

Place Value

Artificial Intelligence makes computers think and learn, enabling them to solve problems, plan and reason like human beings. AI is not only used by doctors, scientists, artists and others in their work, it is used even if we want to choose a movie to watch online! The idea was thought of in 1950 but the term Artificial Intelligence was coined in 1956. How long ago was the word AI coined?



LOOKING BACK

Lakhs

1,72,404 – One lakh, seventy-two thousand, four hundred four

Lakhs		Thousands			Ones		
Lakhs	Ten Thousands	Thousands	Hundreds	Tens	Ones		
1	7	2	4	0	4		← - - Period
1 Lakh	7 Ten Thousands	2 Thousands	4 Hundreds	0 Tens	4 Ones		← - - Place
$1 \times 1,00,000$	$7 \times 10,000$	$2 \times 1,000$	4×100	0×10	4×1		

Expanded notation: $1,00,000 + 70,000 + 2,000 + 400 + 0 + 4$

- Give the place value of the coloured digit.
a. 34,987 b. 63,653 c. 4,10,987 d. 3,09,764
- Use the digits 5, 6, 3, 8, 9, and 1 to:
a. build the greatest number possible. b. build the smallest number possible.
c. give the expanded notation and number name for both.
- Compare using $>$, $<$, or $=$.
a. 86,543 9,876 b. 7,01,765 7,10,765
- Spot the pattern and fill in the blanks.
a. 23567, 23667, 23767, _____, _____, _____
b. 15098, 25098, 35098, _____, _____, _____

The expanded form can be used to write the number in standard form.



Mathspeak

FA*

How is each column in the place value chart related to the column to the left of it?

NCF 2023

Competencies in this chapter

- C-1.1: Applicable to the entire chapter
C-1.4: Labelled on specific pages



The Mathspeak feature will help you to express your understanding verbally to your teacher and your classmates.

LAKHS AND CRORES

7-Digit Numbers – Lakhs

In a smart city the authorities installed 13,92,684 AI sensors to collect data on traffic, air pollution, and security.

13,92,684 is a 7-digit number. Let us understand the number before we try to read it.

Do you remember the largest 6-digit number? $\rightarrow 9,99,999$

If you add 1 to it, you get the smallest 7-digit number. $\rightarrow + 1$



A 7-digit number begins at the ten lakhs place.

10,00,000

10,00,000 is ten lakhs.

\rightarrow These digits tell you how many lakhs.

Lakhs		Thousands			Ones		
Ten Lakhs (TL)	Lakhs (L)	Ten Thousands (TTh)	Thousands (Th)	Hundreds (H)	Tens (T)	Ones (O)	
1	3	9	2	6	8	4	
1 Ten Lakh	3 Lakhs	9 Ten Thousands	2 Thousands	6 Hundreds	8 Tens	4 Ones	
$1 \times 10,00,000$	$3 \times 1,00,000$	$9 \times 10,000$	$2 \times 1,000$	6×100	8×10	4×1	

Expanded notation: $10,00,000 + 3,00,000 + 90,000 + 2,000 + 600 + 80 + 4$

Read the number with the help of commas.

\rightarrow These digits tell you how many lakhs.

13,92,684

\rightarrow These digits tell you how many thousands.

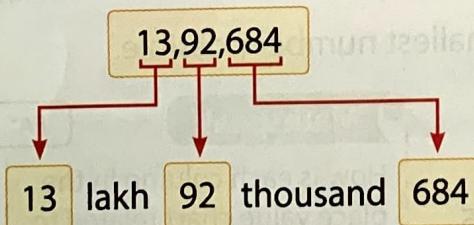
Try This!

Give the expanded notation and write in words.

a. 14,00,651

b. 23,45,000

c. 87,23,986



In words: Thirteen lakh, ninety-two thousand, six hundred eighty-four

Common Mistake!

37,68,000

Thirty-seven lakhs sixty-eight thousand

✗

Thirty-seven lakh, sixty-eight thousand

✓



8-Digit Numbers – Crores

A hospital of the future uses AI for diagnosis by studying 3,67,53,239 patients' records.

Let us understand this 8-digit number.

The largest 7-digit number is $\rightarrow 99,99,999$

If you add 1 to it, $\rightarrow + 1$

it becomes one hundred lakh. $\rightarrow 100,00,000$

One hundred lakh is also called one crore.

