Collins

Maths Zone 6

Updated Edition

Series Editor
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Published by Collins Learning
A division of HarperCollins*Publishers* India Private Limited
HarperCollins *Publishers*
A-75, Sector 57, Noida, Uttar Pradesh 201301, India
1 London Bridge Street, London, SE1 9GF, United Kingdom
2 Bloor Street East, Toronto, Ontario M4W 1A8, Canada
Lvl 13, 201 Elizabeth Street (PO Box A565, NSW, 1235), Sydney NSW 2000, Australia
195 Broadway, New York, NY 10007, USA

Browse the complete Collins catalogue at **www.collins.in**

First edition 2015
Latest updated edition 2019

Reprint 10 9 8 7 6 5 4 3 2 1

ISBN: 978-93-5277-805-8

Content developed by **EXCELSOFT TECHNOLOGIES PVT. LTD.**

Artwork and layout by **AptaraCorp Ltd., Chandraprabhu Enterprise Private Limited**

Printed and bound by

MRP:

Acknowledgements

Cover: Creative-Touch

Title Page: Creative-Touch

This book is produced from independently certified FSC® paper to ensure responsible forest management.

Preface

Maths Zone* (Updated Edition)** is a series of eight books for Classes 1 to 8. The series conforms to the objectives outlined in *National Curriculum Framework*. The updated edition of ***Maths Zone, trying to make a difference with its new features, incorporates the latest requirements across various boards. With its activity-oriented approach, the series aims to inculcate lateral thinking, analytical, research and deduction skills in students, thus urging them to explore beyond the boundaries of textual knowledge.

Based on the NCERT syllabus, the series follows a coherent and structured approach. It provides a seamless continuity in the Maths curriculum for classes 1 to 8, laying emphasis on developing problem-solving skills.

The series has been updated in view of the extensive feedback received from the user schools and experienced teachers. Wherever necessary, content has been simplified to cater to the needs of all kinds of learners in a classroom.

Key Features

Mental Maths to help practise calculation skills and deductive reasoning

Cross-curricular Links (Classes 1 to 5) integrate knowledge across subjects

Exercises after each topic and **Revision Exercises** at the end of each chapter for a comprehensive review of the concepts

Summary (Classes 6 to 8) gives a snapshot of the chapter for quick recapitulation

Maths Lab Activity to test skills of investigation, observation and deduction

Worksheets to reinforce practice with fun exercises

Consolidated **Practice Worksheets** and **Reasoning Worksheet** at the end of the book for further practice

Latest **International Mathematics Olympiad** paper to help students prepare for competitive exams

Maths Tales (Classes 1 to 5) at the end of the book give colourful cartoon spreads

Vedic Maths (Classes 3 to 8) to master shortcut techniques which aid in faster calculations

Poster, at the end as a pull-out, for a quick revision of important points and formulae

Remember, **Common Errors**, **Challenge** and **Projects** are a few other features included in the books.

Four **assessment papers** and **two comprehensive assessment papers** have been given at the end of each book, in addition to the exercises within and at the end of each chapter.

In line with the CBSE guidelines, evaluation features along with the tools of assessment have been provided extensively to the teachers and learners in a well-integrated manner.

Feedback, valuable comments and suggestions from the users are welcome.

Authors

Key Features

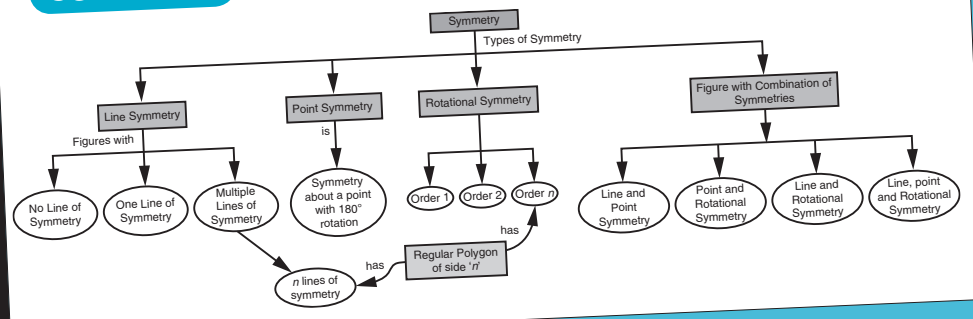
Cross-curricular Link:
What is the difference in the meaning of the words ‘remainder’ and ‘reminder’?

Mental Maths

Which is greater? $\frac{1}{2}$ [ ] $\frac{1}{4}$

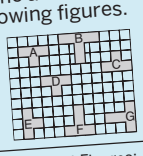
Which is lesser? $\frac{1}{11}$ [ ] $\frac{3}{11}$

SUMMARY

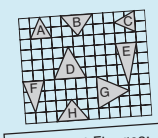


Exercise 12.1

1 Name all the congruent shapes given in the following figures.



Congruent Figures:



Congruent Figures:

Revision Exercise

1 Classify the following expressions into monomials, binomials and trinomials.

(a) $4x^2 - 7$ (b) $-10x$

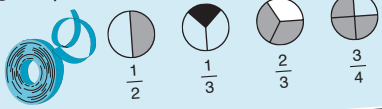
(c) $\frac{2x}{7} + 5y + 6$ (d) $\frac{3}{5}abc$

Maths Lab Activity

Aim: To represent fractions on a number line

Materials required:

- Satin ribbon
- Chart paper



WORKSHEET

WORKSHEET

Solve the sums given below. Then, write the code letter given below your answer on the correct line at the bottom of the page. The first one has been done for you.

13.5 – 2.8 = _____ S

12.24 + 5.68= _____ A

594.5 + 86.4 = _____ E

78.2 – 6.7 = _____ I

93.25 + 4.18 = _____ ☐

9.75 + 0.83 = _____ ☐

5.762 + 8.5 = _____ O

211.9– 8.7 = _____ M

70.5 – 13.2 = _____ R

REASONING WORKSHEET

1. Which of the following is incorrect?
   (a) MMCDXCII (b) CMLXIX (c) MDCCCXLV (d) MMMLCX
2. Identify the one that does not belong to the group.
   (a) 758.64 + 395.36 (b) 0.0476 ÷ 0.14 (c) 35.2 × 18.7 (d) 843.92 – 397.45
3. A dog jumps 5 feet up and 3 feet down per hour. How long will it take to reach 25 feet?
   (a) 9 hours (b) 10 hours (c) 11 hours (d) 12 hours
4. Three bells ring every 36 seconds, 40 seconds and 18 seconds, respectively. At 4:17 p.m., the three bells rang simultaneously. At what time will the bells ring again at the same time?
   (a) 4:19 p.m. (b) 4:23 p.m. (c) 4:20 p.m. (d) 4:21 p.m.
5. Pick the odd one out.
   (a)  (b)  (c)  (d) 

Vedic Maths

Multiplication by All from 9 and the last from 10

For multiplication of two numbers which are both close to the numbers of 10, 100, 1000 etc., use the quick method of **All from 9 and the last from 10** sutra.

