

- Place Values and Number Systems
- Estimation and Rounding of Large Numbers
- Factorization and Regrouping of Large Numbers
- Real Life Applications of Large Numbers
- Multiplication Patterns with Large Numbers

Place Values and Number Systems

Understanding place values is fundamental to working with large numbers. In the Indian number system, digits are grouped as ones, tens, hundreds, thousands, lakhs, crores, etc. For example, the number ₹7,56,43,210 is read as seven crores, fifty-six lakhs, forty-three thousand, two hundred ten.

In the International number system, digits are grouped as ones, tens, hundreds, thousands, millions, billions, etc. For example, \$75,643,210 is read as seventy-five million, six hundred forty-three thousand, two hundred ten.

Key conversions:

- 1 Lakh = 100,000
- 1 Crore = 10,000,000

Reading and Writing Numbers

Commas are used to group digits to make large numbers easier to read. In the Indian system, commas are placed after three digits from the right, then every two digits. For

example, 12,78,830 is read as twelve lakh seventy-eight thousand eight hundred thirty.

In the International system, commas are placed every three digits from the right. For example, 1,278,830 is read as one million two hundred seventy-eight thousand eight hundred thirty.

Worked Example

Write the number 1,23,45,678 in words using the Indian system.

Solution:

1,23,45,678 = One crore twenty-three lakh forty-five thousand six hundred seventy-eight.

Practice Set

- Level 1: Write 56,78,900 in words (Indian system).
- Level 2: Convert 4,56,78,901 into words (Indian system).
- Level 3: Write 123,456,789 in words (International system).

Answer Key

- Level 1: Fifty-six lakh seventy-eight thousand nine hundred.
- Level 2: Four crore fifty-six lakh seventy-eight thousand nine hundred one.
- Level 3: One hundred twenty-three million four hundred fifty-six thousand seven hundred eighty-nine.

Quick Reference

Number	Indian System	International System
--------	---------------	----------------------

1,00,000	One Lakh	One Hundred Thousand
1,00,00,000	One Crore	Ten Million

Glossary

- **Place Value:** The value of a digit depending on its position in a number.
- **Indian Number System:** Number grouping system using lakhs and crores.
- **International Number System:** Number grouping system using millions and billions.

Estimation and Rounding of Large Numbers

Estimation simplifies large numbers to make calculations easier and results easier to understand. Rounding is a common method of estimation where numbers are approximated to the nearest ten, hundred, thousand, lakh, or crore.

Rounding Rules

- If the digit to the right of the rounding place is 5 or more, round up.
- If the digit to the right is less than 5, round down.

Worked Example

Round 7,89,654 to the nearest thousand.

Solution:

Look at the hundreds digit: 6 (which is greater than 5), so round up.

7,89,654 rounded to nearest thousand = 7,90,000.

Practice Set

- Level 1: Round 45,678 to the nearest hundred.
- Level 2: Round 3,45,678 to the nearest lakh.
- Level 3: Round 9,87,65,432 to the nearest crore.

Answer Key

- Level 1: 45,700
- Level 2: 3,00,000
- Level 3: 10,00,00,000

Quick Reference

Number	Nearest Thousand	Nearest Lakh	Nearest Crore
6,72,85,183	6,72,85,000	6,73,00,000	7,00,00,000

Glossary

- **Estimation:** Finding an approximate value close to the exact number.
- **Rounding Up:** Increasing the digit in the rounding place by one.
- **Rounding Down:** Keeping the digit in the rounding place the same.

Factorization and Regrouping of Large Numbers

Factorization breaks a number into its prime factors. Regrouping uses these factors to simplify multiplication or division.

Prime Factorization

Example: Factorize 84.

$$84 = 2 \times 42 = 2 \times 2 \times 21 = 2^2 \times 3 \times 7.$$

Using Factors to Simplify Multiplication

Example: Multiply 25×64 .

$$25 \times 64 = (5^2) \times (2^6) = 5^2 \times 2^6.$$

We can regroup as $(5^2 \times 2^2) \times 2^4 = (25 \times 4) \times 16 = 100 \times 16 = 1600$.

Practice Set

- Level 1: Factorize 36.
- Level 2: Simplify 18×50 using prime factors.
- Level 3: Multiply 45×80 by regrouping prime factors.

Answer Key

- Level 1: $36 = 2^2 \times 3^2$
- Level 2: $18 \times 50 = (2 \times 3^2) \times (2 \times 5^2) = 2^2 \times 3^2 \times 5^2 = 900$
- Level 3: $45 \times 80 = (3^2 \times 5) \times (2^4 \times 5) = 3^2 \times 2^4 \times 5^2 = 3600$

Quick Reference

Number	Prime Factors
84	$2^2 \times 3 \times 7$

25	5^2
64	2^6

Glossary

- **Prime Factorization:** Expressing a number as a product of prime numbers.
- **Regrouping:** Rearranging factors to simplify calculations.

Real Life Applications of Large Numbers

Large numbers are used in various real-life contexts such as population, economy, and astronomy.

- **Population:** India's population is approximately 1.4 billion or 140 crores.
- **Economy:** National budgets use lakhs and crores for large sums.
- **Astronomy:** Distances like the Earth to the Moon are about 3.84×10^5 km.

Worked Example

Express 1.4 billion in crores.

1 billion = 100 crores, so 1.4 billion = $1.4 \times 100 = 140$ crores.

Practice Set

- Level 1: Convert 500 million to crores.
- Level 2: Express 3.84×10^5 km in standard form.
- Level 3: Calculate the population if 1 crore people live in 10 cities equally.

Answer Key

- Level 1: 500 million = 50 crores.
- Level 2: 3.84×10^5 km = 384,000 km.
- Level 3: Population per city = 1 crore \div 10 = 10 lakhs.

Quick Reference

Quantity	Value
1 Lakh	100,000
1 Crore	10,000,000
1 Billion	100 Crores

Glossary

- **Population:** The total number of people in a place.
- **Economy:** The wealth and resources of a country.
- **Astronomy:** The study of celestial objects and space.

Multiplication Patterns with Large Numbers

Multiplying large numbers by powers of 10 is simplified by adding zeros. For example, multiplying by 10 adds one zero, by 100 adds two zeros, and so on.

Worked Example

Calculate 25×100 .

$25 \times 100 = 25$ followed by two zeros = 2500.

Another example:

116×5 can be calculated as:

$$\begin{aligned} 116 \times 5 &= 116 \times \frac{10}{2} \end{aligned}$$

\

$$= \frac{116 \times 10}{2}$$

\

$$= \frac{1160}{2} = 580 \quad \text{\end{align*}}$$

Practice Set

- Level 1: Multiply 45×1000 .
- Level 2: Calculate 123×50 using factorization.
- Level 3: Find 75×64 by regrouping factors.

Answer Key

- Level 1: $45 \times 1000 = 45,000$
- Level 2: $123 \times 50 = 123 \times (100/2) = (123 \times 100)/2 = 12,300/2 = 6,150$
- Level 3: $75 \times 64 = (25 \times 3) \times (64) = 25 \times (3 \times 64) = 25 \times 192 = 4,800$

Quick Reference

Multiplication	Result
25×100	2,500
116×5	580

Glossary

- **Power of Ten:** Numbers like 10, 100, 1000, etc., which are 10 raised to some exponent.
- **Factorization:** Breaking a number into factors to simplify calculations.

Prepzy