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**Large Numbers**

**To Do**

* Read and write large numbers
* Differentiate between the Indian place value system and the International place value system
* Explain the concept of face value, place value and expanded form
* Compare and order large numbers
* Form the smallest and the greatest numbers using the given digits
* Find the successor and the predecessor of the given numbers
* Explain the concept of rounding off the numbers
* Read and write Roman numerals

**Tune Up**  
The speed of light in vacuum is two lakh ninety-nine thousand seven hundred and ninety-two kilometres per second.  
Represent this value on the place value chart. Then, write the place value of each digit.

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**LARGE NUMBERS**

The digits of a number keep on increasing by putting an extra digit at the highest place value.

* The largest 4-digit number is 9999.
* The smallest 5-digit number is 10000.
* The smallest 8-digit number is 10000000.
* The largest 9-digit number is 999999999.

We can write any large number by increasing the digits of a number. How to read such large numbers? Let us find out.  
We have studied about place value chart to write large numbers in previous grades. There are two place value systems to represent large numbers — the **Indian place value system** and the **International place value system**. It means that there are two systems to read and write large numbers. Let us learn about these systems.

**The Indian Place Value System**

To represent a number in the Indian place value system, we need to write a face value of each digit of a number in the Indian place value chart.

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In the Indian place value system, the first 9 places are grouped into four periods — **Ones, Thousands, Lakhs and Crores**.

Let us write a 9-digit number, 3155576000, according to the Indian place value system.

**Rules to Read and Write a Large Number**

1. Write the number in the place value chart.
2. Always read from left to right.
3. Read the number in each period.
4. Say the name of the period after each number in the period. The name of the period is always read or written in singular. If a period has zeroes at all the places, skip that period.
5. Do not read out the name of the ones period. Just read or write the numbers.
6. While writing a number, always put a comma after each period.

So, the number 3155576000 is written as 31,55,76,000 and read as thirty-one crore fifty-five lakh seventy-six thousand.

**Example 1:** Write and read the following numbers according to the Indian place value system.

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1010101 is written as 10,10,101 and read as ten lakh ten thousand one hundred one.

50000005 is written as 5,00,00,005 and read as five crore five.

**Example 2:** Mark the periods using commas in the number 501006007 and then read the given number according to the Indian place value system.

Solution: Write the number and mark the periods with commas.

50,10,06,007

It can be read as fifty crore ten lakh six thousand seven.

**Example 3:** Write the numerals for the numbers according to the Indian place value system.  
a) Forty-five lakh eleven thousand two hundred sixty-three

Answer: 45,11,263

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b) Ninety lakh one hundred five

Answer: 90,00,105

c) Seventeen crore eight lakh forty-one thousand nineteen

Answer: 17,08,41,019

**Exercise 1.1**

1. Write the following numbers in the Indian place value chart.
2. Mark the periods using commas in the following numbers according to the Indian place value system.
3. Write the numerals for the following numbers according to the Indian place value system.
4. Write the number names for the following numbers.
5. Circle the numbers that are written correctly according to the Indian place value system.

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**FACE VALUE AND PLACE VALUE**

**Face Value**

The **face value** of a digit in a number is the digit itself. The place at which the digit is present does not matter.

**Example 4:** Write the face value of each digit in the number 31,50,736.

**Place Value**

Each place in a number has a value associated with it. The place value chart shown below is used to find the place value of a digit.

The place value of a digit in a number depends on the place it occupies in the place value chart. It is calculated by the following formula:

**Place value of a digit = Face value of the digit × Value of the place**

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**Example 5:** Write the place value of each digit in the number 31,50,736.

**Place Value:**

* 6 × 1 = 6
* 3 × 10 = 30
* 7 × 100 = 700
* 0 × 1000 = 0
* 5 × 10,000 = 50,000
* 1 × 1,00,000 = 1,00,000
* 3 × 10,00,000 = 30,00,000

**Expanded Form**

Expressing a number as the sum of the place values of all its digits is called its expanded form.

Expanded form in words:  
3 ten lakhs + 1 lakh + 5 ten thousands + 0 thousands + 7 hundreds + 3 tens + 6 ones

**Exercise 1.2**

Write the face value and the place value of the coloured digit in each number.  
Write the place value of the coloured digits in each number. Also, write the sum of the place values of the coloured digits.

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1. Write the following numbers in the expanded form. Also, write their expanded form in words.
2. Write the standard form for each of the following:

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**COMPARING AND ORDERING NUMBERS**

Compare the number of digits in the two numbers. The number with more number of digits is greater than the number with less number of digits.

If the two numbers have equal number of digits, write them one above the other. Compare the digits at each place starting from the extreme left.

Stop when you come across different digits at the same place. The number with greater digit at that place is greater.

**Forming Numbers**

To form the greatest number with a given set of digits, arrange the digits in the descending order.

To form the smallest number with a given set of digits, arrange the digits in the ascending order.

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**Predecessor and Successor**

The number that comes ‘just before’ a given number is called its predecessor. The number that comes ‘just after’ a given number is called its successor.

Example: Find the predecessor and successor of 5,47,36,219.