When you apply this sutra to any number, it gives the complement of that number. For the last number (digit in the ones place), the complement should be calculated from 10. For all the remaining digits, the complement should be calculated from 9.

The complement of one-digit number should be calculated as the difference from 10; the complement of a 2-digit number should be calculated as the difference from 100; the complement of a 3-digit number should be calculated as the difference from 1000 and so on.

For example, the complement of 6 is 4; the complement of 78 is 22; and the complement of 825 is 175.

Once the concept of **All from 9 and the last from 10** is understood properly, multiplication of numbers using complements is very easy to understand.

Example 1: Multiply 108 by 122.

Write down the two numbers and their complements to the right of the number.

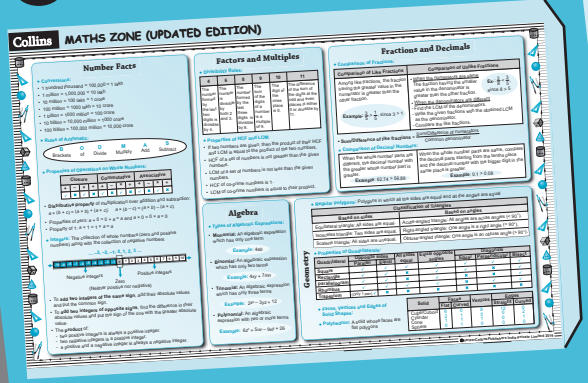
122 + 22
×108 + 08
131 / 76
1 1

Step 1: Complement of 122 is 22. Write it as + 22 to show that it is 22 more than 100.

Complement of 108 is 8. Write it as + 8 to show that it is 8 more than 100.

Step 2: Multiply the complements. Place a stroke line to show two parts of the answer.

Carry-over digits are written as shown. +22 × +8 = +176.



Contents

1 Number System

Learning Objectives

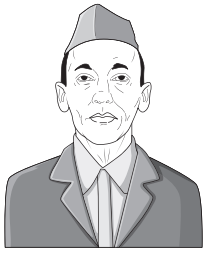
- To understand the Hindu-Arabic, International and Roman systems of numeration
- To understand the use of brackets in simplifying expressions

Let's Get Started

Mathematicians have discovered numbers over centuries and they are still in the quest for new discoveries. The contribution of Indian mathematicians to the world of numbers is noteworthy. Some of the renowned mathematicians are Aryabhata (who introduced '0'), Brahmagupta, Ramanujan and Kaprekar.

Aryabhata

Ramanujan



Kaprekar

Let us recall some of the basic terminologies used in numbers.

Digits: The ten basic elements (0, 1, 2, 3, 4, 5, 6, 7, 8 and 9) of numbers are known as digits. They are similar to the letters of the English alphabet or the letters of your mother tongue.

Number: A number is a value in mathematics used for measuring or counting a certain quantity. Numbers are represented using the combination of digits from 0 to 9. A single or group of digits denoting a number is called a **numeral**.

Examples: 12, 98, 127, 13, 486, etc.

NUMERATION SYSTEMS

Numeration refers to numbers being written in words or symbols.

Examples: Twelve, ninety-eight, one hundred twenty-seven, etc.

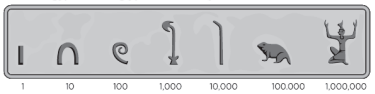
There are different numeration systems that have evolved over the period of time. In each numeration system, numbers are represented in a different way. Some of them are given below.

Tally Mark System	The Egyptian System	The Roman System	The Babylonian System
In this system, vertical lines of equal length called tally marks are used to count numbers.	In this system, picture symbols are used to represent different numbers.	In this system, letters of the alphabet are used to represent the numbers.	This system uses two symbols to represent a number.

1	2	3	4	5	6	7	8	9	10
|	||		||||	||||→	||||→|	||||→||	||||→|||	||||→||||	||||→|||||

1	2	3	4	5	6	7	8	9	10
|	||	|||	||||	||||→	||||→|	||||→||	||||→|||	||||→||||	||||→|||||

Ancient Egyptian hieroglyphic numeral system



1	10	100	1,000	10,000	100,000	1,000,000
Stroke	Heel bone	Scroll	Lotus flower	Pointing finger	Burbot fish	Astonished person

I	V	X	L	C	D	M
1	5	10	50	100	500	1000

I	V	X	L	C	D	M
1	5	10	50	100	500	1000

1	10

The Hindu-Arabic System: This is the most widely used system across the world. This system is also known as base-10 system. The main features of this system are given below.

(a) A combination of 10 digits (0, 1, 2, 3, 4, 5, 6, 7, 8 and 9) are used to represent a number.

(b) Numbers are grouped into tens, hundreds, thousands and so on.

(c) Concept of place value is used. A number is grouped into periods of ones, tens, hundreds, etc. and the value of each digit depends on its place in the period. For example, in 34, the place values of 3 and 4 are 30 and 4 respectively. There are broadly two ways of writing a number using place values: **Indian place value system** and **International place value system**.

Indian Place Value System

In the Indian place value system, the places are Ones, Tens, Hundreds, Thousands, Ten Thousands, Lakhs, Ten Lakhs, etc. The following table gives the details of periods and their place values.

PERIODS	CRORES		LAKHS		THOUSANDS		ONES		
Places	Ten Crores	Crores	Ten Lakhs	Lakhs	Ten Thousands	Thousands	Hundreds	Tens	Ones
Place Value	10,00,00,000	1,00,00,000	10,00,000	1,00,000	10,000	1000	100	10	1

Commas are used after each period (Ones, Thousands, Lakhs and Crores). This helps us to read the numbers.

