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Volume - 4

Mathematics

SIERRA INNOVATIONS

INDEX

1 CHAPTER General introduction to Numbers

Whole Numbers up to One Crore (10 million):

- We know that **10 digits** are used in mathematics to write any number, and these 10 digits are as follows - 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 ।

- **Number -** A number is written **from right to left** when placing digits according to their place values. –

For Example - 12406892

In words – One crore twenty-four lakh six thousand eight hundred ninety-two

Ten Crore	Crore	Ten Lakh	Lakh	Thousand	Hundred	Tens	Units
1	2	4	0	6	8	9	2

Example :

Representation of 28800:

- In Digits - 28800
- In Words - Twenty-eight thousand eight hundred
- Expanded Form – 20000+8000+800+0+0

Ten Thousand	**Thousand**	**Hundred**	**Tens**	**Units**
2	**8**	**8**	**0**	**0**
2 x 10000	8 x 1000	8 x 100	0 x 10	0 x 1
20000	8000	800	0	0

Greatest Numbers

Greatest Number	**Number obtained by adding 1**
One-digit number = 9	9 + 1 = 10 (Ten)
Two-digit number = 99	99 + 1 = 100 (One hundred)
Three-digit number = 999	999 + 1 = 1000 (One thousand)
Four-digit number = 9999	9999 + 1 = 10,000 (Ten thousand)
Five-digit number = 99999	99999 + 1 = 1,00,000 (One lakh)
Six-digit number = 999999	999999 + 1 = 10,00,000 (Ten lakh)
Seven-digit number = 9999999	9999999 + 1 = 1,00,00,000 (One crore)

The order of numbers from one-to-one crore is as per the following table.

Crore	Lakh		Thousand		Units		
One Crore	Ten Lakh	Lakh	Ten Thousand	Thousand	Hundred	Tens	Units
1,00,00,000	10,00,000	1,00,000	10,000	1,000	100	10	1

Types of Number Systems :

- **Devanagari Number System:** This number system has been in use in our country since ancient times. It has ten digits: ०, १, २, ३, ४, ५, ६, ७, ८, ९. Because of the concept of **zero** and **place value**, any number can be written easily using these ten digits.
- **Roman Number System:** The Roman number system has also been in use since ancient times for writing numbers. Roman symbols can still be seen on the dials of many clocks. There are **seven basic symbols** in the Roman numeral system:

I (one), **V** (Five), **X** (Ten), **L** (Fifty), **C** (one hundred), **D** (Five Hundred),
M (One thousand)

Numbers are written using only these symbols. The symbols **I, X, C, and M** can be repeated, but **no symbol is repeated more than three times consecutively**.

Example 1: IX = 10 − 1 = 9

The symbol **I (one)** written to the **left** of **X (ten)** means one less than ten; hence **IX** = **nine**.

Example 2: XI = 10 + 1 = 11

The symbol **I (one)** written to the **right** of **X (ten)** means one more than ten; therefore **XI** = **eleven**.

- **Hindu–Arabic Number System:** This system uses ten digits: **0, 1, 2, 3, 4, 5, 6, 7, 8, 9**. These digits originated in India. From India, they reached the Arab world, and from there they gradually spread to Europe. Europeans called them **Arabic numerals**, because they received them from the Arabs. The Arabs, however, called them **Hindu numerals**. Therefore, this number system is known as the **Hindu–Arabic Number System**.
  - ✓ The system of writing numbers in a **place-value chart** was discovered in India. Historical facts show that Indians knew about **zero** long before the Common Era.
  - ✓ **Zero** and **place value** are the defining features of this number system.
  - ✓ With their help, any number can be written easily using these ten digits.

Devanagari Number System	१	२	३	४	५	६	७	८	९
Roman Number System	I	II	III	IV	V	VI	VII	VIII	IX
Hindu–Arabic Number System	1	2	3	4	5	6	7	8	9

Devanagari Number System	१०	२०	३०	४०	५०	६०	७०	८०	९०	१००
Roman Number System	X	XX	XXX	XL	L	LX	LXX	LXXX	XC	C
Hindu–Arabic Number System	10	20	30	40	50	60	70	80	90	100

Devanagari Number System	१	५	१०	५०	१००	५००	१०००
Roman Number System	I	V	X	L	C	D	M
Hindu–Arabic Number System	1	5	10	50	100	500	1000

Nearest Value of Numbers or Round of the Numbers:

Generally, numbers are presented or written in their exact form. However, sometimes when the exact value is not known, we estimate the **approximate value** of a number. In such cases, we round the given number to the nearest ten, hundred, or thousand as required.

Example: Round of the number 4256 to the nearest value.

