Mathematics

5

With the blessings of:

Our Parents

Mathematics (Part-5)

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Based on:

- National Education Policy 2020
- NCF 2022
- Activity Based Format
- Innovative Approach
- Learning with fun
- Eco-Friendly Paper

Preface

Mathematics, a well arranged series of Mathematics strictly confirms to the vision of National Curriculum Framework 2022 and also meets the requirement of the NCERT latest syllabus. It is an activity-based maths textbook created to give the students a National Education Policy 2020-based interactive learning foundation in mathematics while also fostering the holistic development of learners through critical thinking and creativity.

These traits will aid the students in better understanding the fundamental ideas through play. Core educational ideas are the foundation of this textbook. The goal is to encourage youngsters to look beyond the theoretical side of arithmetic and to learn about practical applications.

The book's design emphasises effectiveness and logical progression. Through teaching and interactive learning, NEP 2020 seeks to enhance higher order thinking.

The purpose of this book's design and presentation is to reinforce mathematical concepts through the use of simple games. This book includes enough questions in accordance with the NEP 2020 criteria.

Salient Features of the series:

Learning Objectives: Learning objective shows the right path of learning to the teacher as well as students. It determines the direction of learning for effective and quality learning outcomes.

Warm-Up: It aids pupils in remembering lessons learnt in previous years and lets them ready for new concepts. Also, allows learners to process and explore mathematical concepts while applying, extending, and analysing information within their own unique range of understanding.

Teacher's note: A "Teacher's Note" is a set of instructions laid out for the teachers to follow in the classroom in order to make class interactive and discussion based.

Quick Tip: It offers suggestions on how to quickly solve the questions.

Facts To know: The inclusion of it gives the learner plenty of chances to investigate the information regarding the topics..

Think Wisely: These questions have been included to encourage learners to think, analyse and apply.

Mental Maths: The main goal of teaching Mental Maths to the learners is to focus on improving their arithmetic abilities through memory, practice and number manipulation.

Maths Lab Activities: These are provided with the intention of making maths learning efficient, engaging, pleasant, and intellectually stimulating.

This series of Mathematics books from class 1-8 contains sufficient questions for practice on each topic.

I am very appreciative of the entire staff and the management for working so hard to get this book into such a wonderful arrangement.

The books are always open to suggestions and enhancements.

Author

Contents

1 Numbers and Numeration

Learning Objectives

At the end of this lesson, students will be able to:

- Develop a proper understanding of the Indian and International Number Systems.
- Compare the place value of different numbers upto 9 digits.
- Write the short and expanded form of the numbers.

Warm-Up

Observe the abacus given below and write down the digits with their place value.

Digits:

Place Value:

Teacher's Note:

Ask the students about the largest seven-digit numbers, which is read as ninety-nine lakh, ninety-nine thousand, nine hundred and ninety-nine.

In the previous class, we have studied upto 7-digit numbers.

Let's see the Indian place value chart given below.

TL	L	T-Th	Th	H	T	O
9	9	9	9	9	9	9

So, the largest 7-digit number is 9999999.

Extension of Numbers

Let's learn 8-digit and 9-digit numbers.

Indian Place Value Chart

Crores		Lakhs		Thousands		Ones		
TC	C	TL	L	T-Th	Th	H	T	O
Ten Crores 10000000	Crores 10000000	Ten Lakhs 1000000	Lakhs 100000	Ten Thousands 10000	Thousands 1000	Hundreds 100	Tens 10	Ones 1

Place Value		TC	C	TL	L	T-Th	Th	H	T	O
8-Digit	Smallest		1	0	0	0	0	0	0	0
	Largest		9	9	9	9	9	9	9	9
9-Digit	Smallest	1	0	0	0	0	0	0	0	0
	Largest	9	9	9	9	9	9	9	9	9

From the above place value chart,

Smallest 8-digit number is, 10000000

This is read as one crore.

Largest 8-digit number is 99999999. This is read as,

Nine crore ninety-nine lakh ninety nine thousand nine hundred ninety nine.

Smallest 9-digit number is 100000000. This is read as, Ten Crores.

Largest 9-digit number is 999999999. This is read as, Ninety-nine crore ninety-nine thousand nine hundred ninety-nine.

Solved Examples

Example 1 : Rewrite the following numbers using commas, in the Indian Number System.

(a) 27645089 (b) 201457892

(c) 7349562 (d) 8300596

Solution : **Indian Place Value Chart**

Crores		Lakhs		Thousands		Ones		
TC	C	TL	L	T-Th	Th	H	T	O

(a) 27645089 = 2,76,45,089 (b) 201457892 = 20,14,57,892

(c) 7349562 = 73,49,562 (d) 8300596 = 83,00,596

Example 2 : Write 28,64,02,542 in expanded form.

Solution : We can expand the given number in any of the following three ways.

(i) 2 ten crores + 8 crores + 6 ten lakhs + 4 lakhs + 2 thousands + 5 hundreds + 4 tens + 2 ones

OR

(ii) 2 × 10,00,00,000 + 8 × 1,00,00,000 + 6 × 10,00,000 + 4 × 1,00,000 + 2 × 1,000 + 5 × 100 + 4 × 10 + 2 × 1

OR

(iii) 20,00,00,000 + 8,00,00,000 + 60,00,000 + 4,00,000 + 2,000 + 500 + 40 + 2

Example 3 : Write 78, 05, 62, 158 in expanded form.

Solution : We can expand the given number in any of the following three ways:

(i) 7 ten crores + 8 crores + 5 lakhs + 6 ten thousands + 2 thousands + 1 hundreds + 5 tens + 8 ones

OR

(ii) 7 × 10,00,00,000 + 8 × 1,00,00,000 + 5 × 1,00,000 + 6 × 10,000 + 2 × 1,000 + 1 × 100 + 5 × 10 + 8 × 1

OR

(iii) 70,00,00,000 + 8,00,00,000 + 5,00,000 + 60,000 + 2,000 + 100 + 50 + 8

Quick Tip

As per the Indian numeral system, the first comma is placed after the hundreds place post which they are placed after every two digits. E.g., 1,23,45,67,890.

Exercise 1.1

1. Write the following numerals using proper commas.

(a) 28764259 (b) 138465002

(c) 94962080 (d) 798962420

(e) 834265210 (f) 91345642

(g) 13465920 (h) 83056900

2. Write the following numerals in expanded form.

(a) 2,86,54,203 (b) 76,00,42,951 (c) 3,84,60,259

(d) 4,05,06,429 (e) 21,34,56,701 (f) 81,00,56,159

(g) 7,01,32,645 (h) 5,99,02,105

3. Write the following in short form.

(a) 40,00,00,000 + 3,00,00,000 + 4,000 + 20.

(b) 8,00,00,000 + 40,000 + 2,000 + 1

(c) 80,00,00,000 + 50,00,000 + 9,000 + 50 + 2

(d) 70,00,00,000 + 4,00,000 + 8,000 + 3

(e) 60,00,00,000 + 2,00,00,000 + 10,00,000 + 2,00,000 + 50,000 + 3,000 + 400 + 90 + 6

(f) 70,00,00,000 + 4,00,00,000 + 4,000 + 400 + 2

4. Write the following numerals in words.

(a) 46, 52, 20, 829 (b) 2,00,56,420 (c) 80,00,00,000

(d) 7,00,00,000 (e) 67,29,02,010 (f) 5,01,52,143

(g) 36,52,14,729 (h) 1,54,00,140

5. Write the following numbers in figures.

(a) Six crore seven lakh five thousand three hundred seventeen.

(b) Ten crore eleven thousand one hundred sixty.

(c) Five crore five lakh five thousand five hundred five.

(d) Nine crore fifty.

(e) Eighty six crore fifty lakh twenty thousand one.

(f) Nine crore fifty six thousand twelve.

6. Write the place value of the encircled digits.

(a) 2 8 , 0 0 , 4(2) , 0 7 6

(b) 7(2) , 2 6 , 5 9 , 0 8 9

(c) (9)8 , 0 2 , 5 3 , 1 8 3

(d) 7 0 , 2 8 , 5 8 , 1(0)3

(e) 2 1 , (7)3 , 8 6 , 2 1 1

(f) 4 5 , 3(9) , 4 2 , 1 5 9

International Place Value System

International Place Value Chart

Millions			Thousands			Ones		
HM	TM	M	H-Th	T-Th	Th	H	T	O
Hundred Millions 100,000,000	Ten Millions 10,000,000	Millions 1,000,000	Hundred Thousands 100,000	Ten Thousands 10,000	Thousands 1000	Hundreds 100	Tens 10	Ones 1

Remember

1 Lakh = 100 Thousands
10 Lakhs = 1 Million
1 Crore = 10 Millions
10 Crores = 100 Millions

Facts to Know

The International Place Value System is also referred to as the Western Place Value System.

Think Wisely

Think of three examples from real-life situations where you are using more than four digits, for example, dialling a phone number.

Solved Examples

Example 1 : Rewrite the following numbers using commas, in the International Number System.

(a) 29170798 (b) 731460298 (c) 42596405 (d) 198400596

Solution : **International Place Value Chart**

Millions			Thousands			Ones		
HM	TM	M	H-Th	T-Th	Th	H	T	O

(a) 29170798 = 29,170,798 (b) 731460298 = 731,460,298

(c) 42596405 = 42,596,405 (d) 198400596 = 198,400,596

Example 2 : Write the following numerals in words, using International Number System.

(a) 28,042,579 (b) 102,586,107 (c) 182,542,000 (d) 102,159,120

Solution : (a) Twenty eight million forty two thousand five hundred seventy nine.

(b) One hundred two million five hundred eighty six thousand one hundred seven.

(c) One hundred eighty two million five hundred forty two thousand.

(d) One hundred two million one hundred fifty nine thousand one hundred twenty.

Quick Tip

As per the International numeral system, the first comma is placed after the hundreds place, post which they are placed after every three digits. E.g., 1,234,567,890

Exercise 1.2

1. **Write the following numerals using proper commas, in the International Number System.**

(a) 710245682 (b) 21246305 (c) 764253402

(d) 28376901 (e) 920457681 (f) 2359462

(g) 1742053 (h) 55551111

2. **Write the following numerals in words, using International Number System:**

(a)	456,028,740	(b)	900,000,000	(c)	30,000,000
(d)	40,670,002	(e)	2,342,112	(f)	70,145,208
(g)	60,150,400	(h)	120,460,140		

3. **Write the following numbers in figures, using Western Number System:**

(a) Four hundred million one hundred two thousand eleven.

(b) Sixty million sixty thousand six hundred sixty.

(c) Five hundred million two hundred thirty thousand one.

(d) Seven hundred seventy seven million thirty two.

(e) Two million eight hundred twenty three thousand three.

(f) Fifty two million five hundred twelve thousand twelve.

Mental Maths

Answer the following.

1. How many:

(a) Tens make a lakh? _____

(b) Hundreds make a crore? _____

2. How many times the digit 4 occur between 1 and 100? _____

3. What is the predecessor of the largest 8 - digit number? _____

4. Rewrite the numbers in both Indian and International Systems.

Number	Indian System	International System
7577344		
90067		

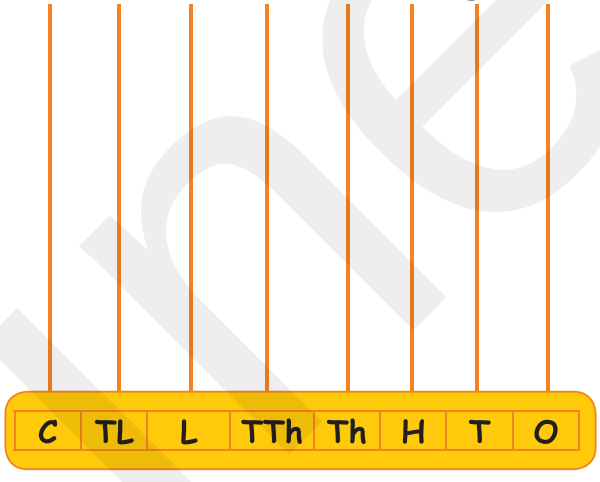
Maths Lab Activity

Materials required: An abacus with 8 rods and beads of 8 different colours.

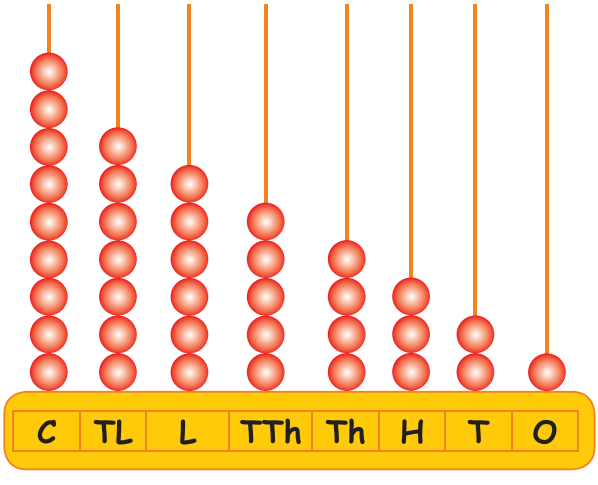
Steps:

1. Let us have 8 digits say 3, 9, 5, 1, 7, 4, 2, 6.

   Let us now form the greatest 8-digit number that can be formed using these digits.



2. Find the greatest digit (here it is 9), pick up nine beads and put them in the crores rod.
3. Find the second largest digit (here it is 7), pick up seven beads and put them on the ten lakhs rod.
4. Find the third-largest digit (here it is 6), pick up six beads and put them in the lakhs rod.
5. Find the fourth-largest digit (here it is 5), pick up five beads, and put them in the ten thousand rod.
6. Find the fifth-largest digit (here it is 4) and put four beads in the thousands rod.
7. Find the sixth-largest digit (here it is 3), pick up three beads and put them in the hundreds rod.



8. Find the seventh-largest digit (here it is 2), pick up two beads and put them in the tens rod.
9. Find the eighth largest digit (here it is 1) and put one bead in the ones rod. The greatest number formed is: 9, 76, 54, 321.
10. Form the smallest 8-digit number from the given digits by reversing the direction.

2 Roman Numbers

Learning Objectives

At the end of this lesson, students will be able to:

- Write Roman numbers upto 1000.
- Know the multiplication, addition and subtraction rules, for writing Roman Numbers.

Warm-Up

Priyank's teacher has given the task of completing the following table. She has filled some missing numbers but couldn't complete the table. Help her to complete the entire table.

Numbers	Roman Numbers
1	I
2	II
3	
4	IV
5	V
6	
7	VII
8	
9	IX
10	X

Numbers	Roman Numbers
11	XI
12	XII
13	
14	XIV
15	XV
16	XVI
	XVII
18	XVIII
19	XIX
20	XX

Numbers	Roman Numbers
	XXX
40	XL
50	
	LX
70	LXX
80	
90	XC
	C

Teacher's Note: Assist the students in filling the missing numbers. Further, inform them not to forget that Roman numerals have no zeros.

As we know, there are seven distinct symbols used by Romans to form Roman Numbers.

These are given below:

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

In the class IV, we have studied about Roman numbers upto 100. Now, in this class, we shall extend our learning.

Writing Roman Numbers for Hindu-Arabic Numerals

Hindu-Arabic Numerals	Roman Numerals
1	I
5	V
10	X
20	XX
30	XXX
45	XLV
50	L
60	LX
90	XC
450	CDL
500	D
559	DLIX
600	DC
740	DCCXL

Hindu-Arabic Numerals	Roman Numerals
100	C
101	CI
105	CV
110	CX
150	CL
180	CLXXX
200	CC
248	CCXLVIII
400	CD
900	CM
1009	MIX
1200	MCC
1450	MCDL
3000	MMM

Facts to Know

While the fourth Roman numeral is written as IV, most clocks in the world have it IIII instead of IV. Among the most famous clocks, which depicted four as IIII, is the Clock Tower of the Washington's old post office.

Rules For Writing Roman Numbers

1. **Multiplication Rule:**

Repetition of roman numbers means addition.

Remember

(i) Only symbols I, X, C and M can be repeated.

(ii) Symbols V, L and D cannot be repeated.

(iii) No symbol is repeated more than 3 times.

Examples :

II	=	1 × 2	= 2
III	=	1 × 3	= 3
XX	=	10 × 2	= 20
XXX	=	10 × 3	= 30
CC	=	100 × 2	= 200
CCC	=	100 × 3	= 300
MM	=	1000 × 2	= 2000
MMM	=	1000 × 3	= 3000

2. **Addition Rule:**

When a smaller number is written to the right of a larger number, then the smaller number is added to the larger number.

Examples :

XII	=	10 + 1 + 1 = 12
XVI	=	10 + 5 + 1 = 16
CVIII	=	100 + 5 + 1 + 1 + 1 = 108
CXX	=	100 + 10 + 10 = 120
DXX	=	500 + 10 + 10 = 520

DCCLXI = 500 + 100 + 100 + 50 + 10 + 1 = 761

MDCLXXIII = 1000 + 500 + 100 + 50 + 10 + 10 + 1 + 1 + 1 = 1673

MDC = 1000 + 500 + 100 = 1600

3. Subtraction Rule:

When a smaller number is written to the left of a larger number, then the smaller number is subtracted from the larger number.

Quick Tip

(i) Symbols V, L and D are never subtracted.

(ii) Symbol I can only be subtracted once from V and X

(iii) Symbol X can only be subtracted once from L and C.

(iv) Symbol C can only be subtracted once from D and M.

Examples :

IV = 5 – 1 = 4

IX = 10 – 1 = 9

XL = 50 – 10 = 40

XC = 100 – 10 = 90

CD = 500 – 100 = 400

CM = 1000 – 100 = 900

Solved Examples

Example 1 : Multiply the following.

(i) VI × V (ii) II × IV (iii) VIII × X (iv) XII × V (v) XX × C

Solution : (i) VI × V

Hindu-Arabic Numeral of VI = 6

Hindu-Arabic Numeral of V = 5

∴ VI × V = 6 × 5

= 30

(ii) II × IV

Hindu-Arabic Numeral of II = 2

Hindu-Arabic Numeral of IV = 4

∴ II × IV = 2 × 4

= 8

(iii) VIII × X

Hindu-Arabic Numeral of VIII = 8

Hindu-Arabic Numeral of X = 10

∴ VIII × X = 8 × 10

= 80

(iv) XII × V

Hindu-Arabic Numeral of XII = 12

Hindu-Arabic Numeral of V = 5

∴ XII × V = 12 × 5

= 60

(v) XX × C

Hindu-Arabic Numeral of XX = 20

Hindu-Arabic Numeral of C = 100

∴ XX × C = 20 × 100

= 2000

Exercise 2.1

1. Write the Roman numbers for the following numerals.

(a)	82	(b)	121	(c)	645
(d)	426	(e)	580	(f)	269
(g)	1302	(h)	2076	(i)	1045
(j)	1500	(k)	1872	(l)	2242
(m)	1400	(n)	3000	(o)	488

2. Write the Hindu-Arabic Numbers for the following Roman numerals.

(a)	XXXVI	(b)	XLVI	(c)	XCVIII
(d)	DCC	(e)	MCXI	(f)	DCX
(g)	CDXLIX	(h)	CCCXX	(i)	MMMCC
(j)	DLV	(k)	LXIX	(l)	MMCCC
(m)	MCD	(n)	CCC	(o)	MX

3. **Which of the following are meaningless?**

(a) IIC (b) CXL (c) DVLV

(d) CCC (e) MMVVII (f) MCDIV

4. **Compare (> , <, =) the following Roman numbers.**

(a) XCIV ☐ XCVI (b) CXL ☐ CLX (c) DC ☐ CD

(d) MCC ☐ CML (e) CCXX ☐ CXX (f) MC ☐ CD

5. **Multiply the following.**

(a) VII × X (b) IX × II (c) XXI × III

(d) XIX × V (e) XX × II (f) XV × D

(g) XXII × IX (h) CC × XII (i) XIX × XVII

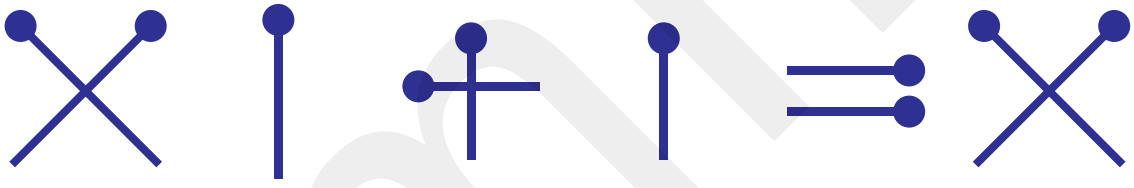
(j) LX × XL

Think Wisely

Correct this Roman-number sentence in two ways.

a. By moving one stick

b. By removing one stick



Mental Maths

Write T for True Statements and F for False Statements.