CRORES		LAKHS		THOUSANDS		ONES			Number	Name
TC	C	TL	L	T Th	Th	H	T	O		
						6	3	7	637	Six hundred thirty-seven
				1	3	7	4	6	13,746	Thirteen thousand seven hundred forty-six
			6	5	1	8	3	2	6,51,832	Six lakh fifty-one thousand eight hundred thirty-two
3	6	5	4	9	8	2	1	7	36,54,98,217	Thirty-six crore fifty-four lakh ninety-eight thousand two hundred seventeen

Place Value of a Digit: Each digit in a number has a value. The place value of a digit is determined by identifying its place and multiplying it by the digit. For example, in 52, the digit 2 is at ones place. So, the place value of 2 is $2 \times 1 = 2$, whereas the place value of 5 is $5 \times 10 = 50$.

The table below shows the place value of digits in the number 36,54,98,217.

CRORES		LAKHS		THOUSANDS		ONES			Number
TC	C	TL	L	T Th	Th	H	T	O	
3	6	5	4	9	8	2	1	7	36,54,98,217

Expanded Form: Find the place value of each digit in the number and add them. This way of writing a number is known as its expanded form.

Face Value: The face value of a digit in a number is the digit itself irrespective of its position. For example, in 637, the face value of 6 is 6, 3 is 3 and 7 is 7.

Place value of a digit = (Face value of a digit) × (Value of its place)

Note: The place value and the face value of the digit 0 is always 0 irrespective of its position.

Example 1: Insert commas to rewrite 745892 in the Indian place value system and in words. Also, write the expanded form.

In words, 7,45,892 is Seven lakh forty-five thousand eight hundred ninety-two
Expanded form of 7,45,892 = 7,00,000 + 40,000 + 5000 + 800 + 90 + 2

Example 2: Find the place values and the face values of 7 in the number 71,72,17,007.

71,72,17,007		
Place	**Face Value**	**Place Value**
Ones	7	7
Thousands	7	7000
Ten Lakhs	7	70,00,000
Ten Crores	7	70,00,00,000

Example 3: Find the greatest 7-digit number that can be formed using the digits 5, 3, 2, 7, 1, 8 and 4 only once.

The given digits are 5, 3, 2, 7, 1, 8 and 4. In order to form the greatest 7-digit number using these digits only once, the ten lakhs place should have the greatest digit among 5, 3, 2, 7, 1, 8 and 4. So, write 8 in the ten lakhs place.

The next place should have the greatest among the left over digits (5, 3, 2, 7, 1 and 4), that is, 7.

Repeat this process until all the places are filled.

Thus, 87,54,321 is the greatest 7-digit number that can be formed using the digits 5, 3, 2, 7, 1, 8 and 4 only once.

Note the arrangement of digits in the number 87,54,321. The digits are arranged in decreasing order. So, to get the greatest possible number using the given digits only once, you just need to write them in descending order.

Think: What would be the smallest 7-digit number that can be formed using the digits 5, 3, 2, 7, 1, 8 and 4 only once? Can 0 be in the leftmost position? Why?

International Place Value System

The international place value system of writing and reading numbers is widely used across the world. In this system, the places are written as Ones, Tens, Hundreds, Thousands, Ten Thousands, Hundred Thousands, Millions, Ten Millions, Hundred Millions, etc. Also, every three places are grouped into one period. The following table gives the details of periods and their place values.

BILLIONS			MILLIONS			THOUSANDS			ONES		
Hundred Billions	Ten Billions	Billions	Hundred Millions	Ten Millions	Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
100,000,000,000	10,000,000,000	1,000,000,000	100,000,000	10,000,000	1,000,000	100,000	10,000	1000	100	10	1

Think: What comes after the billions period?

Let us consider some examples given in the following table.

Number	Use of Commas	Number Name
821356	821,356	Eight hundred twenty-one thousand three hundred fifty-six
81256307	81,256,307	Eighty-one million two hundred fifty-six thousand three hundred seven
7045623850	7,045,623,850	Seven billion forty-five million six hundred twenty-three thousand eight hundred fifty
546102340145	546,102,340,145	Five hundred forty-six billion one hundred two million three hundred forty thousand one hundred forty-five

Expanded Form: Write the place value of each digit and add them to write the given number in its expanded form. Some examples are given below.

(a) 7,452,891 = 7,000,000 + 400,000 + 50,000 + 2000 + 800 + 90 + 1

(b) 230,478,014 = 200,000,000 + 30,000,000 + 400,000 + 70,000 + 8000 + 10 + 4

(c) 14,200,305,700 = 10,000,000,000 + 4,000,000,000 + 200,000,000 + 300,000 + 5000 + 700

Example 4: Write the numbers corresponding to the following number names.

(a) One billion forty-six million twenty-five = 1,046,000,025
(b) Nine hundred sixty-five billion four thousand three hundred seventy-one = 965,000,004,371
(c) Six hundred one million eight hundred twenty-six thousand nine = 601,826,009

Example 5: What is the smallest 8-digit number which can be formed using the digits 3, 5, 1, 9, 0, 8, 4 and 7 only once? Write the number name in both the Indian and the international systems.

The smallest 8-digit number that can be formed using all the digits 3, 5, 1, 9, 0, 8, 4 and 7 only once can be obtained by writing the digits in ascending order.

0	1	3	4	5	7	8	9	✗

1	0	3	4	5	7	8	9	✓

But, when **0** is taken as the smallest number, the number obtained is not an 8-digit number. So, interchange the positions of 0 and 1.

The required number is 10345789.

1,03,45,789 = One crore three lakh forty-five thousand seven hundred eighty-nine

10,345,789 = Ten million three hundred forty-five thousand seven hundred eighty-nine

Exercise 1.1

1 **Write the number names of the following numbers in both the Indian and the international place value systems.**

(a) 12450 (b) 203105 (c) 7845691 (d) 601245312

(e) 30024001 (f) 74512463 (g) 500200006 (h) 96000500001

2 **Write the numerals corresponding to the following number names.**

	Number in Words	Numeral
(a)	Twenty-five crore seventy-nine lakh thirty thousand two hundred eight	
(b)	Two crore forty-nine thousand six	
(c)	Seventeen billion four hundred million six thousand forty-four	
(d)	Ninety-nine lakh forty-one thousand six hundred ninety	
(e)	Sixty-seven billion seven	

3 **Write the place value and face value of the underlined digit(s) in each number. Also, write the numbers in expanded form.**

(a) 87,595,762 (b) 74,52,283 (c) 148,049,831 (d) 72,35,408

(e) 17,003,004 (f) 3,45,892 (g) 6,90,39,283 (h) 2,35,67,890

4 **Find the difference between the place values of:**

(a) 5's in 43,56,78,512 (b) 2's in 2,48,12,791 (c) 9's in 1,97,819

5 How many 3-digit numbers can be formed using the digits 2, 7 and 1 only once? List them in ascending order.

6 **Find the greatest and the smallest numbers that can be formed using the following digits only once.**

(a) 7, 4, 5, 1, 2, 6, 9 (b) 3, 4, 6, 8, 7, 1 (c) 8, 0, 6, 3, 5

COMPARISON OF NUMBERS

The following rules are followed to compare two or more numbers.

