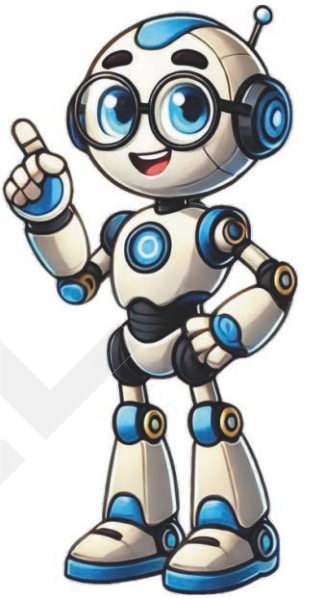
3
Chapter

Number Play

We'll cover the following key points:

- → Introduction to Number Play
- → Understanding Numbers (Place Value for Large Numbers)
- → Patterns of Numbers on the Number Line
- → Methods for Comparing Different Types of Numbers
- → Supercells
- → Playing with Digits
- → Playing with Number Patterns
- → Operations on Numbers
- → An Unsolved Mystery: The Collatz Conjecture
- → Palindromes in Mathematics
- → Clock and Calendar Numbers in Mathematics
- → The Magic Number of Kaprekar
- → Estimation in Mathematics



Hi, I'm EeeBee

Do you Remember fundamental concept in previous class.

In class 5th we learnt

- → Introduction of Large Numbers
- → Place Value

In class 4th we learnt

- → Estimating Sum
- → Estimating Difference
- → Estimating Product

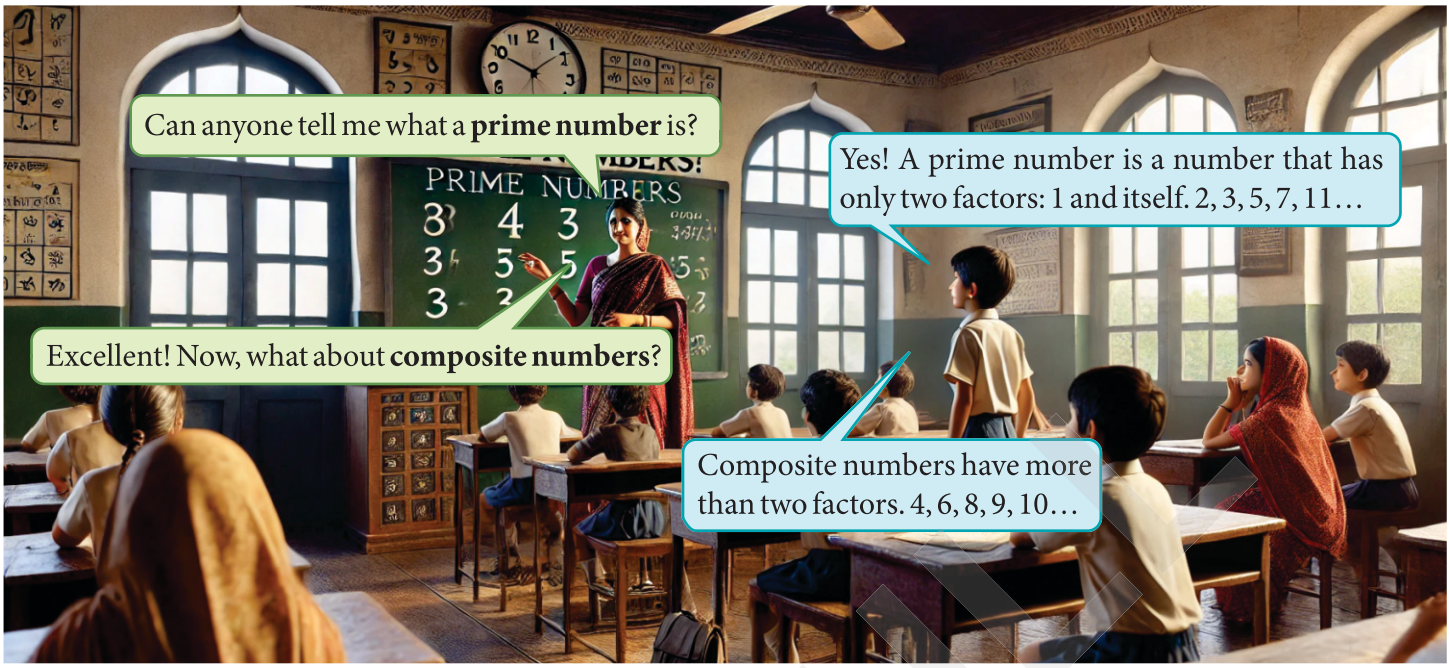
Still curious? Talk to me by scanning the QR code.

Learning Outcomes

By the end of this chapter, students will be able to:

- Recognize and apply factors, multiples, and divisibility rules.
- Find the greatest common divisor (GCD) and least common multiple (LCM) of numbers.
- Solve problems involving factors and multiples in real-life situations.
- Use prime factorization to find the factors of a number.
- Understand the concept of divisibility in number play.
- Solve word problems involving number operations.
- Apply number patterns in different contexts like puzzles and games.
- Use number properties to simplify complex mathematical expressions.
- Develop mental math strategies to quickly identify factors and multiples in everyday scenarios.
- Explore the interplay between prime and composite numbers to deepen understanding of number structure.
- Integrate GCD and LCM concepts to simplify fractions and solve ratio or rate problems.

Introduction



Number Play

Number Play is introduced as a fun and engaging way to build foundational math skills. It focuses on enhancing a student's ability to work with numbers, recognize patterns, and develop problem-solving skills. The activities are designed to help students apply mathematical concepts in real-world scenarios, making learning interactive and enjoyable.

Key Concepts in Number Play:

1. Understanding Numbers:

- **Place Value:** Understanding how the value of digits changes based on their position (ones, tens, hundreds, etc.).
- **Large Numbers:** Learning how to handle larger numbers and perform basic operations like addition, subtraction, multiplication, and division.

2. Number Patterns:

- Recognizing and creating sequences of numbers like even and odd numbers, multiples, factors, and prime numbers.
- **Patterns in Multiplication and Division:** Exploring multiplication tables and understanding division patterns.
- Series and Sequences: Identifying arithmetic and geometric progressions, number series, and finding the missing terms in a sequence.

3. Basic Operations

- Performing operations (addition, subtraction, multiplication, division) with multi-digit numbers.
- **Order of Operations:** Learning the correct sequence of operations (**PEMDAS/ BODMAS**) for solving expressions.

4. Problem Solving and Logical Reasoning

- Applying mathematical concepts to solve word problems and puzzles
- Using number patterns and operations to reason through challenges and derive solutions.

Understanding Numbers (Place Value for Large Numbers)

Place value is a fundamental concept in mathematics that helps us understand the value of each digit in a number based on its position. For large numbers, place value becomes even more critical, as it enables us to read, write, and compare numbers efficiently.

What is Place Value?

- Place value refers to the value of a digit depending on its position in a number.
- For example, in the number 4,672, the digit 4 is in the thousands place, so its value is 4,000.

Place Value Chart for Large Numbers

To understand large numbers, we use a place value chart that organizes digits into groups or periods. In the Indian and International systems of numeration, the grouping differs slightly.

Method of Writing/Reading Large Numbers in Words

1. Indian Place Value System

The Indian system groups digits into ones, thousands, lakhs, and crores:

- **Ones Period:** Ones, Tens, Hundreds
- **Thousands Period:** Thousands, Ten Thousands
- **Lakhs Period:** Lakhs, Ten Lakhs
- **Crores Period:** Crores, Ten Crores

Place	Ten Crores	Crores	Ten Lakhs	Lakhs	Ten Thousands	Thousands	Hundreds	Tens	Ones
Example (3,47,85,291)		3	4	7	8	5	2	9	1

Three crore forty-seven lakh eighty-five thousand two hundred ninety-one.

Indian Place Value System

Name of Place	Value of the Place
TKh (Ten kharabs)	10,00,00,00,00,000
Kh (Kharabs)	1,00,00,00,00,000
TA (Ten arabs)	10,00,00,00,000
A (Arabs)	1,00,00,00,000
TC (Ten crores)	10,00,00,000
C (Crores)	1,00,00,000
TL (Ten lakhs)	10,00,000
L (Lakhs)	1,00,000
TTh (Ten thousands)	10,000
Th (Thousands)	1,000
H (Hundreds)	100
T (Tens)	10
O (Ones)	1

Fig. 3.1

2. International Place Value System

The International system groups digits into ones, thousands, and millions:

- **Ones Period:** Ones, Tens, Hundreds
- **Thousands Period:** Thousands, Ten Thousands, Hundred Thousands
- **Millions Period:** Millions, Ten Millions, Hundred Millions

Place	Hundred Millions	Ten Millions	Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
Example (347,852,291)	3	4	7	8	5	2	2	9	1

Three hundred forty-seven million eight hundred fifty-two thousand two hundred ninety-one.