1,00,00,000 is one crore.

This digit tells you how many crores.

Take the 8-digit number 3,67,53,239.



Remember

- ★ An 8-digit number begins with the one crore (C) place. 1 crore has 7 zeros.
- ★ 10 ten lakhs (100 lakhs) = 1 crore.
- ★ We put a comma or leave space to separate the crores period from the lakhs period.

Crores		Lakhs		Thousands			Ones		
Crores (C)	Ten Lakhs (TL)	Lakhs (L)	Ten Thousands (TTh)	Thousands (Th)	Hundreds (H)	Tens (T)	Ones (O)		
3	6	7	5	3	2	3	9		
3 Crores	6 Ten Lakhs	7 Lakhs	5 Ten Thousands	3 Thousands	2 Hundreds	3 Tens	9 Ones		
3 × 1,00,00,000	6 × 10,00,000	7 × 1,00,000	5 × 10,000	3 × 1,000	2 × 100	3 × 10	9 × 1		
3,00,00,000	67,00,000		53,000			239			
3 crores	67 lakhs		53 thousands			239 ones			

Expanded notation: $3,00,00,000 + 60,00,000 + 7,00,000 + 50,000 + 3,000 + 200 + 30 + 9$

3,67,53,239

These digits tell you how many thousands.

These digits tell you how many lakhs.

This digit tells you how many crores.

It is easy to read a number with three commas. The first comma says crore, the second says lakh, and the third, thousand.

In words: Three crore, sixty-seven lakh, fifty-three thousand, two hundred thirty-nine

Try This!

Write the number in standard form and give the number name.

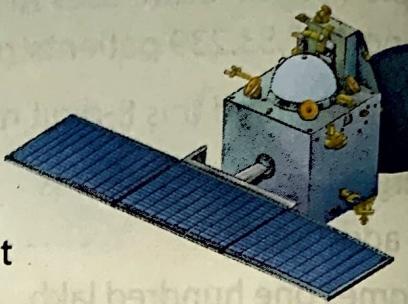
- $4,00,00,000 + 70,00,000 + 0 + 40,000 + 800 + 20 + 9$
- $2,00,00,000 + 0 + 5,00,000 + 0 + 900 + 20 + 9$



Exercise I A

1. Read these statements out aloud.

- The diameter of the Sun is approximately 13,92,684 km.
- The Mangalyan was sent by the Indian Space Research Organisation from Earth to Mars. The distance between Earth and Mars keeps changing, but at its closest, it is about 5,46,00,000 km.



2. Give the place value of the coloured digit.

- 89,00,345
- 30,34,112
- 87,93,389
- 2,67,23,592
- 7,08,19,004

3. Give the word form and the expanded notation for these numbers.

- 67,09,654
- 9,83,10,809
- 2,10,23,008
- 45,00,091

4. Give the standard numeral for:

- 4,00,00,000 + 60,00,000 + 5,00,000 + 40,000 + 200
- 90,00,000 + 60,000 + 3,000 + 6
- 6,00,00,000 + 5,00,000 + 20
- 30,00,000 + 9,00,000 + 7,000 + 80

Journal

We use numbers to **count** (there are 28 people in the room), to **identify** (my house number is 738), or to tell the **order of things** (Sabina picked the 9th book on the shelf).

Find two more examples of each of the different ways in which we use numbers.

In what other ways can numbers be used?

You may keep a separate notebook as your maths journal. You can use it to express thoughts, ideas, and experiences about the different things you have learnt in the maths class.

FA



Data Connect

Open the Data Bank on page 243 and study the data on 'If you Started Reading in Grade 1'. Then answer the questions below.

- Read the statements out aloud.
- Rewrite the numbers in word form.
- Give the expanded notation for each number.
- Arrange the numbers in increasing order.

In real life, we often come across facts and figures called data. **Data Connect** helps you to understand and use such data.

UNDERSTANDING NUMBERS BETTER

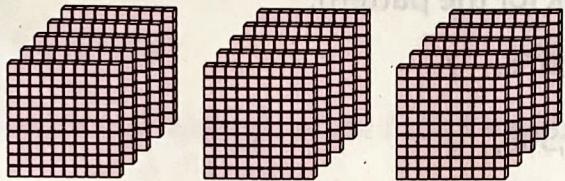
When we read the number 1500 as one thousand five hundred, we mean that there are 1500 ones in the number.