Solution:  
Predecessor = 5,47,36,218  
Successor = 5,47,36,220

**Exercise 1.3**

Identify the order (ascending or descending) in which the following numbers are arranged.  
Write the successor and predecessor of each number.  
Compare each pair of numbers and put < or > sign.  
Form the smallest and the greatest numbers using the given digits.

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**INTERNATIONAL PLACE VALUE SYSTEM**

The place value system used worldwide is known as the International place value system.

The International place value chart and its comparison with the Indian place value chart are given below:

* **International Place Value System:**
  + Billions, Millions, Thousands, Ones
* **Indian Place Value System:**
  + Crores, Lakhs, Thousands, Ones

By comparing the two systems, we can make the following observations:

* In the International place value system, the first nine places are grouped into 3 periods — ones, thousands, and millions.
* In the Indian place value system, the first nine places are grouped into 4 periods — ones, thousands, lakhs and crores.

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* In the International place value system, each period has 3 places.
* In the Indian place value system, the ones period has 3 places, other periods have 2 places.
* The places from ones till ten thousands are the same in both the systems.
* The rules for writing number names are the same in both the systems. The only difference lies in the places and periods.

**Example 9:** Mark the periods with commas in the number 45276981 and write the number name as per both Indian and International systems.

**Solution:**

* In Indian system, we write: 4,52,76,981 — Four crore fifty-two lakh seventy-six thousand nine hundred eighty-one
* In International system, we write: 45,276,981 — Forty-five million two hundred seventy-six thousand nine hundred eighty-one

**Example 10:** Write the place value of each digit of the number 452760318 according to the International place value system. Also, write it in expanded form.

**Expanded form:**

* **In words:** 4 hundred millions + 5 ten millions + 2 millions + 7 hundred thousands + 6 ten thousands + 3 hundreds + 1 ten + 8 ones
* **In figures:** 400,000,000 + 50,000,000 + 2,000,000 + 700,000 + 60,000 + 300 + 10 + 8

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Beyond millions, the periods of three digits each are introduced to the left of the millions period. These periods are Billions (to the left of Millions) and Trillions (to the left of Billions).

**Example 11:** For the given numbers, rearrange the commas as per the International place value system.

* a) 22,41,36,001 → 224,136,001
* b) 1,19,57,642 → 11,957,642

**Exercise 1.4**

1. Write the number names of the following numbers according to the International place value system.
2. Write numerals for the given numbers.
3. Rearrange the commas according to the International place value system.
4. Fill in the blanks:
   * 1 crore = \_\_\_ lakhs
   * 1 trillion = \_\_\_ billions
   * \_\_\_ lakhs = 1 million
   * \_\_\_ millions = 1 crore
   * 1 lakh = \_\_\_ thousands
   * \_\_\_ millions = 1 billion

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**5.** Mark periods with commas as per the Indian and International systems. Also, write the place value of the coloured digit in each system.

**6.** Write the following number names according to the International place value system.  
a) Eighty-seven lakh fifty-three thousand twelve  
b) Seventy-three crore five lakh eighty-five thousand three hundred five  
c) Eighty-five lakh seven  
d) Forty-five lakh six thousand nine  
e) Three crore six lakh forty-two thousand eight hundred ten

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**ROUNDING OFF NUMBERS**

Anshul organised a birthday party at home. There were 28 guests. He said in the class that there were about 30 guests at his birthday party.  
Here, the number 30 is a multiple of 10 and therefore, easy to remember. It is also very close to the actual number 28. Finding such a number that is close to the original number and easy to remember is called **rounding off**.

The numbers such as 10, 100 and 1000 and their multiples are easy to remember. So, while rounding off, we always find a multiple of 10, 100 or 1000, that is nearest to the actual number.

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**Rounding off to the Nearest 10**

Example 12: Round off 23 to the nearest 10.  
Solution: 23 lies between 20 and 30. So, on a number line, mark all the numbers from 20 to 30.

Clearly, 23 is closer to 20 than to 30. So, we round off 23 to 20.

Example 13: Round off 68 to the nearest 10.  
Solution: 68 lies between 60 and 70. So, on a number line, mark all the numbers from 60 to 70.

Clearly, 68 is closer to 70 than to 60. So, we round off 68 to 70.

**Rounding off to the Nearest 100**

To round off a given number to the nearest 100, find out the multiple of 100 that is nearest to the given number.

Example 14: Round off 230 to the nearest 100.  
Solution: 230 lies between 200 and 300. So, draw a number line from 200 to 300.

Clearly, 230 lies closer to 200 than to 300. So, we round off 230 to 200.

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**Rounding off to the Nearest 1000**

Example 15: Round off 6800 to the nearest 1000.  
Solution: 6800 lies between 6000 and 7000. So, draw a number line from 6000 to 7000.

Clearly, 6800 lies closer to 7000 than to 6000. So, we round off 6800 to 7000.

**Shortcut Method of Rounding off**

1. Identify the place to be rounded off. Underline the digit at this place.
2. Highlight the digit to the immediate right of the underlined digit.
3. Compare the highlighted digit with 5 (midway mark).

i) If it is < 5, then the number is rounded down. All the digits to the right of the underlined digit are replaced with zero.

ii) If it is equal to or > 5, then the number is rounded up. The underlined digit is increased by 1. All the numbers to the right of it are replaced with zeroes.