International Place Value System

Name of Place	Value of the Place
Ten billions (Ten Arabs)	10,000,000,000
Billions (One Arab)	1,000,000,000
Hundred millions (Ten Crores)	100,000,000
Ten millions (One Crore)	10,000,000
Millions (Ten Lakhs)	1,000,000
Hundred thousands (One Lakh)	100,000
Ten Thousands	10,000
Thousands	1,000
Hundreds	100
Tens	10
Ones	1

Fig. 3.2

Reading and Writing Large Numbers

1. Use Commas for Clarity

- **Indian System:** Write commas (,) after every two digits starting from the right (after hundreds) and then after every three digits.

  Example: 3,47,85,291

- **International System:** Write commas (,) after every three digits starting from the right.

  Example: 347,852,291

2. Read Each Period Separately

- **Indian System:** Read periods as lakhs, crores, etc.
- **International System:** Read periods as thousands, millions, etc.

Group the Digits According to Place Value:

- In the Indian System, group digits as follows:

  Example: 56,78,910 → 5, 67, 89, 10 → 56 Lakh 78 Thousand 910.

- In the International System, group digits into periods of three (from right to left):

  Example: 56,789,010 → 56 Million 789 Thousand 10.

Read the Number from Left to Right:

- Read each group of numbers (period) along with its place value.

  Example (Indian System):

  4,32,560 → Four Lakh Thirty-Two Thousand Five Hundred Sixty.

  Example (International System):

  432,560 → Four Hundred Thirty-Two Thousand Five Hundred Sixty.

Points to Remember

- Use commas to separate periods according to the place value system.
- Always begin with the leftmost period and move to the right.
- Avoid unnecessary conjunctions like "and" unless specified in your curriculum.

This step-by-step method helps students build confidence in reading and writing large numbers accurately.

Example : Write the corresponding numerals in figures and in words for each of the following.

4,00,00,000 + 30,00,000 + 6,00,000 + 40,000 + 5,000 + 100 + 8

Solution: In Figures: 4,36,45,108

In Words: Four crore thirty-six lakh forty-five thousand one hundred eight.

Example: Write the corresponding numerals in figures and in words for each of the following.

2,00,00,000 + 90,00,000 + 7,00,000 + 50,000 + 1,000 + 300 + 6

Solution: In Figures: 2,97,51,306

In Words: Two crore ninety-seven lakh fifty-one thousand three hundred six.

Example: Write the corresponding numerals in figures and in words for each of the following.

7,00,00,000 + 80,00,000 + 5,00,000 + 60,000 + 4,000 + 900 + 2

Solution: In Figures: 7,85,64,902

In Words: Seven crore eighty-five lakh sixty-four thousand nine hundred two.

Example: Write the corresponding numerals in figures and in words for each of the following.

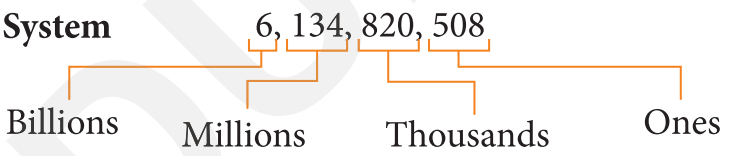
1,00,00,000 + 20,00,000 + 9,00,000 + 30,000 + 7,000 + 500 + 4

Solution: In Figures: 1,29,37,504

In Words: One crore twenty-nine lakh thirty-seven thousand five hundred four

Example: Write the number name for the numeral 6134820508 in International and Indian systems of numeration.

Solution: International System



Indian System

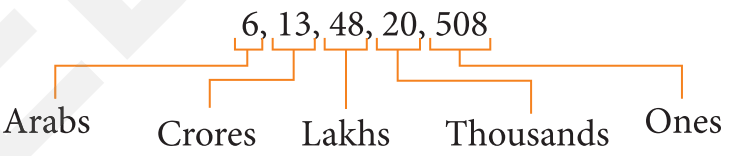


Fig. 3.3

Example: In the number 54,32,109, calculate the difference between the place value and face value of 3.

Solution: Face value of 3 in 54,32,109 = 3.

Place value of 3 in 54,32,109 =3 × 1000 =30000.

Difference = 30000 – 3 = 29997.

Example: In the number **9,42,315** how many times is the place value of **9** greater than the place value of **4**?

Solution: In the number **9,42,315** we need to compare the place values of the digits 9 and 4

Place Value of 9:

Place value of $9 = 9 \times 100{,}000 = 900{,}000$.

Place Value of 4:

Place value of $4 = 4 \times 10{,}000 = 40{,}000$.

Comparison:

To find how many times the place value of 9 is greater than the place value of 4, divide the place value of 9 by the place value of 4:

$$\frac{900{,}000}{40{,}000} = 22.5.$$

Final Answer: The place value of 9 is **22.5 times** greater than the place value of 4.

Exercise 3.1

Knowledge Application

1. **Find the difference between place value and face value:**
   (a) What is the difference between the place value and face value of 7 in the number 1,78,543?
   (b) Find the difference between the place value and face value of 5 in 9,85,432.
   (c) In the number 54,32,109, calculate the difference between the place value and face value of 3.
2. **Provide the missing information in the blanks:**
   (a) The place value of 5 in 65,432 is _____, and its face value is _____.
   (b) In the number 4,32,198, the face value of 9 is _____, and the place value is _____.
   (c) The difference between the place value and face value of 2 in 72,39,450 is _____.
   (d) The place value of 6 in 16,78,290 is _____.
3. **Determine Place Value of bold Digit in Indian and International Systems:**
   (a) 123**4**56789 (b) 20**3**506274 (c) **7**6482059 (d) 1234589**6**
   (e) **2**95678401 (f) 87**6**543210 (g) 12345**6**789 (h) 4382764**9**1
4. **Comparing Place Values and solve them:**
   (a) Compare the place value of **3** in **34,52,879** and **63,47,281**. Which is greater?
   (b) In the number **5,42,396** how many times is the place value of 4 greater than its face value?
   (c) In 6,28,345, how does the place value of 6 compare to the place value of 2?

5. **Write Numbers in Words in the given instruction:**
   (a) Write 76,89,540 in words using the Indian system of numeration.
   (b) Express 1,23,45,678 in words using the International system of numeration.
   (c) Write 5,61,29,834 in words and identify the place value of 6.
   (d) Convert 2,48,76,509 into words and identify the place value of 8.
6. **Fine Place Value Patterns and solve them:**
   (a) In 8,54,92,361, write the place values of 5, 4, and 9, then arrange them in descending order.
   (b) The number is 9,84,312. Write it as the sum of its place values.
   (c) In 7,13,205, if the digit 1 is replaced with 9, how does the number change?
   (d) A library has 4,56,892 books. What is the place value of 4, and what is the difference between its place value and face value?
   (e) The total rainfall in a city last year was 9,35,689 millimeters. What is the place value of 9, and how is it different from the face value?
   (f) A total of 5,64,389 cars were sold in a year. What is the place value of 6, and how does it differ from the face value of 6?
   (g) A city received 3,47,850 millimeters of rainfall last year. What is the place value of 3, and how does it compare to the face value?
   (h) If the number 7,68,920 is rounded to the nearest thousand, what is the rounded number?
   (i) What is the sum of the place values of the digits 5 and 3 in the number 54,32,109?
   (j) Write the number 8,43,56,712 in words using the Indian system of numeration.
   (k) Convert 4,56,789 into words using the International system of numeration.
   (l) How many lakhs are in the number 56,98,432?
7. **Column I (Items) & Column II (Values)**

Column I:	Column II:
(i) Largest 4-digit number	(a) 1,000,000,000
(ii) One trillion	(b) 1,000
(iii) 100 hundred	(c) 100,000
(iv) One thousand million	(d) 1,00,00,000
(v) One lakh	(e) 9999
(vi) 1,000 crores	(f) 10,00,00,000
(vii) 1 billion	(g) 1,000,000,000,000

Patterns of Numbers on the Number Line

Understanding number patterns on a number line helps students visualize how numbers increase or decrease. Here's a simplified explanation, focusing on common patterns found on a number line:

Square Numbers

- **Pattern:** Numbers are the result of multiplying a number by itself.
- **Example:** 1050, 2260, 3280, 4480, 5600, 7060 ...