If we need to find how many tens are in 1500, we need to make the ones into towers of 10. We find we have 150 tens.

If we need to find how many hundreds are in 1500, we need to group the tens further into 100s, and we find we have 15 hundreds.

Can you see a pattern?

$$1500 = 1500 \text{ ones}$$



$$1500 = 150 \text{ tens}$$

$$1500 = 15 \text{ hundreds}$$

Let us try it with the number 3,00,000.

3,00,000 has 3,00,000 ones, or,

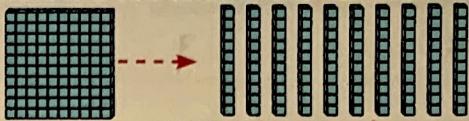
3,00,000 = 30000 tens or

3,00,000 = 3000 hundreds or

Similarly, the number 42,45,987 has 4,24,598 tens or 42,459 hundreds, and so on.

Remember

When we read the number one hundred or 100, we mean that there are 100 ones in the number.



Try This!

1. $670 = \underline{\hspace{2cm}}$ tens

2. $2700 = \underline{\hspace{2cm}}$ hundreds

3. 18 hundreds = $\underline{\hspace{2cm}}$ thousand $\underline{\hspace{2cm}}$ hundreds

4. 3 thousands 2 hundreds = $\underline{\hspace{2cm}}$ hundreds

5. 25 thousands = $\underline{\hspace{2cm}}$ hundreds



Mathspeak

Explain how you can use towers of ten to model the number 1100.

Challenge!

WHO AM I?

My number is made up of 6 ten thousands, 14 thousands, and 12 tens.

I am the number _____

Example 1: Write the number four crore, fifty-three thousand, one.

→ Draw the place value chart and fill in the numbers according to the periods and places.

Then fill in all the vacant places with zeros.

C	TL	L	TTh	Th	H	T	O
4			5	3			1

C	TL	L	TTh	Th	H	T	O
4	0	0	5	3	0	0	1

Answer: 4,00,53,001

Example 2: Find the number before 6,78,800 and the number after 56,79,999.

→ The number before 6,78,800 is 6,78,799.

The number after 56,79,999 is 56,80,000.

Example 3: What comes next? Look for the pattern.

a. 23,45,678, 23,46,678, 23,47,678, ?

b. 40,46,300 41,46,300, 42,46,300, ?

Answer: a. 23,48,678 b. 43,46,300

Example 4: Make the smallest and greatest possible 7-digit numbers using 7, 6, 2, 8, and 0 by repeating the digits.

Answer: Smallest: 20,00,678; Greatest: 88,87,620

Example 5: How many numbers have 4 digits?

→ Let us start by finding out how many numbers have 1, 2, and 3 digits.
We may find a pattern!

a. The smallest one-digit number is 1.

The greatest one-digit number is 9.

$$9 - 1 = 8$$

$$8 + 1 = 9$$

There are 9 one-digit numbers.

You can see that there are 9 one-digit numbers, so put back the extra number that was taken away. Do the same for the rest.



b. Smallest 2-digit number is 10. Greatest 2-digit number is 99.

$$99 - 10 = 89$$

$$89 + 1 = 90$$

There are 90 two-digit numbers.

c. Smallest 3-digit number is 100. Greatest 3-digit number is 999.

$$999 - 100 = 899$$

$$899 + 1 = 900$$

There are 900 three-digit numbers.

Answer: The pattern shows us that there are 9,000 four-digit numbers.

Exercise I B

1. How many ones, tens, hundreds, thousands, ten thousands, and lakhs are there in the number 8,00,000?
2. Write in figures (with commas).
 - a. Eight lakh thirty-nine thousand twenty-three
 - b. Twenty lakh nine hundred five
 - c. Thirty-five thousand eight hundred fifty-seven
 - d. Four crore thirty-seven lakh nineteen thousand
3. Compare using $<$, $>$, or $=$.

