334 + 4317

Sol. Rough estimate : 400 + 300 + 4000 = 4700
For closer estimate, we round off to the nearest hundred
439 is rounded off to 400
334 is rounded off to 300
4317 is rounded off to 4300
Closer estimated sum = 5000

$$\begin{array}{r} 400 \\ 300 \\ +4300 \\ \hline 5000 \end{array}$$

Ex. Estimate 8325 – 491

Sol. If we round off to thousand, we get
8325 rounds off to 8000
491 rounded off to 0
Estimated difference = 8000 – 0 = 8000
This does not give a reasonable difference, so we round off to the nearest hundred.
8325 rounds to 8300
491 round to 500
Estimated difference = 7800
This is reasonable estimation.

$$\begin{array}{r} 8300 \\ -500 \\ \hline 7800 \end{array}$$

Estimation in Products : While estimating in products, we adopt the following rules :

(i) Round each factor to its greatest place, in other words, if a factor contains 2 digits, round it off to the nearest ten and if it contains 3 digits, then round it off to the nearest hundred and so on.

(ii) Do not round off any 1-digit factor.

Ex. Estimate the following products :

(a) 87 × 313 (b) 9 × 795 (c) 898 × 785

Sol. (a) 87 is rounded off to 90

313 is rounded off to 300

∴ Estimated product = 90 × 300 = 27000

(b) 9 is not rounded off [∴ it is a one-digit no.]

795 is rounded off to 800

∴ Estimated product = 9 × 800 = 7200

(c) 898 is rounded off to 900

785 is rounded off to 800

∴ Estimated product = 900 × 800 = 720000

Estimation in Quotients : In the process of estimation in quotients, we round off the divided and the divisor before the process of division.

Ex. Estimate the following quotients :

(a) 81 ÷ 17 (b) 7525 ÷ 365

Sol. (a) 81 is rounded to 80

17 is rounded to 20

To get the estimated quotient think of dividing 80 by 20 or 8 by 2.

∴ Estimated quotient = $\frac{8}{2}$ = 4

(b) 7525 is rounded to 8000

365 is rounded to 400

To get the estimated quotient think of dividing 80 by 4.

∴ Estimated quotient = 20

Use of number in everyday life

Numbers are used immensly in our everyday life, such as measuring the length of a small object as pencil, the distance between two given places ; the weight of an orange, the weight of a ship, the amount of juice in a glass and the amount of water in a like.

Small lengths are measured in millimeter (mm) and centimetre (cm) while bigger lengths are measured in metre (m) and kilometre (km).

Metre (m) is the standard unit of length and we define it as

1 m = 100 cm = 1000 mm

∴ 1 cm = 10mm

∴ 100 cm = 100 × 10 = 1000 mm

1 km = 1000 m

Also, 1 km = (1000m × 1000 mm) = 1000000 mm

Similarly, the units of weight are as under

1 gm = 1000 mg

1 kg = 1000gm

∴ 1 kg = (1000 gms × 1000) mg = 1000000 mg

For capacity or volume,

1 L = 1000 mL and 1 kL = 1000 L

1 kL = 1000 L × 1000 mL = 100000 mL

Ex. A tin of biscuits has 14 kg of biscuits. Express the weight in milligrams.

Sol. Since 1 kg = 1000 gm and 1 gm = 1000 mg

$\therefore$ 1 kg = (1000 × 1000) mg = 1000000 mg

$\Rightarrow$ 14 kg = 14 × 1000000 mg = 14000000 mg

Ex. The population of Rajasthan is 5,64,73,122, of Goa is 13,43,998 and of Karnataka is 5,27,33,958. What is the combined population of the three states.

Sol. Population of Rajasthan = 5,64,73,122

Population of Karnataka = 5,27,33,958.

Pupulation Goa = 13,43,998

$\therefore$ Total population of three states

= 5,64,73,122 + 13,43,998 + 5,27,33,958 = 11,05,51,078

i.e. Eleven crore five lakh fifty one thousand seventy eight.

Ex. What must be added to 34,52,629 to make it equal to 6 corore.

Sol. 6 crore = 6,00,00,000

$\therefore$ required number = 6,00,00,000 – 34,52,629 = 5,65,47,371

Ex. There are 785 students on roll in a residential public school. If the annual fee per student is Rs.62,606. What is the total fee collected annually by the school.

Sol. Annual fee of one student = Rs.62,606

Number of student = 785

$\therefore$ Total annual collection of fee

= Rs. 62,606 × 785

= Rs. 4,91,45,710

Ex. Find the number of pages in a book which has on an average 207 words on a page, and contains 201411 words altogether.

Sol. Number of pages = 201411 ÷ 207 = 973

Thus, the number of pages in the book = 973

USE OF BRACKETS

Raju bought 6 pencils from the market each of Rs. 2.

His brother Ramu also bought 8 pencils of the same type. Raju and Ramu both calculated the total cost but in their own ways. Raju found that they both spent Rs.28 and he used the following method :

Rs. 6 × 2 + Rs. 8 × 2

= Rs. 12 + Rs. 16

= Rs. 28

But Ramu found an easier way. He did 6 + 8 = 14 and then Rs. 2 × 14 = Rs.28. The use of brackets makes this sum easy. It can be done as follows :

Rs. 2 × (6 + 8)

= Rs. 2 × 14

= Rs. 28

Clearly we first solve the operation inside the bracket and then multiply it by the number outside.

ROMAN NUMERALS

One of the earlist systems of writing numerals is the Roman Numeral system. This system is still in use in many places. For example, some faces of clocks show hours in Roman numerals; we use Roman numerals to write numered list; etc.

Unlike the Hindu-Arabic numeral system, Roman numeral system uses seven basic symbols to represent different numbers. The symbols are as follows :

I = 1, V = 5, X = 10, L = 50, C = 100

D = 500, M = 1000

RULES TO FORM ROMAN NUMERALS

We can form different Roman numerals using the symbols and the following rules.

Rule-1 If a symbol is repeated one after the other, its value is added as many times as it occurs. For example

III = 1 + 1 + 1 = 3

XX = 10 + 10 = 20

Rule-2 The symbols I, X, C and M can be repeated up to a maximum of three times. For example

I = 1,

II = 2,

III = 3

X = 10,

XX = 20,

XXX = 30,

C = 100

CC = 200,

CCC = 300,

M = 1000,

MM = 2000,

MMM = 3000

Rule-3 The symbols V, L and D (i.e., 5, 50 and 500 respectively) can never be repeated in a Roman numeral,

Rule-4 If a symbol with a smaller value is written on the right of a symbol with a greater value, then its value is added to the value of the greater symbol. For example

XII = 10 + 2 = 12,

LX = 50 + 10 = 60

DCCCX = 500 + 300 + 10 = 810

Rule-5 If a symbol with a smaller value is written on the left of a symbol with a larger value, then its value is subtracted from the value of the greater symbol.

For example,

IV = 5 – 1 = 4, IX = 10 – 1 = 9, CD = 500 – 100 = 400, VI = 5 + 1 = 6, XI = 10 + 1 = 11, DC = 500 + 100 = 600

Ex. Write the Roman Numerals

(a) 105 (b) 213

Sol. (a) 105 = 100 + 5 = CV

(b) 213 = 200 + 10 + 3 = CCXIII

Ex. Write in Hindu Arabic numerals :

(a) CXXXV (b) CXLI

Sol. (a) CXXXV = C + XXX + V = 100 + 30 + 5 = 135

(b) CXLI = C + XL + I = 100 + 40 + 1 = 141