New

Perfect Composite Mathematics

CLASS – V

[In accordance with the latest NCF prepared by the NCERT, New Delhi]

SPECIAL EDITION FOR ARMY SCHOOLS

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Preface

This book is one from the series '**New Perfect Composite Mathematics**' and is based on the syllabus developed by the National Council of Educational Research and Training (NCERT), New Delhi.

The subject matter is produced in such a way that it relates to the environment and focuses on the development and understanding of the students. It also aims to improve their thinking and reasoning skills. All books in this series are activity based and are written in a simple language.

The subject matter has been presented in graded form. The age, the learning ability and the mathematical difficulties faced by the students at all levels have been kept in mind while presenting difficult concepts.

The syllabus includes the four fundamental operations, namely, addition, subtraction, multiplication and division. These operations have been dealt in a step-by-step approach to enable students understand exactly what is to be done. The traditional and stereotype questions have been avoided.

Salient features of this book are:

- The book covers the entire prescribed syllabus.
- Number system up to 7 digits has been explained. Reading and Writing of Roman Numerals up to 100 has been included.
- International numeration system, up to millions, has been introduced.
- Chapters on 'Percentage' and 'Profit and Loss' have been added as suggested by some fellow teachers from Army Public Schools.
- Formation of **mathematical stories** or **word problems** has been taught.
- In geometry, the concept of **reflection** and **rotation** of familiar 2-D shapes has been explained in a simple way.
- Making of cubes, cylinders and cones from given nets has been explained.
- A separate chapter explaining **Perspective view of 3-D** objects while drawing in 2-D has been given.
- **Making of border strips and tiling** patterns have been explained by taking examples.
- Formulae of area and volume have been verified by Lab Activity methods.
- **Lab Activities** have been included to make the subject interesting for the students.
- Challenging problems under the heading "Challenge" have been included.
- Four model papers, two term-wise papers and one final examination paper covering the entire syllabus have been given for practice.
- A few high level questions have been given under the head "Put on Your Thinking Cap".
- The questions in the chapter "Let us Get Ready for Examinations" are given to enable the students to revise the syllabus before the final examination.

The books of the series will surely prove to be useful for the students.

I am thankful to the teachers for adopting our books and encouraging us to bring out the new edition.

I would like to thank Mrs. Sunita Jai Singh and Mrs. Shuchi Goyal for their valuable suggestions which helped me in bringing the series in the present form.

Last but not the least, I am thankful to the publishers who have taken great pains in making the books reader-friendly.

Suggestions for the improvement of the series will be gratefully acknowledged.

AUTHOR

Syllabus

Geometry   (16 hrs.)

SHAPES AND SPATIAL UNDERSTANDING

- Gets the feel of perspective while drawing a 3-D object in 2-D.
- Gets the feel of an angle through observation and paper folding.
- Identifies right angles in the environment.
- Classifies angles into right, acute and obtuse angles.
- Represents right angle, acute angle and obtuse angle by drawing and tracing.
- Explores intuitively rotations and reflections of familiar 2-D shapes.
- Explores intuitively symmetry in familiar 3-D shapes.
- Makes the shapes of cubes, cylinders and cones using nets especially designed for this purpose.

Numbers   (40 hrs.)

NUMBERS AND OPERATIONS

- Finds place value in numbers beyond 1000.
- Appreciates the role of place value in addition, subtraction and multiplication algorithms.
- Uses informal and standard division algorithms.
- Explains the meaning of factors and multiples.

MENTAL ARITHMETIC

- Estimates sums, differences, products and quotients and verifies using approximation.

FRACTIONAL NUMBERS

- Finds the fractional part of a collection.
- Compares fractions.
- Identifies equivalent fractions.
- Estimates the degree of closeness of a fraction to known fractions ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$ etc.)
- Uses decimal fractions in the context of units of length and money.
- Expresses a given fraction in decimal notation and vice versa.

Money   (5 hrs.)

- Applies the four operations in solving problems involving money.

Measurement   (26 hrs.)

LENGTH

- Determines area and perimeter of simple geometrical figures.
- Applies the four operations in solving problems involving length, weight and volume.
- Relates commonly used larger and smaller units of length, weight and volume and converts one to the other.
- Applies simple fractions to quantities.
- Converts fractional larger unit into complete smaller units.

- Appreciates volume of a solid body: intuitively and also by informal measurement.
- Uses addition and subtraction in finding time intervals in simple cases.

Data Handling (6 hrs.)

- Collects two-dimensional quantitative data.
- Represents the data in the form of a table.
- Draws a bar graph or a pictograph to present a data.

Patterns (6 hrs.)

- Identifies patterns in square numbers, triangular numbers.
- Relates sequences of odd numbers between consecutive square numbers.
- Makes border strip and tiling patterns.

Contents

Warm-Up

EXERCISES

1. Write in figures:
   (a) Twelve thousand five.
   (b) Fifteen thousand nine hundred fifteen.
   (c) Ten thousand twelve.
   (d) Two lakh five thousand five hundred eighty.
2. Write the number names:
   (a) 205600   (b) 169000   (c) 500000
3. Write in Hindu-Arabic numerals:
   (a) XXIV   (b) XXXIX   (c) XVIII   (d) XXXVI
4. Write the greatest number of 5-digits using digits 3, 0 and 5.
5. Write the smallest number of 5-digits using digits 7, 2, 0 and 9.
6. Write the smallest number of 6-digits using 3 different digits.
7. Arrange in ascending order:

   35290, 35092, 35029, 53920 and 350000.
8. Ranjana ran 2059 m and Kanchan ran 2507 m. Who ran more and how much?
9. Write, in as many ways as possible, 32 as the sum of two prime numbers.
10. Encircle the prime numbers from the following:

    1   7   2   9   13   21   29   61   79   81   91
11. Write the number which is
    (a) 1 more than 35007   ....
    (b) 1 less than 80000   ....
12. Look at the amount of soft drink in each 2 L bottle, given here. How much more soft drink should be added to completely fill each of the bottles?

1175 mL
Coke   Coke
750 mL

.... mL .... mL
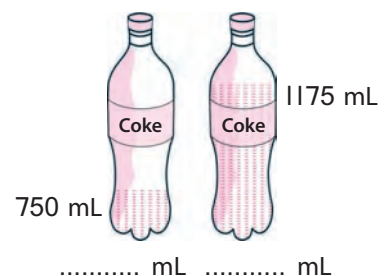
13. Given here is the price list of vegetables shown at a mother dairy vegetable booth.

Mrs. Khanna bought the following vegetables:

Potatoes $2\frac{1}{2}$ kg ;   Onions 3 kg;

Peas $1\frac{1}{2}$ kg ;   Carrots $1\frac{1}{4}$ kg.

Vegetables	Price/kg
Potatoes	₹25
Onions	₹30
Peas	₹70
Carrots	₹40
Cauliflower	₹32

She gave a 500-rupee note to the man at the counter. How much balance did she get?

14. Complete the sequences given below:

(a) 18035, 18070, 18105, ……………… , ……………… .

(b) 3800, 4100, 4400, ……………… , ……………… .

(c) 17200, 18300, 19400, ……………… , ……………… .

15. Choose two numbers from each of the following groups which add up to 2900:

(a) 650, 1300, 2250, 1400   (b) 1125, 1865, 1875, 1775

16. On Diwali, Ranjana packed 90 chocolates in a box. She has an order of 875 boxes. How many chocolates does she need to complete the order?

17. A school wants to plant some trees in 53 rows. The gardener bought 5019 saplings from a nursery. How many least number of saplings should he bring more so that each row has same number of trees?

18. Fill in the missing numbers in the factor trees given below:

(a)

(b)
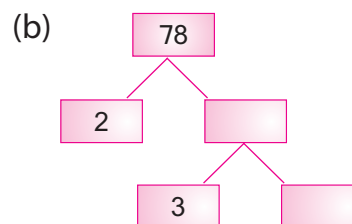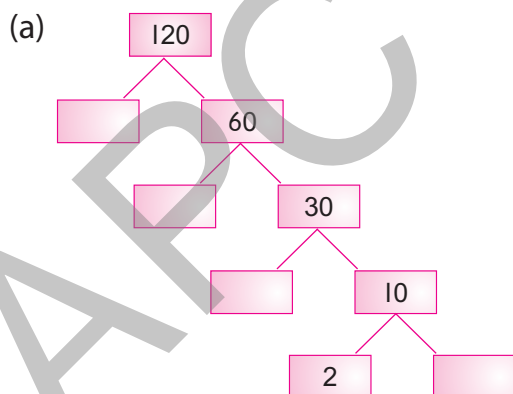
19. 10 pens cost ₹154. Find the cost of 1 pen.

20. Fill in the blanks:

(a) $\frac{13}{23} + \frac{2}{23} =$ _____ .   (b) $\frac{25}{27} - \frac{12}{27} =$ _____ .   (c) $\frac{2}{5}$ of 1 kg = _____ .

21. Poonam bought 12 m 40 cm ribbon and distributed it equally among 4 girls. How much ribbon did each of the girls have?

22. Look at the clock which shows 2:15 p.m. and answer the following questions:

(a) What time will it be after
    (i) 2 hours 30 minutes
    (ii) 9 hours 45 minutes?
(b) What time was it before
    (i) 3 hours 30 minutes
    (ii) 1 hour 50 minutes?

23. What are the perimeters of shape A and shape B?

Shape A = ☐ units

Shape B = ☐ units
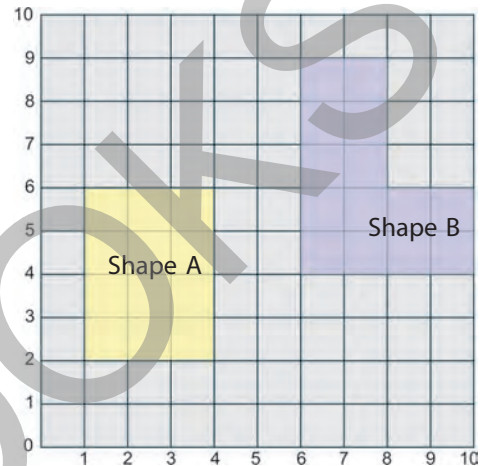
24. Study the patterns and write next three terms:

(a) 3, 6, 12, 24, ... , ... , ...
(b) 2, 5, 8, 11, ... , ... , ...
(c) 1, 8, 27, 64, ... , ... , ...

25. Study the adjoining graph and answer the following questions:

(a) What does this graph show?
(b) How many students play badminton?
(c) What is the most popular game?
(d) At least how many students were surveyed?
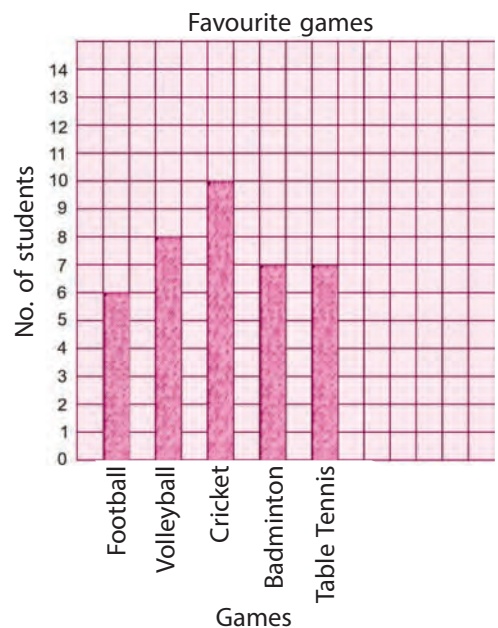
CHALLENGE

Samir bought a box containing ball pens and gel pens. The number of ball pens was six less than gel pens and there were a total of 24 pens. How many gel pens did Samir buy?

1 Large Numbers

Till class IV, we have studied about 5-digit and 6-digit numbers. Now, we will study about 7-digit and 8-digit numbers.