a. 5,87,90,456 <input type="text"/> 5,78,23,567	b. 90,40,908 <input type="text"/> 9,04,908
c. 8,20,45,899 <input type="text"/> 8,20,54,899	d. 1,40,10,178 <input type="text"/> 1,40,10,720
4. Make the smallest and the greatest possible 7-digit numbers.
 - a. 5, 8, 2, 9, 1, 1, 8
 - b. 4, 7, 1, 9, 0, 6, 7
5. Make the smallest and the greatest possible 8-digit numbers by repeating the digits.
 - a. 3, 6, 1, 7, 8, 9, 2
 - b. 4, 7, 1, 0, 3, 5
6. Give the number before:

a. 45,69,500	b. 87,16,000	c. 5,10,000	d. 20,00,000
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7. Give the number after:

a. 9,29,499	b. 79,98,999	c. 99,99,999	d. 1,98,97,950
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8. If you are 10 years old, you would have lived 52,56,000 minutes. Compare the numbers given below and match the age to the minutes lived. Do not calculate. Match by putting the numbers in ascending order.



11



12



13



14



15

68,32,800

73,58,400

57,81,600

63,07,200

78,84,000

NUMBER PATTERNS

Consecutive Numbers

Consecutive numbers are numbers that follow each other in order from the smallest number to the largest number and have a fixed difference between them. This pattern has been made by changing 2-digit numbers to 1-digit numbers. Complete the pattern.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	2	3	4	5	6	7	8	9	1	2	3	4	—	—	—
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
—	—	10	2	3	—	—	—	—	—	—	—	—	—	—	—
—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—

1+0 1+1

Consecutive Even Numbers

2	4	6	8	10	12	14	16	18	20	22	24	—	—	—	—
2	4	6	8	1	3	5	—	—	—	—	—	—	—	—	—
26	28	30	32	34	36	38	40	42	44	46	48	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Add only till you see a pattern, then complete using the pattern.



Consecutive Odd Numbers

1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

PASCAL'S TRIANGLE

Look for a pattern. Extend the triangle by another two rows.

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
— — — — — —

There are many patterns in this triangle. Can you spot at least three?

Project

Explore consecutive numbers.

1. Take 3 consecutive numbers.

5, 6, 7

Multiply the middle number by itself.

$$6 \times 6 = 36$$

Multiply the remaining two numbers.

$$5 \times 7 = 35$$

The difference is 1!

$$(36 - 35 = 1)$$

Do the same with these consecutive numbers.

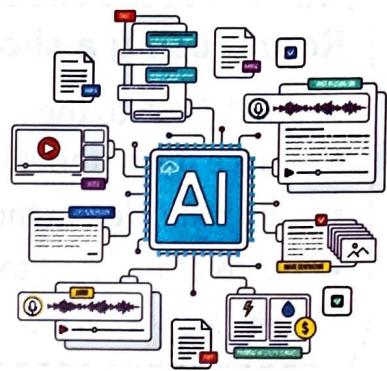
- a. 3, 4, 5 b. 2, 3, 4 c. 6, 7, 8 d. 7, 8, 9

2. Do the same with three consecutive odd numbers and three consecutive even numbers. What do you notice?

ROUNDING

In an AI research laboratory system there are about 4,000 folders each containing approximately 28,000 images.

The figures 4,000 and 28,000 are not exact figures but they are close to the exact figures. They give an idea of **about** how many pictures of balloons the laboratory uses. These are called **rounded** figures.



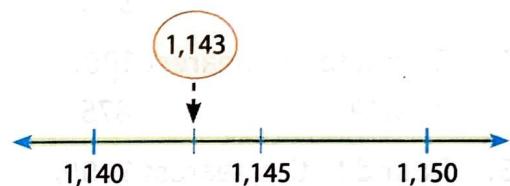
Rules of Rounding

- When we round a number to the nearest 10, we use the **nearest multiple of 10**.
- When we round a number to the nearest 100, we use the **nearest multiple of 100**.
- When we round a number to the nearest 1,000, we use the **nearest multiple of 1,000**.
- A number which is **halfway** is rounded to the **higher multiple**.

Round using a Number line

- a. Round 1,143 to the nearest 10.

- Find which two tens the number lies between, and mark the halfway point
- Place the number to be rounded in the correct place on the number line.

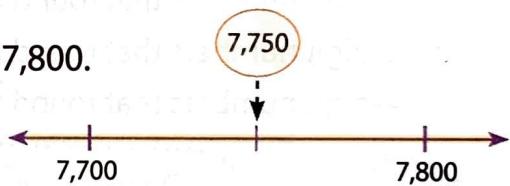


1,143 is closer to 1,140 on the number line. So **1,143 rounds to 1,140**.