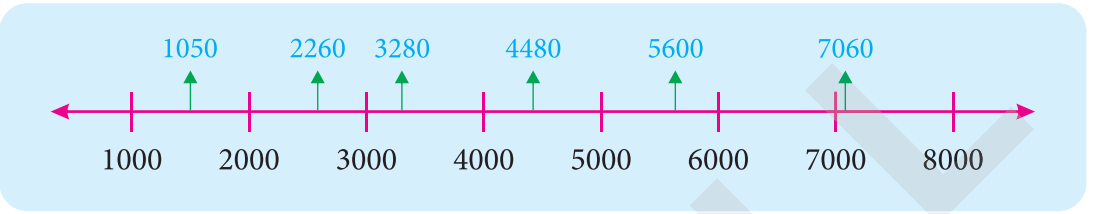


Fig. 3.4

Visualizing the Patterns on a Number Line

- **Zero (0):** The starting point of the number line.
- **Positive Numbers:** Move to the right of 0 (increasing numbers).
- **Negative Numbers:** Move to the left of 0 (decreasing numbers).
- **Intervals:** The space between numbers indicates the order and distance between them.

Comparison of Numbers:

Comparing numbers helps in determining which number is greater, smaller, or equal. Here's a detailed explanation on how to compare numbers:

Steps to Compare Numbers:

1. **Compare the Number of Digits:**
   - The number with more digits is always greater.

   Example: 345 (3 digits) is less than 12345 (5 digits).
2. **Compare from Left to Right:**
   - Start by comparing the digits at the leftmost place (highest place value).
   - If the leftmost digits are the same, move to the next digit, and so on.
3. **Use of Symbols:**
   - **Greater than: >**

   Example : 8 > 5 (8 is greater than 5)
   - **Less than: <**

   Example : 4 < 9 (4 is less than 9)
   - **Equal to : =**

Example : 7 = 7 (both numbers are equal)

Methods for Comparing Different Types of Numbers:

1. Comparing Whole Numbers

Example : Compare 54894 and 45956.

Solution: Both numbers have 5 digits.

Start from the left: 5 (ten thousands) vs 4 (ten thousands).

Since 5 is greater than 4, 548 > 459.

Example : Compare 23456 and 2345.

Solution: 23456 has 5 digits, and 2345 has 4 digits.

Since 23456 has more digits, it is greater.

23456 > 2345.

Rule

1. **For whole numbers:** More digits = greater number.
2. **For decimals:** Compare the whole number part first, then the decimal part.
3. **For negative numbers:** The number closest to zero is greater.

2. Comparing Decimal Number

Compare digits from left to right, starting with the whole part, then the decimal part.

Example: Compare 3.56 and 3.65.

Solution: Both numbers have the same whole part (3).

Compare the tenths place: 5 (in 3.56) vs 6 (in 3.65).

Since 6 > 5, 3.65 > 3.56.

Example: Compare 5.002 and 5.02.

Solution: Both numbers have the same whole part (5).

Compare the tenths place: 0 (in 5.002) vs 0 (in 5.02).

Compare the hundredths place: 0 (in 5.002) vs 2 (in 5.02).

Since 2 > 0, 5.02 > 5.002.

3. Comparing Negative Number

Negative numbers are smaller as they move away from 0.

Example : Compare –5 and –8.

Solution: Since –5 is closer to 0, –5 > –8.

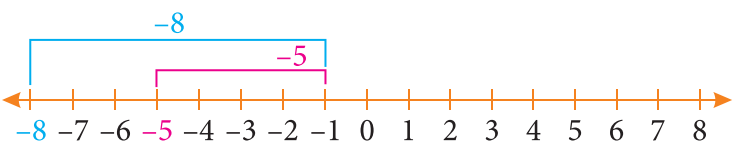


Fig. 3.5

Example : Compare –12 and –7.

Solution: Since –7 is closer to 0, –7 > –12.

Example : Arrange the following numbers in ascending order:

32047, 652130, 254836, 7812345, 542781, 95124, 30842

Solution: Given Numbers:

32047, 652130, 254836, 7812345, 542781, 95124, 30842

Steps to Arrange in Ascending Order

1. **Compare the numbers and find the smallest:**

   Look at the numbers one by one:

   32047, 652130, 254836, 7812345, 542781, 95124, 30842

   The smallest number is **30842**.

2. **Find the next smallest number:**

   From the remaining numbers:

   32047, 652130, 254836, 7812345, 542781, 95124

   The next smallest number is **32047**.

3. **Repeat the process:**

   From the remaining numbers: 652130, 254836, 7812345, 542781, 95124

   The next smallest number is **95124**.

   - 254836
   - 542781
   - 652130

   The last number is **7812345**.

   The numbers in ascending order are:

   30842, 32047, 95124, 254836, 542781, 652130, 7812345.

Example : Arrange the following numbers in descending order:

10238, 752131, 4512368, 1385479, 652307, 230514, 786123

Solution: Given Numbers:

10238, 752131, 4512368, 1385479, 652307, 230514, 786123

Steps to Arrange in Descending Order

1. Compare the numbers and find the largest:

   Look at all the numbers:

   10238, 752131, 4512368, 1385479, 652307, 230514, 786123

   The largest number is **4512368**.

2. **Find the next largest number:**

   From the remaining numbers

- 10238, 752131, 1385479, 652307, 230514, 786123

The next largest number is **1385479**.

3. **Continue finding the next largest:**

From: 10238, 752131, 652307, 230514, 786123

The next largest number is **786123**.

- 752131
- 652307
- 230514

The last remaining number is 10238.

The numbers in descending order are:

4512368, 1385479, 786123, 752131, 652307, 230514, 10238.

Example : Using the digits 1, 3, 5, 7, and 9:

1. Write the smallest and largest odd 3-digit numbers you can form.
2. Write the smallest and largest even 3-digit numbers you can form.

(Digits cannot be repeated.)

Solution : Odd 3-digit numbers

To make a number odd, the last digit must be an odd digit.

Smallest odd 3-digit number: Use the smallest odd digit for the hundreds place, the next smallest for the tens, and the smallest remaining odd digit for the ones place:

Answer: 135

Largest odd 3-digit number: Use the largest odd digit for the hundreds place, the next largest for the tens, and the largest remaining odd digit for the ones place

Answer: 975

Solution : Even 3-digit numbers

To make a number even, the last digit must be an even digit. However, the given digits are all odd (1, 3, 5, 7, 9), so it is not possible to form an even 3-digit number.

Example : Write all 3-digit numbers using the digits 2, 4, and 8, taking each digit only once. Arrange the numbers in ascending order.

Solution: Place each digit in the units place one by one and interchange the tens and hundreds places for the remaining digits as follows:

1. **When 2 is at the units place:** Numbers are 842 and 482.
2. **When 4 is at the units place:** Numbers are 824 and 284.
3. **When 8 is at the units place:** Numbers are 248 and 428.

So, the required numbers are:

842, 482, 824, 284, 248, and 428.

Numbers in ascending order:

248, 284, 428, 482, 824, and 842.

Example : What is the difference between the greatest and smallest numbers that can be formed by rearranging the digits 3, 1, 5, and 9?

Solution: To find the greatest and smallest numbers that can be formed by rearranging the digits 3, 1, 5, and 9:

1. Greatest Number: Arrange the digits in descending order:

   9, 5, 3, 1 → The greatest number is 9531.

2. Smallest Number: Arrange the digits in ascending order:

   1, 3, 5, 9 → The smallest number is 1359.

   Now, to find the difference between the greatest and smallest numbers:

   9531−1359=81729531 - 1359 = 8172

   The difference is 8172.

Example : Plot the following on a number line and find the number that is greater than 54 but less than 58: 52, 55, 57, 60.