(a) No roman symbol is repeated more than three times. ( )

(b) The symbol V is always subtracted. ( )

(c) 900 can also be written as CM. ( )

(d) C can be repeated at most three times. ( )

(e) The roman symbol for 500 is M. ( )

Maths Lab Activity

Materials required: A blank Bingo card and a colour pencil.

Steps:

1. Each student takes out Bingo card.
2. Teacher asks the students to write any 25 Roman numerals (from 1 to 40) on the card.
3. Students can write Roman numerals of their own choice.

B	I	N	G	O
XXII	XIX	XLIV	XXXIX	IX
XLIII	XII	XXIV	IV	XVIII
XLVII	XXI	X	XXXII	XXVII
XXX	XLII	XXXVII	XXV	XL
XV	XXXIV	XXXVIII	XXXV	XXIX

4. The teacher reads out any 25 numbers in a random order with uniform interval.
5. The students then try to look for the number on their Bingo card. If they find it, they cross off that square.
6. The student with maximum number of crossed squares is the winner.

3 Multiples and Factors

Learning Objectives

At the end of this lesson, students will be able to:

- Explain the relationship between the multiples and factors.
- Check the divisibilty of the given number by 2,3,4 to 11.
- Know the properties of HCF and LCM.

Warm-Up

Read the given equations. Find out if it is correct or not. If not, then state the reason.

Equations	Yes/ No	Reasons
1. Is 81 a multiple of 9?		
2. Is 54 a multiple of 6?		
3. Is 64 a multiple of 4?		
4. Is 32 a multiple of 8?		
5. Is 90 a multiple of 7?		

Teacher's Note:

Apprise the students when the dividend is completely divisible by a divisor, then the divisor is known as factor of that dividend and the dividend is known as multiple of the divisor.

Types of Numbers

Even Numbers: A number which is exactly divisible by 2, is known as even number.

Remember

Every even number has 0, 2, 4, 6, 8 at its unit place.

Examples: 2, 4, 6, 8, 12, 14, 16, 18, etc. are even numbers.

Odd Numbers: A number which is not exactly divisible by 2, is known as odd number.

Remember

Every odd number has 1, 3, 5, 7 or 9 at its unit place.

Examples: 3, 5, 7, 9, 11, 13, 15, 17, etc. are odd numbers.

Consecutive Even Numbers: Any two even numbers which differ from one another by 2 are known as consecutive even numbers.

Examples: 286, 288, 290, 292, 294, ... etc. are consecutive even numbers.

Consecutive Odd Numbers: Any two odd numbers which differ from one another by 2 are called consecutive odd numbers.

Examples: 183, 185, 187, 189, 191, 193,... etc. are consecutive odd numbers.

Prime Numbers: A number having only two factors i.e. 1 and the number itself is known as prime number.

Examples: 2, 3, 5, 7, 11, 13, 17, 19, etc are prime numbers.

Composite Numbers: A number having more than two factors is known as composite number.

Examples: 4, 6, 8, 9, 10, 12, 14, 15, etc. are composite numbers.

Facts to Know

(i) 1 has only one factor, i.e. 1. So, 1 is neither a prime nor composite number.

(ii) 2 is the lowest and even prime number.

(iii) 4 is the lowest and even composite number.

(iv) 9 is the lowest odd composite number.

Co-prime Numbers: If two numbers do not have a common factor other than 1 i.e. their HCF is 1, are known as co-prime numbers.

Quick Tip

Co-prime numbers are need not be prime numbers.

Examples: 7 and 10, 12 and 13, 15 and 19, etc. are co-prime numbers.

Twin-prime Numbers: Two prime numbers whose difference is 2 are known as twin prime numbers.

Examples: 3 and 5, 11 and 13, 17 and 19, 29 and 31, etc. are twin prime numbers.

Divisibility Tests

1. **Divisibility by 2:** A number is divisible by 2, if its unit place digit is either 0, 2, 4, 6 or 8.

   Examples: 742, 640, 286, 454, 288, etc. are divisible by 2.

2. **Divisibility by 3:** A number is divisible by 3, if the sum of all its digits is divisible by 3.

   Example: Let us take a number 27315

   Sum of its digits = 2 + 7 + 3 + 1 + 5

   = 18

   18 is divisible by 3

   So, 27315 is also divisible by 3.

3. **Divisibility by 4:** A number is divisible by 4, if the number formed by its last two digits on the extreme right is divisible by 4.

Example: 289716 is divisible by 4 because the last two digits of the number is 16, which is divisible by 4.

4. **Divisibility by 5:** A number is divisible by 5, if its unit place digit is either 0 or 5.

Examples: 2845, 7640, 9875, 2000, etc. are divisible by 5.

5. **Divisibility by 6:** A number is divisible by 6, if it is divisible by both 2 and 3.

Example: Let us take a number 13482

The unit place digit of a number is 2. So, it is divisible by 2.

Sum of its digits = 1 + 3 + 4 + 8 + 2

= 18

18 is divisible by 3.

So, 13482 is divisible by 3.

Thus, the given number is divisible by 6.

6. **Divisibility by 7:** A number is divisible by 7, if the difference between the double of ones place digit and the number formed by rest of the digits is also divisible by 7.

Examples: (i) Let us take a number, 336

Now,

Double of ones place digit = 6 × 2

= 12

Difference = 33 – 12

= 21

21 is divisible by 7.

So, 336 is also divisible by 7.

(ii) Let us take a number, 3192

Now,

Double of ones place digit = 2 × 2 = 4

Difference = 319 – 4

= 315

315 is divisible by 7.

So, 3192 is also divisible by 7.

7. **Divisibility by 8:** A number is divisible by 8, if the number formed by its last three digits on the extreme right is divisible by 8.

Example: 75336 is divisible by 8 because the number formed by its last three digits, i.e. 336 is exactly divisible by 8.

8. **Divisibility by 9:** A number is divisible by 9, if the sum of its digits is divisible by 9.

Example: Let us take a number 425673

Sum of its digits = 4 + 2 + 5 + 6 + 7 + 3

= 27

27 is divisible by 9.

So, 425673 is also divisible by 9.

9. **Divisibility by 10:** A number is divisible by 10, if its unit place digit is zero (0).

Examples: 4560, 7650, 2890, 4800, etc. are divisible by 10.

10. **Divisibility by 11:** A number is divisible by 11, if the difference between the sum of digits at the odd places and the sum of digits at the even places is either 0 or a multiple of 11.

Example: Let us take a number 1 7 2 4 8 (Odd: 1, 2, 8; Even: 7, 4)

Sum of its odd place digits = 8 + 2 + 1 = 11

Sum of its even place digits = 4 + 7 = 11

Difference = 11 – 11 = 0

So, 17248 is divisible by 11.

Solved Examples

Example 1 : Is 142 divisible by 2?

Solution : Since, the unit place of 142 is 2, so 142 is divisible by 2.

Example 2 : Is 298 divisible by 2?

Solution : Since, the unit place of 298 is 8, so 298 is divisible by 2.

Example 3 : Is 3143 divisible by 2?

Solution : Since, the unit place of 3143 is 3, so 3143 is not divisible by 2.

Example 4 : Is 3951 divisible by 2?

Solution : Since, the unit place of 3951 is 1, so 3951 is not divisible by 2.

Example 5 : Is 16986 divisible by 3?

Solution : Sum of its digits = 1 + 6 + 9 + 8 + 6 = 30

30 is divisible by 3.

So, 16986 is also divisible by 3.

Example 6 : Is 93569 divisible by 3?

Solution : Sum of its digits = 9 + 3 + 5 + 6 + 9= 32

32 is not divisible by 3.

So, 93569 is not divisible by 3.

Example 7 : Is 45928 is divisible by 4?

Solution : Since, the last two digits of the number is 28, which is divisible by 4.

So, 45928 is divisible by 4.

Example 8 : Is 934322 is divisible by 4?

Solution : Since, the last two digits of the number is 22, which is not divisible by 4.

So, 934322 is not divisible by 4.

Example 9 : Is 5430 divisible by 5 or 10?

Solution : Since, the unit place of 5430 is 0. So, it is divisible by both 5 and 10.

Example 10: Is 7645 divisible by 5 or 10?

Solution : Since, the unit place of 7645 is 5. So, it is divisible by 5 not 10.

Example 11: Is 27498 divisible by 6?

Solution : The unit place of a number is 2. So, it is divisible by 2.

Sum of its digits = 2 + 7 + 4 + 9 + 8 = 30

30 is divisible by 3.

So, 27498 is divisible by 3.

Thus, the given number is divisible by 6.

Example 12: Is 16983 divisible by 6?

Solution : The unit place of a number is 3. So, it is not divisible by 2.

Thus, the given number is not divisible by 6.

Example 13: Is 30452 divisible by 6?

Solution : The unit place digit of a number is 2. So, it is divisible by 2.

Sum of its digits = 3 + 0 + 4 + 5 + 2 = 14

14 is not divisible by 3.

So, 30452 is not divisible by 3.

Thus, the given number is not divisible by 6.

Example 14 : Is 3164 divisible by 7?

Solution : Double of ones place digit is = 2 × 4 = 8

Difference = 316 – 8 = 308

308 is divisible by 7.

So, 3164 is divisible by 7.

Example 15 : Is 879 divisible by 7?

Solution : Double of ones place digit is = 2 × 9 = 18

Difference = 87 – 18 = 69

69 is not divisible by 7.

So, 879 is not divisible by 7.

Example 16 : Is 51608 divisible by 8?

Solution : Since, the last three digits of the given number is 608, which is divisible by 8.

So, 51608 is divisible by 8.

Example 17 : Is 85462 divisible by 8?

Solution : Since, the last three digits of the given number is 462, which is not divisible by 8.

So, 85462 is not divisible by 8.

Example 18 : Is 4095 divisible by 9?

Solution : Sum of its digits = 4 + 0 + 9 + 5 = 18

18 is divisible by 9.

So, 4095 is divisible by 9.

Example 19 : Is 62673 divisible by 9?

Solution : Sum of its digits = 6 + 2 + 6 + 7 + 3 = 24

24 is not divisible by 9.

So, 62673 is not divisible by 9.

Example 20 : Is 49852 divisible by 11?

Solution :

Odd Odd

4 9 8 5 2

Even

Sum of odd place digits = 2 + 8 + 4 = 14

Sum of even place digits = 5 + 9 = 14

Difference = 14 – 14 = 0

So, 49852 is divisible by 11.

Example 21 : Is 75613 divisible by 11?

Solution :

Odd Odd

7 5 6 1 3

Even

Sum of odd place digits = 3 + 6 + 7 = 16

Sum of even place digits = 1 + 5 = 6

Difference = 16 – 6 = 10 ≠ 0

So, 75613 is not divisible by 11.

Exercise 3.1

1. Check whether the following numbers are EVEN or ODD.

(a) 5473	(b) 6842	(c) 7609	(d) 4563
(e) 21560	(f) 37313	(g) 48677	(h) 31448

2. Check whether the following numbers are prime or composite.

(a) 81	(b) 17	(c) 650	(d) 97
(e) 426	(f) 125	(g) 113	(h) 103

3. Which of the following numbers are divisible by 2?

(a) 7642	(b) 5339	(c) 1764	(d) 2895
(e) 3958	(f) 2540	(g) 3966	(h) 2893

4. Which of the following numbers are divisible by 3?

(a) 126	(b) 2956	(c) 15214	(d) 135
(e) 8354	(f) 2535	(g) 14521	(h) 3750

5. **Which of the following numbers are divisible by 4?**

(a) 7602	(b) 3824	(c) 2305	(d) 3840
(e) 3281	(f) 4616	(g) 5948	(h) 5479

6. **Which of the following numbers are divisible by 5?**

(a) 2859	(b) 2855	(c) 48905	(d) 56428
(e) 7640	(f) 6492	(g) 76421	(h) 95650

7. **Which of the following numbers are divisible by 6?**

(a) 870	(b) 2748	(c) 7892	(d) 1246
(e) 4832	(f) 5124	(g) 14160	(h) 85420

8. **Which of the following numbers are divisible by 7?**

(a) 5894	(b) 8423	(c) 42830	(d) 28875
(e) 31460	(f) 3794	(g) 5754	(h) 7162

9. **Which of the following numbers are divisible by 8?**

(a) 3616	(b) 3880	(c) 7423	(d) 9871
(e) 9785	(f) 4526	(g) 5928	(h) 9888

10. **Which of the following numbers are divisible by 9?**

(a) 1962	(b) 4295	(c) 3840	(d) 7640
(e) 7359	(f) 27608	(g) 9873	(h) 59112

11. **Which of the following numbers are divisible by 10?**

(a) 98765	(b) 5960	(c) 49760	(d) 3842
(e) 37400	(f) 42927	(g) 3840	(h) 5969

12. **Which of the following numbers are divisible by 11?**

(a) 7426	(b) 4128	(c) 4972	(d) 7812
(e) 9372	(f) 8316	(g) 1462	(h) 5016

Highest Common Factor (HCF)

HCF of two or more given numbers is the highest number that divides the given numbers exactly without leaving any remainder.

Prime Factorisation

Prime factorisation means to express the given number as a product of prime factors.

For example: Let us take a number 2460

2	2	4	6	0
2	1	2	3	0
3		6	1	5
5		2	0	5
41			4	1
			1	

Prime factors of 2460 = 2 × 2 × 3 × 5 × 41

Finding HCF By Prime Factorisation Method

To find the HCF of two or more given numbers by prime factorisation method, follow the steps given below.

Step 1 : Find all the prime factors of the given numbers.

Step 2 : Find their common factors.

Step 3 : The largest common factor is the H.C.F. of given numbers.

Solved Examples

Example 1 : Find the HCF of 42 and 36 by prime factorisation method.

Solution :

2	4	2
3	2	1
7		7
		1

2	3	6
2	1	8
3		9
3		3
		1

Prime factors of 42 = 2 × 3 × 7

Prime factors of 36 = 2 × 2 × 3 × 3

Common factors = 2, 3

∴ HCF = 2 × 3 = 6

Example 2 : Find the HCF of 24 and 72 by prime factorisation method.

Solution :

2	2	4
2	1	2
2		6
3		3
		1

2	7	2
2	3	6
2	1	8
3		9
3		3
		1

Prime factors of 24 = $2 \times 2 \times 2 \times 3$

Prime factors of 72 = $2 \times 2 \times 2 \times 3 \times 3$

Common factors = 2, 2, 2, 3

$\therefore$ HCF = $2 \times 2 \times 2 \times 3$

= 24

Example 3 : Find the HCF of 288, 420 and 630 by prime factorisation method.

Solution :

2	2	8	8
2	1	4	4
2		7	2
2		3	6
2		1	8
3			9
3			3
			1

2	4	2	0
2	2	1	0
3	1	0	5
5		3	5
7			7
			1

2	6	3	0
3	3	1	5
3	1	0	5
5		3	5
7			7
			1

Prime factors of 288 = $2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3$

Prime factors of 420 = $2 \times 2 \times 3 \times 5 \times 7$

Prime factors of 630 = $2 \times 3 \times 3 \times 5 \times 7$

Common factors = 2, 3

$\therefore$ HCF = 2×3

= 6

Example 4 : Find the HCF of 250, 200 and 350 by prime factorisation method.

Solution :

2	250
5	125
5	25
5	5
	1

2	200
2	100
2	50
5	25
5	5
	1

2	350
5	175
5	35
7	7
	1

Prime factors of 250 = $2 \times 5 \times 5 \times 5$

Prime factors of 200 = $2 \times 2 \times 2 \times 5 \times 5$

Prime factors of 350 = $2 \times 5 \times 5 \times 7$

Common factors = 2, 5, 5

$\therefore$ HCF = $2 \times 5 \times 5$

= 50

Finding HCF By Division Method

It is not very convenient to find the HCF of large numbers by prime factorisation method. So to find the HCF of large numbers, we use division method.

Steps to find the HCF of two or more given numbers by division method are as follows.

Step 1 : Divide the larger number by the smaller number.

Step 2 : Divide the first divisor by the first remainder.

Step 3 : Divide the second divisor by the second remainder.

Step 4 : Continue this process until the remainder obtained as 0.

The last divisor is the required HCF of the given numbers.

Example 5 : Find the HCF of 126 and 160 by division method.

Solution :

```
126 ) 160 ( 1
    - 126
      34 ) 126 ( 3
           - 102
             24 ) 34 ( 1
                  - 24
                    10 ) 24 ( 2
                         - 20
                           4 ) 10 ( 2
                               - 8
                                 2 ) 4 ( 2
                                   - 4
                                     0
```

∴ HCF of 126 and 160 is 2.

Example 6 : Find the HCF of 158 and 256 by division method.

Solution :

```
158 ) 256 ( 1
    - 158
      98 ) 158 ( 1
           -  98
             60 ) 98 ( 1
                  - 60
                    38 ) 60 ( 1
                         - 38
                           22 ) 38 ( 1
                                - 22
                                  16 ) 22 ( 1
                                     - 16
                                       6 ) 16 ( 2
                                         - 12
                                           4 ) 6 ( 1
                                             - 4
                                               2 ) 4 ( 2
                                                 - 4
                                                   0
```

∴ HCF of 158 and 256 is 2.

Example 7 : Find the HCF of 246, 546 and 760 by division method.

Solution : First we will find the HCF of 246 and 546.

```
246 ) 546 ( 2
    - 492
      54 ) 246 ( 4
         - 216
           30 ) 54 ( 1
              - 30
                24 ) 30 ( 1
                   - 24
                     6 ) 24 ( 4
                       - 24
                         0
```

∴ HCF of 246 and 546 is 6.

Now, we will find HCF of 6 and 760.

```
6 ) 760 ( 126
  - 6
    16
  - 12
     40
   - 36
      4 ) 6 ( 1
        - 4
          2 ) 4 ( 2
            - 4
              0
```

∴ HCF of 6 and 760 is 2.

Hence, HCF of 246, 546 and 760 is 2.

Example 8 : Find the HCF of 346, 458 and 986 by division method.

Solution : First we will find HCF of 346 and 458.

```
346 ) 458 ( 1
    - 346
    -----
      112 ) 346 ( 3
            - 336
            -----
              10 ) 112 ( 11
                   - 110
                   -----
                     2 ) 10 ( 5
                         - 10
                         ----
                           0
```

∴ HCF of 346 and 458 is 2.

Now, we will find HCF of 2 and 986.

```
2 ) 986 ( 493
  - 8
  ---
    18
  - 18
  ----
     06
   -  6
   ----
      0
```

∴ HCF of 2 and 986 is 2.

Hence, the HCF of 346, 458 and 986 is 2.

Exercise 3.2

1. Find the HCF of following using prime factorisation method.

(a) 26 and 42 (b) 50 and 60

(c) 122 and 438 (d) 144, and 111

(e) 169 and 224 (f) 250 and 300

(g) 49, 63 and 84 (h) 58,60 and 85

(i) 240, 335 and 430 (j) 28, 45 and 92

(k) 81, 27 and 60 (l) 25, 30 and 80

2. Find the HCF of following using division method.

(a) 42 and 70 (b) 89 and 98

(c) 72 and 90 (d) 246 and 554

(e) 100 and 200 (f) 50 and 25

(g) 178, 269 and 580 (h) 125, 550 and 645

(i) 217, 385 and 735 (j) 594, 792 and 1848

(k) 390, 702 and 468 (l) 136, 170 and 255

Remember

HCF is also known as GCD (Greatest Common Divisor)

Least Common Multiple (LCM)

LCM of two or more given numbers is the smallest number which is the multiple of each given number.

Finding LCM by Prime Factorisation Method.

To find the LCM of two or more given numbers by prime factorisation method, follow the steps given below.

Step 1 : Find all the prime factors of the given numbers.

Step 2 : The LCM of the given numbers is equal to the product of all the different prime factors, taking the common prime factors occuring maximum number of times.

Solved Examples

Example 1 : Find the LCM of 36 and 54 by prime factorisation method.

Solution :

2	36
2	18
3	9
3	3
	1

2	54
3	27
3	9
3	3
	1

Prime factors of 36 = 2 × 2 × 3 × 3

Prime factors of 54 = 2 × 3 × 3 × 3

∴ LCM of 36 and 54 = 2 × 3 × 3 × 2 × 3

= 108

Example 2 : Find the LCM of 42 and 68 by prime factorisation method.