- b. Round 7,750 to the nearest 100.

- 7,750 lies half way between the hundreds 7,700 and 7,800.

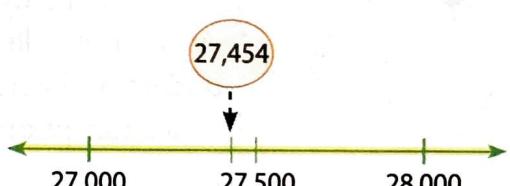
As per the rule, **7,750 is rounded to 7,800**.



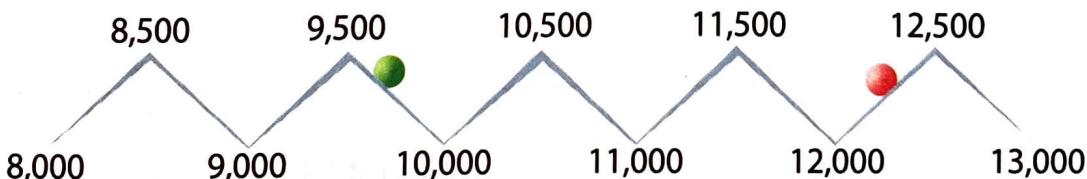
- c. Round 27,454 to the nearest 1,000.

- 27,454 is between the thousands 27,000 and 28,000.
- 27,454 is closer to 27,000.

27,454 is rounded to 27,000.



- d. You can also think of the number line as a series of hills and valleys.



- A ball at 9,625 would roll down to 10,000.
9,625 rounded to the nearest 1,000 is 10,000.
- A ball at 12,324 would roll back to 12,000.
12,324 rounded to the nearest 1,000 is 12,000.

In this example, a 4-digit number has got rounded to a 5-digit number.

Mathspeak

Explain why 25,500 is closer to 30,000 than 20,000.

Round using a shortcut

Round 17,698 to the nearest 1,000.

- Place the number in the place value chart.
- Find the digit in the place you are rounding to. 7 is in the thousands place.
- Look at the digit to its right. 6 is the digit to its right.
- Since $6 > 5$, increase the digit in the thousands place by one. So 17,698 rounds to 18,000.

TTh	Th	H	T	O
1	7	6	9	8

Exercise 1C

Solve. Use any method you like.

1. Round to the nearest 10.

a. 46

b. 388

c. 1,014

d. 92,407

e. 11,003

2. Round to the nearest 100.

a. 649

b. 875

c. 6,850

d. 14,910

e. 58,009

3. Round to the nearest 1000.

a. 567

b. 9,846

c. 4,096

d. 35,502

e. 97,764

4. Shade the following using a pencil.

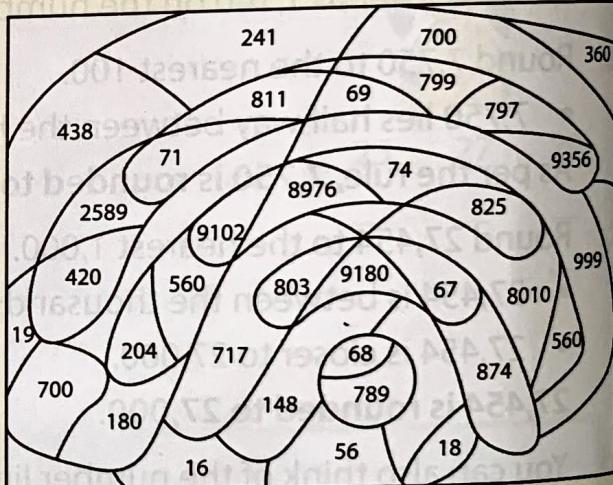
a. 2-digit numbers that round to 70

b. 3-digit numbers that round to 800

c. 4-digit numbers that round to 9,000



Do you recognise this icon?
What is it called? What do you
understand when you see this on
a smartphone or a laptop?



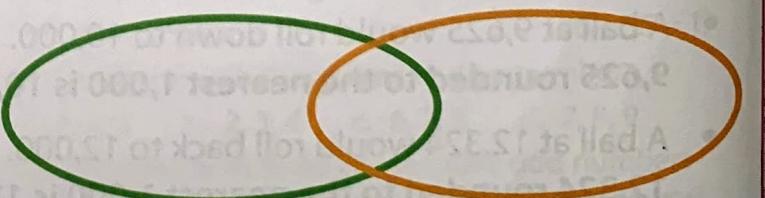
Challenge!