Nearest Ten

The number **4256** lies between **4250** and **4260**.

It is closer to **4260** than to **4250** because:

(4256 − 4250 = 6,4260 − 4256 = 4)

Therefore, the nearest ten of **4256** is **4260**.

Nearest Hundred

To round of **4256** to the nearest hundred, look at numbers between **4200** and **4300**:

(4256 – 4200 = 56, and 4300 – 4256 = 44)

Thus, the number is closer to **4300**.

So, the nearest hundreds of **4256** is **4300**.

Nearest Thousand

To round of **4256** to the nearest thousand, note that it lies between **4000** and **5000**:

(4256 – 4000 = 256, and 5000 – 4256 = 744)

It is closer to **4000**.

Therefore, the nearest thousand of **4256** is **4000**.

Final Rounded Values of 4256

Place Value	Nearest Rounded Value
Nearest Ten	**4260**
Nearest Hundred	**4300**
Nearest Thousand	**4000**

Important Points to Remember:

1. If the digit in the unit's place is less than 5, then we round of the number down. For this, we write the tens digit as it is and put a zero in the unit's place.
2. If the digit in the unit place is 5 or greater than 5, then one is added to the tens place and zero is written in the unit place.
3. Similarly, rounding can be done based on the **tens digit** (for hundreds) and the **hundreds digit** (for thousands).

Note: When writing any large number, commas are used to separate different groups. Commas are placed in the number **from right to left** according to the number system.

Place Value of a Number:

- The value of a digit in a number depends on its position. This position-based value is called the **place value** of the digit.

or

- The value that a digit gets because of its position in a number is known as its **place value**.

Example:

1. Find the place values of both 7s in the number **3477**.

   Solution - 3477 = 3000 + 400 + 70 + 7

   From the right side

   Place value of the first 7 =7

   Place value of the second 7 =70

2. Find the place value of digits 3, 4, and 7 in 3477:

   From the right side:

   Place value of the **first 7** = 7

   Place value of the **second 7** = 70

   Place value of **4** = 400

   Place value of **3** = 3000

Place Value of Digits:

- Place value of the units digit = (units digit × 1)
- Place value of the tens digit = (tens digit × 10)
- Place value of the hundreds digit = (hundreds digit × 100)
- Place value of the thousands digit = (thousands digit × 1000)

Features of Place Value

- For a **single-digit number**, the place value is the same as its **face value**.
- As we move **left**, each place value becomes **10 times** the previous one.
- The place value of **0** is always **0**, no matter where it occurs.
- Example: In **2,345**, the place value of digit **3 (hundreds place)** is 10 times the place value of **4 (tens place)**.

Indian Number System

Example: For the number **31,204**:

Digit	Place	Calculation	Value
3	Ten-thousand place	3 × 10,000	= 30,000
1	Thousand place	1 × 1,000	= 1,000
2	Hundreds place	2 × 100	= 200
0	Tens place	0 × 10	= 0
4	Units place	4 × 1	= 4

Important Fact: Even if a digit is 0, its place value depends on *its position*.

Example: Number **13,10,46,914**

Chart wise division:

Ten Crore	One Crore	Ten Lakh	One Lakh	Ten Thousand	Thousand	Hundred	Ten	Unit
1	3	1	0	4	6	9	1	4

In words: Thirteen crore ten lakh forty-six thousand nine hundred fourteen.

Structure (Indian Place Value Grouping):

- **First Group:** Units, Tens, Hundreds
- **Second Group:** Thousand, Ten Thousand
- **Third Group:** Lakh, Ten Lakh
- **Fourth Group:** Crore, Ten Crore

Decimal Numbers in Indian Systems

Example: In 45.789

7 → Tenths place → 7 × 0.1 = 0.7

8 → Hundredths place → 8 × 0.01 = 0.08

9 → Thousandths place → 9 × 0.001 = 0.009

International Place Value System

In this system, numbers are divided into groups called **periods** such as: ones, thousands, millions।

Example: 987,654,321

Chart:

Hundred Million	Ten Million	Millions	Hundred Thousand	Ten Thousand	Thousands	Hundreds	Tens	Ones
9	8	7	6	5	4	3	2	1

In Words: Nine hundred eighty-seven million, six hundred fifty-four thousand, three hundred twenty-one

Expanded Form: = (9×100,000,000) + (8×10,000,000) +... + (1×1)

Face Value

- The pure or actual value of any digit is called its Face Value.
  Example: In the number **89692**, find the Face value of 8 and 6.

  The face value of 8 = **8**

  The face value of 6 = **6**

Difference Between Place Value and Face Value-

Example: In the number **96259**, find the difference between the place value and face value of 6.