Solution :

2	42
3	21
7	7
	1

2	68
2	34
17	17
	1

Prime factors of 42 = 2 × 3 × 7

Prime factors of 68 = 2 × 2 × 17

∴ LCM of 42 and 68 = 2 × 3 × 7 × 2 × 17

= 1428

Example 3 : Find the LCM of 92, 106 and 112 by prime factorisation method.

Solution :

2	92
2	46
23	23
	1

2	106
53	53
	1

2	112
2	56
2	28
2	14
7	7
	1

Prime factors of 92 = $2 \times 2 \times 23$

Prime factors of 106 = 2×53

Prime factors of 112 = $2 \times 2 \times 2 \times 2 \times 7$

$\therefore$ LCM of 92, 106 and 54 = $2 \times 2 \times 23 \times 53 \times 2 \times 2 \times 2 \times 7$

= 2,73,056

Example 4 : Find the LCM of 78, 136 and 240 by prime factorisation method.

Solution :

2	7	8
3	3	9
13	1	3
		1

2	1	3	6
2		6	6
3		3	3
11		1	1
			1

2	2	4	0
2	1	2	0
2		6	0
2		3	0
3		1	5
5			5
			1

Prime factors of 78 = $2 \times 3 \times 13$

Prime factors of 136 = $2 \times 2 \times 3 \times 11$

Prime factors of 240 = $2 \times 2 \times 2 \times 2 \times 3 \times 5$

$\therefore$ LCM of 78, 136 and 240 = $2 \times 3 \times 13 \times 2 \times 11 \times 2 \times 2 \times 2 \times 5$

= 6 8,640

Finding LCM By Division Method

To find the LCM of given numbers, follow the steps given below.

Step 1 : Arrange the given numbers in a line in any order.

Step 2 : Divide the given numbers by a number which exactly divides atleast two given numbers, and carry forward the numbers which are not divisible.

Step 3 : Repeat the process until the given numbers are not divisible by the same number other than 1.

Step 4 : The product of the divisors and undivided dividends is the LCM of the required numbers.

Example 5 : Find the LCM of 50, 60 and 80 by division method.

Solution :

2	50, 60, 80
5	25, 30, 40
2	5, 6, 8
	5, 3, 4

∴ LCM of 50, 60 and 80

= 2 × 5 × 2 × 5 × 3 × 4

= 1200

Example 6 : Find the LCM of 150, 250 and 300 by division method.

Solution :

2	150, 250, 300
5	75, 125, 150
5	15, 25, 30
3	3, 5, 6
	1, 5, 2

∴ LCM of 150, 250, and 300

= 2 × 5 × 5 × 3 × 5 × 2

= 1500

Example 7 : Find the LCM of 92, 105, 280 and 560 by division method.

Solution :

2	92, 105, 280, 560
2	46, 105, 140, 280
7	23, 105, 70, 140
5	23, 15, 10, 20
2	23, 3, 2, 4
	23, 3, 1, 2

∴ LCM of 92, 105, 280 and 560

= 2 × 2 × 7 × 5 × 2 × 23 × 3 × 1 × 2

= 38,640

Example 8 : Find the LCM of 72, 120, 240 and 350 by division method

Solution :

2	72, 120, 240, 350
3	36, 60, 120, 175
2	12, 20, 40, 175
2	6, 10, 20, 175
5	3, 5, 10, 175
	3, 1, 2, 35

$\therefore$ LCM of 72, 120, 240 and 350

$= 2 \times 3 \times 2 \times 2 \times 5 \times 3 \times 2 \times 35$

$= 25{,}200$

Exercise 3.3

1. Find the LCM of the following using prime factorisation method.

(a) 16 and 40
(b) 36 and 54
(c) 70 and 80
(d) 504 and 594
(e) 42 and 72
(f) 24, 56 and 64
(g) 25, 35 and 55
(h) 86, 92 and 98
(i) 90, 108 and 144
(j) 96, 108 and 180
(k) 75, 100, 175 and 325
(l) 12, 18, 24 and 36

2. Find the LCM of following using division method.

(a) 24 and 30
(b) 92 and 108
(c) 42 and 65
(d) 28 and 90
(e) 78, 82 and 90
(f) 120, 156 and 240
(g) 20, 30 and 50
(h) 100, 150 and 210
(i) 34, 72, 69 and 54
(j) 40, 80, 150 and 160
(k) 6, 7, 8 and 12
(l) 25, 75, 100 and 150

Properties of HCF and LCM

1. HCF of given numbers is always less than or equal to the any of the given numbers.

   For example: HCF of 10 and 15 is 5.

   So, 5 < 10 and 5 < 15.

2. LCM of given numbers is always greater than or equal to the any of the given numbers.

   For example: LCM of 10 and 15 is 30.

   So, 30 > 10 and 30 > 15.

3. HCF of two co-prime numbers is always 1.

   For example: HCF of 5 and 7 is 1.

4. LCM of two co-prime numbers is equal to their product.

   For example: LCM of 5 and 7 is 35.

5. If one number is the factor of the other number, then the smaller number is their HCF and the larger number is their LCM.

   For example: HCF of 25 and 50 is 25.

   LCM of 25 and 50 is 50.

6. Product of two given numbers is equal to the product of their HCF and LCM.

   Thus,

> First Number × Second Number
> = HCF of given numbers × LCM of given numbers

Solved Examples

Example 1 : HCF of two numbers is 30 and their LCM is 900. If one number is 150, find the other number.

Solution : First number × Second number = HCF × LCM

$$\text{Second Number} = \frac{\text{HCF} \times \text{LCM}}{\text{First Number}}$$

$$= \frac{\overset{2}{\cancel{30}} \times 90\cancel{0}}{\cancel{150}_{1}}$$

$$= 2 \times 90$$

$$= 180$$

$\therefore$ Required Number = 180

Example 2 : The HCF and LCM of two numbers are 135 and 7560 respectively. If the one of the numbers is 280, find the other number.

Solution : First number × Second number = HCF × LCM

$$\text{Second Number} = \frac{\text{HCF} \times \text{LCM}}{\text{First Number}}$$

$$= \frac{135 \times \cancel{7560}^{27}}{\cancel{280}}$$

$$= 3645$$

$\therefore$ The other number is 3645

Example 3 : Find the HCF and LCM of 240 and 350.

Solution : First we will find HCF of 240 and 350.

```
240 ) 350 ( 1
    - 240
    ------
      110 ) 240 ( 2
          - 220
          -----
            20 ) 110 ( 5
               - 100
               -----
                 10 ) 20 ( 2
                    - 20
                    ----
                      0
```

$\therefore$ HCF = 10

$$\text{Now, LCM} = \frac{\text{I}^{st}\text{ Number} \times \text{II}^{nd}\text{ Number}}{\text{HCF}}$$

$$= \frac{240 \times 350}{10}$$

$$= 8400$$

$\therefore$ LCM = 8400

Example 4 : Find the greatest number which divides 246 and 196 leaving remainder 6 in each case.

Solution : Clearly, we have to find the largest number that divides (246 – 6) = 240 and (196 – 6) = 190, exactly.

```
190 ) 240 ( 1
    - 190
      50 ) 190 ( 3
           - 150
             40 ) 50 ( 1
                  - 40
                    10 ) 40 ( 4
                         - 40
                           0
```

∴ Required number = HCF of 190 and 240
= 10

Hence, the required number is 10.

Example 5 : Two threads of lengths 15 *cm* and 45 *cm* are to be cut into small pieces of equal lengths. What will be the maximum length of each piece?

Solution : Required length = HCF of 15 *cm* and 45 *cm*

Now, $15 = \boxed{5} \times \boxed{3}$

$45 = \boxed{5} \times \boxed{3} \times 3$

∴ HCF of 15 and 45 = 5 × 3 = 15

Exercise 3.4

1. Find the HCF of 25 and 30.
2. Find the LCM of 60 and 95.
3. Find the HCF and LCM of 13 and 17.
4. Find the HCF and LCM of 11 and 121.
5. Find the HCF and LCM of 680 and 816.

6. HCF of two given numbers is 12 and their LCM is 72. If one number is 24, find the other number.

7. HCF of two given numbers is 9 and thier LCM is 270. If one number is 27, find the other number.

8. The HCF of two numbers is 144 and their LCM is 2880. If one of the number is 720, find the other number.

9. Find the greatest number which divides 148 and 100 leaving remainder 4 in each case.

10. Find the greatest number which divides 130 and 180 leaving remainder 5 in each case.

11. Three pieces of rope 42m, 49m and 63m long have to be divided into pieces of equal length. What is the greatest possible length of each piece?

12. Four bells begin to ring together at intervals of 6, 7, 8 and 12 seconds, respectively. After how much time will they ring together again?

Think Wisely

6 is a perfect number. Because the factors of 6 are 1, 2, 3.

1+2+3=6. The sum of these factors is also 6.

Can you find the next perfect number? (Clue: It is between 20 and 30)

Mental Maths

Tick the (✓) correct choice.

1. The only even number which is a prime number.

a. 4 ☐ b. 1 ☐ c. 2 ☐ d. 6

2. Which of the following numbers are divisible by 4?

a. 7190 ☐ b. 6824 ☐ c. 35876 ☐ d. 10814

3. If two numbers are same, then which of the following relation will be true?

a. HCF > LCM

b. HCF < LCM

c. HCF = LCM

d. None of these

4. The product of two numbers is equal to

a. HCF × first number

b. LCM × first number

c. HCF × LCM

d. HCF = LCM

5. Which of the following number is the lowest odd composite number?

a. 3

b. 5

c. 9

d. 11

Maths Lab Activity

Materials required: Pencil, number grid from 1 to 60.

Steps:

1. Take a number grid from 1 to 60.
2. Cross out 1,as it's neither prime nor composite.
3. Encircle 2 and cross out all the multiples of 2.
4. Encircle 3 and cross out all the multiples of 3.
5. Encircle 5 and cross out all the multiples of 5.
6. Encircle the next prime number 7 and cross out all the multiples of 7

The numbers left in the grid are the prime numbers less than 60.

1	2	3	4	5	6	7	8	9	10
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

Eratosthenes, a Greek Mathematician, who lived in the third century B. C. discovered a method of finding prime numbers by sifting away all the numbers that are not prime.

This method is called the **Sieve of Eratosthenes**.

4 Simplification

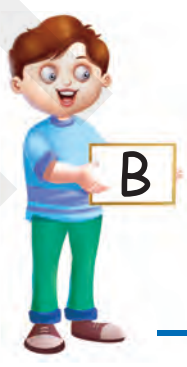
Learning Objectives

At the end of this lesson, students will be able to:

- Define simplification.
- Know the concept of DMAS.
- Solve BODMAS.

Warm-Up

Write the symbols and number the pictures according to 'BODMAS'



Teacher's Note:

Apprise the students that BODMAS rule is an acronym that is used to remember the order of operations to be followed while solving expressions in mathematics. It stands for B - Brackets, O - Order of powers or roots, D - Division, M - Multiplication, A - Addition and S - Subtraction. It means that expressions having multiple operators need to be simplified from left to right in this order only.

In the previous classes, we have studied the four fundamental operations, i.e. addition, subtraction, multiplication and division separately.

But sometimes, a numerical expression consists of one or more fundamental operations. The process of solving such numerical expressions is called Simplifications.

We solve the numerical expressions in the following order.

DMAS

where, D stands for Division
M stands for Multiplication
A stands for Addition
and S stands for Subtraction

We do not change the order of these operations.

Solved Examples

Example 1 : Simplify:

$95 - 42 \div 7 \times 3 + 40$

Solution :

$95 - 42 \div 7 \times 3 + 40$

$= 95 - 6 \times 3 + 40$ (D)

$= 95 - 18 + 40$ (M)

$= 95 + 40 - 18$

$= 135 - 18$ (A)

$= 117$ (S)

Example 2 : Simplify:

$86 - 53 + 29 \times 10 \div 5$

Solution :

$86 - 53 + 29 \times 10 \div 5$

$= 86 - 53 + 29 \times 2$ (D)

$= 86 - 53 + 58$ (M)

$= 86 + 58 - 53$

$= 144 - 53$ (A)

$= 91$ (S)

Example 3 : Simplify:

$8 \times 6 + 24 \div 6 - 18$

Solution :

$8 \times 6 + 24 \div 6 - 18$

$= 8 \times 6 + 4 - 18$ (D)

$= 48 + 4 - 18$ (M)

$= 52 - 18$ (A)

$= 34$ (S)

Example 4 : Simplify:

$198 - 42 \times 15 \div 5 + 9$

Solution : $198 - 42 \times 15 \div 5 + 9$

$= 198 - 42 \times 3 + 9$ (D)

$= 198 - 126 + 9$ (M)

$= 198 + 9 - 126$

$= 207 - 126$ (A)

$= 81$ (S)

Example 5 : Simplify:

$17 + 34 \div 17 \times 2 - 10$

Solution : $17 + 34 \div 17 \times 2 - 10$

$= 17 + 2 \times 2 - 10$ (D)

$= 17 + 4 - 10$ (M)

$= 21 - 10$ (A)

$= 11$ (S)

Facts to Know

Achilles Reselfelt is a mathematician who invented BODMAS.

Exercise 4.1

Simplify.

1. $23 \times 46 \div 2 + 15 - 12$
2. $80 + 40 \div 10 \times 2 - 36$
3. $100 - 50 \div 2 \times 5 + 86$
4. $7 \times 29 + 42 \div 3 - 12$
5. $49 \div 7 \times 11 - 20 + 53$
6. $112 - 10 + 50 \div 10 \times 6$
7. $61 \times 2 \div 2 - 5 + 12$
8. $120 \times 5 + 28 - 56 \div 2$
9. $60 - 48 \div 6 \times 4 + 8$
10. $36 - 13 + 18 \times 12 \div 4$
11. $120 - 42 \div 7 + 15 \times 3$
12. $102 \times 21 \div 7 + 6 - 3$
13. $160 - 82 \times 12 \div 6 + 5$
14. $450 - 350 \div 2 \times 2 + 6$
15. $120 - 50 \div 25 \times 3 - 1$
16. $156 \div 3 \times 3 - 15 \div 3 + 2$

Use of Brackets

Brackets are the grouping symbols, used to separate various parts of an expression.

There are following different types of brackets:

(i)	Bar or Vinculum	—
(ii)	Round Brackets or Small Brackets	( )
(iii)	Curly Brackets or Braces	{ }
(iv)	Square Brackets or Big Brackets	[ ]

We solve the numerical expressions containing brackets in the following order:

(i)	Bar	—
(ii)	Small Brackets	( )
(iii)	Curly Brackets	{ }
(iv)	Big Brackets	[ ]

We use the order as,

BODMAS

where, BODMAS stands for Bracket, Order, Division, Multiplication, Addition and Subtraction.

Quick Tip

If there is no sign before a bracket, then we take the sign as multiplication (×).

Solved Examples

Example 1 : Simplify.

$20 + 2\,(12 - 10 \div 5)$

Solution : $20 + 2\,(12 - 10 \div 5)$

$= 20 + 2\,(12 - 2)$ [Division]

= 20 + 2 × 10 [Removing small brackets]

= 20 + 20 [Multiplication]

= 40 [Addition]

Example 2 : Simplify.

$86 - [42 + \{56 - (10 + 12 \div 3)\}]$

Solution : $86 - [42 + \{56 - (10 + 12 \div 3)\}]$

$= 86 - [42 + \{56 - (10 + 4)\}]$ [Division]

$= 86 - [42 + \{56 - 14\}]$ [Removing small brackets]

$= 86 - [42 + 42]$ [Removing curly brackets]

$= 86 - 84$ [Removing square brackets]

$= 2$ [Subtraction]

Example 3 : Simplify.

$12 - [4 \div 2 + \{8 \div 2\ (8 - 6)\}]$

Solution : $12 - [4 \div 2 + \{8 \div 2\ (8 - 6)\}]$

$= 12 - [4 \div 2 + \{8 \div 2\ (2)\}]$ [Subtraction]

$= 12 - [4 \div 2 + \{8 \div 4\}]$ [Removing small brackets]

$= 12 - [4 \div 2 + 2]$ [Removing curly brackets]

$= 12 - [2 + 2]$ [Division]

$= 12 - 4$ [Removing square brackets]

$= 8$ [Subtraction]

Example 4 : Simplify.

$[40 \div \{19 - 3\ (6 - \overline{4 - 1})\}]$

Solution : $[40 \div \{19 - 3\ (6 - \overline{4 - 1})\}]$

$= [40 \div \{19 - 3\ (6 - 3)\}]$ [Removing Bar]

$= [40 \div \{19 - 3 \times (3)\}]$ [Subtraction]

$= [40 \div \{19 - 9\}]$ [Removing small brackets]

$= [40 \div 10]$ [Removing curly brackets]

$= 4$ [Removing square brackets]

Example 5 : Simplify.

$[\{(30 - \overline{9 - 6}) \div 3\} \times 6 + 6]$

Solution : $[\{(30 - 9 - 6) \div 3\} \times 6 + 6]$

$= [\{(30 - 3) \div 3\} \times 6 + 6]$ [Removing Bar]

$= [\{27 \div 3\} \times 6 + 6]$ [Removing small brackets]

$= [\{9\} \times 6 + 6]$ [Division]

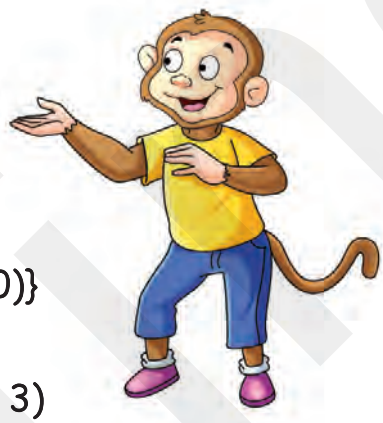
$= [54 + 6]$ [Removing curly brackets]

$= 60$ [Removing square brackets]

Exercise 4.2

Simplify the following.

1. $550 - \{17 + 20\ (12 \times 8 \div 4)\}$
2. $120 - \{80 \div 2 + (56 \times 2 - 80)\}$
3. $[192 + \{56 - (2 \times 6)\} \times 10]$
4. $874 \times [75 + \{60 + (125 \div 25)\}]$
5. $1844 - \{86 + 29 \times 5\ (100 \div 50)\}$
6. $\{(5986 \div 2) + (280 \div 10) + (540 \times 10)\}$
7. $80\ [92 + 3\ \{20 \div 10)\ (86 + 15)\}]$
8. $100 \div 10 \times 56 + (82 - 60) + 15\ (12 \div 3)$
9. $12 - [20 \div \{8 - 2\ (\overline{9 - 5} - 2)\}]$
10. $[24 \div \{10 - (\overline{8 - 6} - 2)\}]$
11. $[50 - \{66 \div 6\ (5 + 6 \times 1)\}]$
12. $[105 \div \{23 + 2\ (9 - 5 - 2)\}]$
13. $23 - [6 + \{8 - 9 - 6\}]$
14. $[960 \div 4 \times 2\ \{15 + 6\ (\overline{5 - 2} - 1)\}]$
15. $[120 + 6\ \{5 \times 12 - 2\ (\overline{6 - 4} - 2)\}]$
16. $[280 \div \{10 - (\overline{4 - 2} - 1)\}]$



Mental Maths

Tick the (✓) correct choice.

1. $(4 + 7) \times 3 =$ _____

a. 33 ☐ b. 36 ☐ c. 38 ☐ d. 39 ☐

2. (24 ÷ 6) - 2 = ____

a. 1 b. 6 c. 2 d. 3

3. (3 x 20) - (11 x 5) = ____

a. 2 b. 3 c. 5 d. 4

4. (17. 8 + 27.4) x 19 = _____

a. 3924.6 b. 260.4 c. 538.4 d. 858.8

5. (9 x 6) - 42 = _____

a. 5 b. 12 c. 36 d. 3

Maths Lab Activity

Fill in the boxes of crossword puzzle to make the equations true.

12	+		=	36						
		÷		÷						+
	-		=	4						23
x		=		=		÷				=
		6			x	5	=			
=						=				
56		20	-		=	11				3
		+		x						x
84	÷		=							13
		=		=						=
				63	-		=			

5 Fractional Numbers

Learning Objectives

At the end of this lesson, students will be able to:

- Identify the type of fraction.
- Apply the four fundamental operations (add, subtract, multiply and divide) on fractions.

Warm-Up Look at the picture. What does it say?

Pizza Eating Competition

Teacher's Note:

In the above activity, ask the students to write the answer in the mixed fractions if the answer does not come out as a proper fraction. Apprise the students that we always write improper fraction as mixed fraction.

In the previous class, we have studied about the different types of fractions. Now, here we shall study the four fundamental operations on fractions, i.e. addition, subtraction, multiplication and division.