Rule 1: Compare the number of digits in both the numbers. If the number of digits is not equal, then the number with more digits is bigger than the other number.

Example 6: Consider the numbers 7846212 and 30245879. Here, 7846212 has 7 digits, whereas 30245879 has 8 digits. So, 30245879 > 7846212.

Rule 2: If the number of digits in both the numbers is equal, then compare the digits at the extreme left in both the numbers. If the leftmost digits are the same in both the numbers, then compare the digits immediately to their right. Continue this till you arrive at unequal digits at the corresponding places.

Example 7: Compare the following numbers and arrange them in descending order.

124518	57456012	312478521	124508	57408745

Write the numbers in the place value chart and then compare them.

TC	C	TL	L	T Th	Th	H	T	O
			1	2	4	5	1	8
	5	7	4	5	6	0	1	2
3	1	2	4	7	8	5	2	1
			1	2	4	5	0	8
	5	7	4	0	8	7	4	5

(a) Clearly, 312478521 is the largest number among the given numbers.

(b) Then, 57456012 and 57408745 have equal number of digits. So, compare the digits at the corresponding places. Note that the digits at the crores, ten lakhs and lakhs places are the same in both the numbers.

(c) 57456012 > 57408745 since the digit at the ten thousands place of 57456012 is greater than the digit at the ten thousands place of 57408745.

(d) Similarly, compare 124518 and 124508, that is, 124518 > 124508.

So, the numbers in descending order are 312478521, 57456012, 57408745, 124518 and 124508.

Therefore, 312478521 > 57456012 > 57408745 > 124518 > 124508.

Exercise 1.2

1 **Compare the following and write the appropriate symbols (>/<).**

(a) 1245601 ___ 461240

(b) 8794123560 ___ 36574582101

(c) 12405789 ___ 124503678

(d) 35678401 ___ 356087124

(e) 102456 ___ 103567

(f) 789241563001 ___ 789240563001

2 **Arrange the following numbers in ascending order.**

(a) 5345678, 4356720, 21567891, 3052678 and 74562187

(b) 100123, 24567812, 102123, 24500123, 999901 and 1112222

3 **Arrange the following numbers in descending order.**

(a) 1245689, 7845124, 21567891, 52678 and 31262187

(b) 811123, 21047812, 21102123, 24500123, 24580123 and 21102183

CONVERSIONS

The following box gives the conversions of numbers from the International system of numeration to the Indian system of numeration.

1 hundred thousand = 100,000 = 1 lakh

1 million = 1,000,000 = 10 lakh

10 million = 100 lakh = 1 crore

100 million = 1000 lakh = 10 crore

1 billion = 1000 million = 100 crore

10 billion = 10000 million = 1000 crore

100 billion = 100000 million = 10,000 crore

Example 8: 120 million = _____ crore

You know that 10 million = 1 crore

So, 120 million = 12 × 10 million = 12 crore

Therefore, 120 million = 12 crore

Example 9: 540 billion = _____ crore

You know that 1 billion = 100 crore

So, 540 billion = 540 × 1 billion = 540 × 100 crore = 54,000 crore

Therefore, 540 billion = 54,000 crore

Example 10: 8 billion = _____ lakh

You know that 1 billion = 100 crore = 100 × 100 lakh = 10,000 lakh

So, 8 billion = 8 × 10,000 lakh = 80,000 lakh

Therefore, 8 billion = 80,000 lakh

Exercise 1.3

Convert the following.

1. 25 million = _____ lakh
2. 500 million = _____ crore
3. 26 billion = _____ crore
4. 1 billion = _____ lakh
5. 1000 billion = _____ crore
6. 130 million = _____ crore
7. 720 million = _____ crore
8. 18 billion = _____ crore
9. 590 million = _____ lakh
10. 450 million = _____ crore

WORD PROBLEMS ON ARITHMETIC OPERATIONS

The four basic arithmetic operations are addition, subtraction, multiplication and division. Let us study some word problems on these operations.

Example 11: The earnings of a company in three successive years are given below. Find the total earnings in three years. Also, arrange the years in increasing order of their earnings.

Year	2011	2012	2013
Earnings	₹ 247812456	₹ 170215478	₹ 397612301

Adding the earnings of respective years will give the total earnings in three years.

Total earnings = ₹ 81,56,40,235
(Eighty-one crore fifty-six lakh forty thousand two hundred thirty-five rupees only)

Comparing the earnings in each year, we get:

	TC	**C**	**TL**	**L**	**T Th**	**Th**	**H**	**T**	**O**
	$^{2}2$	$^{1}4$	$^{1}7$	8	$^{1}1$	$^{1}2$	$^{1}4$	$^{1}5$	6
	1	7	0	2	1	5	4	7	8
+	3	9	7	6	1	2	3	0	1
	8	**1**	**5**	**6**	**4**	**0**	**2**	**3**	**5**

170215478 **(Year 2012)** < 247812456 **(Year 2011)** < 397612301 **(Year 2013)**

Example 12: To stitch a shirt, 2 m 15 cm cloth is needed. Out of 40 m cloth, how many shirts can be stitched and how much cloth will remain?

Cloth needed to stitch a shirt = 2 m 15 cm = 215 cm

Total cloth = 40 m = 4000 cm

Number of shirts that can be stitched with 4000 cm cloth
= 4000 ÷ 215 = 18

```
   18
215)4000
  -215
  1850
 -1720
   130
```

Note that the quotient is 18 and the remainder is 130. So, 18 shirts can be stitched and 130 cm of cloth will be left.

Exercise 1.4

1. A sales person sold 18 cars, each costing ₹12,75,800, and 42 cars, each costing ₹3,75,000, in a year. Find the total amount for the cars sold by the sales person. (Hint: Multiply the number of cars with their respective costs and then add.)