Rohan's elder brother got a school project to find population of different cities of India in 2001. He searched it on internet and found the list as

Mumbai	11978450
Delhi	9879172
Bengaluru	4301326
Ahmedabad	3520085
Jaipur	2322575
Vishkhapatnam	982904
Ghaziabad	968256 and many more.

When Rohan saw the list, he got surprised by seeing so many large numbers. He had studied up to 6-digit numbers. So, Rohan's brother explained it to him.

The largest 5-digit number is	99999
When we add 1 to it, we get smallest 6-digit number, i.e.,	100000
The largest 6-digit number is	999999
When we add 1 to it, we get smallest 7-digit number, i.e.,	1000000
The largest 7-digit number is	9999999
Similarly, smallest 8-digit number is	10000000
and largest 8-digit number is	99999999

We read these numbers like this

99999	–	Ninety nine thousand nine hundred ninety nine
100000	–	One lakh
999999	–	Nine lakh ninety nine thousand nine hundred ninety nine
1000000	–	Ten lakh
9999999	–	Ninety nine lakh ninety nine thousand nine hundred ninety nine
10000000	–	One crore

Have you watched 'Kaun Banega Crorepati' programme on TV?

Let us study about them.

PLACE VALUE CHART

Observe the place value chart given below. The chart has been divided into different groups called periods. These are four periods – Ones, Thousands, Lakhs and Crores.

Crores Period		Lakhs Period		Thousands Period		Units (Ones Period)		
Ten-Crores	Crores	Ten-Lakhs	Lakhs	Ten-Thousands	Thousands	Hundreds	Tens	Ones
	3	2	9	7	8	6	4	5

The number written above would be read as

3 crore 29 lakh 78 thousand 6 hundred forty five.

So, periods help us to read large numbers.

WRITING LARGE NUMBERS

Let us write the number, "sixty four lakh fifty nine thousand two hundred fifty two".

Step 1. Make a place value chart marking periods up to lakhs.

Lakhs		Thousands		Units (Ones)		
T-L	L	T-Th	Th	H	T	O

Step 2. Starting from extreme left, start writing the number.

Lakhs		Thousands		Ones		
T-L	L	T-Th	Th	H	T	O
6	4	5	9	2	5	2

So, the number is 6459252.

REPRESENTATION OF NUMBERS ON SPIKE ABACUS

We represented 5-digit numbers on spike abacus. If we add two more spikes on the left of ten-thousand spike, we can represent 7-digit numbers on the abacus. The numbers 560712 and 1312453 are represented on the spike abacus as follows:
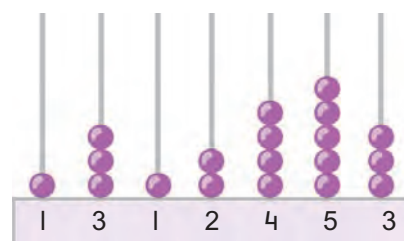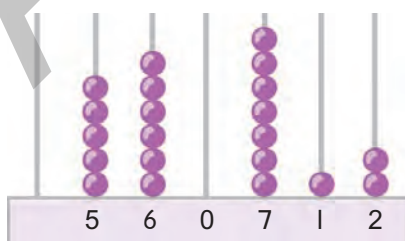
WRITING OF NUMBERS IN FIGURES AND WORDS

(a) By using spike abacus

Example 1. Write the numbers given on each spike abacus in figures and words:
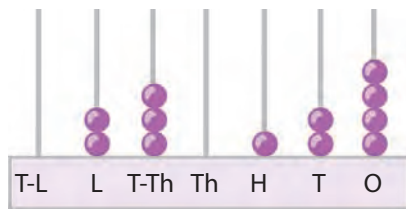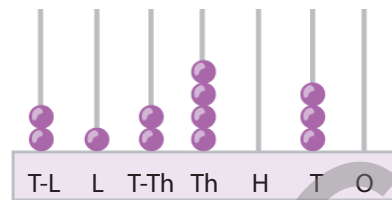
(a)   (b)

Solution. (a) The number has 2 lakhs, 3 ten-thousands, 1 hundreds, 2 tens and 4 ones. In figures, it is written as '230124' and in words as 'two lakh thirty thousand one hundred twenty four'.

(b) The number has 2 ten-lakhs, 1 lakhs, 2 ten-thousands, 4 thousands and 3 tens. In figures, it is written as '2124030' and in words as 'twenty one lakh twenty four thousand thirty'.

(b) By using place value table (chart)

Example 2. Write the numbers given in the table in figures and words:

	Lakhs		Thousands		Units		
	Ten-lakhs	Lakhs	Ten-thousands	Thousands	Hundreds	Tens	Ones
(a)		5	0	3	2	9	1
(b)	2	8	6	7	0	5	4

Solution. (a) The number has 5 lakhs, 3 thousands, 2 hundreds, 9 tens and 1 ones. In figures, it is written as '503291' and in words as 'five lakh three thousand two hundred ninety one.'

(b) The number has 2 ten-lakhs, 8 lakhs, 6 ten-thousands, 7 thousands, 5 tens and 4 ones. In figures, it is written as '2867054' and in words as 'twenty eight lakh sixty seven thousand fifty four'.

READING OF NUMBERS

Before reading a number, we divide it into periods starting from the right. The first period consists of three digits, called the **units period**. Next period consists of two digits, called the **thousands period**. Next period also consists of two digits, called the **lakhs period**. We separate the periods by a comma (,).

While reading, separating the periods by a comma (,) will help us.

Let us have some examples:

Example 3. Read and write the number names of the following:

        (a) 314030   (b) 823005   (c) 1370502   (d) 1000420

Solution.   (a) 3,14,030   = Three lakh fourteen thousand thirty.

           (b) 8,23,005   = Eight lakh twenty three thousand five.

           (c) 13,70,502 = Thirteen lakh seventy thousand five hundred two.

           (d) 10,00,420 = Ten lakh four hundred twenty.

It is easy to read numbers by using commas.

Example 4. Write the following numbers in figures:

        (a) Six lakh three thousand four hundred five.

        (b) Forty five lakh four hundred one.

Solution.

	Ten-lakhs	Lakhs	Ten-thousands	Thousands	Hundreds	Tens	Ones	Number
(a)		6	0	3	4	0	5	603405
(b)	4	5	0	0	4	0	1	4500401

Example 5. How many numbers have 6 digits?

Solution.   Greatest 6-digit number = 999999

         Greatest 5-digit number = 99999

∴   6-digit numbers = $\overline{900000}$
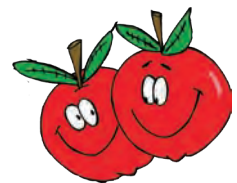
EXERCISE 1.1

1. Read the following numbers from the abacus and write in figures and words.
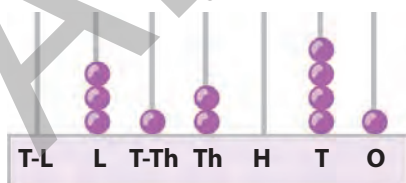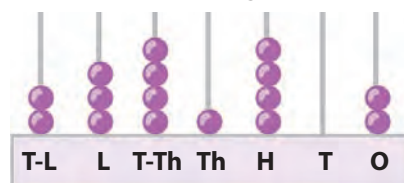
             (a)   (b)

2. Read the following numbers from the table and write in figures and words:

	Lakhs		Thousands		Units		
	Ten-lakhs	Lakhs	Ten-thousands	Thousands	Hundreds	Tens	Ones
(a)		5	0	5	9	1	3
(b)	2	0	4	8	0	5	6

3. Read the following numbers and write their number names:
   (a) 251310   (b) 5602130   (c) 12308731   (d) 1903041

4. Write the following numbers in figures:
   (a) Eight lakh nineteen thousand five hundred sixteen.
   (b) Nine lakh sixteen thousand fifty.
   (c) Two crores sixty two lakh eighty thousand fourteen.
   (d) Eighty lakh seventy thousand five.

5. Build the numbers which have:
   (a) 3 crores, 5 lakhs, 2 tens, 19 thousands, 1 hundreds and 3 ones.
   (b) 41 thousands, 11 lakhs, 3 hundreds and 5 tens.
   (c) 8 thousands, 2 tens, 9 ones, 7 lakhs and 1 hundreds.

6. There are 3508172 men, 2039051 women and 87329 children in a village. Write these numbers in words.

7. Write in figures the numbers given in the following sentences:
   (a) The population of a country is seventy five lakh seven thousand forty nine.
   (b) The number of school going children in a country is five lakh thirty nine thousand two hundred five.

8. Look at the patterns and write next three numbers:
   (a) 535703, 545703, 555703   (b) 1128596, 1328596, 1528596

9. Rohan was asked to write the number 'five lakh seven thousand four hundred five'. He wrote down 5070405. Is this correct? If not, write the correct number.

10. Place commas at the appropriate places in each of the following to separate the periods;
    (a) 2509832   (b) 7526094   (c) 36128979   (d) 18245793

11. Write in ascending order the numbers between
    (a) 870506 and 870510   (b) 1112345 and 1112348

PLACE VALUE AND EXPANDED FORM

We have seen earlier that with the extension of places on the left, the place value chart also extends to the left. The place value chart can help us in determining the place value of a digit.

Example 1. Enter in the place value chart the digits of the following numbers and find the place value of the digit 3 in each case:

(a) 360526   (b) 3500614   (c) 2083569

Solution.

Numbers	Ten-lakhs 1000000	Lakhs 100000	Ten-thousands 10000	Thousands 1000	Hundreds 100	Tens 10	Ones 1
360526		3	6	0	5	2	6
3500614	3	5	0	0	6	1	4
2083569	2	0	8	3	5	6	9

(a) The place value of 3 in words is three lakh and in figures is 300000.

(b) The place value of 3 in words is thirty lakh and in figures is 3000000.

(c) The place value of 3 in words is three thousand and in figures is 3000.

Example 2. Write each of the following numbers in the expanded form and find the place value of the digit 5 in words and in figures:

(a) 858492   (b) 2503702

Solution.   (a) 858492 = 800000 + 50000 + 8000 + 400 + 90 + 2

∴ Place value of 5 in words is fifty thousand and in figures is 50000

(b) 2503702 = 2000000 + 500000 + 0 + 3000 + 700 + 0 + 2

= 2000000 + 500000 + 3000 + 700 + 2

∴ Place value of 5 in words is five lakh and in figures is 500000

Example 3. Find the place value of the digits given in the boxes:

(a) 5 [6] 2391   (b) [2] 95600

Solution.   (a) The place value of 6 is 60000
(b) The place value of 2 is 200000

> Write 6 under 6 and 0 for all other digits to its right and get the place value of 6.
> 5 6 2 3 9 1
> ↓ ↓ ↓ ↓ ↓ ↓
> 6 0 0 0 0

Example 4. Write the following numbers in the short form:

(a) 800000 + 70000 + 5000 + 200 + 50 + 6
(b) 6000000 + 30000 + 500 + 3

Solution. Required short forms are:

        (a) 800000 + 70000 + 5000 + 200 + 50 + 6 = 875256.

        (b) 6000000 + 30000 + 500 + 3 = 6030503

EXERCISE 1.2

1. Write the following numbers in the place value chart and find the place value of the digit 7 in each case:

    (a) 3756920   (b) 7062408   (c) 270053   (d) 8725963

2. Find the place value of 3 in 5320519 both in figures and words.

3. Write the following numbers in the expanded form:

    (a) 670534   (b) 403200   (c) 7820067   (d) 909005

4. Write the following numbers in the expanded form and find the place value of the digit 9 in each case:

    (a) 920561   (b) 9503520   (c) 495604   (d) 3070590

5. Find the place value of the digits given in the boxes:

    (a) 53 6 9521   (b) 9 256143   (c) 700 4 89

6. Find the digits in the required place in each of the following:

    (a) Ten-lakhs place in 5807093   (b) Lakhs place in 5298760

7. Write the following numbers in the short form:

    (a) 500000 + 70000 + 3000 + 200 + 40 + 7

    (b) 100000 + 30000 + 4000 + 30 + 2

    (c) 8000000 + 500000 + 3000 + 400 + 60

> Make use of place value chart.