ADDITION

Addition of Like Fractions

Sum of like fractions $=$ $\dfrac{\text{Sum of Numerators}}{\text{Common Denominator}}$

Solved Examples

Example 1 : Find the sum of the following.

(a) $\frac{5}{8}+\frac{7}{8}$

(b) $\frac{2}{19}+\frac{6}{19}+\frac{7}{19}$

(c) $\frac{3}{9}+\frac{4}{9}+\frac{2}{9}$

(d) $\frac{1}{4}+\frac{5}{4}+\frac{7}{4}+\frac{11}{4}$

(e) $\frac{3}{7}+\frac{1}{7}+\frac{2}{7}+\frac{4}{7}$

Solution : (a) $\frac{5}{8}+\frac{7}{8}$

$= \frac{5+7}{8} = \frac{12}{8} = \frac{3}{2} = 1\frac{1}{2}$

(b) $\frac{2}{19}+\frac{6}{19}+\frac{7}{19}$

$= \frac{2+6+7}{19} = \frac{15}{19}$

(c) $\frac{3}{9}+\frac{4}{9}+\frac{2}{9}$

$= \frac{3+4+2}{9} = \frac{9}{9} = 1$

(d) $\frac{1}{4}+\frac{5}{4}+\frac{7}{4}+\frac{11}{4}$

$= \frac{1+5+7+11}{4} = \frac{24}{4} = 6$

(e) $\frac{3}{7}+\frac{1}{7}+\frac{2}{7}+\frac{4}{7}$

$= \frac{3+1+2+4}{7} = \frac{10}{7} = 1\frac{3}{7}$

Addition of Unlike Fractions

To find the sum of unlike fractions, follow the steps given below.

Step 1 : Convert the unlike fraction into their equivalent like fractions, by finding the LCM of the denominators of unlike fractions.

Step 2 : Now, add like fractions.

Example 2 : Find the sum of the following.

(a) $\frac{7}{9}$ and $\frac{5}{6}$

(b) $\frac{3}{8}, \frac{2}{7}$ and $\frac{1}{3}$

(c) $\frac{1}{2}+\frac{2}{3}+\frac{3}{4}$

(d) $\frac{1}{6}+\frac{3}{8}+2$

(e) $\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\frac{1}{5}$

Solution : (a) $\frac{7}{9}+\frac{5}{6}$

LCM of 9 and 6 $= 3 \times 3 \times 2$

$= 18$

Now, $\frac{7}{9}=\frac{7\times2}{9\times2}=\frac{14}{18}$

and $\frac{5}{6}=\frac{5\times3}{6\times3}=\frac{15}{18}$

So, $\frac{7}{9}+\frac{5}{6}=\frac{14}{18}+\frac{15}{18}=\frac{14+15}{18}=\frac{29}{18}=1\frac{11}{18}$

3	9, 6
	3, 2

(b) $\frac{3}{8}+\frac{2}{7}+\frac{1}{3}$

LCM of 8, 7 and 3 = 8×7×3 = 168

Now, $\frac{3}{8}=\frac{3\times21}{8\times21}=\frac{63}{168}$

$\frac{2}{7}=\frac{2\times24}{7\times24}=\frac{48}{168}$

and $\frac{1}{3}=\frac{1\times56}{3\times56}=\frac{56}{168}$

So, $\frac{3}{8}+\frac{2}{7}+\frac{1}{3}=\frac{63}{168}+\frac{48}{168}+\frac{56}{168}=\frac{167}{168}$

(c) $\frac{1}{2}+\frac{2}{3}+\frac{3}{4}$

LCM of 2, 3 and 4 = 2×3×2 = 12

2	2, 3, 4
	1, 3, 2

Now, $\frac{1}{2}=\frac{1\times6}{2\times6}=\frac{6}{12}$

$\frac{2}{3}=\frac{2\times4}{3\times4}=\frac{8}{12}$

and $\frac{3}{4}=\frac{3\times3}{4\times3}=\frac{9}{12}$

So, $\frac{1}{2}+\frac{2}{3}+\frac{3}{4}$

$=\frac{6}{12}+\frac{8}{12}+\frac{9}{12}$

$=\frac{6+8+9}{12}$

$=\frac{23}{12}=1\frac{11}{12}$

(d) $\frac{1}{6}+\frac{3}{8}+\frac{2}{1}$

LCM of 6, 8 and 1 = 2×3×4 = 24

2	6, 8, 1
	3, 4, 1

Now, $\frac{1}{6}=\frac{1\times4}{6\times4}=\frac{4}{24}$

$\frac{3}{8}=\frac{3\times3}{8\times3}=\frac{9}{24}$

and $\frac{2}{1}=\frac{2\times24}{1\times24}=\frac{48}{24}$

So, $\frac{1}{6} + \frac{3}{8} + 2$

$= \frac{4}{24} + \frac{9}{24} + \frac{48}{24}$

$= \frac{4+9+48}{24}$

$= \frac{61}{24}$

$= 2\frac{13}{24}$

(e) $\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5}$

LCM of 2, 3, 4, 5 = 2×3×2×5 = 60

Now, $\frac{1}{2} = \frac{1\times30}{2\times30} = \frac{30}{60}$

$\frac{1}{3} = \frac{1\times20}{3\times20} = \frac{20}{60}$

$\frac{1}{4} = \frac{1\times15}{4\times15} = \frac{15}{60}$

2	2, 3, 4, 5
	1, 3, 2, 5

and $\frac{1}{5} = \frac{1\times12}{5\times12} = \frac{12}{60}$

So, $\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5}$

$= \frac{30}{60} + \frac{20}{60} + \frac{15}{60} + \frac{12}{60}$

$= \frac{30+20+15+12}{60}$

$= \frac{77}{60} = 1\frac{17}{60}$

Addition of Mixed Fractions

To find the sum of mixed fractions, first convert the mixed fractions into improper fractions and then perform the addition operation.

Example 3 : Find the sum of the following.

(a) $2\frac{3}{5}$ and $3\frac{4}{5}$

(b) $1\frac{2}{9}+3\frac{5}{7}+2\frac{2}{15}$

(c) $1\frac{3}{4}+2\frac{2}{3}+4\frac{1}{6}$

(d) $1\frac{2}{3}+3\frac{1}{4}+5\frac{1}{2}$

(e) $2\frac{1}{4}+1\frac{3}{5}+2\frac{3}{10}+3\frac{1}{2}$

Solution : (a) $2\frac{3}{5}+3\frac{4}{5} = \frac{5\times2+3}{5}+\frac{5\times3+4}{5}$

$= \frac{13}{15}+\frac{19}{5}$

$= \frac{13+19}{5} = \frac{32}{5} = 6\frac{2}{5}$

(b) $1\frac{2}{9}+3\frac{5}{7}+2\frac{2}{15} = \frac{11}{9}+\frac{26}{7}+\frac{32}{15}$

LCM of 9, 7, 15 is 315

3	9, 7, 15
	3, 7, 5

Now, $\frac{11}{9} = \frac{11\times35}{9\times35} = \frac{385}{315}$

$\frac{26}{7} = \frac{26\times45}{7\times45} = \frac{1170}{315}$

and $\frac{32}{15} = \frac{32\times21}{15\times21} = \frac{672}{315}$

So, $\frac{11}{9}+\frac{26}{7}+\frac{32}{15} = \frac{385+1170+672}{315}$

$= \frac{2227}{315} = 7\frac{22}{315}$

(c) $1\frac{3}{4}+2\frac{2}{3}+4\frac{1}{6} = \frac{7}{4}+\frac{8}{3}+\frac{25}{6}$

2	4, 3, 6
3	2, 3, 3
	2, 1, 1

LCM of 4, 3, 6 = 2×3×2 = 12

Now, $\frac{7}{4} = \frac{7\times3}{4\times3} = \frac{21}{12}$

$\frac{8}{3} = \frac{8\times4}{3\times4} = \frac{32}{12}$

and $\frac{25}{6} = \frac{25\times2}{6\times2} = \frac{50}{12}$

So, $\frac{7}{4}+\frac{8}{3}+\frac{25}{6}$

$=\frac{21}{12}+\frac{32}{12}+\frac{50}{12}$

$=\frac{21+32+50}{12}$

$=\frac{103}{12}$

$=8\frac{7}{12}$

(d) $1\frac{2}{3}+3\frac{1}{4}+5\frac{1}{2}$

$=\frac{5}{3}+\frac{13}{4}+\frac{11}{2}$

LCM of 3, 4, 2 = 2×3×2 = 12

2	3, 4, 2
	3, 2, 1

Now, $\frac{5}{3}=\frac{5\times4}{3\times4}=\frac{20}{12}$

$\frac{13}{4}=\frac{13\times3}{4\times3}=\frac{39}{12}$

and $\frac{11}{2}=\frac{11\times6}{2\times6}=\frac{66}{12}$

So, $\frac{5}{3}+\frac{13}{4}+\frac{11}{2}$

$=\frac{20}{12}+\frac{39}{12}+\frac{66}{12}$

$=\frac{20+39+66}{12}$

$=\frac{125}{120}$

$=1\frac{5}{12}$

(e) $2\frac{1}{4}+1\frac{3}{5}+2\frac{3}{10}+3\frac{1}{2}$

$\frac{9}{4}+\frac{8}{5}+\frac{23}{10}+\frac{7}{2}$

LCM of 4, 5, 10, 2 = 2×5×2 = 20

2	4, 5, 10, 2
5	2, 5, 5, 1
	2, 1, 1, 1

Now, $\frac{9}{4} = \frac{9 \times 5}{4 \times 5} = \frac{45}{20}$

$\frac{8}{5} = \frac{8 \times 4}{5 \times 4} = \frac{32}{20}$

$\frac{23}{10} = \frac{23 \times 2}{10 \times 2} = \frac{46}{20}$

and $\frac{7}{2} = \frac{7 \times 10}{2 \times 10} = \frac{70}{20}$

So, $\frac{9}{4} + \frac{8}{5} + \frac{23}{10} + \frac{7}{2}$

$= \frac{45}{20} + \frac{32}{20} + \frac{46}{20} + \frac{70}{20}$

$= \frac{45 + 32 + 46 + 70}{20}$

$= \frac{193}{20}$

$= 9\frac{13}{20}$

Exercise 5.1

1. Find the sum of the following like fractions.

(a) $\frac{5}{7} + \frac{3}{7}$

(b) $\frac{12}{19} + \frac{15}{19}$

(c) $\frac{1}{10} + \frac{3}{10}$

(d) $\frac{1}{4} + \frac{3}{4}$

(e) $\frac{12}{21} + \frac{5}{21} + \frac{8}{21}$

(f) $\frac{1}{17} + \frac{15}{17} + \frac{13}{17}$

2. Find the sum of the following unlike fractions.

(a) $\frac{2}{7} + \frac{16}{21}$

(b) $\frac{5}{8} + \frac{7}{10}$

(c) $\frac{1}{2} + \frac{2}{9}$

(d) $\frac{3}{4} + \frac{5}{6}$

(e) $\frac{1}{4} + \frac{5}{6} + \frac{7}{9}$

(f) $\frac{5}{12} + \frac{7}{15} + \frac{19}{21}$

3. **Find the sum of the following mixed fractions.**

(a) $2\frac{1}{5}+3\frac{4}{5}$ (b) $7\frac{1}{9}+6\frac{2}{9}$

(c) $2\frac{1}{7}+3\frac{1}{5}$ (d) $3\frac{2}{17}+2\frac{5}{19}$

(e) $6\frac{4}{5}+\frac{3}{8}+1\frac{2}{5}$ (f) $3\frac{7}{10}+4\frac{5}{27}+1\frac{3}{16}$

SUBTRACTION

Subtraction of Like Fractions

Difference of like fractions = $\frac{\text{Difference between denominators}}{\text{Common Denominator}}$

Solved Examples

Example 1 : Subtract.

(a) $\frac{5}{7}$ from $\frac{8}{7}$ (b) $\frac{3}{9}$ from $\frac{5}{9}$

Solution : (a) $\frac{8}{7}-\frac{5}{7}=\frac{8-5}{7}=\frac{3}{7}$ (b) $\frac{5}{9}-\frac{3}{9}=\frac{5-3}{9}=\frac{2}{9}$

Subtraction of Unlike Fractions

To find the subtraction of unlike fractions, follow the steps given below:

Step 1 : Convert the unlike fractions into their equivalent like fractions, by finding the LCM of denominators of unlike fractions.

Step 2 : Now, find the difference between the like fractions.

Example 2 : Subtract.

(a) $\frac{3}{5}-\frac{3}{15}$ (b) $5-\frac{3}{9}$ (c) $\frac{3}{5}-\frac{1}{6}$ (d) $4-\frac{2}{5}$

Solution : (a) $\frac{3}{5}-\frac{8}{15}$

LCM of 5 and 15 is 15.

$$\frac{3}{5} = \frac{3\times3}{5\times3} = \frac{9}{15}$$

and $\frac{8}{15} = \frac{8\times1}{15\times1} = \frac{8}{15}$

So, $\frac{9}{15} - \frac{8}{15} = \frac{9-8}{15} = \frac{1}{15}$

(b) $\frac{5}{1} - \frac{7}{9}$

$$\frac{5}{1} = \frac{5\times9}{1\times9} = \frac{45}{9}$$

So, $\frac{45}{9} - \frac{7}{9} = \frac{45-7}{9} = \frac{38}{9} = 4\frac{2}{9}$

(c) $\frac{3}{5} - \frac{1}{6}$

LCM of 5 and 6 = 30

$$\frac{3}{5} = \frac{3\times6}{5\times6} = \frac{18}{30}$$

and, $\frac{1}{6} = \frac{1\times5}{6\times5} = \frac{5}{30}$

So, $\frac{18}{30} - \frac{5}{30} = \frac{18-5}{30} = \frac{13}{30}$

(d) $\frac{4}{1} - \frac{2}{5}$

LCM of 1 and 5 = 5

$$\frac{4}{1} = \frac{4\times5}{1\times5} = \frac{20}{5}$$

and $\frac{4}{1} - \frac{2}{5}$

$= \frac{20}{5} - \frac{2}{5}$

So, $= \frac{20-2}{5} = \frac{18}{5} = 3\frac{3}{5}$

Subtraction of Mixed Fractions

To find the difference of mixed fractions, first convert the mixed fractions into improper fractions and then perform the subtraction operation.

Example 3 : Subtract.

(a) $6\frac{1}{5}$ from $8\frac{2}{3}$ (b) $\frac{5}{12}$ from $2\frac{1}{16}$

(c) $3\frac{1}{4}$ from $4\frac{2}{5}$ (d) $\frac{6}{7}$ from $1\frac{1}{4}$

Solution : (a) $8\frac{2}{3} - 6\frac{1}{5}$

$8\frac{2}{3} = \frac{3\times 8+2}{3} = \frac{26}{3}$

$6\frac{1}{5} = \frac{6\times 5+1}{5} = \frac{31}{5}$

So, $\frac{26}{3} - \frac{31}{5}$

LCM of 3 and 5 is 15.

$\frac{26}{3} - \frac{31}{5} = \frac{130-93}{15} = \frac{37}{15} = 2\frac{7}{15}$

(b) $2\frac{1}{16} - \frac{5}{12}$

$= 2\frac{1}{16} = \frac{2\times 16+1}{16} = \frac{33}{16}$

So, $\frac{33}{16} - \frac{5}{12}$

LCM of 16 and 12 = 4 × 4 × 3 = 48

$\frac{33}{16} - \frac{5}{12} = \frac{99-20}{48} = \frac{79}{48}$

$= 1\frac{31}{48}$

(c) $4\frac{2}{5} - 3\frac{1}{4}$

$= \frac{22}{5} - \frac{13}{4}$

LCM of 5 and 4 is 20.

$\frac{22}{5} = \frac{22 \times 4}{5 \times 4} = \frac{88}{20}$

and, $\frac{13}{4} = \frac{13 \times 5}{4 \times 5} = \frac{65}{20}$

So, $\frac{22}{5} \square \frac{13}{4} = \frac{88}{20} \square \frac{65}{20} = \frac{88 \square 65}{20}$

$= \frac{23}{20}$

$= 1\frac{3}{20}$

(b) $1\frac{1}{4} - \frac{6}{7}$

$= \frac{5}{4} - \frac{6}{7}$

LCM of 4 and 7 is 28.

$\frac{5}{4} = \frac{5 \times 7}{4 \times 7} = \frac{35}{28}$

$\frac{6}{7} = \frac{6 \times 4}{7 \times 4} = \frac{24}{28}$

So, $\frac{5}{4} - \frac{6}{7} = \frac{35}{28} - \frac{24}{28}$

$= \frac{35 - 24}{28}$

$= \frac{11}{28}$

Exercise 5.2

1. Find the difference between the following like fractions.

(a) $\frac{7}{8} - \frac{1}{8}$ (b) $\frac{9}{26} - \frac{7}{26}$ (c) $\frac{2}{15} - \frac{1}{15}$

(d) $\frac{5}{12} - \frac{1}{12}$ (e) $\frac{9}{16} - \frac{5}{16}$ (f) $\frac{7}{10} - \frac{3}{10}$

(g) $\frac{4}{5} - \frac{1}{5}$ (h) $\frac{5}{23} - \frac{2}{23}$ (i) $\frac{7}{11} - \frac{2}{11}$

(j) $\frac{12}{13} - \frac{2}{13}$ (k) $\frac{83}{100} - \frac{21}{100}$ (l) $\frac{62}{79} - \frac{10}{79}$

2. Find the difference between the following unlike fractions.

(a) $\frac{7}{9} - \frac{1}{12}$ (b) $\frac{2}{5} - \frac{3}{8}$ (c) $\frac{1}{4} - \frac{3}{16}$

(d) $\frac{5}{24} - \frac{13}{60}$ (e) $6 - \frac{9}{14}$ (f) $2 - \frac{3}{16}$

(g) $5 - \frac{1}{7}$ (h) $\frac{7}{8} - \frac{5}{12}$ (i) $2 - \frac{5}{9}$

(j) $\frac{4}{9} - \frac{5}{12}$ (k) $\frac{1}{4} - \frac{1}{5}$ (l) $\frac{1}{8} - \frac{1}{10}$

3. Find the difference between the following mixed fractions.

(a) $5\frac{7}{8} - 4\frac{6}{7}$ (b) $2\frac{1}{7} - \frac{1}{5}$ (c) $6\frac{9}{10} - 5\frac{2}{5}$

(d) $1\frac{11}{12} - \frac{5}{24}$ (e) $9\frac{2}{7} - 6\frac{5}{8}$ (f) $5\frac{2}{3} - 4\frac{1}{5}$

(g) $10 - \frac{2}{2} - 5\frac{1}{6}$ (h) $3\frac{1}{5} - \frac{7}{10}$ (i) $1\frac{11}{24} - \frac{7}{8}$

(j) $3\frac{3}{4} - \frac{7}{10}$ (k) $5 - 1\frac{6}{7}$ (l) $3 - 2\frac{1}{8}$

MULTIPLICATION

Multiplication of A Fraction By A Whole Number

$$\text{Fraction} \times \text{Whole Number} = \frac{\text{Numerator of a fraction} \times \text{Whole number}}{\text{Denominator of a fraction}}$$

Solved Examples

Example 1 : Multiply.

(a) $\frac{5}{12}$ by 6 (b) $\frac{4}{15}$ by 5

Solution : (a) $\frac{5}{12} \times 6 = \frac{5 \times 6}{12} = \frac{\cancel{30}^{\,10^{\,5}}}{\cancel{12}_{\,4_{\,2}}} = \frac{5}{2}$

$= 2\frac{1}{2}$

(b) $\frac{4}{15}$ by 5

$= \frac{4}{15} \times 5$

$= \frac{4 \times 5}{15}$

$= \frac{\cancel{20}^{\,4}}{\cancel{15}^{\,3}}$

$= \frac{4}{3} = 1\frac{1}{3}$

Remember

'Of' means multiplication.

Example 2 : Find.