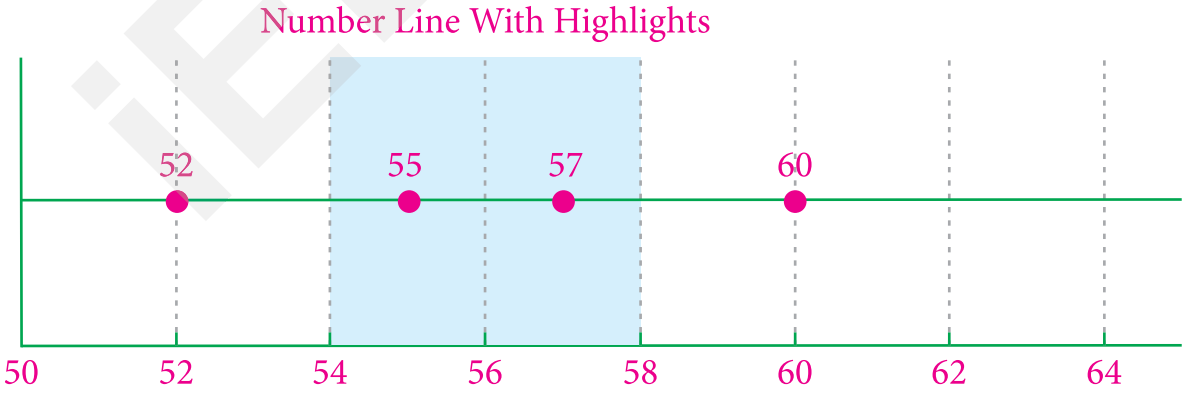


Fig. 3.6

On the number line, the numbers that are greater than 54 but less than 58 are **55** and **57**.

Exercise 3.2

Knowledge Application

1. **Rearrange the digits 7, 5, 3, 2 to form the greatest and smallest possible three-digit numbers.**
2. **Find the greatest number from the following set:**

   1,232; 1,232,000; 1,220,000; 1,300,000.
3. **Mark the numbers on a number line. What is the middle number in this set?**

   (a) 15, 20, 35, 50,60 (b) 56, 59, 62, 67,70

   (c) 60,70,65,85,90 (d) 30,45,25,50,60
4. **On a number line, if 25 is placed between 20 and 30, where would 27 be placed? Which number is closest to 27:20 or 30?**
5. **Using the digits 1, 8, 5, 3, form the largest possible four-digit number that is less than 5,000.**
6. **Compare the following numbers and write the correct symbol (<, >, =):**

   (a) 562,384 ___ 562,438 (b) 823,690 ___ 829,603

   (c) 100,345 ___ 103,450 (d) 45,130 ___ 45,130

   (e) 769,580 ___ 759,608 (f) 73,891 ___ 73,198

   (g) 45,672 ___ 45,672 (h) 239,581 ___ 239,815

   (i) 872,540 ___ 875,430 (j) 3,465 ___ 3,456
7. **Identify the smallest number from the following numbers:**

   4,098; 4,809; 4,880.
8. **Plot the following numbers on a number line:**

   10, 50, 100, 150, 200.

   Which number is between 50 and 100 on the number line?
9. **Rearrange the digits 4, 6, 2, 0, and 1 to form the largest and smallest possible five-digit numbers.**
10. **Find the difference between the largest and smallest numbers formed using the digits 4, 5, 2, and 9.**
11. **Plot the numbers 56, 59, 62, 67 on a number line.**

    What is the smallest and greatest number on the number line?
12. **Arrange the following numbers in ascending order (from smallest to largest):**

    (a) 45234, 45214, 45243, 45241 (b) 3.14, 2.98, 3.05, 2.45

(c) 67854, 56823, 54567, 68000 (d) 347892, 347828, 347922, 347902, 347892

13. Arrange the following numbers in descending order (from largest to smallest).

(a) 89321, 90421, 85321, 89102 (b) 983213, 982432, 981543, 982341

(c) 4.12, 5.67, 3.45, 6.89. (d) 8756234, 8765432, 8765234, 8752345

14. Arrange the following numbers in ascending order and then descending order.

(a) 15682, 16200, 16100, 15700 (b) 120001, 120000, 119999, 120050, 119998

(c) 568, 423, 598, 347 (d) 5.367, 5.68, 5.34, 5.306, 5.74

15. Write the numbers from the greatest to the smallest and from the smallest to the greatest using the digits 6, 3, 8, 4, and 2.

(a) Arrange the numbers in order from greatest to smallest.

(b) Arrange the numbers in order from smallest to greatest.

(c) By reversing the order of digits of the greatest number made by these five digits, what number do you get?

Supercells

A supercell can refer to a larger unit of a repetitive pattern or a structure. In geometry or grid-based problems, the term could be used to describe a large unit that contains smaller cells. A Supercell is a cell that contains a number larger than all its neighboring cells (cells directly next to it, either above, below, left, or right).

72	27	19	12	70	**89**	22	11

180	526	621	**699**	226	448	**589**	185

Fig. 3.7

The shaded cells are called Supercells. Here, the number is shaded if the adjacent number are smaller than that number. For eg. 72 is shaded as 27 < 72.89 is shaded as 70 < 89 and 22 < 89 Similarly, in th table, 621 < 699, 226 < 695, so 699 is shaded.

Exercise 3.3

Knowledge Application

1. Colour or mark the sercells in the table below:

(a)

2758	5268	2458	6584	4587	6254	5249	1025	2548

(b)

1105	2548	5428	9852	4258	3584	8524

(c)

2257	6250	1189
8453	9852	5248
4321	9158	9999

(d)

8524	5248	9562	2548
2542	52486	9546	6666
6584	4444	2547	1125
3254	7542	5924	5842

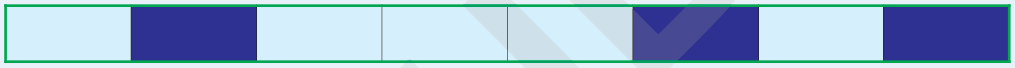
2. Fill the table below with numbers from 100 to 1000 (without repetitions) so that we get as many supercells as possible.

(a)

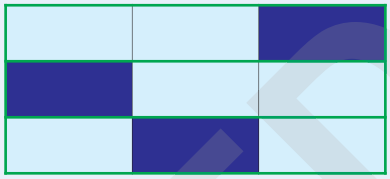
(b)

3. Fill the tables below with 4-digit numbers such that the supercells are exactly the shaded cells.

(a)



(b)



4. In the table, if the number 76 is in the center, we check if it is greater than the numbers surrounding it: 54 (left), 23 (right), 88 (below), and 67 (above). If 76 is greater than all of these, then it is a Supercell.

5. In the following table, some numbers are shaded.

	5428	
		9532
1248		8425

(a) Find all the supercells in the table.

(b) Identify all the supercells in the grid.

(c) Which is the biggest number in the table?

Playing with Digits

"Playing with Digits" typically refers to a chapter that focuses on number patterns, place value, and operations with digits. This topic helps students understand the structure and properties of numbers, including:

1. **Place Value System:** Understanding how digits in a number represent different values based on their position. For example, in the number 348, the place value of 3 is 300, of 4 is 40, and of 8 is 8.
2. **Forming Numbers:** Creating different numbers by rearranging or adding digits. For example, using the digits 2, 5, and 7, you can form numbers like 257, 572, 725, etc.
3. **Patterns with Digits:** Identifying patterns in numbers, such as even and odd numbers, palindromes, or numbers formed using repetitive digits like 111, 222, etc.
4. **Operations on Numbers:** Applying addition, subtraction, multiplication, and division to numbers formed by different combinations of digits.
5. **Small Number Tricks:** Learning shortcuts or tricks for quickly calculating with numbers. For example, recognizing that numbers ending in 0 or 5 are divisible by 5.

Example : Identify whether the following numbers are divisible by 9 or not: 153, 274, 369, 846.

To determine if a number is divisible by 9, you can add up the digits of the number.

If the sum of the digits is divisible by 9, then the number itself is divisible by 9.

Let's check each number:

1. 153:

Sum of digits: 1 + 5 + 3 = 9

Since 9 is divisible by 9, 153 is divisible by 9.

2. 274:

Sum of digits: 2 + 7 + 4 = 13

Since 13 is not divisible by 9, 274 is not divisible by 9.

3. 369:

Sum of digits: 3 + 6 + 9 = 18

Since 18 is divisible by 9, 369 is divisible by 9.

4. 846:

Sum of digits: 8 + 4 + 6 = 18

Since 18 is divisible by 9, 846 is divisible by 9.

So, the numbers divisible by 9 are: 153, 369, and 846.

Points to Remember

A number is divisible by:

- 2 if its last digit is 0, 2, 4, 6, or 8.
- 3 if the sum of its digits is divisible by 3.
- 5 if it ends in 0 or 5.
- 9 if the sum of its digits is divisible by 9

Example : A number is divisible by 11 if the difference between the sum of the digits in odd positions and the sum of the digits in even positions is a multiple of 11 (or 0). Check if the number 531024 is divisible by 11.

To check if the number 531024 is divisible by 11, we will:

1. Separate the digits into odd and even positions.
2. Calculate the sum of the digits in odd positions and the sum of the digits in even positions.
3. Find the difference between these sums.
4. If the difference is divisible by 11 (or 0), the number is divisible by 11.