ORDER RELATION

We have already learnt the method of finding the greater of the two given 5-digit numbers in standard IV. The same method is applied when the number consists of more than 5 digits. For example,

    25 > 9;   356 > 89;   5049 > 620;   76549 > 9876;   120345 > 68234

Thus

    The number with more digits is greater than the number with less digits.

Now let us take some examples of numbers having the same number of digits.

    We know that

    251 > 193; 8052 > 2984; 57081 > 54394; 87632 > 87395

Thus

    To compare two numbers having the same number of digits, we start comparing the digits from the leftmost position.

Example 1. Which is greater of 351761 and 292873?

Solution. 351761 has 6 digits.

292873 has 6 digits.

∴ We compare the digits at the leftmost positions in the two given numbers.

The digit on the leftmost position of 351761 is 3.

The digit on the leftmost position of 292873 is 2.

Since 3 > 2

∴ 351761 > 292873.

Example 2. Compare 8705321 and 8702358 and find which is greater.

Solution. 8705321 has 7 digits.

8702358 also has 7 digits.

Now the digit on the leftmost position of 8705321 is 8.

Similarly, the digit on the leftmost position of 8702358 is 8.

But 8 = 8

∴ We compare the next digit.

The digit next to 8 in 8705321 is 7.

The digit next to 8 in 8702358 is 7.

But 7 = 7

∴ We compare the next digit.

The next digit to 7 in both the numbers are again equal.

∴ We compare still the next digits.

The digit next to 0 in 8705321 is 5.

The digit next to 0 in 8702358 is 2.

But 5 > 2

∴ 8705321 > 8702358.

Now it is easy to compare.

Example 3. Arrange the following numbers in ascending order:

518896, 872300, 27562, 300252.

Solution. The smallest number is 27562. The next number greater than 27562 is 300252. The numbers greater than 300252 in order are 518896 and 872300.

∴ The numbers when arranged in ascending order are:

27562, 300252, 518896, 872300

Example 4. Arrange the following numbers in descending order:

301516, 8620031, 302650, 6532289.

Solution. The greatest number is 8620031. The next number smaller than 8620031 is 6532289. Other numbers smaller than 6532289 in order are 302650 and 301516.

∴ The numbers when arranged in descending order are:

8620031, 6532289, 302650, 301516.

FORMATION OF GREATEST AND SMALLEST NUMBERS

We have learnt the method of forming the greatest and the smallest number of 5 digits. The same rule applies in the formation of numbers of more than 5 digits.

Study the following examples:

(a) Repetition of digits not allowed

Example 5. Form greatest and smallest number of 6 digits using the digits 3, 1, 8, 0, 5 and 9 only once.

Solution. To write the greatest number of 6 digits, start with the greatest digit on the leftmost place and then write the other digits in descending order.

L	T-Th	Th	H	T	O
9	8	5	3	1	0

∴ The greatest number of 6 digits is 985310.

Watch Out!
0 is never written on the leftmost place.

To write the smallest number of 6 digits, start with the smallest digit on the leftmost place and then write the other digits in ascending order.

∴ The smallest number of 6 digits is 103589.

L	T-Th	Th	H	T	O
1	0	3	5	8	9

(b) Repetition of digits is allowed

Example 6. Write 6-digit greatest and smallest numbers by using the digits 1, 8, 5, 0, 2.

Solution. For writing the greatest number, the greatest digit is repeated on the leftmost places. We start writing from ones place and write the smallest given digit and then other digits in ascending order. The greatest 6-digit number is 885210.

L	T-Th	Th	H	T	O
8	8	5	2	1	0

For writing the smallest number, the greatest digit is written in ones place and the smallest number is repeated on the leftmost places.

L	T-Th	Th	H	T	O
1	0	0	2	5	8

The smallest 6-digit number is 100258.

Note If 0 is given, then 0 is repeated on the places just before the last place.

EXERCISE 1.3

1. Compare the following numbers and put > or < in the blanks:
   (a) 725029......89945
   (b) 45005.....295030
   (c) 807670......769070
   (d) 327605......345005
   (e) 8787878......8778878
   (f) 9005370......9068921

2. Find the smallest and the greatest numbers from the following:
   (a) 723523, 72315, 640219, 900101
   (b) 9323562, 2897050, 999999, 9999999

3. Arrange the following numbers in ascending order:
   (a) 435198, 285002, 997651, 900302
   (b) 402019, 292725, 450020, 370587
   (c) 1925378, 2035450, 35715, 537819

4. Arrange the following numbers in descending order:
   (a) 8775923, 878919, 2023785, 423610
   (b) 525, 925215, 170819, 1920023
   (c) 3232572, 1923892, 62705, 407084

5. Write the smallest and the greatest numbers using each of the following digits only once:
   (a) 2, 3, 5, 0, 9, 4
   (b) 2, 3, 0, 4, 6, 8, 7

6. Write any number of seven digits. Write another number by reversing the digits. Find which of the two numbers is smaller.

7. By using 0, 2, 4, 5 and 6, write the smallest and the greatest numbers of six digits.

8. By using 0, 1, 2, 3 and 4, write the smallest and greatest numbers of seven digits.

9. Write the greatest and smallest numbers of 6 digits by using 2, 3, 0, 5, 4, 1 only once such that the digit 4 always appears at the hundreds place.
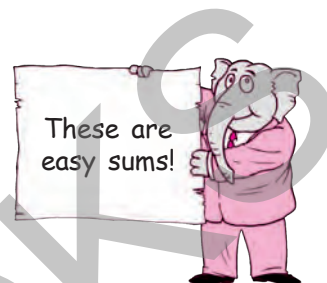
INTERNATIONAL SYSTEM OF WRITING NUMBERS IN WORDS

The system of writing numbers in words discussed earlier is called Indian system. In English system (or International system), we use the following:

$$1 \text{ lakh } = 100 \text{ thousands}$$
$$10 \text{ lakhs } = 1 \text{ million}$$
$$1 \text{ crore } = 10 \text{ millions}$$

In offices also, we sometimes use millions etc.

While writing in international system, we separate the period by putting comma (,) in groups of three from the extreme right, e.g., 3,540,986.

The following table will help us in writing the numbers in international system:

Indian System	I Crore 10000000	Ten-lakhs 1000000	Lakhs 100000	Ten-thousands 10000	Thousands 1000	Hundreds 100	Tens 10	Ones I
International System	Ten Millions	Millions	Hundred-thousands	Ten-thousands	Thousands	Hundreds	Tens	Ones
	Millions		Thousands			Units		

> **Note** The first three digits from the extreme right make units period, next three digits make thousands period and the next period makes millions period.

Example 1. Separate by commas and write in words, in international system:
   (a) 304219   (b) 9340596   (c) 18390439

Solution.   (a) 304219   = 304,219
                = Three hundred four thousand two hundred and nineteen.

   (b) 9340596 = 9,340,596
                = Nine million three hundred forty thousand five hundred and ninety six.

   (c) 18390439 = 18,390,439
                = Eighteen million three hundred ninety thousand four hundred and thirty nine.

Example 2. Write in figures:
   Two million six hundred two thousand three hundred and eighty.

Solution.

Millions	Thousands			Units		
2	6	0	2	3	8	0

∴ The number is 2602380.

EXERCISE 1.4

I. Write the following numbers in words (international system):
   (a) 2035708   (b) 55086105   (c) 315705
   (d) 700800   (e) 70302905   (f) 2030405

2. Write the following numbers in figures:
  (a) Two million five hundred fifty thousand three hundred and six.
  (b) Six million ninety thousand two hundred and thirty.
  (c) Five million nine hundred and twelve.
  (d) Four million three hundred forty thousand and six hundred.
  (e) One million seven hundred thousand and ninety.
  (f) Nineteen million thirty four thousand and four.

ROMAN NUMERALS

We know that the seven basic Roman numerals are I, V, X, L, C, D and M.

These numerals stand respectively for 1, 5, 10, 50, 100, 500 and 1000. We have used I, V and X and formed numbers up to 39 in class IV. Here we shall learn the use of L and C to form numbers up to 100.

Symbols	I	V	X	L	C	D	M
Value (Hindu Arabic Numerals)	1	5	10	50	100	500	1000

According to the convention, the compound symbols are formed by the rules given below:

(a) X when written to the left of L or C, it is subtracted from that numeral, e.g.,
   XL = 50 – 10 = 40;
   XC = 100 – 10 = 90

(b) X when written to the right of L or C, it is added to that numeral, e.g.,

   LX = 50 + 10 = 60;

   LXX = 50 + 10 + 10 = 70;

   LXXX = 50 + 10 + 10 + 10 = 80

> I is subtracted from V and X only.
> V and L are never subtracted.
> X is subtracted from L and C only.
> V and L are never repeated.

(c) I and X can be repeated a maximum of three times.

Example 1. Write the following in Roman numerals:
        (a) 47   (b) 75   (c) 89   (d) 98

Solution.   (a) 47 = 40 + 7   (b) 75 = 70 + 5
                   = XL + VII   = LXX + V
                   = XLVII   = LXXV
              (c) 89 = 80 + 9   (d) 98 = 90 + 8
                   = LXXX + IX   = XC + VIII
                   = LXXXIX   = XCVIII

Example 2. Write the following in Hindu-Arabic numerals:
        (a) LXIV   (b) LIX   (c) LXXIII
        (d) XCVI

> Do you know?
> Romans did not have '0'

Solution.   (a) LXIV = L + X + IV   (b) LIX = L + IX
                      = 50 + 10 + 4 = 64   = 50 + 9 = 59
              (c) LXXIII = L + XX + III   (d) XCVI = XC + VI
                      = 50 + 20 + 3 = 73   = 90 + 6 = 96

EXERCISE 1.5

1. Write the following in Roman numerals:
   (a) 40　　　　　(b) 55　　　　　(c) 74　　　　　(d) 89　　　　　(e) 94
   (f) 88　　　　　(g) 44　　　　　(h) 67　　　　　(i) 99　　　　　(j) 79

2. Write the following in Hindu-Arabic numerals:
   (a) LXIII　　　(b) XLIX　　　(c) LXXXIII　　(d) XCV　　(e) LXXVII

3. Compare: Use >, < or = in the box:
   (a) XCI ☐ LXII　　　　　　　　　(b) XLIII ☐ LXIII
   (c) LIX ☐ C　　　　　　　　　　(d) XCVI ☐ LXVI

4. Write the equivalent Roman numeral in the box:
   (a) L – X = ☐　　　(b) XLII + XXIX = ☐　　　(c) XCII – LXVIII = ☐

LIFE SKILLS

Today the world has become one place where trade and travel between various countries is very common. It is very important to understand the currencies of various countries and their conversion.

Learn the names of currencies used in different countries.

Answer the following questions:

1. Mr. Mittal went to England for a business deal. He was required to pay £120 thousand (£ stands for pound).
   (a) How much did Mr. Mittal pay in Indian rupees? (1£ = ₹89)
   (b) Express the answer in Indian system.