Solution - First, prepare the table.

Ten Thousand	Thousand	Hundred	Ten	Unit
9	6	2	5	9

Place value of 6 = 6 × 1000 = **6000**

Face value of 6 = **6**

Therefore,

Difference 6000 - 6 = 5994

Sum of Place Values

Example - In the number **106295**, what is the sum of the place values of 6, 2, and 5?

Solution -

Place value of 6 = 6×1000 = 6000

Place value of 2 = 2×100 = 200

Place value of 5 = 5×1= 5

Sum of all three Place value = 6000 + 200 +5 = 6205

Product of Place Values

Q.1. In the number **60321045**, the product of the place values of 3, 4, and 5 is:

(a) 60 (b) 900

(c) 60000000 (d) 1200000

Ans. Prepare the table

Crore	Ten Lakh	Lakh	Ten Thousand	Thousand	Hundred	Ten	Unit
6	0	3	2	1	0	4	5

Place value of 3 = $3 \times 100000 = 300000$

Place value of 4 = $4 \times 10 = 40$

Place value of 5 = $5 \times 1 = 5$

Product = $300000 \times 40 \times 5 = 60{,}000{,}000$

Place Value in Decimal Numbers

Thousand	Hundred	Ten	Unit	Decimal	Tenths	Hundredths	Thousandths
Digit × 1000	DIgit × 100	Digit × 10	Digit × 1	·	$\frac{1}{10}$	1/100	1/1000

Example - Write the place value in the number **28.329**.

Solution -

Ten	Unit	Decimal	Tenths	Hundredths	Thousandths
2	8	·	3	2	9

Place value of 2 = $2 \times 10 = 20$

Place value of 8 = $8 \times 1 = 8$

Place value of 3 = $3 \times \frac{1}{10} = \frac{3}{10}$

Place value of 2 = $2 \times \frac{1}{100} = \frac{2}{100}$

Place Value of 9 = $9 \times \frac{1}{1000} = \frac{9}{1000}$

Expanded form of the above number:

Solution $-20 + 8 + \frac{3}{10} + \frac{2}{100} + \frac{9}{1000}$

Comparison of Number

We compare numbers based on which is smaller or larger

This is done in two ways: -

1. **Ascending Order-** In this the numbers increase in the order from small to large, this is called ascending order.

   Example- Write **492, 496, 312, 981, 201, 204, 106, 196** in ascending order.

   Solution (Ascending Order): 106, 196, 201, 204, 312, 492, 496, 981

2. **Descending Order -** In this the number decreases in the order from large to small, this is called descending order.

   Example - Arrange 9424, 9892, 9812, 9622, 8922, 9629 in descending order.

   (a) 9892, 8922, 9629, 9424, 9812, 9622

   (b) 9892, 9812, 9629, 9622, 9424, 8922

   (c) 9892, 9812, 9629, 8922, 9622, 9424

   (d) 9892, 9629, 9812, 9622, 9424, 8922

   Solution- (b)

Ascending & Descending Order of Decimal Numbers

1. Example - Write **48.92, 48.62, 49.23, 48.91** in descending order.?

   Solution - 49.23, 48.92, 48.91, 48.62

   While solving such questions, compare:

➢ The number **before** the decimal

➢ If these are equal, compare the number **after** the decimal

2. Example - Write **191.92, 191.91, 181.68, 191.99** in ascending order.?

   Solution – 181.68, 191.91, 191.92, 191.99

Basic Arithmetic Operations

- Arithmetic operations refer to performing operations on numbers such as adding, subtracting, multiplying, or dividing.
- These operations are called the **fundamental operations of mathematics**, and they are used to solve mathematical problems.
- In mathematics, an operation is a process or action applied to one or more numbers in order to obtain a result.
- The four fundamental operations are:

1. **Addition**
2. **Subtraction**
3. **Multiplication**
4. **Division**

1. Addition

Definition: When two or more numbers are combined, it is called addition. It is represented by the symbol '+'.

Rule:

✓ It applies to decimal numbers, fractions, real numbers, and complex numbers.

✓ If 0 is added to any number, the result is the same number.

Example: 0 + 7 = 7

✓ Adding a number and its opposite (additive inverse) results in 0.

Example: 4 + (–4) = 0

2. Subtraction

Definition: When one number is Subtract from another, it is called subtraction. It is represented by the symbol '–'.

Rule:

✓ If a smaller number is subtracted from a larger number, the result is positive.

✓ If a larger number is subtracted from a smaller number, the result is negative.

Example:

8 – 2 = 6

2 – 8 = –6

3. Multiplication

Definition: In multiplication, two numbers (multiplicand and multiplier) are combined to obtain a product. It is represented by the symbol '×'.