(a) $\frac{7}{9}$ of 8 (b) $\frac{3}{4}$ of 6

Solution : (a) $\frac{7}{9} \times 8 = \frac{7 \times 8}{9} = \frac{56}{9} = 6\frac{2}{9}$

(b) $\frac{3}{4}$ of 6

$= \frac{3}{4} \times 6$

$= \frac{3 \times 6}{4}$

$= \frac{\cancel{18}^{\,9}}{\cancel{4}^{\,2}}$

$= \frac{9}{2} = 4\frac{1}{2}$

Multiplication of A Fraction By A Fraction

Product of fractions = $\frac{\text{Product of their numerators}}{\text{Product of their denominators}}$

Example 3 : Multiply:

(a) $\frac{5}{12}$ by $\frac{7}{8}$ (b) $\frac{4}{5}$ by $\frac{15}{6}$ (c) $7\frac{3}{5}$ by $\frac{4}{7}$ (d) $\frac{3}{8}$ by $1\frac{2}{5}$

Solution :

(a) $\frac{5}{12} \times \frac{7}{8} = \frac{5 \times 7}{12 \times 8} = \frac{35}{96}$

(b) $\frac{4}{5} \times \frac{15}{6} = \frac{\cancel{4}^{2} \times \cancel{15}^{3}}{\cancel{5} \times \cancel{6}^{3}} = 2$

(c) $7\frac{3}{5} \times \frac{4}{7} = \frac{7 \times 5 + 3}{5} \times \frac{4}{7}$

$= \frac{38}{5} \times \frac{4}{7} = \frac{38 \times 4}{5 \times 7} = \frac{152}{35}$

$= 4\frac{12}{35}$

(d) $\frac{3}{8} \times 1\frac{2}{5} = \frac{3}{8} \times \frac{5 \times 1 + 2}{5}$

$= \frac{3}{8} \times \frac{7}{5} = \frac{3 \times 7}{8 \times 5}$

$= \frac{21}{40}$

Facts to Know

Multiplicative inverse of a proper fraction is an improper fraction and multiplicative inverse of an improper fraction except 1 is a proper fraction.

Example 4 : Solve:

(a) $\frac{7}{8} \times \frac{6}{12} \times \frac{5}{7}$ (b) $2\frac{1}{4} \times 1\frac{5}{6} \times 2\frac{1}{9}$

(c) $1\frac{1}{2} \times 6\frac{1}{5} \times 2\frac{3}{7} \times \frac{2}{9}$ (d) $\frac{3}{4} \times 1\frac{5}{7} \times \frac{7}{9} \times 1\frac{3}{8}$

Solution :

(a) $\frac{7}{8} \times \frac{6}{12} \times \frac{5}{7}$

$= \frac{\cancel{7}^{1} \times \cancel{6} \times 5}{8 \times \cancel{12}_{2} \times \cancel{7}} = \frac{5}{8 \times 2} = \frac{5}{16}$

(b) $2\frac{1}{4} \times 1\frac{5}{6} \times 2\frac{1}{9}$

$= \frac{4 \times 2 + 1}{4} \times \frac{6 \times 1 + 5}{6} \times \frac{9 \times 2 + 1}{9}$

$= \frac{9}{4} \times \frac{11}{6} \times \frac{19}{9} = \frac{\cancel{9} \times 11 \times 19}{4 \times 6 \times \cancel{9}}$

$= \frac{209}{24} = 8\frac{17}{24}$

(c) $1\frac{1}{2} \times 6\frac{1}{5} \times 2\frac{3}{7} \times \frac{2}{9}$

$= \frac{1\times2+1}{2} \times \frac{6\times5+1}{5} \times \frac{2\times7+3}{7} \times \frac{2}{9}$

$= \frac{3}{2} \times \frac{31}{5} \times \frac{17}{7} \times \frac{2}{9}$

$= \frac{\cancel{3} \times 31 \times 17 \times \cancel{2}}{\cancel{2} \times 5 \times 7 \times \cancel{9}_{3}} = \frac{31\times17}{5\times7\times3} = \frac{527}{105}$

$= 5\frac{2}{105}$

(d) $\frac{3}{4} \times 1\frac{5}{7} \times \frac{7}{9} \times 1\frac{3}{8}$

$= \frac{3}{4} \times \frac{7\times1+5}{7} \times \frac{7}{9} \times \frac{8\times1+3}{8}$

$= \frac{3}{4} \times \frac{12}{7} \times \frac{7}{9} \times \frac{11}{8}$

$= \frac{\cancel{3} \times \overset{\cancel{3}}{\cancel{12}} \times \cancel{7} \times 11}{\cancel{4} \times \cancel{7} \times \underset{\cancel{3}}{\cancel{9}} \times 8}$

$= \frac{11}{8} = 1\frac{3}{8}$

Exercise 5.3

1. Multiply.

(a) $\frac{6}{15}$ by 2 (b) $\frac{7}{9}$ by 5 (c) $\frac{3}{10}$ by $\frac{5}{9}$

(d) $\frac{7}{15}$ by $\frac{4}{14}$ (e) $4\frac{1}{5}$ by $6\frac{3}{7}$ (f) $1\frac{1}{7}$ by $8\frac{7}{12}$

(g) $\frac{6}{14}$ by 2 (h) $\frac{5}{19}$ by 2 (i) $\frac{4}{18}$ by 9

(j) $\frac{11}{22}$ by 2 (k) $\frac{9}{72}$ by 4 (l) $\frac{3}{15}$ by 6

2. Find.

(a) $\frac{8}{9}$ of 12 (b) $\frac{7}{10}$ of 16 (c) $\frac{5}{12}$ of 24

(d) $\frac{9}{20}$ of 5 (e) $\frac{2}{3}$ of 10 (f) $\frac{3}{7}$ of 49

(g) $\frac{5}{9}$ of 15 (h) $\frac{5}{6}$ of 8 (i) $\frac{3}{4}$ of 12

(j) $\frac{7}{20}$ of 5 (k) $\frac{9}{10}$ of 6 (l) $\frac{15}{30}$ of 2

3. Solve the following.

(a) $\frac{6}{15} \times \frac{5}{7} \times \frac{8}{9}$ (b) $5\frac{1}{2} \times 4\frac{2}{9} \times 2\frac{1}{11}$ (c) $2\frac{1}{4} \times \frac{2}{9} \times \frac{4}{7}$

(d) $\frac{5}{7} \times \frac{14}{20} \times \frac{6}{10}$ (e) $\frac{3}{4} \times \frac{8}{9} \times \frac{7}{12}$ (f) $1\frac{1}{2} \times \frac{8}{12} \times 1\frac{2}{5}$

(g) $\frac{5}{9} \times \frac{9}{83} \times \frac{6}{13} \times \frac{5}{9}$ (h) $10\frac{8}{10} \times 5\frac{6}{7} \times 6\frac{1}{5} \times 2\frac{1}{3}$ (i) $\frac{6}{7} \times \frac{21}{30} \times \frac{5}{12} \times \frac{3}{10}$

(j) $\frac{5}{9} \times \frac{4}{7} \times \frac{48}{52} \times 1\frac{2}{5}$ (k) $3\frac{1}{2} \times 1\frac{1}{4} \times \frac{5}{7} \times \frac{2}{3}$ (l) $2\frac{1}{4} \times \frac{2}{9} \times 1\frac{3}{5} \times \frac{7}{8}$

DIVISION

Reciprocal of a Number

Reciprocal of a number is the inverse of the number.

Examples : (i) Reciprocal of $\frac{3}{6}$ is $\frac{6}{3}$

(ii) Reciprocal of $\frac{5}{8}$ is $\frac{8}{5}$

(iii) Reciprocal of 2 is $\frac{1}{2}$

(iv) Reciprocal of $\frac{1}{5}$ is 5

Note: Product of reciprocal numbers is 1.

Also, we can say that if the product of two numbers is 1, then they are reciprocal or multiplicative inverse of each other.

How to find the reciprocal of a number?

To find the reciprocal of a number, simply interchange the numerators and denominators.

Solved Examples

Example 1 : Find the reciprocal of the following.

(a) $\frac{6}{13}$ (b) $\frac{3}{10}$ (c) $2\frac{1}{17}$ (d) $5\frac{1}{4}$

(e) $\frac{1}{5}$ (f) $\frac{1}{12}$ (g) 8 (h) 3

Solution : (a) Reciprocal of $\frac{6}{13}$ is $\frac{13}{6}$

(b) Reciprocal of $\frac{3}{10}$ is $\frac{10}{3}$

(c) Reciprocal of $2\frac{1}{17}$ = Reciprocal of $\frac{35}{17} = \frac{17}{35}$

(d) Reciprocal of $5\frac{1}{4}$ = Reciprocal of $\frac{21}{4} = \frac{4}{21}$

(e) Reciprocal of $\frac{1}{5} = \frac{5}{1} = 5$

(f) Reciprocal of $\frac{1}{12} = \frac{12}{1} = 12$

(g) Reciprocal of 8 = Reciprocal of $\frac{8}{1} = \frac{1}{8}$

(h) Reciprocal of 3 = Reciprocal of $\frac{3}{1} = \frac{1}{3}$

Division of A Fraction By A Fraction

First Fraction ÷ Second Fraction = First Fraction × Reciprocal of Second fraction

Example 2 : Divide the following.

(a) $\frac{2}{15} \div \frac{7}{30}$ (b) $2\frac{1}{5} \div \frac{3}{10}$ (c) $6\frac{4}{7} \div 4\frac{5}{42}$

(d) $\frac{3}{5} \div \frac{2}{15}$ (e) $2\frac{1}{4} \div \frac{7}{20}$ (f) $3\frac{1}{5} \div 2\frac{3}{8}$

Solution : (a) $\frac{2}{15} \div \frac{7}{30}$

Reciprocal of $\frac{7}{30} = \frac{30}{7}$

So, $\frac{2}{15} \div \frac{7}{30} = \frac{2}{15} \times \frac{30}{7} = \frac{2 \times \cancel{30}^{2}}{\cancel{15} \times 7} = \frac{2 \times 2}{7} = \frac{4}{7}$

(b) $2\frac{1}{5} \div \frac{3}{10}$

$2\frac{1}{5} = \frac{2 \times 5 + 1}{5} = \frac{11}{5}$

Reciprocal of $\frac{3}{10} = \frac{10}{3}$

So, $\frac{11}{5} \div \frac{3}{10} = \frac{11}{5} \times \frac{10}{3} = \frac{11 \times \cancel{10}^{2}}{\cancel{5} \times 3} = \frac{11 \times 2}{3} = \frac{22}{3}$

$= 7\frac{1}{3}$

Quick Tip

To find the reciprocal of proper or improper fractions, interchange the top and bottom numbers.

(c) $6\frac{4}{7} \div 4\frac{5}{42}$

$6\frac{4}{7} = \frac{6 \times 7 + 4}{7} = \frac{46}{7}$

$4\frac{5}{42} = \frac{4 \times 42 + 5}{42} = \frac{173}{42}$

Reciprocal of $\frac{173}{42} = \frac{42}{173}$

So, $\frac{46}{7} \div \frac{173}{42} = \frac{46}{\cancel{7}} \times \frac{\cancel{42}^{6}}{173}$

$= \frac{276}{173}$

$= 1\frac{103}{173}$

(d) $\frac{3}{5} \div \frac{2}{15}$

Reciprocal of $\frac{2}{15} = \frac{15}{2}$

So, $\frac{3}{5} \div \frac{2}{15} = \frac{3}{5} \times \frac{15}{2} = \frac{3 \times \cancel{15}^{3}}{\cancel{5} \times 2} = \frac{9}{2} = 4\frac{1}{2}$

(e) $2\frac{1}{4} \div \frac{7}{20}$

$= \frac{9}{4} \div \frac{7}{20}$

Reciprocal of $\frac{7}{20} = \frac{20}{7}$

So, $2\frac{1}{4} \div \frac{7}{20} = \frac{9}{4} \div \frac{7}{20}$

$= \frac{9}{4} \times \frac{20}{7}$

$= \frac{9 \times \cancel{20}^{5}}{\cancel{4} \times 7}$

$= \frac{45}{7} = 6\frac{3}{7}$

(f) $3\frac{1}{5} \div 2\frac{3}{8}$

$= \frac{16}{5} \div \frac{19}{8}$

Reciprocal of $\frac{19}{8} = \frac{8}{19}$

So, $3\frac{1}{5} \div 2\frac{3}{8} = \frac{16}{5} \div \frac{19}{8}$

$= \frac{16}{5} \times \frac{8}{19}$

$= \frac{16 \times 8}{5 \times 19}$

$= \frac{128}{95} = 1\frac{33}{95}$

Division of A Fraction By A Whole Number

Fraction ÷ Whole number = Fraction × Reciprocal of a whole number

$$= \text{Fraction} \times \frac{1}{\text{Whole Number}}$$

Example 3 : Divide the following.

(a) $\frac{2}{5} \div 16$ (b) $1\frac{5}{7} \div 10$

Solution : (a) $\frac{2}{5} \div 16$

$\therefore$ Reciprocal of $16 = \frac{1}{16}$

$\therefore \quad \frac{2}{5} \div 16 = \frac{2}{5} \times \frac{1}{16} = \frac{\cancel{2} \times 1}{5 \times \cancel{16}\,8} = \frac{1}{40}$

(b) $1\frac{5}{7} \div 10$

$1\frac{5}{7} = \frac{12}{7}$

Reciprocal of $10 = \frac{1}{10}$

$\therefore \quad 1\frac{5}{7} \div 10 = \frac{12}{7} \times \frac{1}{10} = \frac{\cancel{12}^{6} \times 1}{7 \times \cancel{10}_{5}} = \frac{6}{35}$

Division of A Whole Number By A Fraction

Whole number ÷ Fraction = Whole number × Reciprocal of a fraction

Example 4 : Divide the following.

(a) $40 \div \frac{5}{8}$ (b) $35 \div 1\frac{2}{3}$

Solution : (a) $40 \div \frac{5}{8}$

Reciprocal of $\frac{5}{8} = \frac{8}{5}$

$\therefore \quad 40 \div \frac{5}{8} = 40 \times \frac{8}{5} = \frac{^{8}\cancel{40} \times 8}{\cancel{5}}$

$= \quad 64$

(b) $35 \div 1\frac{2}{3}$

$1\frac{2}{3} = \frac{3 \times 1 + 2}{3} = \frac{5}{3}$

Reciprocal of $\frac{5}{3} = \frac{3}{5}$

$\therefore \quad 35 \div \frac{5}{3} = 35 \times \frac{3}{5} = \frac{^{7}\cancel{35} \times 3}{\cancel{5}} = 21$

Exercise 5.4

1. Find the reciprocal of the following.

(a) $\frac{5}{12}$ (b) $6\frac{1}{5}$ (c) $\frac{4}{7}$ (d) 5

(e) $\frac{7}{13}$ (f) $2\frac{7}{8}$ (g) $\frac{5}{9}$ (h) 9

2. Divide the following.

(a) $\frac{4}{5} \div \frac{6}{10}$ (b) $\frac{2}{3} \div \frac{8}{27}$ (c) $1\frac{5}{6} \div \frac{7}{30}$

(d) $2\frac{3}{7} \div \frac{5}{42}$ (e) $3\frac{1}{5} \div 2\frac{1}{10}$ (f) $5\frac{7}{9} \div 2\frac{8}{63}$

(g) $\frac{3}{5} \div 69$ (h) $\frac{7}{8} \div 84$ (i) $2\frac{11}{13} \div 26$

(j) $5\frac{5}{53} \div 50$ (k) $50 \div \frac{10}{13}$ (l) $52 \div 2\frac{3}{5}$

Word Problems

Example 1 : Sona bought $1\frac{1}{2}$ *kg* mangoes and $2\frac{2}{3}$ *kg* apples. What is the total weight of fruits she purchased?

Solution : Weight of mangoes = $1\frac{1}{2}\,kg = \frac{2\times1+1}{2}\,kg = \frac{3}{2}\,kg$

Weight of apples = $2\frac{2}{3}\,kg = \frac{2\times3+2}{3}\,kg = \frac{8}{3}\,kg$

$\therefore$ Total weight of fruits she purchased = $\left(\frac{3}{2}+\frac{8}{3}\right)kg$

$= \left(\frac{9}{6}+\frac{16}{6}\right)kg$

$= \left(\frac{9+16}{6}\right)kg$

$= \left(\frac{25}{6}\right)kg = 4\frac{1}{6}\,kg$

Hence, Sona purchased $4\frac{1}{6}\,kg$ fruits.

Example 2 : Mr. Raghav purchased $5\frac{1}{6}$ *litres* of milk. Out of it, his dog drank $\frac{1}{4}$ *litres* of milk. How much milk was left with him?

Solution : Quantity of milk purchased by Mr. Raghav = $5\frac{1}{6}\,l$

$= \frac{31}{6}\,l$

Quantity of milk drank by his dog = $\frac{1}{4}\,l$

$\therefore$ Quantity of milk left with him = $\left(\frac{31}{6}-\frac{1}{4}\right)l$

$= \left(\frac{62}{12}-\frac{3}{12}\right)l$

$= \left(\frac{62-3}{12}\right) l$

$= \left(\frac{59}{12}\right) l = 4\frac{11}{12} l$

Hence, $4\frac{11}{12}$ litres milk left with Mr. Raghav.

Example 3 : The cost of 1 litre of oil is ₹ $19\frac{2}{5}$. What is the cost of $17\frac{1}{2}$ litres of oil?

Solution : Cost of 1 litre of oil = ₹ $19\frac{2}{5}$

Cost of $17\frac{1}{2}$ litres of oil = ₹ $\left(19\frac{2}{5} \times 17\frac{1}{2}\right)$

= ₹ $\left(\frac{97}{\cancel{5}} \times \frac{^{7}\cancel{35}}{2}\right)$

= ₹ $\left(\frac{679}{2}\right)$

= ₹ 339.50

Hence, the cost of $17\frac{1}{2}$ litres of oil is ₹ 339.50.

Example 4 : The cost of $2\frac{1}{5}$ metres of ribbon is ₹ $82\frac{7}{10}$. What is the cost of 1 metre of ribbon?

Solution : Cost of $2\frac{1}{5}$ m of ribbon = ₹ $82\frac{7}{10}$

Cost of 1 m of ribbon = ₹ $\left[82\frac{7}{10} \div 2\frac{1}{5}\right]$

= ₹ $\left(\frac{827}{10} \div \frac{11}{5}\right)$

= ₹ $\left[\frac{827}{\cancel{10}_{2}} \times \frac{\cancel{5}}{11}\right]$

$= ₹\left(\frac{827}{22}\right)$

$= ₹\left(37\frac{13}{22}\right)$

Hence, the cost of 1 m of ribbon is $₹\left(37\frac{13}{22}\right)$

$= ₹ 37.59.$

Exercise 5.5

1. Pooja weighs $15\frac{1}{4}$ kg. She gains $4\frac{1}{2}$ kg more. What is the weight of Pooja now?
2. A cloth is cut into two pieces of length $3\frac{2}{5}$ metres and $4\frac{1}{6}$ metres. What is the original length of the cloth?
3. What must be added to $2\frac{1}{7}$ to make $5\frac{1}{6}$?
4. A gas cylinder contained 40 litres of gas. $4\frac{3}{5}$ litres of gas is used. How much litres of gas is left in the cylinder?
5. A bag contains $51\frac{1}{2}$ kg of wheat. How much wheat do 12 such bags contain?
6. Mr. Goyal can walk $4\frac{3}{7}$ km in an hour. How much distance will he cover in $2\frac{4}{5}$ hours?
7. A rope of length $24\frac{3}{5}$ m has been cut into 10 pieces of equal length. Find the length of each piece.
8. The product of two fractions is $2\frac{1}{2}$. If one of the fraction is $7\frac{1}{2}$, find the other.

Simplification of Fractions

As we perform simplification of whole numbers, similarly we perform here using ODMAS rule.

ODMAS stands for:

O : Of

D : Division

M : Multiplication

A : Addition

S : Subtraction

Solved Examples

Example 1 : Simplify:

$$\frac{6}{17} \times \frac{34}{15} - \frac{6}{35} \text{ of } 2\frac{1}{3}$$

Solution :

$$\frac{6}{17} \times \frac{34}{15} - \frac{6}{35} \text{ of } \frac{7}{3}$$

$$= \frac{6}{17} \times \frac{34}{15} - \frac{6}{35} \times \frac{7}{3} \quad \text{(Of)}$$

$$= \frac{\overset{2}{\cancel{6}} \times \overset{2}{\cancel{34}}}{\cancel{17} \times \underset{5}{\cancel{15}}} - \frac{\overset{2}{\cancel{6}} \times \cancel{7}}{\underset{5}{\cancel{35}} \times \cancel{3}} \quad \text{(Multiplication)}$$

$$= \frac{4}{5} - \frac{2}{5}$$

$$= \frac{4-2}{5} \quad \text{(Subtraction)}$$

$$= \frac{2}{5}$$

Example 2 : Simplify:

$$\frac{11}{5} + \frac{4}{21} \text{ of } 42 - \frac{18}{5} \div \frac{27}{45}$$

Solution :

$$\frac{11}{5} + \frac{4}{21} \times 42 - \frac{18}{5} \div \frac{27}{45} \quad \text{(Of)}$$

$$= \frac{11}{5} + \frac{4}{21} \times 42 - \frac{18}{5} \times \frac{45}{27} \quad (\div)$$

$$= \frac{11}{5} + \frac{4 \times \cancel{42}^{2}}{\cancel{21}} - \frac{\cancel{18}^{6} \times \cancel{45}^{9}}{\cancel{5} \times \cancel{27}_{3}} \quad (\times)$$

$$= \frac{11}{5} + 8 - 6$$

$$= \frac{11 + 40}{5} - 6 \quad (+)$$

$$= \frac{51}{5} - 6$$

$$= \frac{51 - 30}{5} \quad (-)$$

$$= \frac{21}{5}$$

$$= 4\frac{1}{5}$$

Use of Brackets

Commonly, three brackets are used. These are (), {}, []. We use brackets as we have used in the simplification of whole numbers. Here, we use **BODMAS** rule.