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**Example 16:** Round off each of the following numbers.  
a) 72 to the nearest 10  
b) 2,538 to the nearest 100  
c) 21,620 to the nearest 1000  
d) 47,580 to the nearest 1000

**Solution:**  
a) 72 → 70  
b) 2,538 → 2,500  
c) 21,620 → 22,000  
d) 47,580 → 48,000

**Exercise 1.5**

1. Round off the following numbers to the nearest 10.
2. Round off the following numbers to the nearest 100.
3. Round off the following numbers to the nearest 1000.

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**ROMAN NUMERALS**

Roman numeral system is the numeral system that was used in ancient Rome. It has 7 basic symbols — I, V, X, L, C, D and M. Different combinations of these symbols are used to represent numbers.

| **Roman numeral** | **I** | **V** | **X** | **L** | **C** | **D** | **M** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Hindu-Arabic numeral | 1 | 5 | 10 | 50 | 100 | 500 | 1,000 |

Rules for Writing Roman Numerals:

1. When a symbol is repeated, its value is added as many times as it is repeated.
2. When a symbol of smaller value is written to the right of a symbol of greater value, the smaller value is added to the greater value.
3. When a symbol of smaller value is written to the left of a symbol of greater value, the smaller value is subtracted from the greater value.
4. If a smaller numeral is placed between two greater numerals, then it is always subtracted from the numeral immediately following it.
5. If a bar is placed over a numeral, then it is multiplied by 1,000.

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**Exercise 1.6**

1. Write the corresponding Hindu-Arabic numeral for the following:  
   a) LXIX  
   b) XLVIII  
   c) XCIV  
   d) CCCXLIX  
   e) CXLII
2. Write the corresponding Roman numeral for the following:  
   a) 59  
   b) 98  
   c) 324  
   d) 447  
   e) 210
3. Which of the following Roman numerals are meaningless? Give reasons to justify your answer.  
   a) DCVX  
   b) LXIIII  
   c) CDXCIX  
   d) CMXC  
   e) XDIV
4. Fill in the boxes with the correct symbol < or > :  
   a) XVI \_\_ XIV  
   b) LXVII \_\_ XLVII  
   c) CD \_\_ DC  
   d) XC \_\_ DC  
   e) MLI \_\_ MXL  
   f) LXXXIX \_\_ XCIX

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**Wrap Up**

* The periods in Indian and International place value systems are separated by commas.
* The first five places in the Indian and International systems are the same.
* The face value of a digit in a number is the digit itself.
* The place value of a digit in a number can be calculated by:  
  **Place value of a digit = Face value of the digit × Value of the place**
* Expressing a number as the sum of the place values of all its digits is called its expanded form.
* The number with more number of digits is greater than the number with less number of digits.
* If the two numbers have equal number of digits, then compare the digits at each place, starting from the left.
* The smallest and the greatest numbers can be formed by arranging the given digits in ascending and descending order, respectively.
* Roman numeral system uses the symbols — I, V, X, L, C, D and M to represent numbers.

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**Workout**

1. Write the number names for the following numbers.  
   a) 26,04,783  
   b) 5,901,080  
   c) 4,63,20,539  
   d) 70,051,900  
   e) 17,25,09,250  
   f) 905,203,417
2. Write the numerals for the following number names.  
   a) Forty-six lakh eight thousand five hundred seventy-nine  
   b) Seven crore five thousand twelve  
   c) Ninety million three thousand two hundred seven  
   d) One million three hundred twenty thousand four hundred eighty
3. Write the place value of the coloured digit.  
   a) 2,10,56,734  
   b) 5,27,60,480  
   c) 13,06,25,425
4. Write the following numbers in words, using both Indian and International systems.  
   a) 2460091  
   b) 54075407  
   c) 308056014
5. Write the following numbers in the expanded form.  
   a) 15,73,091  
   b) 4,05,68,330  
   c) 6,18,07,520
6. Write the following in the standard form.  
   a) 4,00,000 + 40,000 + 400 + 4  
   b) 50,00,000 + 4,000 + 20 + 8
7. Arrange the following numbers in the ascending order.  
   a) 27,45,305; 1,18,46,306; 17,45,300; 26,90,318; 27,54,779  
   b) 37,07,945; 11,60,68,426; 47,06,940; 37,10,148; 34,10,148
8. Arrange the following numbers in the descending order.  
   a) 17,25,695; 17,35,600; 17,20,798; 27,25,695; 1,12,24,306  
   b) 64,10,428; 64,09,430; 6,30,06,300; 63,10,420; 63,30,859
9. Write the successor and the predecessor of the following numbers.  
   a) 25,20,100  
   b) 80,64,925  
   c) 2,25,40,509  
   d) 2,19,99,999
10. Form the greatest and the smallest 8-digit numbers with the digits 8, 5, 2, 4, 0, 6 and 1. You may repeat one of the digits. Use all digits at least once to form the 8-digit numbers.