Rules:

✓ The product is written as **a** × **b** or **a·b**.

✓ The product of two positive numbers = **positive**

✓ The product of two negative numbers = **positive**

✓ The product of a positive and a negative number = **negative**

Example:8 × 4 = 32

4. Division

Definition: Dividing a number into parts is called division. It is represented by the symbol '÷'.

नियम:

✓ In division, the first number is called the **dividend** and the second number is called the **divisor**.

✓ If **dividend** > **divisor**, then the result > 1.

Example: 6 ÷ 2 = 3

If dividing a number, **a** by **b** gives quotient **q** and remainder **r**, then:

a = Dividend
b = Divisor
q = Quotient
r = Remainder

Dividend = Divisor × Quotient + Remainder

BODMAS Rule

When many operations appear in a mathematical expression, they must be solved in a fixed order. This rule is called **BODMAS** or **PEMDAS**.

1. **BODMAS**

   BODMAS stands for::

   B - Brackets

   O - Orders

   D - Division

   M - Multiplication

   A - Addition

   S - Subtraction

   Example: $2 \times 20 \div 2 + (3 + 4) \times 3^2 - 6 + 15$

   Step 1: Solve brackets: $= 2 \times 20 \div 2 + 7 \times 3^2 - 6 + 15$

   Step 2: Solve powers $= 2 \times 20 \div 2 + 7 \times 9 - 6 + 15$

   Step 3: Multiply and divide (left to right): $= 40 \div 2 + 63 - 6 + 15 = 20 + 63 - 6 + 15$

   Step 4: Addition and subtraction: = 92

2. **PEMDAS**

   PEMDAS stands for:

   P - Parentheses

   E - Exponents

   M - Multiplication

   D - Division

   A - Addition

   S - Subtraction

   Example:$(4 \times 3 \div 6 + 1) \times 3^2$

   $= (12 \div 6 + 1) \times 9$

   $= (2 + 1) \times 9$

   $= 3 \times 9 =$ **27**

Other Methods of Addition

1. **Sum of the first n natural numbers** $= \frac{n(n+1)}{2}$

   where n is the number of natural numbers.

   Example: What is the sum of natural numbers from 1 to 25?

   Solution - Sum of natural numbers from 1 to 25

   $$= \frac{n(n+1)}{2}$$

   $$n = 25$$

   $$\Rightarrow = \frac{25(25+1)}{2} = \frac{25 \times 26}{2}$$

   $$\Rightarrow \frac{650}{2} = 325$$

   Thus, the total sum from 1 to 25= 325

2. **Sum of the first n even numbers** $= n(n+1)$

   Example - Find the sum of the first 25 even numbers.

   Solution - Sum of first 25 even numbers $= 25(25+1)$

   $$= 25 \times 26$$
   $$= 650$$

   Thus, the sum of the first 25 even numbers = 650

3. **Sum of the first n odd numbers** $= n^2$

   Example

   (i) Find the sum of the first 20 odd numbers.

Solution -

Sum of first 20 odd numbers= $(20)^2 = 400$

(ii) What is the sum of odd numbers from 1 to 100?

Solution - You know that from 1 to 100, there are approximately 50 odd numbers.

Thus, the sum of the first 50 odd numbers -

$$= (50)^2$$
$$= 2500$$

Thus, the sum of the first 50 odd numbers = **2500**.

4. Sum of the first n whole numbers = $\frac{n(n-1)}{2}$

Example - What is the sum of the first 20 whole numbers?

Solution - We know that whole numbers begin from zero.

Whole numbers = 0,1,2,3,4,

Sum of First 20 whole Number = $\frac{n(n-1)}{2}$

$$= \frac{20(20-1)}{2} = \frac{20 \times 19}{2}$$
$$= \frac{380}{2}$$
$$= 190$$

Thus, the sum of the first 20 whole numbers = **190**.

5. Sum of Squares of the first n natural numbers = $\frac{n(n+1)(2n+1)}{6}$

Example - Find the sum of squares of the first 10 natural numbers.