BODMAS stands for:

B : Brackets

(Ist) {2nd} [3rd]

O : Of

D : Division

M : Multiplication

A : Addition

S : Subtraction

Example 3 : Simplify:

$$\left[\left\{\left(2\frac{1}{5} + 1\frac{4}{5}\right) \times 3\frac{1}{3} - \frac{1}{2}\right\} \div \frac{11}{2}\right]$$

Solution :

$$= \left[\left\{\left(2\frac{1}{5}+1\frac{4}{5}\right)\times 3\frac{1}{3}-\frac{1}{2}\right\}\div\frac{11}{2}\right]$$

$$= \left[\left\{\left(\frac{11}{5}+\frac{9}{5}\right)\times\frac{10}{3}-\frac{1}{2}\right\}\div\frac{11}{2}\right]$$

$$= \left[\left\{\left(\frac{11+9}{5}\right)\times\frac{10}{3}-\frac{1}{2}\right\}\div\frac{11}{2}\right]$$ [Solving small brackets]

$$= \left[\left\{\left(\frac{\overset{4}{\cancel{20}}}{\cancel{5}}\right)\times\frac{10}{3}-\frac{1}{2}\right\}\div\frac{11}{2}\right]$$

$$= \left[\left\{\frac{40}{3}-\frac{1}{2}\right\}\div\frac{11}{2}\right]$$ [Removing small brackets]

$$= \left[\left\{\frac{80-3}{6}\right\}\div\frac{11}{2}\right]$$ [Solving curly brackets]

$$= \left[\frac{77}{6}\div\frac{11}{2}\right]$$ [Removing curly brackets]

$$= \frac{77}{6}\times\frac{2}{11}$$ [Removing square brackets]

$$= \frac{7}{3}$$ [Multiplication]

$$= 2\frac{1}{3}$$

Example 4 : Simplify:

$$7\frac{1}{3}-2\frac{1}{4}+\left(4\frac{1}{3}\right)-\left(2\frac{1}{5}-\frac{3}{4}\right)$$

Solution :

$$= \frac{22}{3}-\frac{9}{4}+\left(\frac{13}{3}\right)-\left(\frac{11}{5}-\frac{3}{4}\right)$$

$$= \frac{22}{3} - \frac{9}{4} + \left(\frac{13}{3}\right) - \left(\frac{44-15}{20}\right)$$ [Solving small brackets]

$$= \frac{22}{3} - \frac{9}{4} + \frac{13}{3} - \frac{29}{20}$$ [Removing small brackets]

$$= \frac{22}{3} + \frac{13}{3} - \frac{9}{4} - \frac{29}{20}$$ [Addition]

$$= \frac{22+13}{3} - \frac{9}{4} - \frac{29}{20}$$

$$= \frac{35}{3} - \frac{9}{4} - \frac{29}{20}$$

$$= \frac{140-27}{12} - \frac{29}{20}$$ [Subtraction]

$$= \frac{113}{12} - \frac{29}{20}$$

$$= \frac{565-87}{60}$$

$$= \frac{478}{60}$$

$$= \frac{239}{30}$$

$$= 7\frac{29}{30}$$

Exercise 5.6

Simplify the following.

1. $6\frac{1}{3} \div \frac{3}{5} \text{ of } \frac{19}{9} + \frac{6}{3}$

2. $\frac{15}{21} \text{ of } \frac{2}{3} - \frac{1}{5} \div \frac{3}{7}$

3. $\frac{3}{4} \text{ of } \frac{16}{27} + \frac{23}{14} + \frac{12}{18}$

4. $25 \text{ of } \frac{3}{5} \div 1\frac{2}{3} + 3 \text{ of } \frac{1}{3} - 10$

5. $\frac{4}{7} \div \left[1\frac{2}{7} - \frac{3}{14}\right]$

6. $7 + \left\{\frac{1}{3} + \frac{2}{9} + \left(\frac{7}{4} - \frac{5}{12}\right)\right\}$

7. $\left[\left\{18+\left(2\frac{1}{2}+\frac{4}{5}\right)\right\} \text{ of } \frac{1}{1000}\right]$

8. $5\frac{1}{2} \div \left[\left\{\frac{1}{4}-\left(\frac{1}{6}-\frac{1}{30}\right)\right\}+\frac{1}{15}\right]$

9. $25 \div \left[1+\left\{8+\left(7\frac{1}{3}+8\frac{2}{3}\right)\right\}\right]$

10. $\left[\left\{\left(14\frac{1}{3}-\frac{2}{9}\right) \div \frac{5}{18}\right\} \text{ of } \left(\frac{3}{8}+\frac{1}{4}\right)\right]$

Think Wisely Which is greater: Half of half or one-third of three quarters.

Mental Maths

Write the correct number in the place of '*' to make equivalent fractions.

a. $\frac{4}{5} = \frac{*}{25}$ b. $\frac{13}{15} = \frac{169}{*}$

c. $\frac{3}{10} = \frac{*}{60}$ d. $\frac{72}{*} = \frac{8}{11}$

e. $\frac{8}{96} = \frac{1}{*}$ f. $\frac{85}{95} = \frac{*}{19}$

Quick Tip

To find if the pair of fractions are equivalent or not, cross multiply the numbers.

3/9 = 1/3

If the products of both pairs are same, they are equivalent fractions.

3 x 3 = 9 x 1

9 = 9

They are equivalent fractions.

Maths Lab Activity

Materials required: Marbles in different colours with checker board, markers, a large marker board for all responses or small marker boards for all responses or small marker boards for each student. (Alternatively, a piece of thermocol with holes punched in it with marbles can also serve as a checker board.)

Value of marbles: Black shows 1 whole, white shows $\frac{1}{2}$, pink shows $\frac{1}{4}$, and grey shows $\frac{1}{8}$, of a whole.

Steps:

1. This is a group activity. Divide yourselves into groups of 4 or 5.
2. Choose a leader to conduct the activity.
3. The leader asks one group to come forward and start the proceedings. They take the checker board and the marbles.
4. Marbles of different values are arranged separately and put on the checker board. The group goes through different combinations of fractions and the details are noted.
5. Now the leader asks the group to create a table and fill it with details of the mathematical fractions (Step 4).
6. Looking at the table answer the following.

- Which is greater 1 or $\frac{1}{2}$?
- Find the sum of 2 halves.
- Out of 2 marbles of the value $\frac{1}{2}$ and, which would be more and by how much?
- How many $\frac{1}{8}$, parts will make $\frac{1}{2}$?

7. The students can themselves frame their own activity and derive questions based on them.

6 Decimals

Learning Objectives

At the end of this lesson, students will be able to:

- Identify the purpose of using decimals.
- Convert the fraction into decimals numbers.
- Add, subtract, multiply and divide decimal numbers.

Warm-Up

Observe the picture and arrange the weight in ascending order.

Teacher's Note:

Tell the students that the weight of two boys, i.e. 31.8 kg and 31.5 kg are in decimal numbers, which is a shorthand way to write fractions and mixed numbers with denominators that are powers of 10, like 10,100,1000,10000, etc.

In the previous class, we have studied about the basics of decimals.

Thousands 1000	Hundreds 100	Tens 10	Ones 1	Decimal (.)	Tenths $1 \mid 10$ (.1)	Hundredths $1 \mid 100$ (.01)	Thousandths $1 \mid 1000$ (.001)

A decimal number consist of two parts:

(i) Integer Part

(ii) Decimal Part

For example: 28 . 79

Integer Part — Decimal Part

Facts to Know

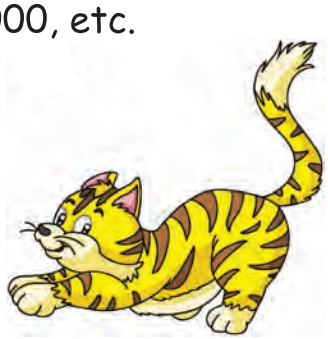
Decimal fractions were first developed and used by the Chinese in the late 4th century BC, then spread to the Middle East and Europe.

The number before the decimal is known as integer part and the number after the decimal is known as decimal part.

Decimal Fractions

Decimal fractions are composed of denominators like 10, 100, 1000, etc.

For Example: $\frac{1}{10}, \frac{2}{100}, \frac{50}{1000}$, etc. are decimal fractions.



Decimal Places

The number of digits after the decimal are known as decimal places.

Like Decimal Fractions

If two or more decimal fractions have equal number of decimal places, then they are known as like decimal fractions.

Examples : (i) 28.50 and 12.15 are like decimal fractions.

(ii) 132.4, 57.2 and 28.3 are like decimal fractions.

However, the number of digits in the integer part does not matter.

Unlike Decimal Fractions

If two or more decimal fractions have unequal (or different) number of decimal places, then they are known as unlike decimal fractions.

Examples : (i) 1.72, 12.814 and 128.5 are unlike decimal fractions.

(ii) 12.30, 13.3 and 146.125 are unlike decimal fractions.

Equivalent Decimal Fractions

The unlike decimal fractions which are equal in value are known as equivalent decimal fractions.

For example: 0.5, 0.50, 0.500, 0.5000, etc. are equivalent decimal fractions.

Quick Tip

Substituting any number of zeros to the extreme right side of the decimal part does not change the value of a decimal number.

For example: 0.29 can be written as,

0.290 = 0.2900 = 0.29000, etc.

Converting Unlike Decimals to Like Decimals

We can change the unlike decimals into like decimals by adding as many zeros as required.

Solved Examples

Example 1 : Convert 72.95, 63.2, 124.264 into like decimals.

Solution : To convert above unlike decimals into like decimal, we can add as many zeros as required.

72.950, 63.200, 124.264 are like decimals.

Example 2 : Compare the following decimals numbers.

(a) 23.58 and 56.29

(b) 17.29 and 17.27

Solution : (a) 23.58 and 56.29

Let us first compare integer part.

So, $23 < 56$

$\therefore$ $23.58 < 56.29$

(b) 17.29 and 17.27

Let us first compare integer part.

$17 = 17$

Now, we will compare decimal part.

$29 > 27$

$\therefore$ $17.29 > 17.27$

Converting Fractions To Decimal Numbers

Step 1 : Count the number of zeros in the denominator following 1.

Step 2 : Count an equal number of places in the numerator starting from the ones place digit and then place the decimal.

Example 3 : Convert the following fractions into decimal numbers.

(a) $\frac{7}{10}$ (b) $\frac{5007}{100}$ (c) $\frac{60}{1000}$ (d) $\frac{2017}{10}$

Solution :

(a) $\frac{7}{10} = 0.7$ (b) $\frac{5007}{100} = 50.07$

(c) $\frac{60}{1000} = 0.060$ (d) $\frac{2017}{10} = 201.7$

Converting Decimal Numbers Into A Fractional Number

Step 1 : Write the given number in the numerator without decimal or point.

Step 2 : Write 1 in the denominator followed by as many zeros as the decimal places in the given number.

Step 3 : Now, write the resulting fraction into lowest (or simplest) form.

Example 4 : Convert the following decimal numbers into fractional numbers.

(a) 2.6 (b) 23.65 (c) 52.125 (d) 0.0000252

Solution :

(a) $2.6 = \frac{\cancel{26}^{13}}{\cancel{10}_{5}} = \frac{13}{5}$

(b) $23.65 = \frac{\cancel{2365}^{473}}{\cancel{100}_{20}} = \frac{473}{20}$

(c) $52.125 = \frac{\cancel{52125}^{\cancel{2085}^{417}}}{\cancel{1000}_{\cancel{40}_{8}}} = \frac{417}{8}$

(d) $0.0000252 = \frac{\cancel{252}^{63}}{\cancel{10000000}_{2500000}} = \frac{63}{2500000}$

Exercise 6.1

1. **Convert the following into like decimals.**

(a) 46.42, 4.3, 7.845 (b) 0.56, 2.571, 3.5429

(c) 174.76, 800.540, 28.2 (d) 1.72, 12.026, 3.2

2. Compare (>, <, =) the following decimal numbers.

(a)	28.76	☐	27.76	(b)	176.54	☐	200.90
(c)	50.05	☐	50.50	(d)	21.280	☐	21.28
(e)	1283.546	☐	1283.549	(f)	389.59	☐	389.68

3. Convert the following fractions into decimal numbers.

(a) $\frac{28}{10}$ (b) $\frac{632}{1000}$ (c) $\frac{4}{10000}$

(d) $\frac{28745}{100}$ (e) $\frac{7642}{1000}$ (f) $\frac{702}{10}$

4. Convert the following decimal numbers into fractional numbers.

(a) 3.8 (b) 28.75 (c) 125.565

(d) 28.3208 (e) 0.000755 (f) 0.0000012

Addition And Subtraction of Decimal Numbers

Step 1 : Convert the given decimal numbers into like decimal numbers.

Step 2 : Now, perform the normal addition (or subtraction) operation.

Solved Examples

Example 1 : Add: 28.75, 481.32, 2.78

Solution :

		2	8	.	7	5
	4	8	1	.	3	2
+			2	.	7	8
	5	1	2	.	8	5

Example 2 : Add: ₹ 4.35, ₹ 78.6, ₹ 291.05, ₹ 308.586

Solution : Converting the given unlike decimals into like decimals,

₹ 4.350, ₹ 78.600, ₹ 291.050,

₹ 308.586

	₹		4	.	3	5	0
	₹	7	8	.	6	0	0
	₹	2	9	1	.	0	5	0
+	₹	3	0	8	.	5	8	6
	₹	6	8	2	.	5	8	6

Example 3 : Subtract: 146.278 from 259.99

Solution : Converting the given unlike decimals into like decimals, we get

						8	10
	2	5	9	.	9	~~9~~	~~0~~
−	1	4	6	.	2	7	8
	1	1	3	.	7	1	2

∴ 259.99 − 146.278 = 113.712

Example 4 : Subtract: 986.41 from 2491.992

Solution : Converting the given unlike decimals into like decimals, we get

	1	14	8	11				
	~~2~~	~~4~~	~~9~~	~~1~~	.	9	9	2
−		9	8	6	.	4	1	0
	1	5	0	5	.	5	8	2

∴ 2491.992 − 986.410 = 1505.582

exercise 6.2

1. Add the following.

(a) 28.75, 4.621, 291.20

(b) 489.68, 2.7, 3.95, 48.621

(c) 7.32, 4.05, 28.736, 43.95

(d) 270.009, 48.7, 93.27, 2.008

2. Find the sum of the following.

(a) ₹ 76.25, ₹ 20, ₹ 33.6, ₹ 125.123

(b) 42.95 kg, 83.9 kg, 52 kg, 32.62 kg

(c) 1045.20 km, 2862.1 km, 387.095 km

(d) 47.92 m, 96.53 m, 285.9 m, 720 m

3. Find the difference.

(a) 17.25 − 10.8

(b) 458.289 − 458

(c) 1246.28 − 734.729

(d) 340.65 − 120.429

4. Subtract.

(a) 280.56 g – 120.4 g

(b) ₹ 450.50 – ₹ 320.25

(c) 4.95 cm – 2.6 cm

(d) 279.4 kg – 100 kg

(e) 73.435 l – 62.20 l

(f) ₹ 80.15 – ₹ 72.125

(g) 74.67 m – 60.49 m

(h) 60.50 kg – 54.65 kg

Multiplication of Decimal Numbers

Multiplication of A Decimal Number By A Whole Number.

Step 1 : Take the given numbers as whole numbers (i.e. remove the decimal or point) and then multiply them.

Step 2 : Count the number of decimal places in both the numbers from the ones place digit.

Step 3 : Place the decimal in the product after taking the equal number of decimal places in both the numbers.

Solved Examples

Example 1 : Multiply: 28.7 by 5

Solution : First we multiply 287 by 5

$$\begin{array}{r} 2\ 8\ 7 \\ \times\ \ 5 \\ \hline 1\ 4\ 3\ 5 \end{array}$$

The given deciaml number has 1 decimal place.

So, the product will have 1 decimal place.

$\therefore$ 28.7 × 5 = 143.5

Example 2 : Multiply: 48.65 by 29

Solution : First we multiply 4865 by 29

$$\begin{array}{r} 48\ 65 \\ \times\ \ 29 \\ \hline 43785 \\ +\ 97300 \\ \hline 141085 \end{array}$$

The given decimal number has 2 decimal places.

So, the product will have 2 decimal places.

$\therefore$ $48.65 \times 29 = 1410.85$

Example 3 : Multiply: 3.852 by 149

Solution : First we multiply 3852 by 149

$$\begin{array}{r} 3852 \\ \times\ 149 \\ \hline 34668 \\ 154080 \\ +\ 385200 \\ \hline 573948 \end{array}$$

The given decimal number has 3 decimal places.

So, the product will have 3 decimal places.

$\therefore$ $3.852 \times 149 = 573.948$

Multiplication of A Decimal Number By 10, 100, 1000, etc.

Example 4 : Multiply.

(a) 278.5×10 (b) 32.956×100 (c) 48.7625×1000

What do you observe?

Solution : (a) 278.5×10

$$= \frac{2785}{\cancel{10}} \times \cancel{10}$$

$$= 2785$$

(b) 32.956×100

$$= \frac{32956}{10\cancel{00}} \times 1\cancel{00}$$

$$= \frac{32956}{10} = 3295.6$$

(c) 48.7625×1000

$$= \frac{487625}{10\cancel{000}} \times 1\cancel{000}$$

$$= \frac{487625}{10}$$

$$= 48762.5$$

Observation

Step 1 : When a decimal number is multiplied by 10, then the point moves to the right by one place.

Step 2 : When a decimal number is multiplied by 100, then the point moves to the right by two places.

Step 3 : When a decimal number is multiplied by 1000, then the point moves to the right by three places, and so on.

Multiplication of A Decimal Number By a Decimal Number

Example 5 : Multiply: 3.67 by 5.2

Solution : First we multiply 367 by 52

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

Sum of decimal places in given decimals = 2 + 1 = 3

So, the product will have 3 decimal places.

$\therefore$ $3.\underline{67} \times 5.\underline{2} = 19.\underline{084}$

Example 6 : Multiply: 4.65 by 8.47

Solution : First we multiply 465 by 847

$$\begin{array}{r} 465 \\ \times\ 847 \\ \hline 3255 \\ 18600 \\ +\ 372000 \\ \hline 393855 \end{array}$$

Sum of decimal places in given decimals = 2 + 2 = 4

So, the product will have 4 decimal places.

$\therefore$ 4.65 × 8.47 = 39.3855

Example 7 : Multiply: 42.5 by 0.56

Solution : First we multiply 425 by 56

$$\begin{array}{r} 425 \\ \times\ 56 \\ \hline 2550 \\ +\ 21250 \\ \hline 23800 \end{array}$$

Sum of decimal places in given decimals = 1 + 2 = 3

So, the product will have 3 decimal places.

$\therefore$ 42.5 × 0.56 = 23.800

or = 23.8

Example 8 : Multiply: 242.53 by 4.356

Solution : First we multiply 24253 by 4356

$$\begin{array}{r} 24253 \\ \times\ 4356 \\ \hline 145518 \\ 1212650 \\ 7275900 \\ +\ 97012000 \\ \hline 105646068 \end{array}$$

Sum of decimal places in given decimals = 2 + 3 = 5

So, the product will have 5 decimal places.

∴ 242.53 × 4.356 = 1056.46068

Example 9 : Multiply: 0.0021 by 0.07

Solution : First we multiply 21 by 7

$$\begin{array}{r} 21 \\ \times\ 7 \\ \hline 147 \end{array}$$

Sum of decimal places in given decimals = 4 + 2 = 6

So, the product will have 6 decimal places.

∴ 0.0021 × 0.07 = 0.000147

Example 10 : Find the continued product.