Let's break down the number 531024:

Odd positions: 5, 1, 2 (1st, 3rd, 5th digits)

Even positions: 3, 0, 4 (2nd, 4th, 6th digits)

Now, we'll calculate the sums and check the difference.

The difference between the sum of the digits in odd positions and the sum of the digits in even positions is 1, which is not divisible by 11. Therefore, the number 531024 is not divisible by 11.

Exercise 3.4

Knowledge Application

1. **Write the next three numbers in the pattern: 1, 11, 111, 1111, _____, _____, _____.**
2. **A number is formed by repeating the digit 4 three times (i.e., 444). What is the value of this number when it is divided by 4?**
3. **If you multiply any number by 9, the sum of the digits of the product is always 9. Verify this with the number 56.**
4. **What is the remainder when the number 987654321 is divided by 9?**
5. **Find the sum of all numbers formed by arranging the digits 2, 4, 6, and 8 in all possible 3-digit combinations without repetition of digits.**
6. **Using the digits 2, 4, and 6, form all the possible three-digit numbers. How many different numbers can you form**
7. **The sum of two digits is 15. If the first digit is 7, what is the second digit?**
8. **Arrange the digits 3, 8, 1, 5, and 0 to form the largest and smallest possible numbers. What is the difference between the largest and smallest number?**

Playing with Number Patterns

Example : Find the sum of all the numbers in the above triangle pattern

Method 1: Multiply each number by its frequency and add the results.

Method 2: Sum in all triangle = $15 \times 4 + 25 \times 4 + 40 \times 8 = 480$

The other way, can be:

Sum in one triangle = $15 \times 1 + 25 \times 1 + 40 \times 2 = 120$

Sum of all numbers = $120 \times 4 = 480$

15	40	15	25
25	40	40	40
15	40	15	40
40	25	40	25

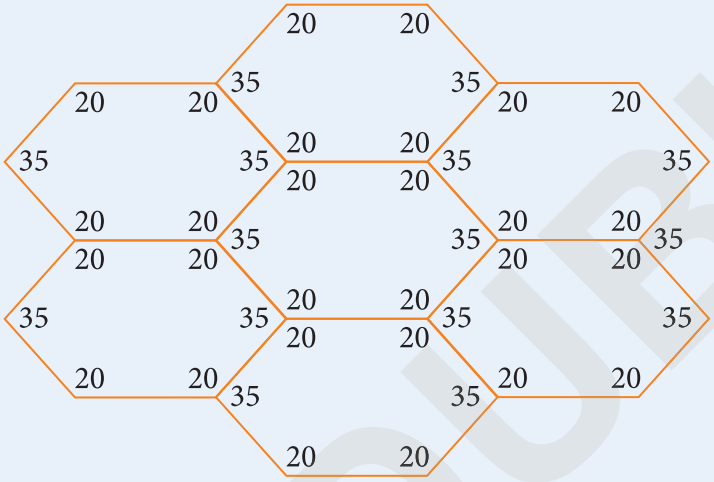
Fig. 3.8

Exercise 3.5

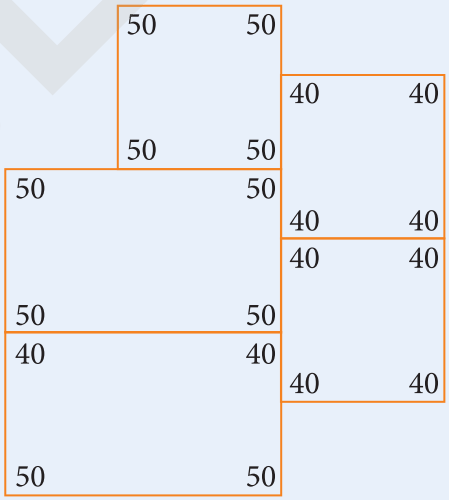
Knowledge Application

1. Find the sum of the numbers given in pattern in each of the following figures:

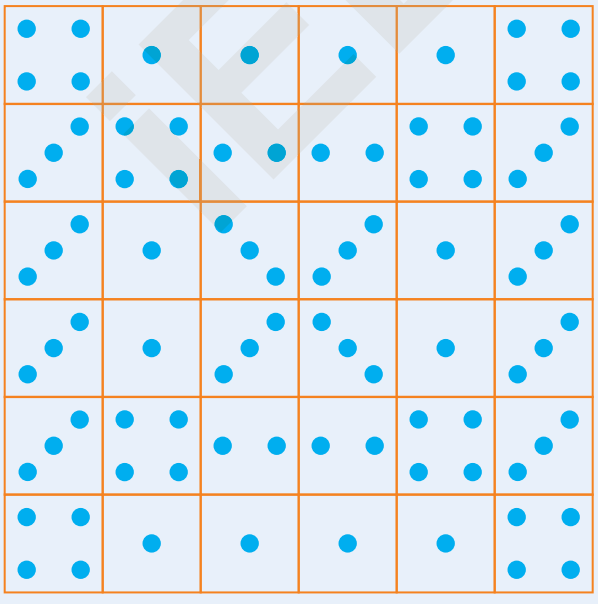
(a)



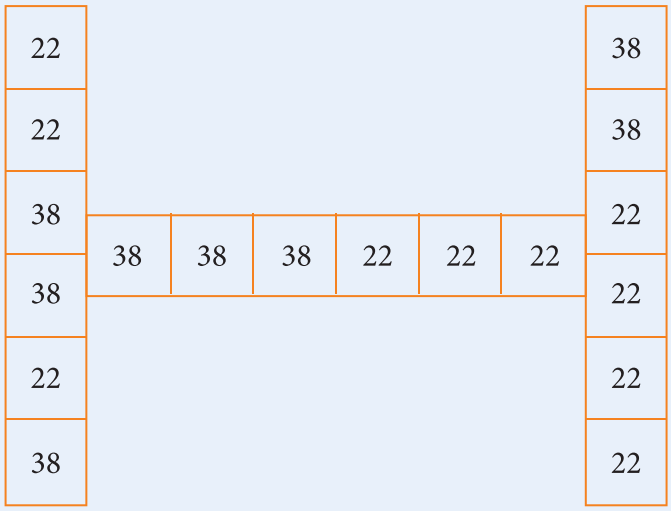
(b)



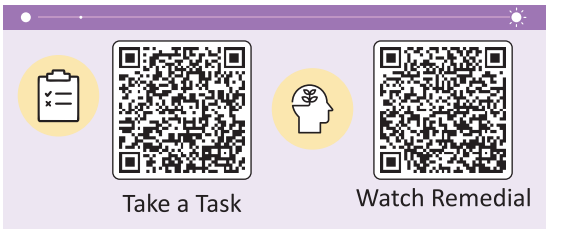
(c)



(d)



Operations on Numbers



Students are typically introduced to operations on numbers, which involve using basic mathematical operations to solve problems. These operations are essential for understanding arithmetic and include: addition, subtraction, multiplication and division. We shall study about this with large numbers.

Addition of large numbers

When teaching the addition of large numbers , it's important to focus on a structured approach. Here's how to add large numbers step-by-step:

Steps for Adding Large Numbers:

1. **Align the Numbers:** Write the numbers vertically, one under the other, ensuring the digits are aligned by place value (ones, tens, hundreds, thousands, etc.).
2. **Start from the Right:** Begin adding the numbers from the ones place (rightmost digit).
3. **Carry Over:** If the sum of any column exceeds 9, carry over the extra value to the next place value. For example, if you add 7 and 5, the result is 12. You write 2 in the ones place and carry over 1 to the tens place.
4. **Move to the Next Column:** After adding the ones place, move to the tens, hundreds, and continue similarly to the left.
5. **Final Result:** Continue adding each column and carry over when necessary until the final sum is obtained.

Add 4457 and 6789

$$\begin{array}{r} 4\ 4\ 5\ 7 \\ +\ 6\ 7\ 8\ 9 \\ \hline 11\ 2\ 4\ 6 \end{array}$$

Subtraction of large numbers

Subtraction of large numbers involves a similar process to addition, but this time you'll be taking digits away. Here's a step-by-step guide on how to subtract large numbers:

Steps for Subtracting Large Numbers:

1. **Align the Numbers:** Write the numbers vertically, one under the other, ensuring that the digits are aligned by place value (ones, tens, hundreds, thousands, etc.).
2. **Start from the Right:** Begin subtracting from the rightmost digit (the ones place).
3. **Borrow if Necessary:** If the top digit is smaller than the bottom digit (i.e., you can't subtract directly), you need to borrow from the next higher place value.

   For example, if you need to subtract 7 from 3 in the ones place, you borrow 1 from the tens place, making the 3 become 13 and the tens place decrease by 1.
4. **Move to the Next Column:** After subtracting one column, move to the next (tens, hundreds, etc.), remembering to borrow when needed.