The green oval has numbers which when rounded to the nearest 100 is 4500. The orange oval has numbers which when rounded to the nearest 1000 is 4000. The overlapping part will have numbers that fit into both categories. Look at the list given below and write the numbers in their correct place on the shapes.

4143, 4489, 4517, 4475, 3549, 4541

Nearest 100

Nearest 1000



INTERNATIONAL SYSTEM

AI software that was being trained to recognise the different accents that people spoke in, used 3,40,000 voice recordings to do that.

Using the International system, we would write it as 340,000 and read it as '**three hundred forty thousand**' accents.

5-digit numbers are read the same way in both the Indian and International systems.

6-digit and greater numbers are read differently in the Indian and International systems.



Indian		International
10,000	↔ 5 digits ↔	10,000
Ten thousand	10000	Ten thousand
1,00,000	↔ 6 digits ↔	100,000
One lakh	100000	One hundred thousand
10,00,000	↔ 7 digits ↔	1,000,000
Ten lakh	1000000	One million

International system

Million			Thousands				Ones		
Hundred Millions	Ten Millions	Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones	

The International system has 3 places in each period.

The periods are separated by commas. The commas help us read the number by taking the name of the period it follows.

M	HTh	TTh	Th	H	T	O
1	0	0	, 0	0	0	0
1	,	0	0	0	, 0	0

↔ ----- One hundred thousand (100,000)

↔ ----- One million (1,000,000)

Thousands				Ones		
M	HTh	TTh	Th	H	T	O
4	1	5	3	4	8	

415 thousand

348

Four hundred fifteen thousand, three hundred forty-eight

Comparing the Indian and International Systems

Indian System	(10 lakh) TL	(1 lakh) L	TTh	Th	H	T	O
International System	(1 million) M	(100 thousand) HTh	TTh	Th	H	T	O

Different

Same

Let us read the number 5237819 in both International and Indian systems.

International System

M	HTh	TTh	Th	H	T	O
5	2	3	7	8	1	9

5 million 237 thousand 819

Five million, two hundred thirty-seven thousand, eight hundred nineteen

Indian System

TL	L	TTh	Th	H	T	O
5	2	3	7	8	1	9

52 lakh 37 thousand 819

Fifty-two lakh, thirty-seven thousand, eight hundred nineteen

M	I	L	L	I	O	N
1	0	0	0	0	0	0

Read these figures in the International system.

- 439,168—Four hundred thirty-nine thousand, one hundred sixty-eight
- 705,001—Seven hundred five thousand, one
- 1,201,590—One million, two hundred one thousand, five hundred ninety
- 5,500,109—Five million, five hundred thousand, one hundred nine

Try This!

Read these aloud.

- There are more than 400,000 species of plants in the plant kingdom.
- There are about 250,000 flowering plants.
- Mr Acharya's new house costs ₹5,703,800.

I remember that a million has 6 zeros with the help of this grid.



Mathspeak

FA

Explain what is same, what is different between the Indian and the International number systems.

Exercise I D

1. Rewrite using figures.
 - a. One million, three hundred thousand Earths could fit inside the Sun.
 - b. The Moon is about three hundred fifty-six thousand, four hundred kilometres from the Earth.
 - c. There are about one million, thirteen thousand, nine hundred thirteen words in the English language.
2. Insert commas and rewrite in words according to the International system.
 - a. 712801 = 712,801
 - b. 602590 = _____
 - c. 1016800 = _____
 - d. 5397284 = _____
3. Give the place value of the coloured digit using the International system.
 - a. 234,198
 - b. 6,042,381
 - c. 191,291
 - d. 7,184,089
4. Write the following numbers in the Indian and International systems, using both figures and words.
 - a. 850009
 - b. 1670112
 - c. 4290281
 - d. 530563



Maths and Art



Making a spiral design with number patterns.