4.56 × 3.4 × 0.58

Solution : Let us first find the product of:

456 × 34 × 058

$$\begin{array}{r} 456 \\ \times\ 34 \\ \hline 1824 \\ +\ 13680 \\ \hline 15504 \\ \times\ 58 \\ \hline 124032 \\ +\ 775200 \\ \hline 899232 \end{array}$$

Sum of decimal places in given decimals = 2 + 1 + 2 = 5

So, the product will have 5 decimal places.

∴ 4.56 × 3.4 × 0.58 = 8.99232

Exercise 6.3

1. **Multiply.**

(a)	36.5 × 4	(b)	28.652 × 26	(c)	234.650 × 150
(d)	386.27 × 293	(e)	2.38 × 6.5	(f)	7.642 × 2.8
(g)	273.64 × 92.6	(h)	196.52 × 1.53	(i)	17.326 × 2.8

2. **Fill in the blanks.**

(a)	28.56 × 10	=	.....	(b)	73.545 × 10	=	.....
(c)	73.64 × 100	=	.....	(d)	0.54 × 100	=	.....

3. **Find the continued product.**

(a)	0.5 × 1.6 × 2.59	(b)	10.5 × 6.8 × 3.59	(c)	2.74 × 1.3 × 0.56
(d)	1.73 × 8.6 × 0.9	(e)	0.273 × 4.5 × 0.8	(f)	0.5 × 0.5 × 0.5

Division Of Decimal Numbers

Division of A Decimal Number By A Whole Number

Step 1 : Perform the division operation by considering the dividend as a whole number.

Step 2 : When the division of whole number part of the dividend is complete, then insert the decimal in the quotient and proceed the divisions in case of whole numbers.

Solved Examples

Example 1 : Divide: 34.412 by 14.

Solution :

$$
\begin{array}{r}
2 \cdot 458 \\
14 \overline{)\,34 \cdot 412} \\
-28 \\
\hline
64 \\
-56 \\
\hline
81 \\
-70 \\
\hline
112 \\
-112 \\
\hline
0
\end{array}
$$

$\therefore$ 34.412 ÷ 14 = 2.458

Example 2 : Divide 0.5978 by 7

Solution :

$$
\begin{array}{r}
0.0854 \\
7\overline{)\,0.5978} \\
-0 \\
\hline
5 \\
-0 \\
\hline
59 \\
-56 \\
\hline
37 \\
-35 \\
\hline
28 \\
-28 \\
\hline
0
\end{array}
$$

$\therefore$ $0.5978 \div 7 = 0.0854$

Example 3 : Divide 4.935 by 7.

Solution :

$$
\begin{array}{r}
0.705 \\
7\overline{)\,4.935} \\
-0 \\
\hline
49 \\
-49 \\
\hline
03 \\
-0 \\
\hline
35 \\
-35 \\
\hline
0
\end{array}
$$

$\therefore$ $4.935 \div 7 = 0.705$

Example 4 : Divide 48.65 by 25

Solution :

$$
\begin{array}{r}
1.94 \\
25\overline{)\,48.65} \\
-25 \\
\hline
236 \\
225 \\
\hline
115 \\
-100 \\
\hline
15
\end{array}
$$

Now,

$$
\begin{array}{r}
1.946 \\
25\overline{)\,48.650} \\
-25 \\
\hline
236 \\
-225 \\
\hline
115 \\
-100 \\
\hline
150 \\
-150 \\
\hline
0
\end{array}
$$

→ One zero inserted

$\therefore$ $48.65 \div 25 = 1.946$

Example 5 : Divide 58.944 by 8

Solution :

$$
\begin{array}{r}
7.368 \\
8\overline{)\,58.944} \\
-56 \\
\hline
29 \\
-24 \\
\hline
54 \\
-48 \\
\hline
64 \\
-64 \\
\hline
0
\end{array}
$$

$\therefore$ $58.944 \div 8 = 7.368$

Remember

Sometimes, the remainder obtained is non-zero. In such cases, insert as many zeros, as required to the right of the decimal part of the dividend, so as to get the last remainder zero.

Example 6 : Divide 217.44 by 18

Solution :

$$
\begin{array}{r}
12.08 \\
18\overline{)\,217.44} \\
-18 \\
\hline
37 \\
-36 \\
\hline
14 \\
-0 \\
\hline
144 \\
-144 \\
\hline
0
\end{array}
$$

$\therefore$ $217.44 \div 18 = 12.08$

Example 7 : Divide: 1.8 by 24

Solution :

```
      0.075
24 ) 1.800   ← two zeros added
   - 00
     180
   - 168
      120
    - 120
        0
```

∴ 1.8 ÷ 24 = 0.075

Example 8 : Divide: 0.04 by 8

Solution :

```
      0.005
 8 ) 0.040   ← one zero added
   -  00
      40
    - 40
       0
```

∴ 0.04 ÷ 8 = 0.005

Exercise 6.4

Divide.

1.	128.25 ÷ 15	**2.**	364.48 ÷ 8	**3.**	3676.26 ÷ 42
4.	1033.44 ÷ 12	**5.**	0.262 ÷ 5	**6.**	1.905 ÷ 75
7.	8.128 ÷ 32	**8.**	43.128 ÷ 12	**9.**	7.155 ÷ 9
10.	112.38 ÷ 8	**11.**	1.877 ÷ 25	**12.**	0.0018 ÷ 6
13.	1.001 ÷ 14	**14.**	0.04 ÷ 5		

Division of Decimal Number By 10, 100, 1000, etc.

Rule : When a decimal number is divided by 10, 100, 1000, etc. then the point moves to the left by one, two, three, etc. places, respectively.

Solved Examples

Example 1 : Divide the following.

(a) $86.5 \div 10$

(b) $4632.128 \div 100$

(c) $28.5002 \div 1000$

Solution : (a) $86.5 \div 10$

$$= \frac{865}{10} \div 10$$

$$= \frac{865}{10} \times \frac{1}{10}$$

$$= \frac{865}{100}$$

$$= 8.65$$

(b) $4632.128 \div 100$

$$= \frac{4632128}{1000} \div 100$$

$$= \frac{4632128}{1000} \times \frac{1}{100}$$

$$= \frac{4632128}{100000}$$

$$= 46.32128$$

(c) $28.5002 \div 1000$

$$= \frac{285002}{10000} \div 1000$$

$$= \frac{285002}{10000} \times \frac{1}{1000}$$

$$= \frac{285002}{10000000}$$

$$= 0.0285002$$

Division of Decimal Numbers By Multiples of 10, 100, 1000, etc. (like 20, 30, ... 90, 100, 200 ... 900, 1000, 2000 ... 9000)

Example 2 : Divide 285.33 by 30

Solution : $\frac{285.33}{30} = \frac{285.33}{3 \times 10} = \frac{285.33}{3} \times \frac{1}{10}$

```
      9 5 . 1 1
   ___________
3 ) 2 8 5 . 3 3
    - 2 7
    -------
      1 5
    - 1 5
    -------
        0 3
      -   3
      -------
          0 3
        -   3
        -------
            0
```

Now, $\frac{95 \cdot 11}{10} = 9 \cdot 511$

Hence, 285.33 ÷ 30 = 9.511

Example 3 : Divide 4856.25 by 5000

Solution : $\frac{4856.25}{5000} = \frac{4856.25}{5 \times 1000} = \frac{4856.25}{5} \times \frac{1}{1000}$

$\therefore$ 4856.25 ÷ 5 = 971.25

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

Now, $\frac{971.25}{1000}$

$= 0.97125$

Hence, $4856.25 \div 5000 = 0.97125$

Example 4 : Divide 18.08 by 400

Solution : $\frac{18.08}{400} = \frac{18.08}{4 \times 100} = \frac{18.08}{4} \times \frac{1}{100}$

$$
\begin{array}{r}
4.52 \\
4\overline{)\,18.08} \\
-16 \\
\hline
20 \\
-20 \\
\hline
08 \\
-\ 8 \\
\hline
0
\end{array}
$$

Now, $\frac{4.52}{100} = 0.0452$

Hence, $18.08 \div 400 = 0.0452$

Exercise 6.5

Divide.

1.	$28.79 \div 10$	2.	$13.26 \div 600$	3.	$76.25 \div 1000$
4.	$2.745 \div 1000$	5.	$2.465 \div 800$	6.	$72.642 \div 20$
7.	$136.142 \div 2000$	8.	$12.15 \div 300$	9.	$23.2 \div 4000$
10.	$650.3 \div 7000$	11.	$0.769 \div 10$	12.	$182.65 \div 5000$

Solved Examples

Example 1 : $33.6 \div 4.2$

Solution :

$$\frac{336}{10} \div \frac{42}{10}$$

$$= \frac{{}^{8}\cancel{336}}{\cancel{10}} \times \frac{\cancel{10}}{\cancel{42}}$$

$$= 8$$

$\therefore$ $33.6 \div 4.2 = 8$

Example 2 : $2.340 \div 1.56$

Solution :

$$\frac{2340}{1000} \div \frac{156}{100} = \frac{234\cancel{0}}{1\cancel{0}\,\cancel{00}} \times \frac{\cancel{100}}{156}$$

$$= \frac{\cancel{234}}{\cancel{156}}$$

$$= \frac{117}{78}$$

$$= 1.5$$

$\therefore$ $2.340 \div 1.56 = 1.5$

Example 3 : Divide 56.192 by 3.2

Solution : We have,

$$\frac{56{\cdot}192}{3{\cdot}2} \times \frac{10}{10}$$

$$= \frac{561{\cdot}92}{32}$$

```
      17.56
32 ) 561.92
   - 32
     241
   - 224
      179
    - 160
       192
     - 192
         0
```

Hence, $56.192 \div 3.2 = 17.56$

Example 4 : Divide 0.0028 ÷ 0.7

Solution : We have,

$$0.0028 \div 0.7 = \frac{0{\cdot}0028}{0{\cdot}7} \times \frac{10}{10}$$

$$= \frac{0{\cdot}028}{7}$$

```
      0 . 0 0 4
   ┌──────────
 7 │ 0 . 0 2 8
   - 2 8
   ─────
       0
   ─────
```

Hence, 0.0028 ÷ 0.7 = 0.004

Example 5 : Divide 0.00216 ÷ 0.27

Solution : We have,

$$0.00216 \div 0.27 = \frac{0{\cdot}00216}{0{\cdot}27} \times \frac{100}{100}$$

$$= \frac{0{\cdot}216}{27}$$

```
      0 . 0 0 8
   ┌──────────
27 │ 0 . 2 1 6
   - 2 1 6
   ─────
       0
   ─────
```

Hence, 0.00216 ÷ 0.27 = 0.008.

Exercise 6.6

Divide.

1.	13.6 ÷ 1.6	**2.**	188.5 ÷ 2.5	**3.**	267.7112 ÷ 3.26
4.	6.3168 ÷ 0.14	**5.**	2.618 ÷ 0.05	**6.**	0.6816 ÷ 1.2
7.	2.9484 ÷ 0.78	**8.**	11.47 ÷ 0.031	**9.**	0.00876 ÷ 0.219
10.	0.024 ÷ 0.4	**11.**	0.0018 ÷ 0.09	**12.**	0.169 ÷ 1.3
13.	21.976 ÷ 1.64	**14.**	0.0102 ÷ 1.7	**15.**	0.228 ÷ 0.38
16.	0.8085 ÷ 0.35	**17.**	2.0484 ÷ 0.18	**18.**	0.0108 ÷ 0.0009
19.	917.8 ÷ 0.13	**20.**	3.287 ÷ 1.9		

Division of A Whole Number By A Decimal Number

Rule : Convert the divisor into a whole number by multiplying the dividend and the divisor (i.e. Numerator and denominator) by 10 or 100 or 1000 etc., depending upon the number of decimal places in the divisor.

Solved Examples

Example 1 : Divide 48 by 0.08

Solution : $48 \div 0.08$

$$= \frac{48}{0.08} = \frac{48 \times 100}{0.08 \times 100} = \frac{^{600}\cancel{4800}}{\cancel{8}} = 600$$

$\therefore \quad 48 \div 0.08 = 600$

Example 2 : Divide 720 by 0.16

Solution : $720 \div 0.16$

$$= \frac{720}{0.16} = \frac{720 \times 100}{0.16 \times 100} = \frac{^{4500}\cancel{72000}}{\cancel{16}} = 4500$$

$\therefore \quad 720 \div 0.16 = 4500$

Exercise 6.7

Divide.

1. $7 \div 0.14$
2. $169 \div 0.13$
3. $540 \div 1.2$
4. $600 \div 480$
5. $12 \div 0.006$
6. $684 \div 1.5$
7. $54 \div 0.6$
8. $9999 \div 0.009$
9. $26 \div 3.25$
10. $7 \div 0.028$
11. $42 \div 0.025$
12. $3 \div 0.25$

Conversion of Fractional Numbers Into Decimal Numbers

Solved Examples

Example 1 : Convert the following fractions into decimal numbers.

(a) $\frac{3}{5}$ (b) $2\frac{4}{5}$

Solution : (a) $\frac{3}{5}$

$= 3 \div 5$

$$\begin{array}{r} 0.6 \\ 5\overline{)3.0} \\ -0 \\ \hline 30 \\ -30 \\ \hline 0 \end{array}$$

$\therefore \frac{3}{5} = 0.6$

(b) $2\frac{4}{5}$

$= \frac{14}{5} = 14 \div 5$

$$\begin{array}{r} 2.8 \\ 5\overline{)14.0} \\ -10 \\ \hline 40 \\ -40 \\ \hline 0 \end{array}$$

$\therefore \frac{14}{5} = 2.8$

Exercise 6.8

Convert the following fractions into decimal numbers.

1. $\frac{1}{2}$
2. $\frac{2}{8}$
3. $\frac{4}{5}$
4. $4\frac{1}{4}$
5. $4\frac{3}{5}$
6. $12\frac{3}{6}$
7. $16\frac{8}{25}$
8. $9\frac{9}{20}$
9. $\frac{17}{20}$
10. $3\frac{7}{20}$
11. $8\frac{9}{20}$
12. $\frac{15}{32}$

Word Problems

Example 1 : Shreya went to the market. She purchased a pen costing ₹ 32.50, an eraser costing ₹ 6.25, a lunch box costing ₹ 120.60 and a pencil box costing ₹ 62.75. What is the total amount of money spend by her?

Solution :

Cost of a pen	=	₹ 32.50
Cost of an eraser	=	₹ 6.25
Cost of a lunch box	=	₹ 120.60
Cost of a pencil box	=	+ ₹ 62.75
Total money she spend	=	₹ 222.10

Hence, Shreya spend ₹ 222.10

Example 2 : The sum of two numbers is 196.45. If one number is 80.20, find the other number.

Solution :

Sum of two numbers	=	196.45
One number	=	− 80.20
Other number	=	116.25

Hence, the other number is 116.25

Example 3 : Cost of 1 kg sugar is ₹ 45.65. What is the cost of 8 kg sugar?

Solution :

Cost of 1 kg sugar = ₹ 45.65

Cost of 8 kg sugar = ₹ (45.65 × 8)

= ₹ 365.20

Hence cost of 8 kg sugar is ₹ 365.20

Example 4 : The product of two numbers is 560.48. If one number is 45.2, find the othe number.

Solution :

Product of two numbers = 560.48

One number = 45.2

Other number = 560.48 ÷ 45.2

= 12.4

Exercise 6.9

1. Radha weighs 55.42 kg. She gains 12.35 kg more weight. What is her weight now?
2. Mr. Raj covered 4160.580 km by aeroplane, 840.26 km by train and 180.520 km by bus. What is the total distance covered by Mr. Raj?
3. Lallu Ram has 84.91 ℓ milk. He sold 60.83 ℓ milk. How much milk is left with him now?
4. Mrs. Sharma earns ₹ 8950.95 monthly. What is her yearly salary?

5. If 12 metres of ribbon costs ₹ 547.56, what is the cost of 1 metre of ribbon?

6. The cost of 1 chocolate is ₹ 14.65. Find the cost of 48 such chocolates.

7. The cost of 1 metre of rope is ₹ 40.65. What will be the cost of 12.6 metres of rope?

8. The total cost of 57 calculators is ₹ 21982.05. What is the cost of 1 calculator?

9. The weight of 37 bags of rice is 3644.5 *kg*. If all the bags weigh equally, what is the weight of each bag?

10. If 61 buckets of equal capacity can be filled with 518.5 litres of oil, what is the capacity of each bucket?

Think Wisely

What is the difference in the place value of 5 in 35.35?

Mental Maths

Write 'T' for True Statement and 'F' for False Statements.

1. 49.39 is called a decimal, and the dot (.) is a decimal point.

2. $191 + \frac{3}{10} + \frac{4}{100} + \frac{5}{1,000}$ is written as 191.345

3. 0.009 is read as zero point zero nine.

4. In 18.00, the whole number part is 18, and the decimal part is 10.

5. In 47.32, the whole number part is 47, and the decimal part is 32.

Materials required: Squared paper and coloured sketch pens.

Steps:

1. Divide yourselves in groups of 4.
2. Choose a leader to conduct the activity.
3. Each group is given two sheets of squared paper and sketch pens.
4. The leader calls a group and they start the activity. This group is asked to shade different portions of the squared papers and count the coloured portions in both the sheets.

Fig. 1

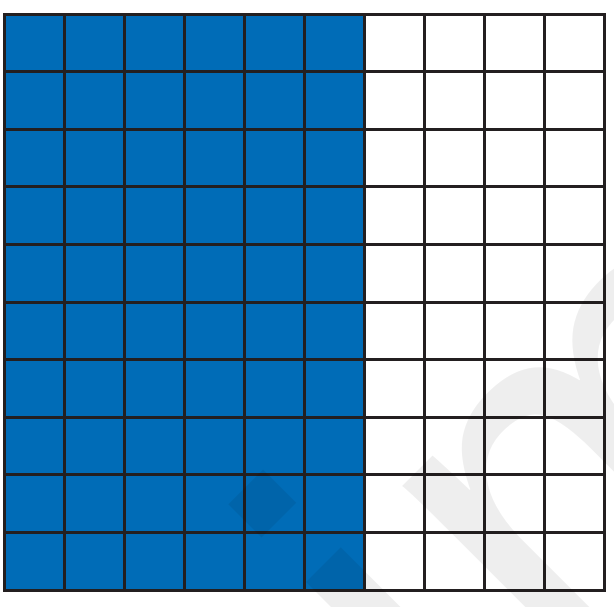
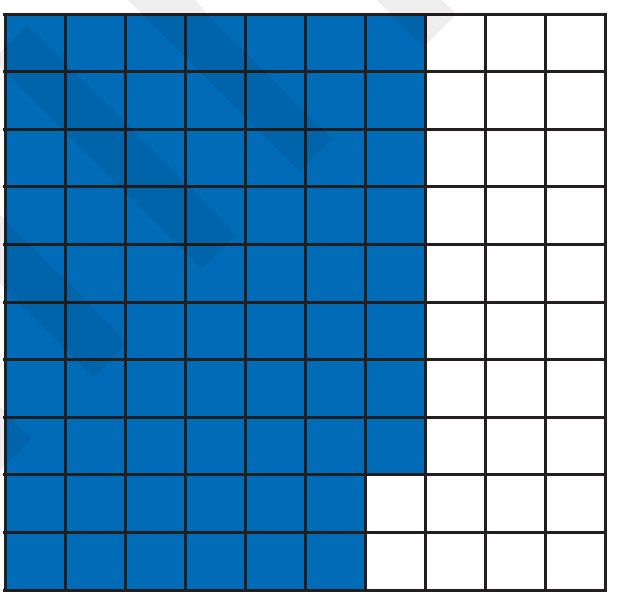


Fig. 2



5. There are, say 52 in Fig. 1 and 68 in Fig. 2.
6. The performing group is asked to express the shaded portions in fractions and decimals, as shown below.