2. Mr. Williams came to India from USA for holidays. He spent fourteen lakh rupees in India. How much money did Mr. Williams pay in terms of dollars if $1 = ₹70? ($ stands for dollar)

3. What lesson (value) do you get from it?

CHALLENGE

Rearrange one matchstick only to make the statements true:

1. LXIX + V = LXIII

2. XXII – X = XXXI

3. IX + III = XIV

Chapter Test

Note: *Each question is of 2 marks.*

1. Encircle the correct answer from the given options:

   (a) The place value of 8 in 4806951 is

       (i) 4800000   (ii) 800000   (iii) 80000   (iv) 8000000

   (b) One million eight thousand nineteen is

       (i) 108091   (ii) 1008019   (iii) 180019   (iv) 180090

2. Fill in the correct numbers in the boxes connected to each pointer. The points are placed equidistant on the line.

   Space for rough work
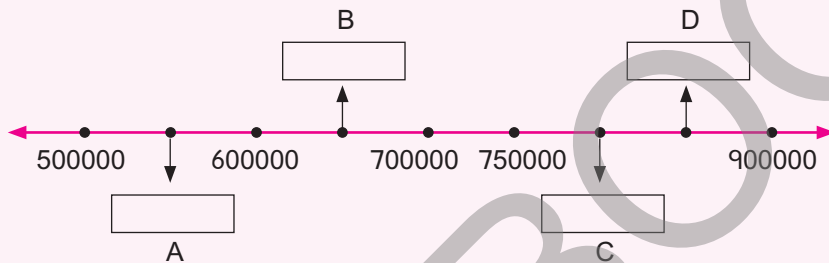
3. Fill in the blanks:

   (a) One million   = ... lakh

   (b) Sixty lakh   = ... million

   (c) One lakh   = ... thousand

   (d) 5 hundred thousand = ... lakh

4. Write in Roman numerals:

   (a) 49 ....   (b) 110 ....

   (c) 90 ....   (d) 59 ....

5. The prices of 4 cars of different makes are given below:

   Car A → ₹1530000   Car B → ₹1528500

   Car C → ₹2109000   Car D → ₹2190000

   Use the symbol > or < to compare the prices:

   (a) Car A ◯ Car B   (b) Car B ◯ Car C

   (c) Car D ◯ Car C   (d) Car B ◯ Car D

2   Addition and Subtraction

ADDITION

In our previous classes we have learnt the addition of 4 or 5-digit numbers. In the same way we add 6 or 7-digit numbers.

Example 1. Add 537923 and 365408. Write the number sentence.

Solution. Putting the digits of the given numbers in the column form and then adding:

L	T-Th	Th	H	T	O
I	I	I		I	
5	3	7	9	2	3
+ 3	6	5	4	0	8
9	0	3	3	3	I

Add and regroup where needed

11 **O**   = 1 **T**   + 1 **O**

13 **H**   = 1 **Th** + 3 **H**

13 **Th** = 1 **T-Th** + 3 **Th**

10 **T-Th** = 1 **L**   + 0 **T-Th**

Number Sentence: 537923 + 365408 = 903331

Example 2. Add 513051 2 and 3989095 and write the sum in words.

Solution. Putting the digits of the given numbers in the column form and then adding:

T-L	L	T-Th	Th	H	T	O
I	I			I		
5	1	3	0	5	1	2
+ 3	9	8	9	0	9	5
9	1	1	9	6	0	7

Remember to regroup lakhs

Sum = Ninety one lakh nineteen thousand six hundred seven.

> **Note**   In the addition sum, the numbers to be added are called addends.

EXERCISE 2.1

Add:

1.

```
  4 5 6 7 1 2
+ 4 6 4 3 9 8
```

2.

```
  6 7 8 5 3 2 6
+ 1 4 0 8 3 9 1
```

3.

```
  3 4 2 8 8 9 1
+ 2 0 9 6 3 8 4
```

4.

```
  5 6 3 2 8 0 9
+   8 6 4 9 8 9
```

5.

```
  2 5 5 6 7 8 2
+ 3 6 3 4 0 7 8
```

6.

```
  4 8 5 6 3 2 9
+   9 0 7 9 9 3
```

7.

```
  2 8 8 2 7 7 7
+   5 9 8 7 6 5
+   7 0 2 0 8 1
```

8.

```
  1 7 0 3 0 2 9
+ 2 6 3 4 5 1 1
+ 3 5 7 6 0 8 4
```

Find the sum of the following:

9. 3703895 + 2887098

10. 2080706 + 3887765

11. 2387640 + 5487604 + 859726

12. 85 + 999 + 23456 + 9054381

I will write in columns and then add.

WORD PROBLEMS ON ADDITION

Example 1. A housing company built 567083 flats in 2017 and 397927 flats in 2018. How many total flats were built in the two years? Write the solution sentence.

Solution.

Flats built in 2017	=	5 6 7 0 8 3
Flats built in 2018	=	3 9 7 9 2 7
Total flats built in two years	=	9 6 5 0 1 0

To find total, we add

Solution sentence:

The company built 965010 flats in two years.

Example 2. In one year, the states of Punjab, U.P. and M.P. produced 1370819, 2505925 and 2795947 bags of wheat respectively. Find the total number of bags produced by these three states.

Solution.

			1	1	1	2		2		
Wheat produced by Punjab =	1	3	7	0	8	1	9	bags
Wheat produced by U.P. =	2	5	0	5	9	2	5	bags
Wheat produced by M.P. =	2	7	9	5	9	4	7	bags
Total wheat produced =	6	6	7	2	6	9	1	bags

∴ The three states produced 6672691 bags of wheat.
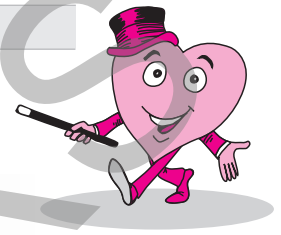
EXERCISE 2.2

1. The number of persons who visited Kanyakumari in the years 2015 and 2016 was 2537615 and 4088294 respectively. How many persons visited Kanyakumari in these two years?

2. A factory produced 5592827 pink bulbs and 4267985 milky bulbs. How many bulbs did it produce altogether?

3. There are 5725819 men, 3209792 women and 795983 children in a city. What is its population?

4. In an election 2795946 votes were found valid, 2305 votes were found invalid and 305 persons did not vote. How many voters were registered in all?

5. In 2017, hand pumps were dug in drought areas. The Government dug 325712, 180025 and 97509 hand pumps respectively in three different states. How many total hand pumps were dug in these states?

6. An examination board conducted four examinations in a year. The fees received from these examinations was ₹ 785812, ₹ 99871, ₹ 82090 and ₹ 1590803 respectively. Find the total fees received by the board in that year.

SUBTRACTION

We have learnt the method of subtracting 4 or 5-digit numbers. In the same way we subtract the numbers having 6 or 7 digits.

Example 1. Subtract 5317903 from 6823812 and check your answer.

Solution. Writing the numbers in the columns, we have

T-L	L	T-Th	Th	H	T	O
			12	18	0	12
6	8	$\overset{1}{\cancel{2}}$	$\overset{2}{\cancel{3}}$	$\cancel{8}$	$\cancel{1}$	$\cancel{2}$
– 5	3	1	7	9	0	3
1	5	0	5	9	0	9

Decompose or rename

Add to check

Checking:

		1	1		1	
5	3	1	7	9	0	3
+ 1	5	0	5	9	0	9
6	8	2	3	8	1	2

Note In the above example 6823812 is called minuend and 5317903 is called subtrahend.

Example 2. Find the difference between 3502108 and 787916. Write the number sentence.

Solution. Writing the digits of the greater number on the top and then subtracting as usual, we get

← After renaming

	14	9	11	10	10	
$\overset{2}{\cancel{3}}$	$\overset{4}{\cancel{5}}$	$\overset{10}{\cancel{0}}$	$\overset{1}{\cancel{2}}$	$\overset{0}{\cancel{1}}$	$\cancel{0}$	8
–	7	8	7	9	1	6
2	7	1	4	1	9	2

The number sentence: 3502108 – 787916 = 2714192.

EXERCISE 2.3

Subtract:

1.
```
  5 0 3 4 8 1
– 2 1 8 3 7 5
```

2.
```
  4 3 2 5 7 0
–   8 7 3 9 1
```

3.
```
  5 7 0 0 0 0 0
– 1 3 8 0 5 4 2
```

4.
```
  8 5 7 0 3 1 2
– 3 8 9 1 4 2 5
```

5.
```
  9 6 0 3 8 2 5
– 2 7 1 4 0 8 7
```

6.
```
  3 5 0 6 7 0 8
–   8 5 7 1 2 9
```

Find the difference:

7. 827903 – 718014
8. 7123056 – 6048108
9. 7020029 – 501249
10. 8023425 – 648930
11. Find the difference between 6509312 and 5483609. Check the answer.
12. Look at the pattern and write next two terms:
    (a) 158913, 159014, 159115, ..., ...
    (b) 627509, 627304, 627099, ..., ...

WORD PROBLEMS ON SUBTRACTION

Example 1. The sum of two numbers is 4482308. If one number is 918695, find the other number.

Solution.

			4	4	8	2	3	0	8
One of the numbers =	–			9	1	8	6	9	5
Other number =			3	5	6	3	6	1	3

Sum of two numbers = 4 4 8 2 3 0 8

One of the numbers = – 9 1 8 6 9 5

Other number = 3 5 6 3 6 1 3

∴ Second number = 3563613.

Example 2. 8607975 bags of wheat were stored in a godown. Out of these, 875918 bags were taken out in March and 877509 bags were taken out in April. How much wheat was in stock after April in the godown?

Solution.

Wheat taken out in March = 8 7 5 9 1 8 bags — Add

Wheat taken out in April = 8 7 7 5 0 9 bags

Total wheat taken out = 1 7 5 3 4 2 7 bags

Wheat in godown = 8 6 0 7 9 7 5 bags — Subtract

Wheat taken out = 1 7 5 3 4 2 7 bags

Balance in stock = 6 8 5 4 5 4 8 bags

EXERCISE 2.4

1. A factory produced 1535798 bulbs in 2015 and 2285905 bulbs in 2016. Find the increase in the production of bulbs.
2. The sum of two numbers is 3798905. If one of the numbers is 890905, find the other number.
3. There are two numbers, one of which is 2587925. The second number is 287887 less than the given number. Find the second number.
4. What should be added to 287098 so that the sum becomes 309103?
5. The difference of two numbers is 109253. If the greater number is 202020, find the smaller number.

6. The population of a city was 3728205 in 2017 and in 2018 it became 3729519. Find the increase in population.

7. The population of a city is 523503. If the number of males is 298825, find the number of females.

8. Vijay's van travelled 137825 kilometres in 2016. Rahim's van travelled 140207 kilometres the same year. How many kilometres Rahim's van travelled more than Vijay's?

9. Ashok wanted to buy a new car which costs ₹428825. He had ₹379500 and borrowed the rest from a bank. How much money did he borrow from the bank?

10. The total sale proceeds of a Super Bazaar in the month of February, 2018 was ₹6870813. If the sale proceeds for the first two weeks was ₹1800925 and ₹2150708, find the sale for the remaining two weeks.

ESTIMATING THE SUM AND THE DIFFERENCE

We have learnt in standard IV, the method of estimating the sum to the nearest thousands and ten-thousands. We apply the same rule here as well. To round a number at the lakhs place, we consider the number at the ten-thousands place, if it is 5 or more, we move up otherwise, we move down.

For example:

(a) 352080 is rounded off to 400000 to the nearest lakh.

(b) 239786 is rounded off to 200000 to the nearest lakh.

(c) 4802159 is rounded off to 5000000 to the nearest ten-lakh.

In general,

When we round off a given number to the required place, we consider the next number at the right side. If this number is 5 or more than 5, the number at the required place is increased by 1 and all the numbers at the right side become zeros. If this number at the right side is less than 5, the number at the required place remains the same and all the numbers at the right side become zeros.

Example 1. Find the actual and estimated sum of 380419 and 218765 by rounding off to the nearest lakh.

Solution.

Actual sum	Estimated Sum
380419	400000
+ 218765	+ 200000
599184	600000

Example 2. Find the actual and the estimated difference of 832910 and 590100 by rounding off to the nearest lakh.
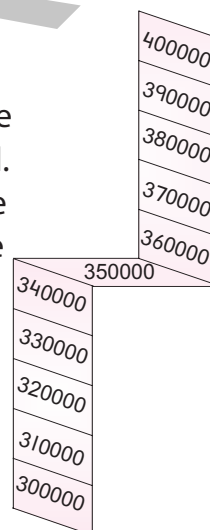
Solution.

Actual difference	Estimated difference
832910	800000
− 590100	− 600000
242810	200000

Example 3. Rishab spent ₹6370915 on buying a flat and ₹549810 on buying a car. Estimate the total cost he paid and compare with the actual cost.