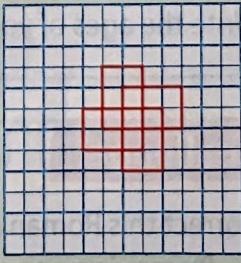
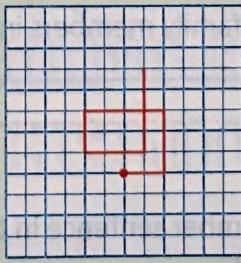
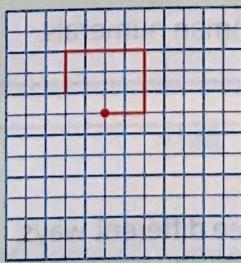
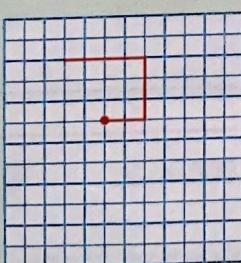
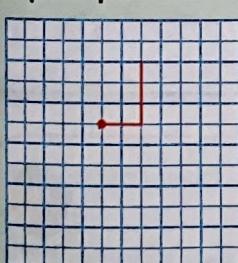
You need a ruler, square-lined paper, and colour pencils.

Choose a repeating number pattern like 2-3-4, 2-3-4, ...

Mark a point on the square-lined paper. It will be your starting and finishing point.

Go right 2 squares. Go up 3 squares. Go left 4 squares. Go down 2 squares. Then right again

3 squares and so on. Keep repeating in a loop till you reach your starting point. You have made a spiral pattern. You can colour your design.



- Experiment with other spiral loops.
- Try 3-2-5. Will 5-2-3 look any different?
- Try loops with 4 and 5 numbers. Are there some loops that don't end?

ROMAN NUMBERS

You are familiar with Roman numbers up to 39. Let us look back at the rules of forming Roman numerals and apply it to numbers up to 100. Remember that the Romans did not have '0', so they did not use place value.

They had seven basic symbols represented by these letters.



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

They formed other numbers by combining these letters and following certain rules.

- Putting a letter **after** one of bigger value means you **add** it.
 - $75 = LXXV$ ($50 + 10 + 10 + 5$)
 - $60 = LX$ ($50 + 10$)
- Putting a letter **before** one of bigger value means you **subtract** it.
 - $40 = XL$ ($50 - 10$)
 - $94 = XCIV$ ($100 - 10$) + ($5 - 1$) = $90 + 4$
- A letter can be **repeated** up to a maximum of **three times** only.
 $80 = LXXX$ ($50 + 10 + 10 + 10$)
- When a smaller number that has been made of two letters using the addition/ subtraction rule is combined with a larger number, the whole of the smaller number is written to the right of the larger one.
 - $59 = LIX$
 - $74 = 70 + 4 = LXX + IV = LXXIV$

Remember

- ★ V and L are never subtracted.
- ★ I can be subtracted from V and X only.
- ★ X can be subtracted from L and C only.
- ★ V and L are never repeated.

Try This!

Write the ages of your family members in Roman numerals.

Challenge!

Correct this Roman number sentence in three different ways.

- By moving one stick
- By removing one stick
- By not touching any stick

$$\text{X} \mid + \mid = \text{X}$$



Exercise I E

1. Fill in the boxes with Hindu-Arabic numerals.

C	L	XL	X	LXX	XXX	XC	XX	LX	LXXX
		40							

2. Write the Hindu-Arabic numerals.

- a. XXIV b. XC c. LVII d. XLIV
 e. LXXV f. LXXXII

3. Write the numbers from 41 to 100 in your notebook using Roman numerals.

4. Compare using $<$, $>$, or $=$.

- a. XC XL b. XLIV LXX c. XXVII LX d. LVII C

5. Give the answer in Roman numerals.

- a. XXV + XL b. LXII + XII c. LXX - XXX d. L - XXXIX

Project

The ancient Egyptians did not have a place value system, and neither did they have a symbol for zero. This is how they wrote their numbers.

Stick		1
Heel bone		10
Coiled rope		100
Lotus flower		1000
Pointing finger		10,000
Tadpole		1,00,000
Astonished man		10,00,000

Since they did not have a place value system, the Egyptians simply combined the symbols and added their values. So they could write the symbols from right to left or left to right. Sometimes they even wrote it vertically.

18

350

4186

1. Write your age in standard numerals and Egyptian numbers.
2. Write the year of your birth in standard numerals and Egyptian numerals.
3. Write the year of India's independence in standard numerals and Egyptian numerals.