Solution -

the sum of squares of the first 10 natural numbers.

$$= 1^2 + 2^2 + 3^2 \ldots\ldots.. + 10^2$$
$$= \frac{10(10+1)(2 \times 10 + 1)}{6}$$
$$= \frac{10 \times 11 \times 21}{6}$$
$$= 385$$

Important Questions:

1. What is the difference between the largest five-digit number and the smallest four-digit number?

Solution - First of all we will find the largest five digit number - smallest four digit number

Largest five-digit number= 99.999

Smallest four-digit number = 1000

Then

$$\begin{array}{r} 99999 \\ -\ 1000 \\ \hline 98999 \\ \hline \end{array}$$

Difference = 98999

2. Raju has ₹632.75. He buys goods worth ₹182.28. How much money is left with him?

Solution - Raju's total money = 632.75

Amount spent = 182.28

$$\begin{array}{ccccc} 6 & 3 & 2 & & \\ -1 & 8 & 2 & 2 & 5 \\ \hline 4 & 5 & 0 & 4 & 7 \\ \hline \end{array}$$

Thus, remaining money = **₹450.47**

3. Ram bought 9 kg 500 g sugar and Radha bought 7 kg 875 g sugar. How much more sugar did Ram buy?

Solution -

Ram → 9 kg 500 g

Radha → 7 kg 875 g

1 Kg = 1000 Gram

Kg.	Gram
9	500
- 7	875
1	652

Ram bought **1 kg 625 g** more sugar.

4. The price of one cell phone is ₹434 2/3. What will be the price of 14 cell phones?

Solution - One cell phone price= $434\frac{2}{3}$ Rs.

Price of 14 phones:

$$= 434\frac{2}{3} \times 14$$
$$= \frac{1304}{3} \times 14$$
$$= \frac{18256}{3}$$
$$= 6085\frac{1}{3}$$

Thus, price of 14 phones = = $6085\frac{1}{3}$ Rs

Additive Identity

- x has additive identity = 0
- $x + 0 = x$

Additive inverse

- Additive inverse of $x = -x$
- $x + (-x) = 0$

Example – What is additive inverse of 4?

Solution – Additive inverse of 4 = -4

$= 4 + (-4) = 0$

Multiplicative Identity

- Multiplicative identity of x = 1
- $x \times 1 = x$

Multiplicative Inverse

- $Multiplicative\ inverse\ of\ x = \frac{1}{x}$
- $x \times \frac{1}{x} = 1$

Example -

(i) Find the multiplicative inverse of 3?

Solution – Multiplicative inverse of 3 = $3 \times \frac{1}{3} = 1$

(ii) *Find the multiplicative inverse of 5/7?*

Solution – Find the multiplicative inverse of $\frac{5}{7}$ = $\frac{5}{7} \times \frac{7}{5} = 1$

Divisibility Rules:

There are certain rules used to determine whether a number is divisible by another number without performing complete division. These are called **divisibility rules**. Using these rules, we can quickly find out whether a number will be divisible or not.

- **Rule of Divisibility by 2:** A number is divisible by 2 if its last digit (unit digit) is **0, 2, 4, 6, or 8**.
- **Rule of Divisibility by 3:** If the **sum of all digits** of a number is divisible by 3, then the number is divisible by 3.

  Example. 38922

  $$3 + 8 + 9 + 2 + 2 = 24$$

  Since 24 is divisible by 3, the number 38922 is fully divisible by 3.

- **Rule of Divisibility by 4:** If the last **two digits** (tens and units place) of the number form a number divisible by 4, then the entire number is divisible by 4.

  Example: 42984

  Last two digits = 84

  Since 84 is divisible by 4, the entire number is also divisible by 4.
- **Rule of Divisibility by 5:** If the last digit (units digit) of a number is **0 or 5**, then it is divisible by 5.

  Example: 9240

  Since the last digit is 0, it is fully divisible by 5.

  Note - The divisibility rule for 15 works similarly (number must be divisible by both 3 and 5).
- **Rule of Divisibility by 6 -** If a number is divisible by both **2 and 3**, then it is divisible by 6.
- **Rule of Divisibility by 7:**

  To check divisibility by 7:
- Double the last digit of the number.
- Subtract it from the remaining number.
- Repeat the process if necessary.
- If the final result is divisible by 7, then the original number is also divisible.

  Example: 2961

  2961

  Step 1: Last digit = 1 → 1×2 = 2

  296 – 2 = 294

  Step 2: Last digit of 294 = 4 → 4×2 = 8

  29 – 8 = 21

  Since 21 is divisible by 7, the number 2961 is also divisible by 7.

  Note- If any number contains repeated digits like 6 digits of the same number continuously, it is always divisible by 7.

  Examples: 222222, 999999
- **Rule of Divisibility by 13 -** Multiply the units digit by 4 and add the result to the remaining number. If the final number is divisible by 13, then the original number is divisible.

  Example: 6357

  Step 1: 635 + (7×4) = 635 + 28 = 663

  Step 2: 66 + (3×4) = 66 + 12 = 78

  Since 78 is divisible by 13, the number 6357 is also divisible.
- **Rule of Divisibility by 8:** If the last **three digits** (units, tens, hundreds) form a number divisible by 8, then the entire number is divisible by 8.