2. In an apartment, there are 24 flats. The cost of 24 flats is ₹1,38,82,800. Find the cost of (a) 1 flat (b) 12 flats (c) 6 flats (d) 4 flats. (Hint: Find the cost of 1 flat and then multiply it with the required number of flats.)

3. The population of a city is 12539784, out of which 5874123 are males. Find the population of females in that city.

4. A petrol bunk has 5,24,160 litres of petrol. If 520 litres of petrol is sold every hour, then how many days will the stock last? (Hint: First find the amount of petrol sold in a day. Assume that the petrol bunk functions 24 hours.)

5. The income of a person for five consecutive years is ₹1,89,560, ₹2,85,612, ₹4,12,356, ₹7,89,451 and ₹8,75,640 respectively. In the five years, the person saved ₹5,89,124. Find the amount spent in five years. (Hint: Add the income for five years and then subtract the saved amount.)

6. A company manufactures 12,546 bolts in a day. How many bolts would it manufacture in the month of February assuming the year as a non-leap year?

7. Find the difference between the greatest and the smallest numbers that can be formed using the digits 4, 0, 2, 5, 7, 6 and 8 only once.

8. A dhoti is of length 450 cm. How many such dhotis can be made from a cloth of 5,58,375 cm? Will there be any cloth left?

9. A cup of ice cream weighs 64 grams. How many ice cream cups can be filled from 55 kg 936 g of ice cream mixture? (Hint: Convert the given weight of ice cream into unit grams.)

10. A train covers 816 km distance in 12 hours. Find the average speed of the train.

ESTIMATION

The word estimation is used to represent an approximate value of certain things. You can estimate things by rounding off. As you know, numbers can be rounded off to different place values, such as, ten, hundred, thousand and so on. Let us recall rounding off the numbers to different place values.

Less than 5					5 and More than 5				
0	1	2	3	4	5	6	7	8	9
0					1				

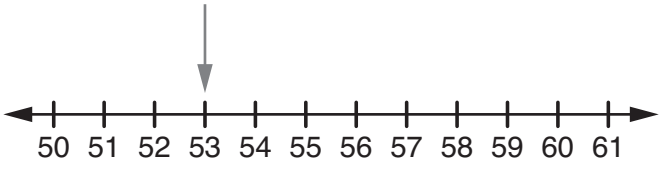
Rounding down ← → Rounding up

In order to round off a number to a certain place, you need to check whether the digit immediately to the right of that place is less than, greater than or equal to 5.

For example, if we want to round off a number to the nearest tens place, we look at the digit at the units place to see if it is < 5 or > 5.

Rounding off to the nearest ten

Let us round off 53 to the nearest ten. Note that the digit at the ones place is 3 and it is less than 5. So, make it 0.
Hence, 50 is the answer.



Consider another number 78. Note that the digit at the ones place is 8 and is more than 5. So, make 8 as 0 and add 1 to the digit at the tens place i.e. 7 + 1 = 8. Hence, 80 is the answer.

Examples: 142 → 140 578 → 580 1079 → 1080 87142 → 87140

Rounding off to the nearest hundred

Consider the number 423. Note that the digit at the tens place is 2 and is less than 5. So, make 2 and 3 as 0. In other words, 423 is closer to 400 than to 500. So, 400 is the answer.

Consider another number 178. Note that the digit at the tens place is 7 and is more than 5. So, make 7 and 8 as 0 and add 1 to the digit at the hundreds place, that is, 2. Hence, 200 is the answer.

Examples: 938 → 900 2558 → 2600 51079 → 51100

Rounding off to the nearest thousand

Consider the number 1623. Note that the digit at the hundreds place is 6 and is greater than 5. So, make 6, 2 and 3 as 0. Also, add 1 to the digit at the thousands place, that is, 2. In other words, 1623 is closer to 2000. So, 2000 is the answer.

Examples: 3178 → 3000 4938 → 5000 17258 → 17000 68579 → 69000

Rounding off to the nearest ten thousand

Consider the number 71245. Note that the digit at the thousands place is 1 and is less than 5. So, it can be rounded off to 70000.

Examples: 13178 → 10000 47938 → 50000 85258 → 90000 20579 → 20000

Estimation of Sum

Estimate the individual addends and add them to get the estimated sum. Study the examples given below.

Estimation	Nearest Ten	Nearest Hundred	Nearest Thousand	Nearest Ten Thousand
Problem	57 + 42	248 + 391	2856 + 7123	55268 + 72045
Addends	57 ⟶ 60 42 ⟶ 40	248 ⟶ 200 391 ⟶ 400	2856 ⟶ 3000 7123 ⟶ 7000	55268 ⟶ 60000 72045 ⟶ 70000
Estimated Sum	60 + 40 = 100	200 + 400 = 600	3000 + 7000 = 10000	60000 + 70000 = 130000

Estimation of Difference

Estimate the individual addends and subtract them to get the estimated difference. Study the examples given below.

Estimation	Nearest Ten	Nearest Hundred	Nearest Thousand	Nearest Ten Thousand
Problem	57 – 42	391 – 248	7123 – 2856	72045 – 55268
Addends	57 ⟶ 60 42 ⟶ 40	248 ⟶ 200 391 ⟶ 400	2856 ⟶ 3000 7123 ⟶ 7000	55268 ⟶ 60000 72045 ⟶ 70000
Estimated Difference	60 – 40 = 20	400 – 200 = 200	7000 – 3000 = 4000	70000 – 60000 = 10000

Estimation of Product

Estimate the individual multiplicands and multiply them to get the estimated product. Study the examples given below.

Estimation	Nearest Ten	Nearest Hundred	Nearest Thousand
Problem	57 × 42	391 × 248	7123 × 2856
Multiplicands	57 ⟶ 60 42 ⟶ 40	248 ⟶ 200 391 ⟶ 400	2856 ⟶ 3000 7123 ⟶ 7000
Estimated Product	60 × 40 = 2400	400 × 200 = 80000	7000 × 3000 = 21000000

Estimation of Quotients

In order to estimate the quotient of a division problem, you need to round off the dividend and the divisor, and then carry out the division.

Example: 589 ÷ 34 589 → 600 34 → 30 600 ÷ 30 = 20

Example: 1489 ÷ 18 1489 → 1000 18 → 20 1000 ÷ 20 = 50.