5. **Final Result:** Continue until you've subtracted all the digits.

Example:

Let's subtract 9367 from 87582:

$$\begin{array}{r} 8\,7\,5\,8\,2 \\ -\,9\,3\,6\,7 \\ \hline 7\,8\,2\,1\,5 \end{array}$$

Multiplication of large numbers

Multiplying large numbers involves breaking down the process into manageable steps, using the multiplication of smaller numbers. Here's how you can multiply large numbers step-by-step:

Steps for Multiplying Large Numbers

1. **Write the Numbers Vertically:** Place the numbers vertically, one under the other, ensuring proper alignment by place value (ones, tens, hundreds, etc.).
2. **Multiply Each Digit of the Second Number by the First Number:** Start by multiplying the first digit of the second number by each digit of the first number (from right to left).

   Write the result below the line, aligning it according to the place value of the digit you're multiplying by.
3. **Carry Over if Necessary:** Just like addition or subtraction, if the product of any multiplication exceeds 9, carry over the extra value to the next column.
4. **Move to the Next Digit:** Move to the next digit of the second number and repeat the multiplication for all digits.

   When multiplying with the next digit, remember to shift the results to the left by one place to account for the tens, hundreds, etc.
5. **Add the Partial Products:** After completing the multiplication for each digit of the second number, add the results (partial products) together to get the final product.

Example:

Let's multiply 8945 by 67.

$$\begin{array}{r} 8\,9\,4\,5 \\ \times\quad 6\,7 \\ \hline 6\,2\,6\,1\,5 \\ +\,5\,3\,6\,7\,0\quad \\ \hline 5\,9\,9\,3\,1\,5 \end{array}$$

Division of Large numbers

Dividing large numbers follows a structured approach similar to multiplication but involves repeated subtraction. Here's a step-by-step guide on how to divide large numbers:

Steps for Dividing Large Numbers

1. **Set Up the Division:** Write the division in the long division format. The larger number (dividend) goes inside the division box, and the smaller number (divisor) goes outside.
2. **Divide the First Few Digits:** Start with the leftmost digits of the dividend (the number inside the division box).

   Determine how many times the divisor can fit into the selected digits without exceeding them. This is the quotient for that portion.

3. **Multiply and Subtract:** Multiply the divisor by the quotient you found and write the result below the selected digits of the dividend.

   Subtract the result from the selected digits of the dividend.

4. **Bring Down the Next Digit:** Bring down the next digit of the dividend and repeat the process.

   Continue dividing, multiplying, and subtracting until all the digits of the dividend have been used.

5. **Final Result:** Once you've worked through all the digits, the final quotient is the answer to the division problem.

   If there is a remainder, write it as "remainder X" or as a decimal (depending on the problem).

Example:

Let's divide 8745 by 23.

```
      3 8 0
   ┌──────
23 ) 8 7 4 5
     −6 9
      1 8 4
     −1 8 4
        0 5
```

Example : A charity event sold 1,050 tickets on the first day, 1,280 on the second day, and 1,540 on the third day. How many more tickets were sold on the third day compared to the first day?

To find how many more tickets were sold on the third day compared to the first day, subtract the number of tickets sold on the first day from the number of tickets sold on the third day.

Given:

- Tickets sold on the first day = 1,050
- Tickets sold on the third day = 1,540

Solution: 1,540 − 1,050 = 490

So, 490 more tickets were sold on the third day compared to the first day.

Example : A concert was held for five days. The number of tickets sold on each day was: 1,236, 1,472, 1,830, 2,150, and 2,640. Find the total number of tickets sold.

To find the total number of tickets sold over the five days, we add the number of tickets sold each day.

Given:

- **Day 1:** 1,236
- **Day 2:** 1,472
- **Day 3:** 1,830
- **Day 4:** 2,150
- **Day 5:** 2,640

Solution: 1,236 + 1,472 + 1,830 + 2,150 + 2,640

= 9,328

So, the total number of tickets sold is **9,328**.

Example : A factory produces 2,150 toys a day. How many toys will it produce in 30 days?

To find out how many toys the factory will produce in 30 days, multiply the number of toys produced per day by 30.

Given:

- Toys produced per day = 2,150
- Number of days = 30

Solution:

$$2{,}150 \times 30 = \frac{64{,}5002{,}150}{\text{times } 30} = 64{,}500$$

So, the factory will produce 64,500 toys in 30 days.

Example : A factory produces 15,000 cookies in a month. If each packet contains 50 cookies, how many full packets will be made, and how many cookies will remain unpacked?

To find how many full packets will be made and how many cookies will remain unpacked, we divide the total number of cookies by the number of cookies per packet.

Given:

- Total cookies = 15,000
- Cookies per packet = 50

Step 1: Find the number of full packets by dividing the total cookies by the number of cookies per packet:

15,000 ÷ 50 = 300 full packets

Step 2: Find how many cookies remain unpacked by calculating the remainder:

15,000 – (300 × 50) = 15,000 – 15,000 = 0

So, 300 full packets will be made, and there will be no cookies remaining unpacked.

Example : A warehouse has 50,000 products. 9,500 are packed in large cartons, 12,000 in medium cartons, and 10,500 in small cartons. How many products are not packed yet?

To find how many products are not packed yet, we need to calculate the total number of products packed and subtract it from the total number of products in the warehouse.

The number of products packed in each carton type is:

- Large cartons: 9,500
- Medium cartons: 12,000
- Small cartons: 10,500

Now, let's add the number of products packed in all cartons:

Total packed products = 9,500 + 12,000 + 10,500 = 32,000

Now, subtract the total packed products from the total number of products in the warehouse:

Products not packed = 50,000 − 32,000 = 18,000

So, 18,000 products are not packed yet.

Exercise 3.6

Knowledge Application

1. **Does the following statement stand True (T) or False (F):**
   (a) A concert hall has 500 seats. If it is 50% full, 250 tickets have been sold.
   (b) If 40% of the 5,000 employees of a company commute by bus, then 2,000 employees travel by bus.
   (c) A factory produces 1,000 units every day. In 10 days, the factory will produce 9,000 units.
   (d) A company has 25,000 products to pack. If each box contains 50 items, the number of boxes required to pack all products is 500.
   (e) A school in class VI has 2,000 students. If 30% of the students are absent, then 600 students are absent.
   (f) If a store has 1,000 items and 25% of them are sold, 250 items remain unsold.

2. **Determine the following statements with Decimals:**
   (a) What is the sum of 12.56 and 8.99?
   (b) Subtract 23.892 from 45.678
   (c) Multiply of large numbers 3.75 and 4.56.
   (d) Division of Large numbers 150.890 ÷ 28.75.

3. **During a book fair, the number of tickets sold on each day for a week were as follows: 1,520, 2,190, 2,760, 3,110, 3,450, 4,080, and 4,320. How many tickets were sold in total for the week?**

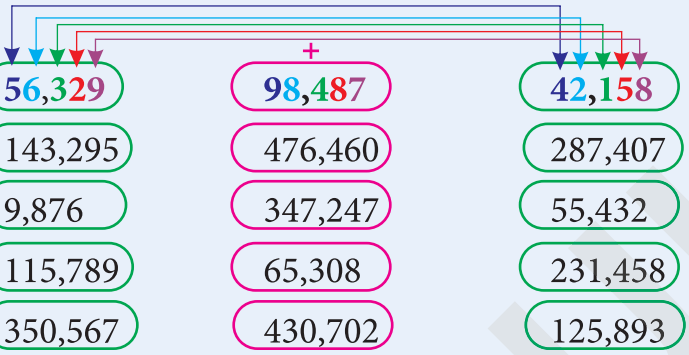
4. **There are 35,000 workers in a factory. Out of these, 4,500 workers attend their duty by car, 10,000 by bus, and 7,200 by train. How many workers attend by foot?**

5. A company manufactures 1,235 units of a product every day. How many units will the company produce in the first 15 days of a month?

6. A bakery bakes 7,800 cakes in a month. If each box holds 12 cakes, how many boxes will be packed, and how many cakes will remain?

7. A farm produces 7,200 eggs per day. How many eggs will be produced in a month of 30 days?

8. In the rectangular box given below, some differences are written which are obtained by addition two numbers given on the two sides. Find the numbers to match the difference. One is done for you.



9. A company packs 24,000 books in boxes. If each box can hold 120 books, how many boxes will be needed and how many books will be left unpacked?

10. A warehouse has 50,000 products. 9,500 are packed in large cartons, 12,000 in medium cartons, and 10,500 in small cartons. How many products are not packed yet?