Solution.

Estimated cost of flat = ₹6400000

Estimated cost of car = ₹500000

Estimated total cost = ₹6900000

Actual cost = ₹(6370915 + 549810)

= ₹6920725

Estimated cost and actual cost are almost equal.

Example 4. Renuka earns ₹1509500 in a year and spends ₹1285000. Estimate her annual savings.

Solution. Rounding off to the nearest lakh

Annual income = ₹1500000

Annual expenditure = ₹1300000

Annual savings = ₹(1500000 − 1300000)

= ₹200000

EXERCISE 2.5

1. Find the actual and estimated sum by rounding off to the nearest ten-thousand:

(a)

Actual	Estimated
329512	
+112087	

(b)

Actual	Estimated
522714	
+283929	

2. Find the actual and estimated sum by rounding off to the nearest lakh:

(a)

Actual	Estimated
280125	
+128509	

(b)

Actual	Estimated
1429817	
+5607520	

3. Find the actual and estimated difference by rounding to the nearest lakh:

(a)	Actual	Estimated	(b)	Actual	Estimated
	5 2 7 3 1 9			2 1 9 5 6 7	
	– 2 8 5 1 0 3			– 8 7 3 0 9	

4. A farmer produced 390784 kg wheat and 123000 kg pulses in a year. Estimate his total produce by rounding off to the nearest lakh.

5. A fruit seller bought 280514 bananas, 301718 oranges and 453892 apples from the wholesale market. Round off to the nearest lakh and estimate the total fruits he bought.

6. A school needs ₹4987653 for its building. It has only ₹3592468 in its accounts. Estimate the money by rounding off to the nearest lakh, it has still to raise.

7. An exporter has an order to supply 380519 shirts. He has 213456 shirts in stock. How many more shirts has he to arrange? Estimate by rounding off to the nearest lakh.

8. A big car costs ₹817812 and a small one costs ₹385906. Estimate the difference in their costs.

9. Write in a better way:

Example: "My salary is ₹79495 per month" can be written in a better way as "My salary is ₹80000 per month."

(a) I am 15 years 3 months 8 days old.
(b) 2830145 teachers are working in primary schools in a country.
(c) 4892 persons attended the function.
(d) I spent ₹8110 on buying a suit.

Story writing (Framing a word problem)

We have already learnt how to write a story for the given number sentence in standard IV. There may be different stories for a single sentence. It all depends upon you, how you look at it.

For example, for the number sentence 523809 + 297000 = ?

We can write the following stories:

(a) What is the sum of 523809 and 297000?

(b) Arun's father bought two cars, one costing ₹523809 and the other costing ₹297000. How much total money did his father pay for the cars?

(c) A pump throws 523809 litre and 297000 litre water in two days. How much total water does the pump throw in two days?

Similarly, we can write following stories for the number sentence

6573000 – 5987000 = ?

(a) What is the difference between 5987000 and 6573000?

(b) Nitika bought a flat for ₹6573000 and her friend Manjula bought a flat for ₹5987000. How much more money did Nitika pay?

(c) A cloth merchant has 6573000 m cloth in his shop. He sells out 598700 m cloth. How much cloth is still in the shop?

EXERCISE 2.6

Frame word problem (or write a story) for each of the following number sentence:

1. 800000 + 200000 = ?
2. 530219 + 87100 = ?
3. 280915 + 894 = ?
4. 317849 – 286500 = ?
5. 100000 – 1 = ?
6. 387619 – 25700 = ?

CHALLENGE

1. A factory produced 1858509 bolts in January and 7623 bolts more in February than in January. However, due to short supply of electricity it produced 25838 bolts less in March than in February. How many total bolts did it produce in these three months?

2. Find the smallest and the greatest numbers which are rounded off to the nearest lakh as 500000.

3. Fill in the boxes and check your answer:

| 137869 | (+) 5635 → | 143504 | (–) 2312 → | 141192 |

(+) 550 ↑   (+) 3815 ↓

| | ← (–) 983 | | ← (–) 6705 | |
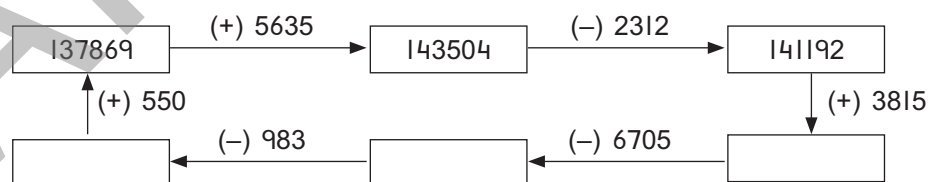
Chapter Test

Time: 30 minutes   **M.M. 10**

Note: *Each question is of 2 marks.*

1. Encircle the correct answer from the given options:

   (a) Round off 322521 to the nearest lakh.

      (i) 300000   (ii) 400000

      (iii) 320000   (iv) 330000

   (b) The estimated sum of 28019 and 32925 is

      (i) 61000   (ii) 70000

      (iii) 60000   (iv) 71000

2. Write a number in the blank space which is

   (a) 2 thousands more than 532500 ....

   (b) 3 lakhs more than 432526 ....

   (c) 15 thousands more than 623445 ....

   (d) 12 thousands less than 500310 ....

3. Find the estimated difference of 58991 and 141000.

4. There are two numbers. One of them is 150319 and the second is 27827 more than this. What is the second number?

   ....

5. The population of two cities A and B is 530820 and 489519 respectively.

   (a) Which city is more populated?   ....

   (b) What is the difference of population of the given cities?

   ....

3 Multiplication and Division

MULTIPLICATION

In our previous classes we have learnt the multiplication of a number by 2 or 3-digit numbers. In this chapter we shall learn more about multiplication.

Let us first review some important properties of multiplication.

1. **The product of two numbers does not change, when the order of numbers is changed,** e.g.,

$$15 \times 12 = 12 \times 15; \qquad 503 \times 23 = 23 \times 503;$$
$$1418 \times 315 = 315 \times 1418; \qquad 530019 \times 12 = 12 \times 530019.$$

2. **The product of three numbers does not change, when the grouping of numbers is changed,** e.g.,

$$(15 \times 18) \times 10 = 15 \times (18 \times 10) = (15 \times 10) \times 18;$$
$$(423 \times 12) \times 25 = 423 \times (12 \times 25) = (423 \times 25) \times 12.$$

3. **The product of a number and 1 is the number itself,** e.g.,

$$819 \times 1 = 819; \qquad 1513 \times 1 = 1513;$$
$$17509 \times 1 = 17509; \qquad 319814 \times 1 = 319814.$$

4. **The product of a number and 0 is 0,** e.g.,

$$18 \times 0 = 0 \times 18 = 0; \qquad 403 \times 0 = 0 \times 403 = 0;$$
$$2917 \times 0 = 0 \times 2917 = 0; \qquad 718205 \times 0 = 0 \times 718205 = 0.$$

Now let us review the product of a number by tens and hundreds.

For example,

$$23 \times 10 = 230$$
$$504 \times 30 = 15120$$
$$18 \times 100 = 1800$$
$$12 \times 500 = 6000$$

Similarly, on the same pattern

$$25 \times 1000 = 25000$$
$$143 \times 7000 = 1001000$$

> Put as many zeros in the product as in the multiplier. Then multiply by the non-zero part of the multiplier.

Now we solve below a few examples.

Example 1. Multiply 6718 by 83.

Solution.

```
      6 7 1 8
    ×     8 3
  ───────────
    2 0 1 5 4
  5 3 7 4 4 0
  ───────────
  5 5 7 5 9 4
```

Add the products of 3 and 80

Example 2. Multiply 7842 by 306 and write the number sentence.

Solution.

```
      7 8 4 2
    ×   3 0 6
  ───────────
    4 7 0 5 2
    0 0 0 0 0   ←
  2 3 5 2 6 0 0
  ─────────────
  2 3 9 9 6 5 2
```

We can avoid multiplication by zero.

```
      7 8 4 2
    ×   3 0 6
  ───────────
    4 7 0 5 2
  2 3 5 2 6 0 0
  ─────────────
  2 3 9 9 6 5 2
```

Number sentence: $7842 × 306 = 2399652$

Example 3. Multiply 531 by 2583 and write the product in words.

Solution.

$$2583 = 2000 + 500 + 80 + 3$$
$$\therefore \quad 531 × 2583 = 531 × (2000 + 500 + 80 + 3)$$
$$= 531 × 2000 + 531 × 500 + 531 × 80 + 531 × 3$$
$$= 1062000 + 265500 + 42480 + 1593$$
$$= 1371573$$

We do it like this:

```
          5 3 1
      ×  2 5 8 3
    ───────────
        1 5 9 3  ←  (531 × 3)
      4 2 4 8 0  ←  (531 × 80)
    2 6 5 5 0 0  ←  (531 × 500)
  1 0 6 2 0 0 0  ←  (531 × 2000)
  ─────────────
  1 3 7 1 5 7 3  ←  (531 × 2583)
```

Add all the partial products.

Product = Thirteen lakh seventy one thousand five hundred seventy three.

EXERCISE 3.1

I. Multiply the following orally:

    (a) 5637 by 100   (b) 3069 by 1000

Multiply:

2. 5315 × 34   **3.** 7923 × 73   **4.** 4976 × 92

5. 8654 × 48   **6.** 8907 × 27   **7.** 4621 × 263

8. 23456 × 173   **9.** 7829 × 450   **10.** 23906 × 405

11. 32809 × 265   **12.** 4319 × 2300   **13.** 1223 × 3809

14. 506 × 4026

15. Find the product orally in each case:

    (a) 5613 × 0   (b) 965329 × 1   (c) 123056 × 10

    (d) 1570 × 100   (e) 7896 × 0 × 523 (f) 9625 × 1 × 100

WORD PROBLEMS ON MULTIPLICATION

Example 1. There are 2376 bags of wheat in a godown. If each bag weighs 98 kg, find the total weight of these bags.

Solution.

$$
\begin{array}{r}
2376 \\
\times\,98 \\
\hline
19008 \\
213840 \\
\hline
232848 \\
\hline
\end{array}
$$

> To find total weight multiply 2376 by 98

∴ Total weight of wheat = 232848 kg.

Example 2. The cost of a sofa is ₹98050. Find the cost of 35 such sofas.

Solution. Here we multiply ₹98050 by 35.

$$
\begin{array}{r}
₹ \\
98050 \\
\times\,35 \\
\hline
490250 \\
2941500 \\
\hline
3431750 \\
\hline
\end{array}
$$

> Multiply 98050 by 35

∴ Cost of 35 sofas = ₹3431750

Example 3. Find the continued product: 538 × 46 × 91.

    Write the product in words.

Solution. First we multiply 538 by 46.

```
      5 3 8
    × 4 6
    ─────────
      3 2 2 8
    2 1 5 2 0
    ─────────
    2 4 7 4 8
```

Now we multiply 24748 by 91.

```
      2 4 7 4 8
    ×     9 1
    ─────────────
      2 4 7 4 8
    2 2 2 7 3 2 0
    ─────────────
    2 2 5 2 0 6 8
```

∴ 538 × 46 × 91 = 2252068

Product = Twenty two lakh fifty two thousand sixty eight.

EXERCISE 3.2

1. There are 435 apples in a box. How many apples will be there in such 938 boxes?

2. There are 637 schools in a district. If the number of students in each school is 1037, find the total number of students in the district.

3. A milk depot sells 536 litres milk in a day. How much milk will it sell in 256 days?

4. A factory produces 2530900 pens in a month. 144 pens are packed in a carton. There are 17608 cartons in the factory. How many more pens should it produce to fill these cartons?

5. A bag of sugar weighs 105 kg. Find the total weight of sugar in such 1568 bags.

6. The price of a bicycle is ₹2536. Find the total cost of 196 bicycles.

7. A man bought 536 chairs. The price of a chair was ₹398. He paid ₹150000 to the shopkeeper. How much more money he has to pay?