Exercise 1.5

1 **Round off the following numbers and fill in the table.**

Number	Nearest Ten	Nearest Hundred	Nearest Thousand	Nearest Ten Thousand
71243				
50421				
21897				
14630				

2 **Estimate the following.**

(a) 786 – 421 (b) 384 + 236 (c) 28 × 41 (d) 412 ÷ 36

(e) 2378 + 5601 (f) 89014 – 52478 (g) 129 × 387 (h) 76 × 501

RULES OF ARITHMETIC

You may come across situations wherein more than one operation is used in simplifying numbers. In order to solve such problems, we have a rule known as BODMAS. This rule tells us the order one should follow while simplifying.

The abbreviations of each letter are given below.

B	O	D	M	A	S
Brackets	Of	Divide	Multiply	Add	Subtract

Step 1: Look for brackets in a given problem and simplify it.

Step 2: Percentage and powers represents the term 'of'. (But, in this chapter, we will not take this up.)

Step 3: DMAS gives the order in which operations are to be carried out. So, first perform division, then multiplication, then addition and finally subtraction.

Example 13: Simplify: 9 + 45 – (7 + 4) × 6 ÷ 3

= 9 + 45 – 11 × 6 ÷ 3	Brackets
= 9 + 45 – 11 × 2	Division (6 ÷ 3 = 2)
= 9 + 45 – 22	Multiplication (11 × 2 = 22)
= 54 – 22	Addition (45 + 9 = 54)
= 32	Subtraction (54 – 22 = 32)

Example 14: Simplify: (36 ÷ 9) ÷ 4 × 7 + 6 – 13

(36 ÷ 9) ÷ 4 × 7 + 6 – 13

= 4 ÷ 4 × 7 + 6 – 13	Brackets (36 ÷ 9 = 4)
= 1 × 7 + 6 – 13	Division (4 ÷ 4 = 1)
= 7 + 6 – 13	Multiplication (1 × 7 = 7)
= 13 – 13	Addition (7 + 6 = 13)
= 0	Subtraction (13 – 13 = 0)

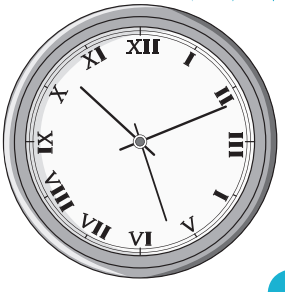
Exercise 1.6

Use the BODMAS rule and simplify the following.

1. 8 × 11 + 5 × 6 – 75
2. 9 + (7 × 2) – 5
3. 14 ÷ 7 × 35 ÷ 5
4. (2 × 6 + 18) ÷ 10
5. 18 ÷ (6 – 3) + 4 – 10
6. 9 + 5 – 6 × 10 ÷ 5
7. 9 + 5 × 6 – 48 ÷ 6
8. 1 + 30 ÷ 2 – 18 ÷ 3
9. 1 + 2 (64 ÷ 8 – 8)
10. 17 – 3 × 5
11. 20 + 11 – 5 × 6
12. 9 – (27 ÷ 9)

ROMAN NUMERALS

Roman number system is one of the ancient systems of writing numerals. In this system, seven symbols **I, V, X, L, C, D, M** are used to represent any number. The basic seven symbols and their values in Hindu-Arabic system are given in the table. There is no **0** in Roman numerals. Let us recall some of the rules that we discussed in the previous class.



Symbol	Value in Hindu-Arabic Number System
I	1
V	5
X	10
L	50
C	100
D	500
M	1,000

Rule 1: If a symbol is repeated, then its value is added as many times as it occurs. However, a symbol can be repeated only three times, not more than that. Also, the symbols V, L and D are never repeated.

Examples: II = 1 + 1 = 2 III = 1 + 1 + 1 = 3
XXX = 10 + 10 + 10 = 30 **VV = Wrong!**

CC = 100 + 100 = 200 MMM = 1000 + 1000 + 1000 = 3000

Rule 2: If a smaller number is written to the left of a bigger number, then it has to be subtracted from the bigger number. The symbol I can only be written to the left of V and X. The symbols V, L and D are never written to the left of a bigger number. Also, the symbol X can be subtracted from L and C only. And C can be subtracted only from D and M.

Examples: IV = 5 – 1 = 4 XL = 50 – 10 = 40
CD = 500 – 100 = 400 CM = 1000 – 100 = 900

VX = Wrong! **IL = Wrong!** **DM = Wrong!**

Rule 3: If a smaller number is written to the right of a bigger number, then it has to be added to the bigger number.

Examples: XV = 10 + 5 = 15 LV = 50 + 5 = 55 CL = 100 + 50 = 150
DC = 500 + 100 = 600

Rule 4: If a smaller number is written in between two greater values, then it is always subtracted from greater numerals immediately following it.

Examples: XXXIV = 10 + 10 + 10 + (5 – 1) = 30 + 4 = 34 MCIX = 1000 + 100 + (10 – 1) = 1109

Example 15: Write the Roman numerals corresponding to the following Hindu-Arabic numbers.

(a) 544 = 500 + 44 = 500 + 40 + 4 = 500 + (50 – 10) + (5 – 1) = DXLIV

(b) 1852 = 1000 + 800 + 50 + 2 = 1000 + (500 + 100 + 100 + 100) + 50 + 2 = MDCCCLII

(c) 3700 = 3000 + 700 = 1000 + 1000 + 1000 + 500 + 100 + 100 = MMMDCC

(d) 2985 = 2000 + 900 + 80 + 5 = 1000 + 1000 + (1000 – 100) + (50 + 10 + 10 + 10) + 5
= MMCMLXXXV

Example 16: Write the Hindu-Arabic numbers for the following Roman numerals.