11. A cinema sold 2,250 tickets on the first day, 2,850 on the second day, 3,100 on the third day, and 4,000 on the fourth day. Find the total number of tickets sold during these four days.

12. A farmer harvested 12,000 apples. 20% of the apples were sold immediately. How many apples were sold immediately?

13. A factory increases its production by 25% every year. If the factory produced 12,000 units last year, how many units will it produce next year?

14. Out of 15,000 employees in a company, 40% travel by train, 25% by bus, and 35% by car. How many employees travel by car?

15. A cinema sells tickets for 150 seats per show. If there are 18 shows in a day, how many seats are sold in total on that day?

An Unsolved Mystery: The Collatz Conjecture

In 1937, German mathematician Lothar Collatz proposed a fascinating conjecture that remains unsolved to this day. According to his rule, starting with any positive whole number and following the steps below, the sequence will always eventually reach 1:

1. If the number is even, divide it by 2.
2. If the number is odd, multiply it by 3 and add 1.

This seemingly simple rule has captivated mathematicians because, despite extensive testing on countless numbers, no one has been able to prove that the sequence always ends in 1 for every positive integer.

Here are some example sequences:

- **Starting with 10:** 10, 5, 16, 8, 4, 2, 1
- **Starting with 15:** 15, 46, 23, 70, 35, 106, 53, 166, 83, 256, 128, 64, 32, 16, 8, 4, 2, 1
- **Starting with 50:** 50, 25, 76, 38, 19, 58, 29, 88, 44, 22, 11, 34, 17, 52, 26, 13, 40, 20, 10, 5, 16, 8, 4, 2, 1

Palindromes in Mathematics

In mathematics, palindromes are numbers that read the same forward and backward. These numbers are simple and fun to work with, making them an exciting topic for young learners.

Examples of Palindromic Numbers

- **Two-digit palindromes:** 11, 22, 33, 44, 55, 66, 77, 88, 99
- **Three-digit palindromes:** 101, 121, 131, 141, 151, 161, 171, 181, 191
- **Four-digit palindromes:** 1001, 1221, 1331, 1441, 1551, 1661, 1771, 1881, 1991

Properties of Palindromic Numbers

1. **Symmetry:** A palindromic number looks the same when reversed.
2. **Patterns:** Palindromic numbers often follow specific patterns, making them easy to identify.
3. **Addition and Palindromes:** Sometimes, adding a number to its reverse can form a palindrome.

Activities for Students

1. Identify Palindromes:

- List all palindromic numbers between 1 and 1000.

2. Create Your Own Palindrome:

- Take a number, reverse its digits, and add them. Repeat the process until you get a palindrome. Example:
- Start with 56 → Reverse: 65 → Add: 56+65=12156 + 65 = 121 (a palindrome!).

3. Odd and Even Palindromes:

✦ Identify palindromes that are odd (e.g., 121, 131) and even (e.g., 44, 1221).

4. Word Palindromes in Numbers:

✦ Numbers can also be written in words to form palindromes. For example: "One" and "121" are both palindromes when reversed.

Clock and Calendar Numbers in Mathematics

Clock and calendar numbers are introduced as fun and practical concepts to help students understand patterns, arithmetic, and the passage of time. These topics are often connected to real-life scenarios, making them relatable and engaging.

Clock Numbers

Clock numbers deal with understanding time and its cyclical nature.

Key Concepts

1. 12-Hour and 24-Hour Format

✦ In a 12-hour clock, numbers repeat after 12 (e.g., 13:00 is 1:00 PM).

✦ In a 24-hour clock, times are written without repetition (e.g., 1:00 PM is 13:00).

2. Addition and Subtraction on a Clock

✦ If it's 07:00 now, what time will it be in 5 hours?

✦ 7 + 5 = 12, so it will be 12:00.

✦ For subtraction: If it's 9:00, what time was it 4 hours ago?

✦ 9 – 4 = 5, so it was 5:00.

3. Angles on a Clock:

✦ Each hour on the clock represents 30° (360° divided by 12).

✦ **Example:** At 03:00, the hands form a 90° angle.

Points to Remember

A number is divisible by:

- Leap Year Trick:
- A year is a leap year if it is divisible by 4.
- If the year ends in 00, it must be divisible by 400.
- Every year starts 1 day later than the previous year (except leap years).
- A century year (like 1900, 2000) does not follow the normal leap year rule unless divisible by 400.

Calendar Numbers

✦ Calendar numbers involve understanding dates, months, years, and days of the week.

Key Concepts

1. Days in Months

✦ Some months have 30 days (e.g., April, June, September, November), others have 31 days (e.g., January, March, May), and February has 28 or 29 days (leap years).

2. Leap Years

✦ A leap year occurs every 4 years. A year is a leap year if it is divisible by 4 but not by 100, unless it is also divisible by 400.

- **Example:** 2020 was a leap year, but 1900 was not.

3. Days of the Week:

- If today is Monday, what day will it be 10 days from now?
- Days repeat in a cycle of 7. 10 mod 7 = 3, so it will be Thursday.

The Magic Number of Kaprekar

The Kaprekar Constant, named after the Indian mathematician D.R. Kaprekar, is a fascinating concept in mathematics. It is best demonstrated using a four-digit number, and the process always leads to the magic number 6174 in at most 7 iterations (excluding numbers with all identical digits).

Kaprekar's Process

1. Choose a four-digit number (at least two digits must be different).
2. Arrange the digits in descending order and ascending order to form two numbers.
3. Subtract the smaller number from the larger number.
4. Repeat the process with the result until you reach the magic number 6174.

Example

Let's start with the number 3524

i. Arrange digits:

- Descending: 5432
- Ascending: 2345

ii. Subtract: 5432–2345 = 3087

iii. Repeat

- Descending: 8730
- Ascending: 0378
- Subtract: 8730 – 0378 = 8352

iv. Repeat:

- Descending: 8532
- Ascending: 2358
- Subtract: 8532 – 2358 = 6174

Once **6174** is reached, repeating the process will always give **6174**.

Points to Remember

Why is 6174 Special?

- Mathematicians have not found any other number like 6174!
- It is a unique number that appears mysteriously in this process.
- It is called a "self-attracting number" because no matter where you start, you end at 6174.

Special Cases

- If the number has all identical digits (e.g., 1111), the result will always be 0.
- For numbers with fewer than 4 digits, leading zeros must be added (e.g., 21 becomes 0021).

Estimation in Mathematics

Estimation is an important mathematical skill that involves finding an approximate value instead of an exact one. It's often used when we want to get a quick idea of a quantity or when precision is not critical. Estimation helps in making calculations easier and faster, especially in everyday situations.

Key Concepts of Estimation

1. **Rounding Numbers :** Rounding means adjusting a number to a simpler or more convenient value. For example, rounding to the nearest 10, 100, or 1000 makes numbers easier to work with.

   Example:

   - 347 rounded to the nearest 10 is 350.
   - 625 rounded to the nearest 100 is 600.

2. **Estimating Sums and Differences:** When adding or subtracting, you can round the numbers first, then perform the operation.

   Example:

   Estimate 87+ 6887 + 6887 + 68 by rounding both numbers to the nearest 10:

   $90 + 70 = 160$

3. **Estimating Products and Quotients:** When multiplying or dividing, round the numbers to a convenient place value and then perform the operation.

   Example:

   - Estimate the product of 42×56 by rounding to the nearest 10:

   $40 \times 60 = 2400$

4. **Using Estimation in Real Life:** Estimation helps in everyday situations like shopping, cooking, or measuring distances where exact numbers may not be necessary but a close approximation is useful.

(i) **Estimation to the Nearest Tens :** Estimating to the nearest ten is a simple and useful skill where we round numbers to the closest multiple of 10. This technique makes large numbers easier to work with, especially in mental math and real-life situations like shopping, measuring, or budgeting.

How to Estimate to the Nearest Tens:

1. Look at the ones place (the last digit)

- If the ones digit is 5 or more, round the number up to the next multiple of 10.
- If the ones digit is less than 5, round the number down to the previous multiple of 10.

Example : Round 27 to the nearest ten.

✦ The ones digit is 7, which is 5 or more, so round up to 30.

(ii) Estimation to the Nearest Hundreds : Estimating to the nearest hundred is a method of rounding numbers to the closest multiple of 100. This helps simplify larger numbers and makes calculations easier, especially when an exact value is not necessary.

Steps for Estimation to the Nearest Hundred:

1. Look at the tens digit (the second-last digit).
2. If the tens digit is 5 or more, round the number up to the next multiple of 100.
3. If the tens digit is less than 5, round the number down to the previous multiple of 100.