8. A cloth mill produces 45337 m cloth in a month. How much cloth will it produce in 78 months?

9. Find the continued product and write the result in words:

(a) 535 × 608 × 19   (b) 3729 × 57 × 12

10. A bus can carry 52 passengers in a trip. How many passengers will it carry in one year if it makes 4 round trips everyday? (one year = 365 days)

11. Replace ✳ in each of the following by correct digits.

(a)
```
    1 ✳ 0 3 8
  ×     2 ✳
  ─────────────
    ✳ 5 ✳ 9 0
  3 8 ✳ 7 ✳ 0
  ─────────────
  4 7 ✳ 9 ✳ 0
```

(b)
```
      3 ✳ 6 7 ✳
    ×     1 ✳ 6
  ───────────────
    2 1 4 ✳ 7 4
  1 ✳ 7 3 ✳ 0
  ✳ 5 ✳ 7 9 0 0
  ───────────────
  4 ✳ 5 ✳ 3 4 ✳
```

DIVISION

In our previous classes we have learnt the division of a number by a 2-digit number. In this class we shall learn the division of a number by a 3-digit or 4-digit number. Before taking up the division sums, let us first review the important properties of division.

1. When a non-zero number is divided by itself, the quotient is 1, e.g.,

$$25 ÷ 25 = 1; \qquad 309 ÷ 309 = 1;$$
$$5623 ÷ 5623 = 1; \qquad 1001 ÷ 1001 = 1.$$

2. When a number is divided by 1, the quotient is the number itself, e.g.,

$$39 ÷ 1 = 39; \qquad 529 ÷ 1 = 529;$$
$$7305 ÷ 1 = 7305; \qquad 23021 ÷ 1 = 23021.$$

3. When 0 is divided by a non-zero number, the quotient is zero, e.g.,

$$0 ÷ 35 = 0; \qquad 0 ÷ 511 = 0;$$
$$0 ÷ 2037 = 0; \qquad 0 ÷ 22022 = 0.$$

4. Divisor × quotient + remainder = dividend.

Let us now solve some examples.

Division by a 2-digit number

Example 1. Divide 537809 by 35 and find the quotient and remainder.

Solution.

$$
\begin{array}{r}
15365 \leftarrow \text{Quotient} \\
35\overline{)\,537809} \\
-\,35 \\
\hline
187 \\
-\,175 \\
\hline
128 \\
-\,105 \\
\hline
230 \\
-\,210 \\
\hline
209 \\
-\,175 \\
\hline
34 \leftarrow \text{Remainder}
\end{array}
$$

I know the method of dividing a given number by a 2-digit number.

Quotient = 15365; Remainder = 34

Check: Divisor × quotient + remainder = dividend

35 × 15365 + 34 = 537775 + 34 = 537809

Note   The remainder at every step would be less than the divisor.

Division by a 3-digit number

Example 2. Divide 3470582 by 429 and find the quotient and remainder.

Solution.   **Explanation:**

Step 1.   The divisor consists of three digits, so we consider the number formed by three digits on the extreme left side of the dividend, i.e., 347.

But 429 > 347, so we take up the number consisting of four digits on the extreme left of the dividend, i.e., 3470. Our first dividend therefore, becomes 3470.

429 × 8 = 3432; 429 × 9 = 3861

3432 < 3470 and 3861 > 3470

∴   429 is contained in 3470 eight times.

We write 8 in the quotient above 0 and subtract 3432 from 3470.

3470 – 3432 = 38, so the remainder is 38.

$$
\begin{array}{r}
8089 \\
429\overline{)\,3470582} \\
-\,3432 \\
\hline
3858 \\
-\,3432 \\
\hline
4262 \\
-\,3861 \\
\hline
401
\end{array}
$$

Step 2.   We bring down the next digit, i.e., 5 from the dividend and write it on the right side of the remainder, i.e., 38. The dividend becomes 385. But 385 is less than 429. We write 0 on the right side of the digit 8 in the quotient and bring down the next digit, i.e., 8 from the dividend and write it on the right of 385 so that the next dividend becomes 3858.

$429 \times 9 = 3861; \quad 429 \times 8 = 3432$

$3861 > 3858$ and $3432 < 3858$

∴   429 is contained in 3858 eight times.

We write the digit 8 on the right of 80 in the quotient and subtract 3432 from 3858.

$3858 - 3432 = 426$, so the remainder this time is 426.

Now following the same steps, we get

Quotient = 8089, Remainder = 401.

EXERCISE 3.3

Divide and find the quotient and remainder:

I. 728023 by 79

2. 409327 by 63

3. 1523811 by 37

4. 2027924 by 84

5. 3018023 by 125

6. 4209816 by 235

7. 4092302 by 527

8. 5282900 by 615

9. 782356 by 3405

Divide and check the answer:

10. 181828 by 175

11. 9200102 by 825

12. Find the dividend when divisor = 135, quotient = 78 and remainder = 29.

13. Divide the greatest number of 6 digits by the greatest number of three digits.

WORD PROBLEMS ON DIVISION

Example 1. A company manufactures 254375 motorcycles in 275 days. How many motorcycles are manufactured in a day? Write the number sentence.

Solution.

```
            9 2 5
  275)  2 5 4 3 7 5
      – 2 4 7 5
        ─────────
          6 8 7
        – 5 5 0
        ─────────
          1 3 7 5
        – 1 3 7 5
        ─────────
                0
```

Divide 254375 by 275 to find the answer.

925 motorcycles are manufactured in a day.

Number sentence: $254375 \div 275 = 925$.

Example 2. A shop collected ₹937125 by selling 105 mobile phones. Find the cost of 1 mobile phone. Write the solution sentence.

Solution.

```
              8 9 2 5
      105) 9 3 7 1 2 5
           - 8 4 0
              9 7 1
            - 9 4 5
                2 6 2
              - 2 1 0
                  5 2 5
                - 5 2 5
                      0
```

Solution sentence: Cost of 1 mobile phone is ₹8925.

EXERCISE 3.4

1. 826512 persons visited a zoo in 257 days. How many persons visited the zoo each day?

2. In a stadium 221373 persons can be seated. There are 911 rows in the stadium. How many persons can be seated in a row?

3. A shopkeeper bought 775 watches for ₹724625. What did he pay for a watch?

4. The students of class V of a school collected ₹649620 for Prime Minister's Relief Fund. Find the amount collected by each student if the number of students is 135 and each of them collected the same amount.

5. 375 water tanks can hold 206250 litres of water. What is the capacity of one tank?

6. 6503820 metres of rope is to be packed in bundles. If each bundle contains 125 metres of rope, how many maximum number of bundles will be made and how much rope will remain unpacked?

7. A company collected ₹9674500 from its shareholders. If the value of each share is ₹550, how many shares were issued?

8. In a book store there are 1601985 books. The books are kept in almirahs. Each almirah has a capacity of holding 803 books. How many almirahs are required to keep the books?

9. 392600 apples are packed equally in 1208 boxes. How many apples are there in a box?

10. The cost of production of a T.V. set is ₹1536. A company spent ₹8154624 on the production of T.V. sets in one year. How many T.V. sets were produced?

11. The product of two numbers is 2317756. If one of the numbers is 826, find the other number.

12. In the months of March, April, May and June, the total sale of a milk depot was 149450 litres. How much milk does it sell everyday?

13. A fruit seller bought 1490825 bananas. If 103 bananas were found rotten and the remaining were packed in 529 baskets, find the number of bananas in each basket.

14. Replace ✻ by a suitable digit in the following:

```
                9 ✻ 5
143)      1 3 0 ✻ ✻ 5
        – 1 2 ✻ 7
              ✻ 1 4
            – 1 4 ✻
              7 1 ✻
            – 7 ✻ 5
                ×
```

I can do it. Can you?

WORD PROBLEMS ON FOUR FUNDAMENTAL OPERATIONS

Example 1. In a garden, there are 403354 plants in 329 rows. If each row has the same number of plants, how many plants are there in 115 rows?

Solution. First we find the number of plants in each row by dividing 403354 by 329. The quotient is then multiplied by 115 to get the number of plants.

```
              1 2 2 6
329)    4 0 3 3 5 4
      – 3 2 9
        7 4 3
      – 6 5 8
        8 5 5
      – 6 5 8
        1 9 7 4
      – 1 9 7 4
              0
```

```
          1 2 2 6
        × 1 1 5
          6 1 3 0
      1 2 2 6 0
    1 2 2 6 0 0
    1 4 0 9 9 0
```

Total number of plants in 115 rows = 140990

∴ Number of plants in one row = 1226.

Example 2. The weight of 298 bags of wheat is 29204 kg. Find the weight of 125 such bags of wheat.

Solution. First we find the weight of one bag of wheat by dividing 29204 by 298.

```
298)  29204 (98
    − 2682
      2384
    − 2384
         0
```

Now we multiply 98 by 125:

```
        9 8
      × 1 2 5
        4 9 0
      1 9 6 0
      9 8 0 0
    1 2 2 5 0
```

∴ Weight of one bag = 98 kg

∴ Weight of 125 bags = 12250 kg

EXERCISE 3.5

1. The total production of natural rubber in India during three years was 494000 tonnes. If the production during two years was respectively 152870 tonnes and 165850 tonnes, find the production of natural rubber during third year.

> 1 ton = 1000 kg

2. The total number of students in classes I to V in 2018 in a state was 2751390. Of these the number of students in classes I to IV was 837050, 758141, 447851 and 401379. Find the number of students in class V of that state in 2018.

3. Ashok packs 580368 apples in 428 boxes. How many apples will he pack in 515 boxes?

4. A factory produced 1188440 bulbs in one year (365 days). How many bulbs did it produce in the month of August?

5. 256 oil tanks can hold 106752 litres. How much oil will be there in 312 tanks?

6. A farmer produced 475812 oranges of one kind and 151768 oranges of another kind. He mixed these oranges and packed in 296 boxes. How many oranges did he pack in a box if 60 oranges remained unpacked?

7. Ravinder sold 325 T.V. sets at ₹8925 each. From this money he bought 625 refrigerators. Find the price of each refrigerator.

8. Find the greatest 6-digit number which is exactly divisible by 625.

ESTIMATING THE PRODUCT AND THE QUOTIENT

We have learnt the rounding off a number to a certain place. Here we shall round off the given numbers and find the estimated product and quotient.

Example 1. Find the actual and estimated product of 1235 × 893.

Solution.

Actual Product	Estimated Product
1 2 3 5	1 2 0 0
× 8 9 3	× 9 0 0
3 7 0 5	1 0 8 0 0 0 0
1 1 1 1 5 0	
9 8 8 0 0 0	
1 1 0 2 8 5 5	

Round off to the nearest hundred

Example 2. A car costs ₹382016. Estimate the cost of 9 such cars.

Solution.   Estimated cost of 1 car = ₹400000

Estimated cost of 9 cars = ₹400000 × 9

= ₹3600000

We do not round off 1-digit number

Example 3. Estimate the quotient:

(a) 1985 ÷ 175

(b) 320715 ÷ 8973

Solution.   (a) 1985 ÷ 175 rounds off to 2000 ÷ 200

To solve this, we think of 20 ÷ 2

∴ The estimated quotient = 10

```
      10
  2 ) 20
     −20
     ───
       0
     ───
```

(b) 320715 ÷ 8973 rounds off to 300000 ÷ 9000

To solve this, we think of 300 ÷ 9

∴ The estimated quotient is 33.

```
          33
    9 ) 300
       −27
       ───
        30
      − 27
      ────
         3
```

Remainder is ignored

Example 4. The cost of 18 watches is ₹17982. What is the estimated price of a watch?

Solution.   Cost of 1 watch = ₹(17982 ÷ 18)

17982 ÷ 18 rounds off to 20000 ÷ 20

We think of 2000 ÷ 2

∴ Quotient is 1000

∴ Estimated cost of 1 watch is ₹1000.