(a) MCDL = 1000 + (500 – 100) + 50 = 1000 + 400 + 50 = 1450

(b) DCXXXII = 500 + 100 + 10 + 10 + 10 + 1 + 1 = 632

(c) MMMDCXIV = 1000 + 1000 + 1000 + 500 + 100 + 10 + 4 = 3614 [XIV = 10 + (5 – 1) = 10 + 4]

Exercise 1.7

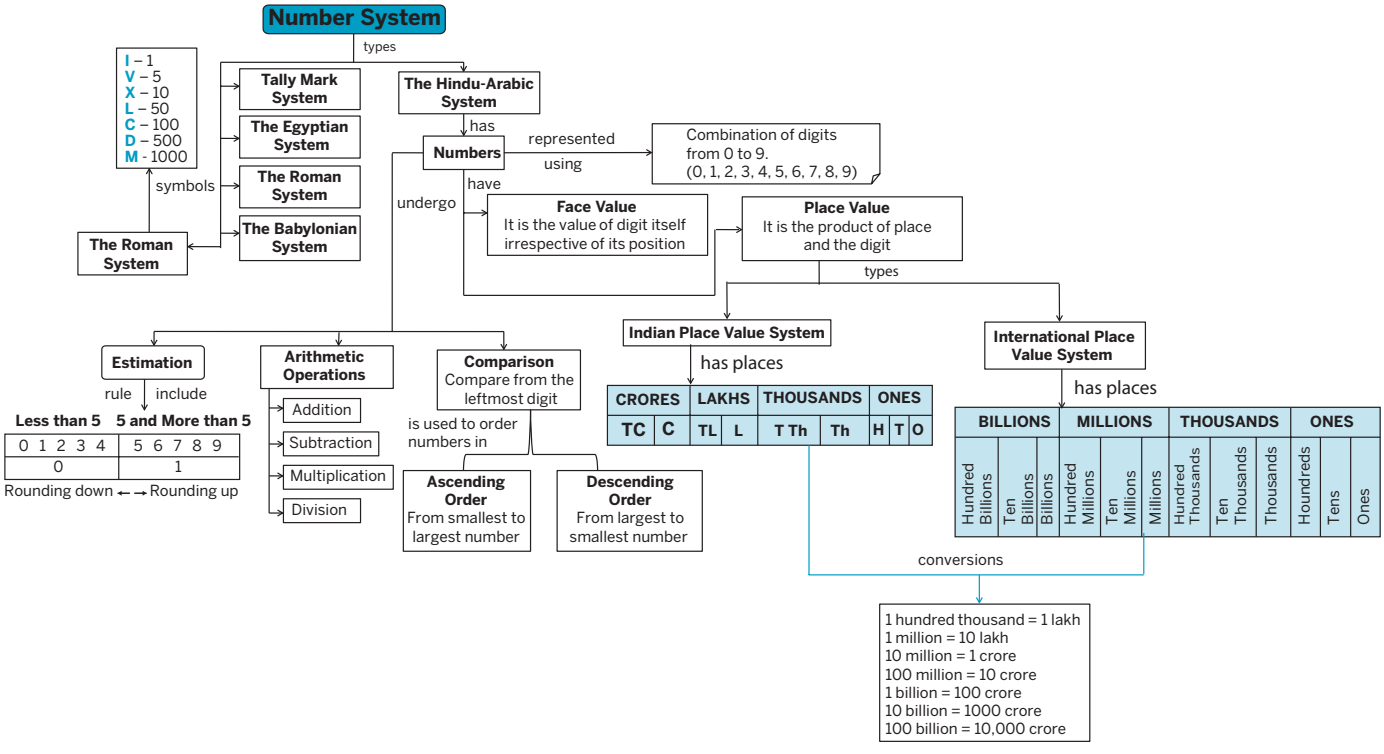
1 **Write the given Hindu-Arabic numbers in Roman numerals.**

(a) 525 (b) 1240 (c) 897 (d) 204 (e) 999 (f) 2712

2 **Write the given Roman numerals in Hindu-Arabic numbers.**

(a) MMMDCIII (b) DCCXLIV (c) LVII (d) CMLXXII (e) MXL (f) MMLIII

SUMMARY



Revision Exercise

1 **Write the following numbers in both the Indian and the international place value systems. Also, write the number names and identify the largest and the smallest numbers among the given numbers.**

(a) 745896 (b) 12456387 (c) 200135 (d) 5021369

(e) 2000140 (f) 9000009 (g) 412389410 (h) 9999999

2 **Write the numbers corresponding to the following number names. Also, arrange the numbers in ascending order.**

(a) Four hundred fifty-six billion nineteen million seventy-one thousand nine-hundred thirty-eight

(b) Ninety-seven crore thirteen lakh twenty-four thousand nine hundred nine

(c) Two billion ninety-two million four-hundred one thousand two hundred eleven

(d) Seventy-eight crore seventy-five lakh forty thousand one hundred fifty-six

3 **Find the difference between the place values of the underlined digits in the numbers.**

(a) 9, 56,253 (b) 18, 25, 10,584 (c) 801, 645, 102, 069 (d) 15, 613,007

4 **Compare the numbers and put the appropriate symbols (>/<).**

(a) 100,500,825 ____ 10, 50, 10, 809 (b) 546, 704, 021,045 ____ 546, 508, 021,036

(c) 19, 11, 14,523 ____ 2, 15, 57,025 (d) 91, 62, 00,008 ____ 916, 000,000

(e) 2,183,687 ____ 2, 87,256 (f) 412,002,891 ____ 412,002,059

(g) 10, 61, 00,012 ____ 58, 56, 45, 854 (h) 5,16, 75,036 ____ 16, 02,031

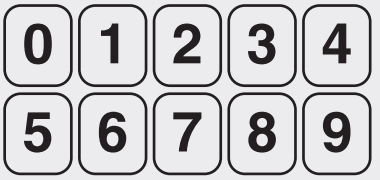
5 **Estimate the following.**

(a) 912 – 568 (b) 5421 + 1236 (c) 56 × 89 (d) 824 ÷ 46

(e) 5601 – 4210 (f) 89014 + 52478 (g) 542 × 712 (h) 49 × 49

(i) 189 ÷ 16 (j) 14563 ÷ 529 (k) 57841 + 35412 (l) 512 × 102

Maths Lab Activity



Aim: To create numbers using the given digits

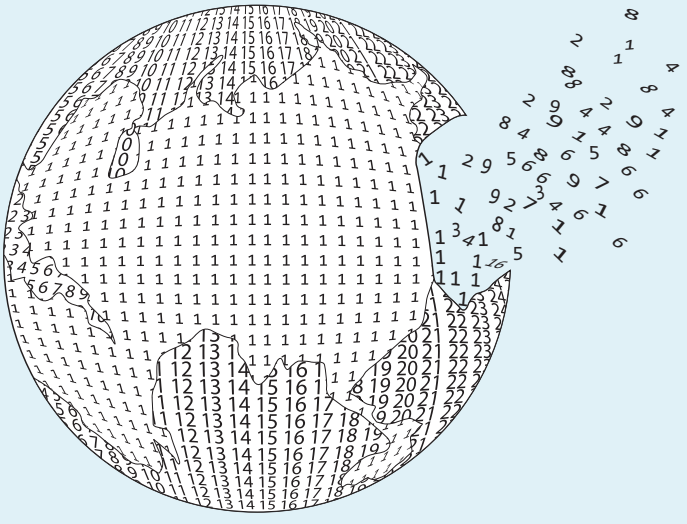
Materials required: Digit cards from 0 to 9

Procedure:

1. Students should work in groups. Provide a set of digit cards from 0 to 9 to each group.
2. Give a problem of the type 'How many 3-digit numbers can be formed using any three distinct digits, say 4, 8 and 9?' to all the groups. Ask them to try and form all the possible 3-digit numbers with the given digits and note down the answers.
3. Discuss the answers with all the groups and ask each group to demonstrate its findings to the whole class. Ask other groups to check their answers.
4. Similarly, pose some more problems of different types and ask students to find all the possibilities. Again, give a chance to each group to demonstrate its findings.