Example :

Round 472 to the nearest hundred.

The tens digit is 7, which is 5 or more, so we round up to 500.

(iii) **Estimation to the Nearest Thousands :** Estimating to the nearest thousand is a method of rounding numbers to the nearest multiple of 1,000. This makes it easier to perform quick calculations and work with large numbers when precision is not essential.

Steps for Estimation to the Nearest Thousand:

1. Look at the hundreds digit (the third digit from the right).
2. If the hundreds digit is 5 or more, round the number up to the next multiple of 1,000.
3. If the hundreds digit is less than 5, round the number down to the previous multiple of 1,000.

Example :

Round 3,472 to the nearest thousand.

The hundreds digit is 4, which is less than 5, so we round down to 3,000.

Example : Estimate the following to the nearest tens.

(i) 56, (ii) 139, (iii) 222

Solution:

(i) 56: The ones digit is 6, which is greater than 5, so we round up.56 rounds to 60.

(ii) 139: The ones digit is 9, which is greater than 5, so we round up.139 rounds to 140.

(iii) 222: The ones digit is 2, which is less than 5, so we round down.222 rounds to 220.

Example : Estimate the following numbers to the nearest hundreds

(i) 745 (ii) 1,262

Solution:

(i) Round 745 to the nearest hundred:

The tens digit is 4, which is less than 5, so we round down.745 rounds to 700.

(ii) Round 1,262 to the nearest hundred:

The tens digit is 6, which is greater than 5, so we round up.1,262 rounds to 1,300.

Example : Estimate each of the following to the nearest thousands

(i) 4,123 (ii) 3,758

Solution:

(i) Round 4,123 to the nearest thousand:

The hundreds digit is 1, which is less than 5, so we round down.

4,123 rounds to 4,000.

(ii) Round 3,758 to the nearest thousand:

The hundreds digit is 7, which is greater than 5, so we round up.

3,758 rounds to 4,000.

Example : If you need to estimate the cost of 47 pencils at ₹6 each, round the number of pencils to the nearest 10 and then estimate the total cost.

Solution: To estimate the cost of 47 pencils at ₹6 each by rounding the number of pencils to the nearest 10:

1. Round 47 pencils to the nearest 10:

- The ones digit is 7, which is greater than 5, so we round up.
- 47 rounds to 50 pencils.

2. Estimate the total cost:

- The cost of each pencil is ₹6.
- Multiply the rounded number of pencils (50) by the cost of each pencil (₹6)

₹50 × ₹6 = ₹300.

So, the estimated total cost for 47 pencils, when rounded to the nearest 10, is ₹300.

Points to Remember

- **LCM (Least Common Multiple):** The smallest number that is a multiple of two or more numbers.
- **HCF (Highest Common Factor):** The biggest number that divides two or more numbers completely.
- Estimation helps in quick calculations without needing exact values!

Exercise 3.7

Knowledge Application

1. **What is the Collatz sequence for the number 23? Does it follow the conjecture to reach 1?**
2. **Which of the following numbers are palindromes: 123, 121, 343, 485?**
3. **What is the significance of the date 02/02/2024 in terms of palindromes?**
4. **Is 12:21 PM a palindrome time? Explain why or why not.**
5. (a) What happens when you square 297? Is it a Kaprekar number? Show the process.
   (b) Check if 9999 is a Kaprekar number. Show the steps to prove your answer
   (c) What is the Kaprekar number of 45? Explain the steps to get the answer.
6. **Consider the following questions:**
   (a) Estimate the sum of 468 and 657 by rounding both numbers to the nearest hundred.
   (b) Estimate the product of 76 and 59 by rounding both numbers to the nearest ten.
   (c) Round 92 and 384 to the nearest ten and then estimate the sum.
   (d) Estimate the total cost of 6 items, each costing ₹259, by rounding the cost of each item to the nearest hundred and multiplying.
   (e) Estimate the difference between 538 and 172 by rounding both numbers to the nearest ten.
7. **If a pack of pencils costs ₹34 and you buy 8 packs, estimate the total cost by rounding the price of each pack to the nearest ten.**
8. **Round 897, 1,235, and 2,194 to the nearest hundred, and then find their sum.**
9. **Round 9,876, 4,251, and 1,732 to the nearest thousand, then find their sum.**
10. **If a book costs ₹162 and you buy 3 books, estimate the total cost by rounding the price of each book to the nearest ten.**
11. **Solve the given questions:**
    (a) Is 121 a palindrome? If yes, explain why. If not, give an example of a palindrome.
    (b) Write down the first 5 3-digit palindromes.
    (c) Which of the following numbers are palindromes: 232, 343, 542, 494?
    (d) Write a 4-digit palindrome where the first digit is 6.
    (e) Check if 9889 is a palindrome. Explain your answer.
12. **A company produces 5,632 items in one month and 3,874 items the next month. Estimate the total number of items produced by rounding each number to the nearest thousand.**

Gap Analyzer™
Take a Test

1. Tick (✓) the correct answer:

a. The smallest 4-digit number is:

(i) 999 ☐ (ii) 1000 ☐ (iii) 9999 ☐ (iv) 1111 ☐

b. The sum of the place values of the digits in the number 2035 is:

(i) 35 ☐ (ii) 2305 ☐ (iii) 2055 ☐ (iv) 2000 ☐

c. A number divisible by both 2 and 5 must end with:

(i) 2 ☐ (ii) 5 ☐ (iii) 0 ☐ (iv) 1 ☐

d. The difference between the greatest and smallest 3-digit numbers is:

(i) 100 ☐ (ii) 999 ☐ (iii) 900 ☐ (iv) 899 ☐

e. If a number is divisible by 9, the sum of its digits must be:

(i) A multiple of 3 ☐ (ii) A multiple of 9 ☐

(iii) An even number ☐ (iv) A prime number ☐

2. Provide the missing information in the blanks:

a. An angle greater than 90° but less than 180° is called an _____ angle.

b. The sum of the angles on a straight line is always _____ degrees.

c. The angle formed by the hands of a clock at 3 o'clock is _____ degrees.

d. If two angles are adjacent and their sum is 180°, they are called _____ angles.

e. A right angle measures exactly _____ degrees.

3. A factory packs 315 boxes of items, and each box contains 9 items. How many items are there in total?

4. Rina has 144 stickers and wants to arrange them into equal groups. Each group must contain at least 6 stickers, and the number of stickers in each group should be a factor of 144. How many groups can Rina form?

5. Match the Columns:

Column A	Column B
a) Divisible by 2 and 5	i) 361
b) A prime number less than 10	ii) 444
c) A number with all even digits	iii) 7
d) A perfect square	iv) 20

Custom Learning Path

Scan to Create Your Own Learning Path

Assertion and Reason

Experiential Learning

Each question has two statements, Assertion (A) and Reason (R). Choose the correct option:

A: Both A and R are true, and R is the correct explanation of A.

B: Both A and R are true, but R is not the correct explanation of A.

C: A is true, but R is false.

D: A is false, but R is true.

1. **Assertion (A):** A number divisible by 10 is also divisible by 5.
   Reason (R): Numbers divisible by 10 end in 0.
2. **Assertion (A):** The product of two even numbers is always even.
   Reason (R): Even numbers are divisible by 2.
3. **Assertion (A):** The greatest common factor (GCF) of any two prime numbers is always 1.
   Reason (R): Prime numbers have no common factors other than 1.
4. **Assertion (A):** A number divisible by 6 must be divisible by both 2 and 3.
   Reason (R): 6 is the product of 2 and 3.
5. **Assertion (A):** The sum of the digits of any number divisible by 9 is also divisible by 9.
   Reason (R): Divisibility rules are based on properties of addition.

HOTS (Higher Order Thinking Skills)

Critical Thinking

1. Ravi has 120 pencils, and he wants to divide them into equal groups such that each group contains at least 5 pencils and the number of pencils in each group is a factor of 120. How many groups can Ravi form?
2. A school bus has 28 students. Each student gets one candy. If the total number of candies distributed must be a multiple of 5, how many additional candies should be added?

Case Study

Critical Thinking

A classroom has 36 students who need to be divided into groups for an activity. The teacher wants to ensure:

1. Each group has an equal number of students.
2. The number of students in each group is either a factor of 36 or a multiple of 3.

Questions:

1. List all possible group sizes that satisfy the teacher's conditions.
2. If there are 9 groups, how many students will be in each group?
3. What is the smallest number of groups that can be formed?
4. Is it possible to have groups with 7 students each? Why or why not?