EXERCISE 3.6

Estimate the following products:

1. 5918 × 310
2. 123 × 4806
3. 925 × 790
4. A man earns ₹938 everyday. Estimate his earnings for the month of February.
5. The cost of a chair is ₹478. Estimate the money Rita should have to buy 189 chairs.
6. Vinit sells 527 stickers everyday. Estimate the number of stickers he will sell in 4 months (January to April).

Estimate the quotient:

7. 1825 ÷ 27
8. 685910 ÷ 7312
9. 29 bags of wheat weigh 2871 kg. Estimate the weight of 1 bag of wheat.
10. Karuna paid a total of ₹618927 for 2929 books. Estimate the price of a book, Karuna paid.

CHALLENGE

1. The weight of a box is 136 kg 58 g. Find the weight of such 256 boxes.
2. The cost of 24 articles is ₹652, 8 P. Find the cost of one article.
3. Find out 3-digit numbers, the sum of whose digits is equal to the product of the digits.

THINK
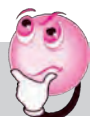
It takes 30 minutes to get 2 shirts dry in the sun. How long will it take to get 3 shirts dry in the sun?

DO YOU KNOW?

1. The following are the only examples of multiplication where all the digits from 1 to 9 have been used without repetition.

   (a) 4 × 1738 = 6952
   (b) 4 × 1963 = 7852
   (c) 12 × 483 = 5796
   (d) 42 × 138 = 5796
   (e) 18 × 297 = 5346
   (f) 27 × 198 = 5346
   (g) 39 × 186 = 7254
   (h) 48 × 159 = 7632
   (i) 28 × 157 = 4396

2. The number of digits in the product of any two numbers cannot be more than the sum of the number of digits of the multiplier and the multiplicand.

Chapter Test

Note: *Each question is of 2 marks.*

1. Encircle the correct answer from the given options:

   (a) The product of 35, 140 and 89 is not the same as

      (i) $(35 \times 140) \times 89$ (ii) $(35 \times 89) \times 140$

      (iii) $35 \times (89 \times 140)$ (iv) 490×89

   (b) When a number is divided by 1, the quotient is

      (i) number itself   (ii) 1

      (iii) 0   (iv) None of these

2. Using place values, fill in the blanks to find each of the following products:

   (a) $274 \times 15 = (200 + 70 + 4) \times 15$

                  $= \ldots\ldots + \ldots\ldots + \ldots\ldots = \ldots\ldots$

   (b) $450 \times 29 = (\ldots\ldots + \ldots\ldots) \times 29$

                  $= \ldots\ldots + \ldots\ldots = \ldots\ldots$

3. A shopkeeper has 750 boxes of chocolates. Each box contains 185 chocolates. How many chocolates are there in all?

                         $\ldots\ldots\ldots\ldots\ldots$ chocolates

4. Fill in the blanks and find the quotients:

   (a) $36000 \div 20 = \ldots\ldots\ldots$

   (b) $36000 \div 200 = \ldots\ldots\ldots$

   (c) $6500 \div 13 = \ldots\ldots\ldots$

   (d) $6500 \div 130 = \ldots\ldots\ldots$

5. Archna bought 29 sarees for ₹57635. Estimate the price of one saree Archna paid. ₹$\ldots\ldots\ldots\ldots$

Space for rough work

4   Factors and Multiples

In standard IV, we have learnt about factors and multiples of a number. Let us review them in brief.

FACTORS

We know that 4 × 7 = 28, so 4 and 7 are factors of 28.

Similarly, 1 × 28 = 28 and 2 × 14 = 28, so 1, 2, 28 and 14 are also factors of 28.

Is there any other factor of 28?   No

Thus

1, 2, 4, 7, 14, 28 are all factors of 28.

Remember! If a number is divided by its factor, the remainder is zero.

Properties of factors

(a) 1 is a factor of every number because 1 divides every number exactly. 1 is the smallest factor of any number.

(b) A number (other than zero) is a factor of itself because every non-zero number divides itself exactly. The number is the greatest factor of itself.

(c) A factor of a number is less than or equal to the number.

(d) Every number (other than 1) has at least 2 factors.

(e) Every non-zero number is a factor of zero, e.g., 0 ÷ 3 = 0, 0 ÷ 51 = 0, etc.

MULTIPLES

Aha! Factors and multiples are related to each other.

We have 4 × 7 = 28, so 28 is a multiple of 4 and 7. It is the 7th multiple of 4 or 4th multiple of 7.

4, 8, 12, ... are all multiples of 4 because they are exactly divisible by 4.

Properties of multiples

(a) Every number is a multiple of 1.

(b) Every number is a multiple of itself and is the smallest multiple of that number.

(c) Every multiple of a number is greater than or equal to that number.

(d) We can find as many multiples of a number as we want.

Rules of divisibility

We have studied the following rules of divisibility.

(a) A number is **divisible by 2** if the digit in its ones place is divisible by 2.

For example: 62, 74, 86, 98, 50 are divisible by 2.

(b) A number is **divisible by 5** if it has 0 or 5 in its ones place.

For example: 20, 35 are divisible by 5.

(c) A number is **divisible by 10** if it has 0 in its ones place.

For example: 40, 300, 90000 are divisible by 10.

> Hey!
> A number having an even digit in its ones place is divisible by 2.

(d) A number is **divisible by 3** if the sum of the digits of the number is divisible by 3.
Look at the following table:

Number	Sum of the digits	Is the sum divisible by 3?
12	1 + 2 = 3	Yes
144	1 + 4 + 4 = 9	Yes
569	5 + 6 + 9 = 20	No
7351	7 + 3 + 5 + 1 = 16	No

The numbers 12 and 144 are divisible by 3.

(e) A number is **divisible by 6** if it is divisible by both 2 and 3.

Look at the following multiples of 2, 3 and 6.

Multiples of 2 → 2, 4, **6**, 8, 10, **12**, 14, 16, **18**

Multiples of 3 → 3, **6**, 9, **12**, 15, **18**

Multiples of 6 → **6**, **12**, **18**

We notice that the multiples of 6 are also multiples of 2 and 3. Thus a number which is divisible by both 2 and 3 is also divisible by 6.

(f) A number is **divisible by 9** if the sum of the digits of the number is divisible by 9.
Look at the following table:

Number	Sum of the digits	Is the sum divisible by 9?
414	4 + 1 + 4 = 9	Yes
56088	5 + 6 + 0 + 8 + 8 = 27	Yes
123	1 + 2 + 3 = 6	No
3457	3 + 4 + 5 + 7 = 19	No

The numbers 414 and 56088 are divisible by 9.

(g) A number is **divisible by 4** if the number formed by the last two digits on its extreme right is divisible by 4.

For example: 6**16**, 5**08**, 3**00**, 123**12** are divisible by 4.

(h) A number is **divisible by 8** if the number formed by the last three digits on its extreme right is divisible by 8.

For example: 1**416**, 7**008**, 5**400** are divisible by 8.

EXERCISE 4.1

1. Find all factors of:
   (a) 8   (b) 15   (c) 24   (d) 36   (e) 54

2. Is 12 a factor of 5636?

3. Find the first 4 multiples of:
   (a) 5   (b) 7   (c) 12   (d) 17   (e) 20

4. Which of the following numbers are divisible by 2?
   25, 48, 83, 104, 217, 322, 500

5. Which of the following numbers are divisible by 5?
   20, 23, 35, 49, 8007, 92300.

6. Which of the following numbers are divisible by 3?
   22, 42, 88, 105, 216, 1739

7. Which of the following numbers are divisible by 9?
   82, 103, 279, 3041, 702306

8. Which of the following numbers are divisible by (a) 4 (b) 8?
   3104, 1205, 316, 907, 2870, 6640, 3900

9. Is 14 a factor of 42 and 112? Is 14 a factor of (112 + 42) and (112 − 42)?

10. Is 54 divisible by 2 and 3? Is it divisible by 6?

PRIME NUMBERS

We have learnt that every number (except 1) has at least two factors.

Thus a number greater than 1 which has only two factors (1 and the number itself) is called a **prime number**.

(a) **2 is the smallest prime number.**

(b) **2 is the only even prime number.**

(c) **2 and 5 are the only prime numbers that end with 2 and 5.**

Examples of other prime numbers are: 3, 5, 7, 11, 13, …

TWIN PRIMES

Two prime numbers with a difference of 2 are called twin primes. For example; 3 and 5; 5 and 7 are twin primes.

COMPOSITE NUMBERS

A number greater than 1 which has more than two factors is called a **composite number.**

The smallest composite number is 4 because its factors are 1, 2, 4.

Examples of other composite numbers are: 6, 18, 39, 70, 125, …

PRIME FACTORISATION

Out of all the factors of a number, the prime ones are called the **prime factors**, e.g.,

All the factors of 30 are 1, 2, 3, 5, 6, 10, 15, 30.

Out of these factors, the prime factors are 2, 3 and 5.

Also 30 = 2 × 3 × 5

Prime factorisation of 30 = 2 × 3 × 5

All the factors of 36 are 1, 2, 3, 4, 6, 9, 12, 18, 36.

Out of these factors, the prime factors are 2 and 3.

But 36 = 2 × 2 × 3 × 3

∴ Prime factorisation of 36 = 2 × 2 × 3 × 3.

Example 1. Find prime factorisation of 72.
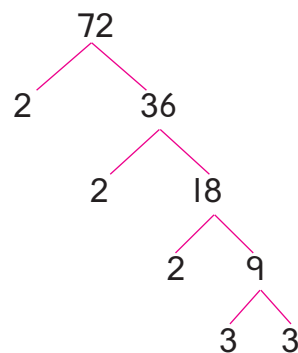
Solution. Steps:

1. Divide 72 by a prime number.
2. Divide the above quotient by a prime number again.
3. Repeat the above steps till the quotient 1 is obtained.

∴ Prime factors of 72 = 2 × 2 × 2 × 3 × 3

The prime factorisation of 72 can also be obtained by the given diagram, known as **factor tree**.

2	72
2	36
2	18
3	9
3	3
	1

Example 2. By division method find the prime factors of 210 and write prime factorisation of 210.

Solution. We divide 210 by prime numbers.

The prime factors of 210 are 2, 3, 5, 7

Prime factorisation of 210 = $2 \times 3 \times 5 \times 7$.

2	210
3	105
5	35
7	7
	1

EXERCISE 4.2

1. Which of the following are prime numbers?

   5, 35, 41, 77, 81, 97

2. List all prime numbers between 10 and 20.

3. Find the greatest prime number which is less than
   (a) 21   (b) 45   (c) 74   (d) 90   (e) 100

4. Write the greatest composite number less than
   (a) 23   (b) 49   (c) 85   (d) 71

5. Find the least prime number which is greater than
   (a) 11   (b) 24   (c) 39   (d) 80

6. Name the smallest (a) prime number (b) composite number.

7. Write the greatest prime number between 21 and 27.

8. Write a pair of twin primes.

9. Which of the following are prime factorisation?
   (a) $35 = 5 \times 7$ (b) $54 = 2 \times 3 \times 9$
   (c) $114 = 2 \times 3 \times 19$ (d) $124 = 2 \times 2 \times 31$
   (e) $180 = 2 \times 2 \times 3 \times 15$ (f) $144 = 2 \times 2 \times 4 \times 3 \times 3$

10. Write the prime factorisation of the following numbers:
    (a) 36   (b) 48   (c) 84   (d) 120
    (e) 356   (f) 840   (g) 720   (h) 980

11. Find the prime factorisation of the smallest number of 3 digits.
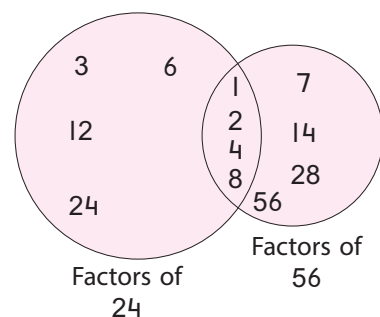
COMMON FACTORS

Let us consider two numbers 24 and 56.