  Example: 5432

  Last three digits → 432

  Since 432 is divisible by 8, the entire number is divisible by 8.
- **Rule of Divisibility by 9:** If the **sum of all digits** of a number is divisible by 9, then the number is divisible by 9.

  Example: 8073

  $8 + 0 + 7 + 3 = 18$

  Since 18 is divisible by 9, the number 8073 is also divisible by 9.
- **Rule of Divisibility by 10:** If the last digit of a number is **0**, it is divisible by 10.

  Example: 100 ,1000, 590

- **Rule of Divisibility by 11:** If the **difference** between the sum of digits in **odd positions** and the sum of digits in **even positions** is **0 or a multiple of 11**, then the number is divisible by 11.
  Example: 2893
  Odd place digits = 2 + 9
  Even place digits = 8 + 3
  = (8+3) - (2+9)
  = 11 – 11 = 0
  Since the result is 0, the number is divisible by 11.

- **Rule of Divisibility by 17 -**Multiply the units digit by **5** and subtract it from the remaining number. If the final result is divisible by 17, then the number is divisible by 17.

Indian Currency

- **Currency** is the accepted medium through which goods and services are bought and sold in an economy.
- **Main functions of money:**
  - ✓ **Medium of exchange** —Makes transactions simple.
  - ✓ **Unit of account** —Measures prices of goods and services.
  - ✓ **Store of value** —Stores wealth for future use.
  - ✓ **Standard of deferred payments** —Basis for repayment of loans and credits.
- **Indian currency** is the official medium through which the value of goods and services is paid within India.
  - ✓ The basic unit of Indian currency is the **Rupee (₹)**.
  - ✓ **1 Rupee = 100 Paise** (although small-denomination coins are rarely used now).
  - ✓ It is issued and regulated by the **Reserve Bank of India (RBI)**.
  - ✓ Indian currency includes both coins and banknotes.
- **Origin of the Word "Rupee"**
  - ✓ The word "Rupee" comes from the Sanskrit term **"Rupyakam"**, meaning *a silver coin*.
  - ✓ It originated during the reign of **Sher Shah Suri (1540–1545 AD)**, who issued a silver rupee weighing **178 grains (approx. 11.53 grams)**.

History of Indian Currency:

- **Vedic Period (1500 BCE – 600 BCE)**
  - ✓ There were no coins or paper notes during this period.
  - ✓ People used the **barter system.**
  - ✓ *Barter system* – One commodity was exchanged for another.
    - Example: Grain for clothes, milk for salt.

Evidence from Vedic Literature:

- Scholars Thomas and Bhandarkar believe that currency originated in India during the Vedic period.
- Words referring to currency occur in Vedic texts.

- The term **"Hiranya"** was used for precious metal pieces (gold and silver).
  - ✓ In the Rigveda:
    - A sage gifted Divodasa *10 horses, 10 cows, 10 valuable garments,* and *10 pieces of Hiranya*.
  - ✓ Types of Hiranya:
    - *Harit Hiranya* – Gold
    - *Rajat Hiranya* – Silver
    - *Hiranya Bindu* – Pearl
- In Panini's *Ashtadhyayi*, a fixed quantity of wealth was referred to as *Hiranya*.
- Rigveda also mentions wealth such as cows, horses, and *Chandravat* (silver).
- The word "silver" likely originated due to its moon-like white color.

Other Important Points

- **James Prinsep** is known as the **Father of Indian Numismatics**. The study of coins is called **Numismatics**.
- **Coins-** Ancient literary texts refer to these metal pieces as **Aahat**, also known as **Punch-marked coins**, because they have five types of symbols. These coins were made of **silver and copper**.
- No gold punch-marked coin has been found yet; gold pieces are mentioned only in Vedic literature as **Nishk** and **Suvarṇa**.
- As per *Manusmriti*, coins were called **Dharan** (fixed weight) and **Puran** (old).
- **Names of Metals & Coins:**
  a. Gold – **Nishk or Suvarṇa**
  b. Silver – **Karshapana, Shatamana, Shaana** (1/8 of Shatamana)
  c. Copper – **Māsha, Kaakani, Vimshatika**

- **Mahajanapada Period (600 BCE to 321 BCE)**
  - ✓ During this period, the use of coins began in India, known as **Punch-marked coins**.
  - ✓ **Punch-marked coins** were made of silver and copper. Small symbols were engraved on both sides of these coins. These symbols included figures like an elephant, the sun, a wheel, or geometric shapes.
  - ✓ The size and weight of the coins were not uniform.
- **Mauryan Period (321 BCE to 185 BCE)**
  - ✓ In the Mauryan period, silver punch -marked coins were widely used.
  - ✓ These coins did not carry the king's name or portrait.
- **Gupta Period (320 CE to 550 CE)**
  - ✓ During this time, gold coins called **Dinar** came into use.
  - ✓ The coins depicted the image of the Gupta emperors or symbols of Hinduism.