Project

Collect information on different number systems used across the world. Also, collect the history of different number systems and contributions of Indian mathematicians.



Challenge

1. How many 4-digit numbers can be formed using 1, 5, 3 and 0 only once? Explain your logic.
2. How many 3-digit numbers can be formed with 1, 5 and 0 if repetition of digits is allowed?

2 Whole Numbers

Learning Objectives

- To understand properties of whole numbers
- To perform basic operations on whole numbers

Let's Get Started

Natural or counting numbers are the numbers used for counting, i.e. 1, 2, 3, 4, 5, etc.

Whole numbers are 0, 1, 2, 3, 4, etc. All the natural numbers along with zero are called whole numbers.

Successor of a given whole number is the next whole number. Every whole number has a successor that can be obtained by adding 1 to the given whole number.
For example, 2 is the successor of 1, 5 is the successor of 4, 12 is the successor of 11.

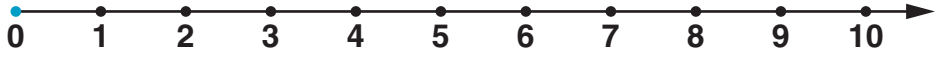
Predecessor of a given whole number is the number that comes just before it. Every whole number except 0 has a predecessor that can be obtained by subtracting 1 from the given whole number. For example, 9 is the predecessor of 10, 4 is the predecessor of 5, 20 is the predecessor of 21.

Think: Is the predecessor of every whole number a whole number?

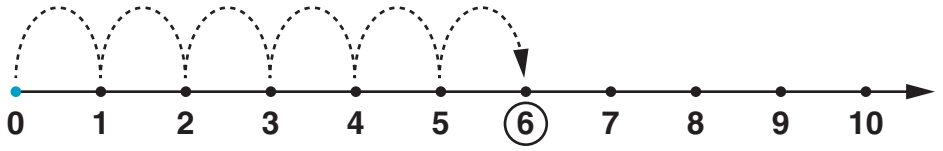
REPRESENTING WHOLE NUMBER ON A NUMBER LINE

Whole numbers can be represented on a number line. Consider the blue dot. Let us take this as a starting point and move equal distances to the right.

Let us mark all these points on a line. The resultant figure gives the number line. The blue dot represents zero.

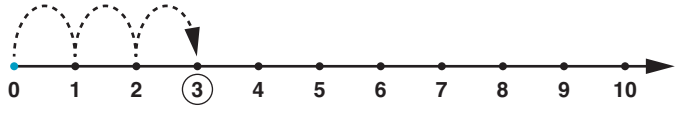


If we want to represent the number 6 on the number line, starting from zero, move 6 units to the right. The point where you reach represents the number 6.

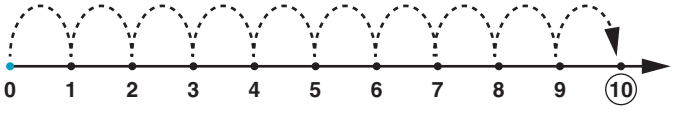


Example 1: Represent the following whole numbers on a number line.

(a) 3



(b) 10



Exercise 2.1

1 Fill in the blanks.

(a) The smallest natural number is _____.

(b) The smallest whole number is _____.

(c) Successor of a number is found by _____ 1 to the given number.

(d) Predecessor of a number is found by _____ 1 from the given number.

(e) The group of all natural numbers and 0 is called _____ numbers.

2 State whether the following statements are true (T) or false (F).

(a) A predecessor of a whole number comes just before the number. ☐

(b) A successor of a whole number comes just after the number. ☐

(c) The successor of the largest 3-digit number is the predecessor of the smallest 3-digit number. ☐

(d) To obtain the smallest 3-digit number, add 1 to the largest 2-digit number. ☐

(e) 9,99,99,999 is the largest whole number and the largest natural number. ☐

3 Write the successor of each of the following.

(a) 79 (b) 9999 (c) 7,54,990 (d) 7,01,70,100

4 Write the predecessor of each of the following.

(a) 101 (b) 455 (c) 1,00,000 (d) 3,08,70,650

5 Find the sum of the successor of the largest 4-digit number and the successor of the smallest 4-digit number.

6 Find the difference between successor of the largest 4-digit number and the successor of the smallest 4-digit number.

7 Represent the following numbers on a number line.
(a) 3 (b) 5 (c) 0 (d) 8

PROPERTIES OF OPERATIONS ON WHOLE NUMBERS

You are familiar with the four basic operations of addition, subtraction, multiplication and division on natural numbers.

You will now learn the properties of these operations on whole numbers.

Properties of Addition

(a) **Closure property**: If *a* and *b* are any two whole numbers, then (*a* + *b*) is also a whole number.

Complete the table given below.

a	***b***	***a* + *b***	**Is (*a* + *b*) a whole number ?**
4	8	4 + 8 = 12	Yes
333	0	333 + 0 = 333	
7489	449	7489 + 449 =	

Therefore, you can say that the sum of any two whole numbers is always a whole number.

(b) **Commutative property**: If *a* and *b* are any two whole numbers, then *a* + *b* = *b* + *a*.

Complete the table given below.

a	***b***	***a* + *b***	***b* + *a***	**Is *a* + *b* = *b* + *a*?**
0	7	0 + 7 = 7	7 + 0 = 7	Yes
17	45	17 + 45 = 62	45 + 17 = 62	
2134	176	2134 + 176 =	176 + 2134 =	

Therefore, you can say that in whatever order two whole numbers are added, the sum remains the same.