The factors of 24 are 1, 2, 3, 4, 6, 8, 12, 24.

The factors of 56 are 1, 2, 4, 7, 8, 14, 28, 56.

The common factors of 24 and 56 are 1, 2, 4, 8.

Diagrammatical representation of common factors

Factors of 24

Factors of 56

HIGHEST COMMON FACTOR

Let us consider two numbers 12 and 28.

The factors of 12 are 1, 2, 3, 4, 6, 12.

⇕ ⇕   ⇕

The factors of 28 are 1, 2,   4, 7, 14, 28.

The common factors of 12 and 28 are 1, 2, 4.

Highest common factor of 12 and 28 is 4.

∴ H.C.F. of 12 and 28 is 4.

H.C.F. is the short form of Highest Common Factor.

We have learnt in standard IV, the method of finding H.C.F. of 2 numbers by finding the factors of the given numbers.

Here we shall use the division method of finding the H.C.F. of 2 numbers.

H.C.F. BY DIVISION METHOD

Sometimes it is very difficult to find the common prime factors of the given numbers, e.g., if the numbers are 2313 and 4819. In such cases we use another method which is called **division method**. This method is based on the following two principles:

(a) If a number is divisible by another number, then every multiple of the first number is also divisible by the second number, e.g., if 8 is divisible by 2, then 16, 24, 32, … are also divisible by 2.

(b) If a number divides two given numbers, then it divides their sum and difference also, e.g., if 6 divides 12 and 42, then 6 divides 42 + 12 or 54 and 42 – 12 or 30 also.

Let us find the H.C.F. of 120 and 208.

Follow the steps given below:

(a) Divide the greater number by the smaller number.

(b) Take remainder as divisor and the divisor as dividend.

(c) Continue the process till you get 0 in the remainder.

(d) The last divisor is the H.C.F.

∴ H.C.F. of 120 and 208 is 8.

```
120) 208 (1
     -120
       88) 120 (1
           -88
            32) 88 (2
                -64
                 24) 32 (1
                     -24
                       8) 24 (3
                          -24
                             0
```

Note Two numbers are called coprime numbers if their H.C.F. is 1.

EXERCISE 4.3

1. Find common factors of the following numbers. Then find their H.C.F.

(a) 25, 45,   (b) 12, 28   (c) 16, 56   (d) 44, 66

(e) 36, 60   (f) 56, 98   (g) 14, 84   (h) 15, 80

2. Use division method to find the H.C.F. of the following numbers:

(a) 25 and 35   (b) 40 and 76   (c) 135 and 165

(d) 198 and 360   (e) 144 and 312   (f) 400 and 575

3. Show that 35 and 48 are coprime numbers.

COMMON MULTIPLES AND LEAST COMMON MULTIPLE

Let us find the common multiples of 2 and 6.

The multiples of 2 are 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, …

The multiples of 6 are 6, 12, 18, 24, …

The common multiples of 2 and 6 are 6, 12, 24, …

Least common multiple of 2 and 6 is 6.

> L.C.M. is the short form of least common multiple.

L.C.M. BY PRIME FACTORISATION

Let us consider the numbers 16 and 24.

Prime factorisation of 16 $= 2 \times 2 \times 2 \times 2$

Prime factorisation of 24 $= 2 \times 2 \times 2 \qquad \times 3$

Product of common and

non-common factors $= 2 \times 2 \times 2 \times 2 \times 3 = 48$

∴ L.C.M. of 16 and 24 = 48

L.C.M. BY DIVISION METHOD

When we want to find the L.C.M. of more than two numbers,

we apply division method.

Let us consider 16, 28, 32 and find their L.C.M.

Use the following steps:

(a) Divide by the smallest prime number which divides at least two of the given numbers.

(b) Write the quotients and the undivided numbers in the next row as shown here.

2	16 – 28 – 32
2	8 – 14 – 16
2	4 – 7 – 8
2	2 – 7 – 4
	1 – 7 – 2

(c) Repeat the first step and continue till coprime numbers exist in the last row.

(d) Multiply all the prime numbers by which we have divided and the coprimes left in the last row to get the L.C.M.

∴ L.C.M. of 16, 28 and 32 = 2 × 2 × 2 × 2 × 7 × 2

= 224

Example 1. Find the L.C.M. of 102 and 170.

Solution.

2	102 – 170
17	51 – 85
	3 – 5

I know 17 is a prime number.

∴ L.C.M. = 2 × 17 × 3 × 5 = 510

Lab Activity

Understanding L.C.M.
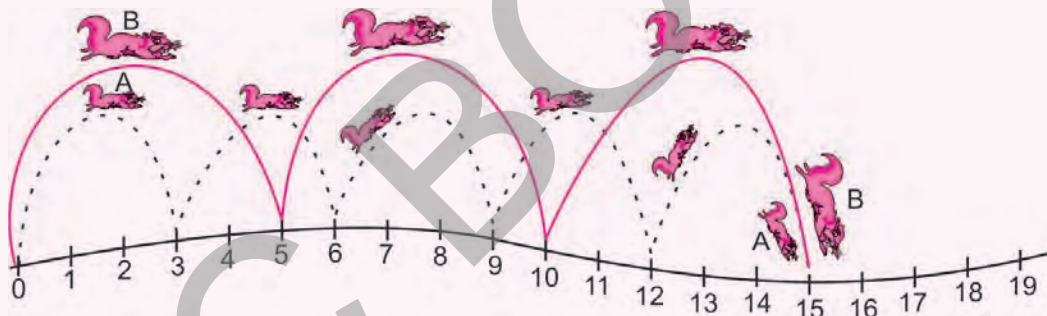
Jumping Squirrels

Squirrel 'A' is small and jumps every third place.

Squirrel 'B' is big and jumps every fifth place.

They both start together at 0.

Where do they meet? At 15

15 is the lowest common multiple (L.C.M.) of 3 and 5.

They will also meet 2nd time at 30, 3rd time at 45, 4th time at 60 and so on.

Now change the size of squirrel jumps to

(a) 3 and 4   (b) 2 and 5   (c) 5 and 7   (d) 5 and 6

Find out where do they meet (Draw your own separated diagrams)

(i) first time—L.C.M.

(ii) second, third and fourth time?

EXERCISE 4.4

1. Find L.C.M. by prime factorisation method:
   (a) 12, 15   (b) 24, 36   (c) 16, 64
   (d) 24, 56   (e) 3, 4, 6   (f) 6, 8, 10

2. Find L.C.M. of the following numbers:
   (a) 20, 50   (b) 72, 96   (c) 55, 77   (d) 16, 48
   (e) 4, 8, 12   (f) 6, 15, 25   (g) 12, 18, 24

3. Find the L.C.M. of the following numbers:
   (a) 108 and 180   (b) 168 and 350

APPLICATIONS OF H.C.F. AND L.C.M.

Example 1. Two ropes 12 m and 18 m long are to be cut into small pieces of equal lengths. What will be the maximum (greatest) length of each piece?

Solution.

```
  12) 18 (1
      – 12
       6) 12 (2
         – 12
          0
```

H.C.F. = 6

∴ Maximum length of each piece = 6 m

> Hey!
> I tell you for maximum length, find the H.C.F.

Example 2. Find the least number of marbles so that heaps of 12, 15 or 20 marbles can be made.

Solution. We find the L.C.M. of 12, 15 and 20.

```
2 | 12 – 15 – 20
2 |  6 – 15 – 10
3 |  3 – 15 –  5
5 |  1 –  5 –  5
  |  1 –  1 –  1
```

> Do you know that for minimum (least) numbers, we find L.C.M.?

L.C.M. = 2 × 2 × 3 × 5 = 60

∴ Least number of marbles = 60

EXERCISE 4.5

1. Find the greatest number which divides 18 and 24 exactly.

2. Two big packets of books contain 54 and 84 books respectively. These books are to be packed into small packets which will contain same number of books. How many maximum number of books can be packed in each small packet?

3. The students of two classes are supposed to stand in rows having same number of students. There are 24 and 36 students in the classes. How many maximum number of students will stand in each row?

4. A shopkeeper sold mathematics books for ₹108 on Monday and for ₹84 on Tuesday. What can be the maximum price of each book?

5. Find the least number which is exactly divisible by 9, 12 and 18.

6. A big can contains some milk. Pots of 2 litres, 4 litres and 5 litres capacity can be used whole number of times to empty the can completely. What is the least capacity of the can?

7. What is the least number of bananas a teacher should have so that when he distributes equal number of them to his 10, 15 and 25 students, no banana is left with him?

8. Three bells ring at intervals of 15, 20 and 30 minutes. If they all ring at 11 a.m. together, at what time will they next ring together?

LIFE SKILLS

Rajat and Kavita volunteer to work at an old age home. Suppose both of them are at the old age home on 15-12-2012 and decide that Rajat will be at the old age home every third day and Kavita will be every fourth day. At which date will they be again together at the old age home?

What lesson (value) do you learn from here?

DO YOU KNOW?

If we assign values 1, 2, 3, ..., 26 to letters A, B, C, ..., Z respectively, then
PRIME = 16 + 18 + 9 + 13 + 5 = 61, is a prime number.

CHALLENGE

1. What is the greatest number which is a factor of 40, 48 and 60?

2. What is the smallest number of 5 digits which is exactly divisible by 12, 24, and 60?

3. A boy saves ₹1.50 daily. What is the least number of days in which he will convert his savings into 20-rupee notes?

Chapter Test

Note: *Each question is of 2 marks.*

I. Encircle the correct answer from the given options:

    (a) The L.C.M. of 8 and 12 is

        (i) 8   (ii) 12

        (iii) 24   (iv) 48

    (b) The H.C.F. of 135 and 5 is

        (i) 135   (ii) 5

        (iii) 27   (iv) 49

2. Fill in the blanks:

    (a) ……… is the only even prime number.

    (b) ……… is the smallest composite number.

    (c) The smallest factor of every number is ……… .

    (d) 29 and 31 are ……… primes.

3. Show that

    (a) 15 is a factor of 120.

    (b) 12 is not a factor of 245.

4. Using division method find the H.C.F. of 144 and 292.

                      H.C.F. of 144 and 292 = ………………

Space for rough work

Model Paper-1 (Chapters 1–4)

Time: 1 hour   **M.M. 20**

Note: *Questions (1–4) are of 1 mark each, questions (5–7) are of 2 marks each, questions (8–9) are of 3 marks each and question 10 is of 4 marks.*

Encircle the correct answer from the given options (1–4):

1. The Roman Numeral for 79 is
   (a) LXXXIX   (b) XXXCIX   (c) LXXIX   (d) ILXXX

2. The number 706 is divisible by
   (a) 6   (b) 3   (c) 4   (d) 2

3. 14559 when rounded off to the nearest thousands is
   (a) 14000   (b) 15000   (c) 14500   (d) 10000

4. The L.C.M. of 10, 20 and 30 is
   (a) 20   (b) 60   (c) 30   (d) 10

5. Which is greater?
   (a) XXX or XIX   (b) XL or LX

6. A milk depot sells 589 litres of milk each day. How much total milk will it sell in the months of March, April and May?

7. Write a story for each of the following:
   (a) 5000 + 6000 = ?   (b) 15900 − 14832 = ?

8. The price of 2 bedroom apartments in a city in different projects are given below.

   Project A ⟶ ₹5540000   Project B ⟶ ₹8572500

   Project C ⟶ ₹8560040   Project D ⟶ ₹9685700

   Use symbols > or < in ◯ to compare the prices of the projects
   (a) Project A ◯ Project B
   (b) Project C ◯ Project B
   (c) Project D ◯ Project A

9. Anushika wanted to buy a car costing ₹587300. She had only ₹298905 with her. How much money must she borrow to buy the car?

10. In the grid given here encircle the multiples of 12 and cross the multiples of 15. Find the numbers which have both the symbols.

    Which is the smallest?

    Is it the L.C.M. of 12 and 15?

11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120