- **Muslim Period (12th Century to 16th Century)**
  - ✓ **Delhi Sultanate**
    - Silver coins called **Tanka**, and copper coins called **Jital**, were in circulation.
    - Arabic and Persian inscriptions were engraved on the coins.
  - ✓ **Mughal Empire:**
    - The first **Rupee** coin was introduced by Sher Shah Suri in 1540 CE. It was made of silver and weighed **178 grains (approximately 11.66 grams)**.
    - This rupee was later adopted and promoted by Mughal emperor Akbar.
    - Akbar inscribed the phrase **"Khuda ka Banda" (Servant of God)** on his gold coins, making them respected even in foreign lands.
    - Gold **Mohur** and copper **Dam** coins were also circulated.
    - Mughal coins bore the emperors' portraits and Persian inscriptions.
- **British Period (18th Century to 1947):**
  - ✓ Under British rule, the Indian currency system changed significantly. A unified currency system was introduced in 1835.
  - ✓ In 1861, paper currency was introduced for the first time in India. Initially, ₹10 and ₹100 notes were issued.
  - ✓ After the Revolt of 1857, the British government declared the Rupee as the official currency of colonial India and replaced traditional Indian designs with the portrait of **King George VI**.
  - ✓ The **Reserve Bank of India (RBI)** was established on 1 April 1935. In January 1938, the first paper note issued by the RBI was a **₹5 note**, carrying the portrait of King George VI.
- **Indian Rupee After Independence**
  - ✓ After independence in 1947, the George VI series was replaced by the **Lion Capital Series** featuring the Ashoka Pillar. The first post-independence notes issued by the RBI was the **₹1 note**.
  - ✓ **Classification of Coins of Independent India**
    - **Pre-determined series 1947-1950**
      - This series represented the transitional currency system until the formation of the Indian Republic.
      - The monetary system remained unchanged:
        - ☞ 1 Rupee = 192 Pies
        - ☞ 1 Rupee = 16 Annas
        - ☞ 1 Anna = 4 Paise
        - ☞ 1 Paisa = 3 Pies

- **Anna Series (Introduced on 15 August 1950)**
  - This was the first currency system of the Republic of India.
  - The image of the king was replaced with the **Lion Capital of Ashoka**.
  - The tiger on the ₹1 coin was replaced with a bunch of paddy stalks, symbolizing progress and prosperity.
  - Other coins carried traditional Indian motifs.
  - The monetary value remained the same: 1 Rupee = 16 Annas.

✓ **Introduction of the Decimal System**

- In September 1955, the Indian Coinage Act was amended to adopt the metric system, implemented on 1 April 1957.
- The rupee retained its value, but instead of 16 annas or 64 paise, it was now divided into **100 paise**.
- For public understanding, the new unit was called **Naya Paisa** (New Paisa), used from 1957 to 1964. Coins of 1, 2, 5, 10, 20, 25, 50 paise and ₹1 were introduced.

✓ In 1996, all Lion Capital series notes were replaced by the **Mahatma Gandhi Series**, starting with ₹10 and ₹500 denominations.

✓ Over time, the Indian currency incorporated advanced security features to prevent counterfeiting, such as:

- **Watermark** – Portrait of Mahatma Gandhi
- **Identification Mark** – Different shapes for different denominations
- **Security Thread** – Inscribed with "Bharat" in Hindi
- **Latent Image** – Denomination visible only when held at eye level horizontally

Currency of India	
Coin	**Banknotes**
➢ Currently, coins of **50 paise, ₹1, ₹2, ₹5, and ₹10** are in circulation. ➢ Coins up to 50 paise are known as **"Small Coins"**, and coins of ₹1 and above are	➢ Currently, banknotes of **₹10, ₹20, ₹50, ₹100, ₹500, and ₹1,000** are issued by the Reserve Bank of India (RBI). ➢ ₹1, ₹2, and ₹5 notes are no longer printed but remain legal tender if found in circulation.

called **"Rupee Coins"**. ➢ Coins of **1, 2, 3, 5, 10, 20, and 25 paise** were withdrawn from circulation on **30 June 2011**, and are no longer legal tender.	➢ **Most Expensive Indian Note:** The highest denomination ever issued was the **₹10,000 note**, released in 1938 and again in 1954. It was demonetized in 1954.

Banknote Series of India

➢ **Ashoka Pillar Banknotes (1949)**: The first banknote of independent India was the ₹1 note issued in 1949. The design was retained but the portrait of King George was replaced with the **Lion Capital of Ashoka** in the watermark window.

➢ **Mahatma Gandhi Series (1996)**: Featured Mahatma Gandhi's portrait on the front side. The Lion Capital emblem was moved to the left, near the watermark window. Included both Gandhi's watermark and printed portrait.

➢ **Mahatma Gandhi Series (2005):** Issued in denominations of ₹10, ₹20, ₹50, ₹100, ₹500, and ₹1,000. Included additional security features compared to the 1996 series. ₹500 and ₹1,000 notes were withdrawn from circulation on **8 November 2016**.

➢ **Mahatma Gandhi (New) Series (2016):**Highlight India's cultural heritage and scientific achievements.

Important Questions:

1. If you have three 1-rupee coins, two 2-rupee coins, and one 10-rupee coin, in how many ways can you give me ₹14?

(A) 1 (B) 2

(C) 3 (D) 4

Solution:

Rupee	**Number**	**Value**
1-rupee	3	3 rupees
2-rupee	2	4 rupees
10-rupee	1	10 rupees

$14 = (10 \times 1) + (2 \times 2)$

$14 = (10 \times 1) + (2 \times 1) + (1 \times 2)$

∴ There are 2 ways to pay ₹14.

Correct answer: (B)

2. Varun has a ₹10 note. He buys a pen worth ₹6. The shopkeeper returns the balance using 1-rupee and 2-rupee coins. How many coins did he receive?

(A) 1 (B) 2

(C) 3 (D) 4

Solution :

Given:

Amount varun has = 10 Rs

Price of pen = 6 Rs

⇒ Remaining amount = 10 Rs - 6 Rs = 4 Rs

4 Rs = (1 Rs × 2) + (2 Rs × 1)

⇒ Total Coin = 2 + 1 = 3

∴ He got a total of 3 coins.

Correct answer: (C)

3. Meeta wants to collect only 2-rupee coins. Her mother gives her an old piggy bank and asks her to exchange all the money for 2-rupee coins. Inside she finds:

i. Two 100-rupee notes

ii. Three 20-rupee notes

iii. Ten 10-rupee notes

iv. Fifty 5-rupee coins

v. Seventy-seven 1-rupee coins

vi. Ninety-eight 50-paise coins

How many 2-rupee coins will she get in exchange?

(A) 638 (B) 386

(C) 368 (D) 736

Solution:

Note/Coin	**Number**	**Amount**
100	2	200
20	3	60
10	10	100
5	50	250
1	77	77
0.50	98	49
Total amount		736

Number of 2-rupee coins = 736 ÷ 2 = **368**

∴ He will get 368 number of 2 rupee coins.

4. Nasima has only 5-rupee, 10-rupee, and 20-rupee coins. She has three times as many 5-rupee coins as 10-rupee coins, and half as many 20-rupee coins as 10-rupee coins. If she has 8 coins of 20 rupees, what is her total amount?

(A) 470 Rs (B) 560 Rs

(C) 615 Rs (D) 495 Rs

Solution :

Given:

20-rupee coins = 8

Let number of 10-rupee coins = 2x

Then 20-rupee coins = x

⇒ x = 8 → therefore 10-rupee coins = 2×8 = 16

5-rupee coins = 3 × 16 = 48

Types of Coin	5 Rs	10 Rs	20 Rs
Number of Coins	6 x	2 x	X
Total number of Coins	6× 8 =48	2 × 8 = 16	8

amount given by him = 48 coins of Rs 5 + 16 coins of Rs 10 + 8 coins of Rs 20

⇒ 48 × 5 + 16 × 10 + 8 × 20

⇒240 +160 + 160

⇒ 560

∴ The total amount given by him is Rs 560.

5. The value of sixteen 50-paise coins is equal to:

(A) Four 1-rupee coins + three 2-rupee coins

(B) Three 2-rupee coins + eight 25-paise coins

(C) Three 2-rupee coins + six 25-paise coins

(D) Two 2-rupee coins + three 1-rupee coins

Solution:

1 rupee = 100 paise

16 coins of 50 paise = 16 × 50 = **800 paise**

Checking each option:

Option 1

4×100 + 3×200 = 400 + 600 = 1000 paise

Option 2

3×200 + 8×25 = 600 + 200 = **800 paise**

Option 3

3×200 + 6×25 = 600 + 150 = 750 paise

Option 4

2×200 + 3×100 = 400 + 300 = 700 paise