S.NO.	Fraction	Decimal
Fig.1	$\frac{52}{100}$	0.52
Fig.2	$\frac{68}{100}$	0.68

7. The other groups will be asked to make different combinations, find out fractions, and convert those into decimals.

7 Rounding Numbers

Learning Objectives

At the end of this lesson, students will be able to:

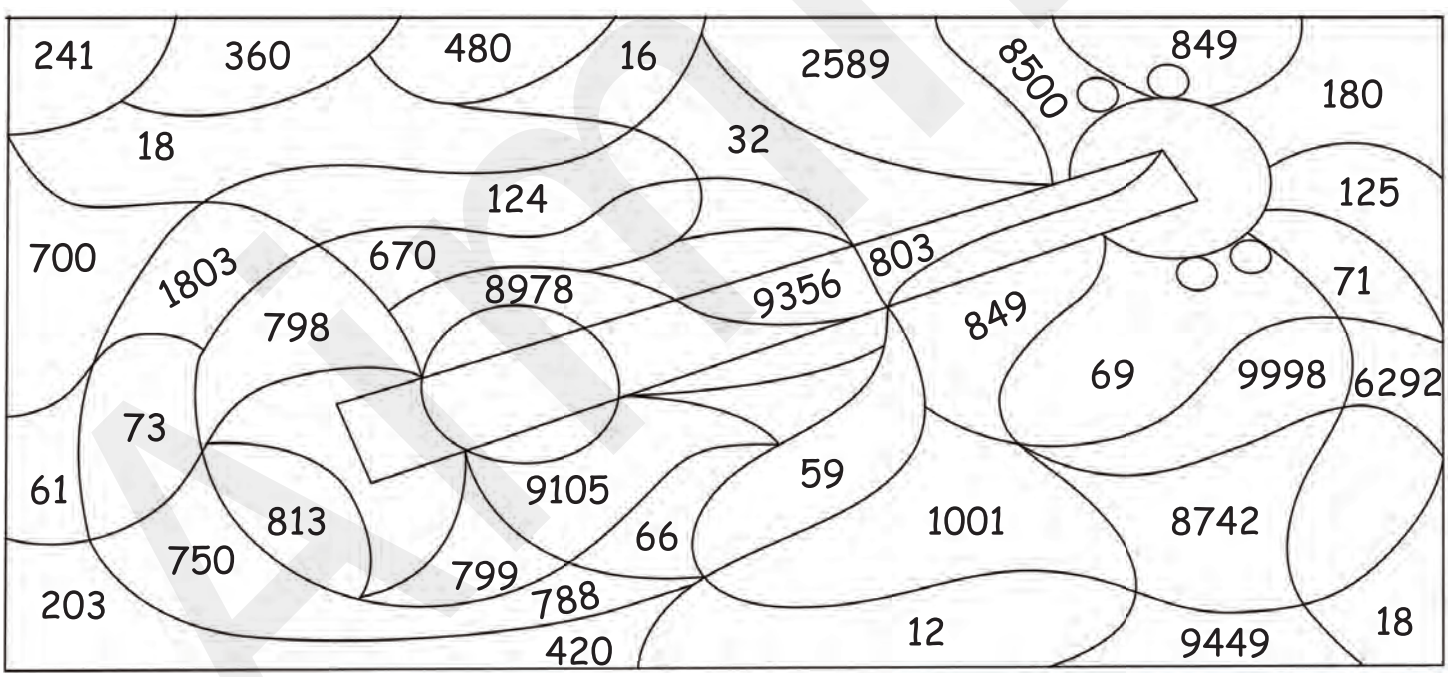
- Apply the rules of rounding numbers to the nearest 10,100 and 1000.
- Round decimal numbers to the nearest ones and tens places.

Warm-Up

Shade the 2 - digit numbers that can be rounded to 70 with yellow.

Shade the 3 - digit numbers that can be rounded to 800 with green.

Shade the 4 - digit numbers that can be rounded to 9000 with blue.



Teacher's Note:

Assist the students in rounding off the numbers.
Also, ask them to count the boxes left uncoloured.

Rounding numbers means to get the approximate value of a number.

For example, when we want to purchase something like dresses, if the cost of the dress is ₹ 985.62, then we pay 985.

Rounding Numbers To The Nearest 10

While rounding off the numbers to the nearest 10, see the ones place digit in the given number.

Rule 1 : If the ones place digit in the given number is between 0-4, i.e. less than 5, then replace the ones place digit by '0'.

Rule 2 : If the ones place digit in the given number is between 5-9, i.e. greater than or equal to 5, then replace the ones place digit by '0' and increase the tens place digit by '1'.

Solved Examples

Example 1 : Round off the following numbers to the nearest 10.

(a) 2,85,463 (b) 18,53,425

(c) 5,43,629 (d) 43,52,122

Solution : (a) 2,85,463

Since the ones place digit is 3, which is less than 5.

∴ Rounded Number = 2,85,460.

(b) 18,53,425

Since the ones place digit is 5, which is equal to 5.

∴ Rounded Number = 18,53,430.

(c) 5,43,629

Since the ones place digit is 9, which is greater than 5.

∴ Rounded Number = 5,43,630.

(d) 43,52,122

Since the ones place digit is 2, which is less than 5.

∴ Rounded Number = 43,52,120.

Facts to Know

A wavy equal sign (≈: approximately equal) is sometimes used to indicate the rounding of exact numbers, for example, 9.98 ≈ 10. Alfred George Greenhill introduced this sign in 1892.

Rounding Numbers To The Nearest 100

While rounding off the numbers to the nearest 100, see the tens place digit in the given number.

Rule 1 : If the tens place digit in the given number is between 0-4, i.e. less than 5, then replace each one of the tens and ones place digits by '0'.

Rule 2 : If the tens place digit in the given number is between 5-9, i.e. greater than or equal to 5 but less than 10, then replace each of the ones and tens place digit by '0' and increase the hundreds place digit by '1'.

Example 2 : Round off the following numbers to the nearest 100.

(a) 2,05,342 (b) 7,68,256

(c) 9,45,783 (d) 43,59,624

Solution : (a) 2,05,342

Since the tens place digit is 4, which is less than 5.

∴ Rounded Number = 2,05,300.

(b) 7,68,256

Since the tens place digit is 5, which is greater than 5.

∴ Rounded Number = 7,68,300.

(c) 9,45,783

Since the tens place digit is 8,

which is greater than 5.

∴ Rounded Number = 9,45,800.

(d) 43,59,624

Since the tens place digit is 2,

which is less than 5.

∴ Rounded Number = 43,59,600.

Rounding Numbers To The Nearest 1000

While rounding off the numbers to the nearest 1000, see the hundreds place digit in the given number.

Rule 1 : If the hundreds place digit in the given number is between 0-4, i.e. less than 5, then replace each one of the hundreds, tens and ones place digit by '0'.

Rule 2 : If the hundreds place digit in the given number is between 5-9, i.e. greater than or equal to 5, then replace each of the ones, tens and hundreds place digit by '0' and increase the thousands place digit by '1'.

Example 3 : Round off the following numbers to the nearest 1000.

(a) 2,54,162 (b) 15,38,596

(c) 42,93,853 (d) 12,64,712

Solution : (a) 2,54,162

Since the hundreds place digit is 1, which is less than 5.

∴ Rounded Number = 2,54,000

(b) 15,38,596

Since the hundreds place digit is 5, which is equal to 5.

∴ Rounded Number = 15,39,000

(c) 42,93,853

Since the hundreds place digit is 8, which is greater than 5.

∴ Rounded Number = 42,94,000

(d) 12,64,712

Since the hundreds place digit is 7, which is greater than 5.

∴ Rounded Number = 12,65,000

Note: The same procedure is followed to round off the large numbers to any number of places.

Exercise 7.1

1. Round off each of the following numbers to the nearest 10, 100 and 1000.

(a) 3,25,462 (b) 18,46,285

(c) 32,41,829 (d) 76,37,232

(e) 7,32,753 (f) 8,73,920

(g) 98,46,594 (h) 78,77,677

Rounding off the Decimal Numbers

Rounding Numbers Correct to Nearest One

While rounding off the numbers corrrect to nearest one, see the tenths place digit in the given number.

Rule 1 : If the tenths place digit in the given number is between 0-4, i.e. less than 5, then replace the tenths place digit and all the following digits by '0'.

Rule 2 : If the tenths place digit in the given number is greater than or equal to 5, then increase the ones place digit by 1 and all the digits after the decimal are replaced by '0'.

Solved Examples

Example 1 : Round off the following numbers correct to nearest one.

(a) 78.38 (b) 46.753

(c) 49.57 (d) 96.872

Solution : (a) 78.38

Since the tenths place digit is 3,

which is less than 5.

∴ Rounded Number = 78.00

(b) 46.753

Since the tenths place digit is 7, which is greater than 5.

∴ Rounded Number = 47.000

(c) 49.57

Since the tenths place digit is 5, which is equal to 5.

∴ Rounded Number = 50.00

(d) 96.872

Since the tenths place digit is 8, which is greater than 5.

∴ Rounded Number = 97.000

Rounding Numbers Correct To One Decimal Place

While rounding off the numbers corrrect to one decimal place, see the hundredths place digit in the given number.

Rule 1 : If the hundredths place digit in the given number is less than 5, then replace the hundredths place digit and all the following digits by '0'.

Rule 2 : If the hundredths place digit in the given number is greater than or equal to 5, then increase the tenths place digit by 1 and all the following digits becomes 0.

Example 2 : Round off the following numbers correct to one decimal place.

(a) 46.543 (b) 78.7852

(c) 14.732 (d) 56.897

Solution : (a) 46.543

Since the hundredths place digit is 4, which is less than 5.

∴ Rounded Number = 46.500

(b) 78.7852

Since the hundredths place digit is 8, which is greater than 5.

∴ Rounded Number = 78.8000

(c) 14.732

Since the hundredths place digit is 3, which is less than 5.

∴ Rounded Number = 14.700

(d) 56.897

Since the hundredths place digit is 9, which is greater than 5.

∴ Rounded Number = 56.900

Rounding Numbers Correct To Two Decimal Places

While rounding off the numbers correct to two decimal places, see the thousandths place digit in the given number.

Rule 1 : If the thousandths place digit in the given number is less than 5, then replace the thousandths place digit and all the following digits by '0'.

Rule 2 : If the thousandths place digit in the given number is greater than or equal to 5, then increase the hundredths place digit by 1 and all the following digits becomes 0.

Example 3 : Round off the following numbers correct to two decimal places.

(a) 83.542 (b) 245.76845

(c) 189.434 (d) 27.987

Solution : (a) 83.542

Since the thousandths place digit is 2, which is less than 5.

∴ Rounded Number = 83.540

(b) 245.76845

Since the thousandths place digit is 8, which is greater than 5.

∴ Rounded Number = 245.77000

(c) 189.434

Since the thousandths place digit is 4, which is less than 5.

∴ Rounded Number = 189.430

(d) 27.987

Since the thousandths place digit is 7,

which is greater than 5.

∴ Rounded Number = 27.990

Exercise 7.2

1. Round off the following numbers to the nearest one.

(a) 24.356 (b) 28.529

(c) 67.842 (d) 127.253

(e) 428.128 (f) 723.986

2. Round off the following numbers correct to one decimal place.

(a) 73.542 (b) 929.323

(c) 47.556 (d) 128.598

(e) 32.259 (f) 782.373

3. Round off the following numbers correct to two decimal places.

(a) 42.562 (b) 172.3865

(c) 73.2452 (d) 246.8259

(e) 124.12359 (f) 249.738923

Think Wisely

I am a number. If you round the number of days in October to the nearest ten and the number of days in February to the nearest ten, I am half the product of those two numbers. What number am I? ☐

Mental Maths

A. Fill in the blanks.

1. Estimation of 27 to its nearest tens place is .....
2. Estimation of 65 to its nearest tens place is .....
3. The cost of 1 kg pomegranate is ₹ 93. Then, the estimation cost is .....

B. Round off the decimal numbers to the nearest whole number.

1. 30.29 - _____
2. 17.12 - _____
3. 1.51 - _____

Maths Lab Activity

Materials required: Crayons

Steps:

1. Colour the number with the help of the following instructions.

2	23	5	37	61	13	17	29	97
1	16	4	25	9	36	49	64	81
1	3	5	7	9	11	13	15	17
2	4	6	8	10	12	14	16	18
6	12	18	24	30	36	42	48	54
8	16	24	32	40	48	56	64	72

Instructions:
Colour all the numbers in:
Yellow, which can be rounded to 5.
Red, which can be rounded to 10.
Blue, which can be rounded to 25.
Purple, which can be rounded to 40.
Orange, which can be rounded to 60.

8 Average

Learning Objectives

At the end of this lesson, students will be able to:

- Calculate the average of similar quantities.

Warm-Up

Neha has obtained the following marks in her Ist term examination. Find out the total marks she has obtained from 500.

Subject	→	English	→ 85
Subject	→	Hindi	→ 91
Subject	→	Mathematics	→ 89
Subject	→	Science	→ 92
Subject	→	Social Studies	→ 98

Teacher's Note:

Tell students that they have calculated the sum of all the numbers obtained. Apprise them about the average that is defined as the mean value which is equal to the ratio of the sum of the number of a given set of values to the total number of values present in the set. So, for the above exercise: Average = Total number obtained / Number of subjects.

Average gives the number which lies between the largest and smallest number.

$$\text{Average} = \frac{\text{Sum of all given items (or numbers)}}{\text{Number of items}}$$

Average can only be calculated for the similar quantities.

Solved Examples

Example 1 : Find the average of given numbers.

(a) 5, 4, 2, 9, 8 (b) 8, 3, 15, 20, 18

(c) $6\frac{1}{6}, 2\frac{3}{4}, 5\frac{1}{2}, 2\frac{1}{3}$ (d) $2\frac{1}{4}, 3\frac{1}{6}, 2\frac{1}{2}, 1\frac{1}{3}, \frac{3}{4}$

(e) 0.5 + 0.7 + 3.2 + 4.6 (f) 1.72 + 3.4 + 5.5 + 6.9.

Solution : (a) Sum of given numbers = 5 + 4 + 2 + 9 + 8 = 28

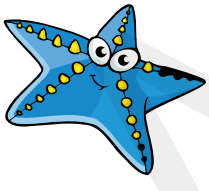
Number of items = 5

Average = $\frac{28}{5} = 5.6$

$\therefore$ Average = 5.6

(b) Sum of given numbers = 8 + 3 + 15 + 20 + 18 = 64

Number of items = 5



Average = $\frac{64}{5}$

$\therefore$ Average = $12\frac{4}{5}$

(c) Sum of given numbers = $6\frac{1}{6} + 2\frac{3}{4} + 5\frac{1}{2} + 2\frac{1}{3}$

= $\frac{37}{6} + \frac{11}{4} + \frac{11}{2} + \frac{7}{3}$

= $\frac{74 + 33 + 66 + 28}{12}$

$= \frac{201}{12} = \frac{67}{4}$

Number of items $= 4$

Average $= \frac{67}{4} \div 4 = \frac{67}{4} \times \frac{1}{4} = \frac{67}{8} = 8\frac{3}{8}$

$\therefore$ Average $= 8\frac{3}{8}$

(d) Sum of given numbers $= 2\frac{1}{4} + 3\frac{1}{6} + 2\frac{1}{2} + 1\frac{1}{3} + \frac{3}{4}$

$= \frac{9}{4} + \frac{19}{6} + \frac{5}{2} + \frac{4}{3} + \frac{3}{4}$

$= \frac{27 + 38 + 30 + 16 + 9}{12}$

$= \frac{120}{12} = 10$

Number of items $= 5$

Average $= 10 \div 5$

$= \frac{10}{5} = 2$

Facts to Know

The average is basically the mean of the values which are represented by $\bar{x}$. It is also denoted by the symbol 'μ'.

(e) Sum of given numbers $= 0.5 + 0.7 + 3.2 + 4.6$

$= 9$

Number of items $= 4$

Average $= \frac{9}{4} = 1\frac{5}{4}$

(f) Sum of given numbers $= 1.72 + 3.4 + 5.5 + 6.9$

$= 17.52$

Number of items $= 4$

Average $= \frac{17.52}{4}$

$= 4.38$

Example 2 : In an annual examination, Sona obtained the following marks.

Mathematics	Computer	English	Hindi	G.K.
98	99	97	92	95

Find the average marks obtained by her in each subject.

Solution : Sum of all the marks = 98 + 99 + 97 + 92 + 95

= 481

Number of subjects = 5

$$\text{Average} = \frac{\text{Sum of all the marks}}{\text{Number of subjects}}$$

$$= \frac{481}{5} = 96.2$$

Hence, average marks obtained by her in each subject is 96.2.

Example 3 : The daily maximum temperature of Delhi during 20th May to 26th May is as follows:

Date	Day	Temperature
20	Monday	40.6°
21	Tuesday	44°
22	Wednesday	42.5°
23	Thursday	40.7°
24	Friday	41.8°
25	Saturday	43.8°
26	Sunday	39°

Find the average temperature.

Solution : Average temperature = $\frac{40.6 + 44 + 42.5 + 40.7 + 41.8 + 43.8 + 39}{7}$

$$= \frac{292.4}{7} = 41.7°$$

Example 4 : The marks obtained by Agriya in the first four unit tests in maths are 85, 92, 98 and 90. Find her average marks.

Solution : Agriya's average marks in maths unit tests

$$= \frac{85 + 92 + 98 + 90}{4}$$

$$= \frac{365}{4}$$

$$= 91.25$$

Hence, Agriya's average marks in maths unit tests = 91.25

Example 5 : Find the average of all the even number between 1 and 11.

Solution : Even numbers between 1 and 11

$$= 2, 4, 6, 8, 10$$

Sum of even numbers $= 2 + 4 + 6 + 8 + 10 = 30$

Total number of even numbers $= 5$

$$\text{Average} = \frac{30}{5} = 6$$

$\therefore$ Average = 6

Quick Tip

We cannot find the average of unlike measures. For e.g. We cannot find an average of lengths and weights together.

Formulae

1. Average = $\frac{\text{Sum of all items}}{\text{Number of items}}$
2. Sum of items = Average × Number of items
3. Number of items = Sum of items ÷ Average

Example 6 : The total height of students in a class is 1200 *cm*. If the average height of a student is 60 *cm*, find the number of students in the class.

Solution : Total $= 1200$ *cm*

Average $= 60$ *cm*

No. of students = Total ÷ Average

$= \frac{1200}{60}$

= 20

Hence, there are 20 students in the class.

Example 7 : The average consumption of rice by a family is 55 kg in 2 months. If there are 8 members in the family, find the total consumption for 2 months.

Solution : Average = 55 kg

No. of members = 8

Total = Average × No. of members

= 55 × 8

= 440 kg

Hence, the total consumption of rice for 2 months is 440 kg.

Exercise 8.1

1. Find the average of given numbers.

(a) 52, 83, 49, 22, 64, 12

(b) 6.5, 4.2, 2.62, 9.6, 8.5

(c) $4\frac{1}{2}, 5\frac{1}{6}, 2\frac{1}{3}, 2\frac{1}{2}, 1\frac{1}{4}$

(d) 2, 3, 5, 7, 11

(e) $5\frac{1}{2}, 3\frac{1}{2}, 4\frac{1}{4}, 4$

(f) 6.9, 4.9, 1.2, 0.3, 0.5

2. The daily earning of a fruitseller during a week are.

₹ 205, ₹ 110, ₹ 540, ₹ 335, ₹ 236, ₹ 430, ₹ 510

Find his average earning per day.

3. During five successive days, the prices of gold are.

Monday	Tuesday	Wednesday	Thursday	Friday
₹ 30, 810	₹ 29,510	₹ 30,980	₹ 28,510	₹ 29,400

Find the average price of gold in these five days.

4. **Find the average of the following.**

(a) All even numbers between 11 and 21.

(b) All odd numbers between 2 and 12.

(c) All prime numbers between 10 and 20.

(d) First six multiples of 10.

5. **The weights of six children in a group are:**

34 *kg* 300 *g*, 33 *kg* 250 *g*, 31 *kg* 600 *g*, 32 *kg* 800 *g*, 32 *kg* 400 *g* and 35 *kg* 450 *g*.

Find the average weight per child.

6. **The daily earnings of a worker during a week are:**

₹ 104, ₹ 85, ₹ 127, ₹ 132, ₹ 96, ₹ 110, ₹ 130.

Find his average daily earning.

7. The prices of six trousers are ₹ 745, ₹ 700, ₹ 793, ₹ 732, ₹ 690 and ₹ 750. Find the average price per trousers.

8. Find the average marks of class V in Maths, if the total marks is 2400 and the strength of the class is 50.

9. The total sales in a tea shop for a week is ₹ 9723.00. What is the average sale per day?

10. **The marks of 7 students are as follows:**

Students	Science	Maths	Social Science	English	Hindi
Sona	92	95	92	90	92
Raman	95	74	63	79	88
Ritu	98	88	76	81	81

Agriya	93	86	83	95	80
Mini	91	100	74	84	79
Mona	99	92	80	92	85
Raj	90	90	98	88	75

(a) Between Sona and Raj who has a better average? Find their averages.

(b) What is the average marks in Science, Maths and Social Science? Which has better average?

(c) In which subject is the average performance better, Hindi or English? Find the averages.

Think Wisely

The average of 5 terms is 50. If the first 4 terms are 45, 42, 32, and 70, what will be the last term?

Mental Maths

Find the average of the following.

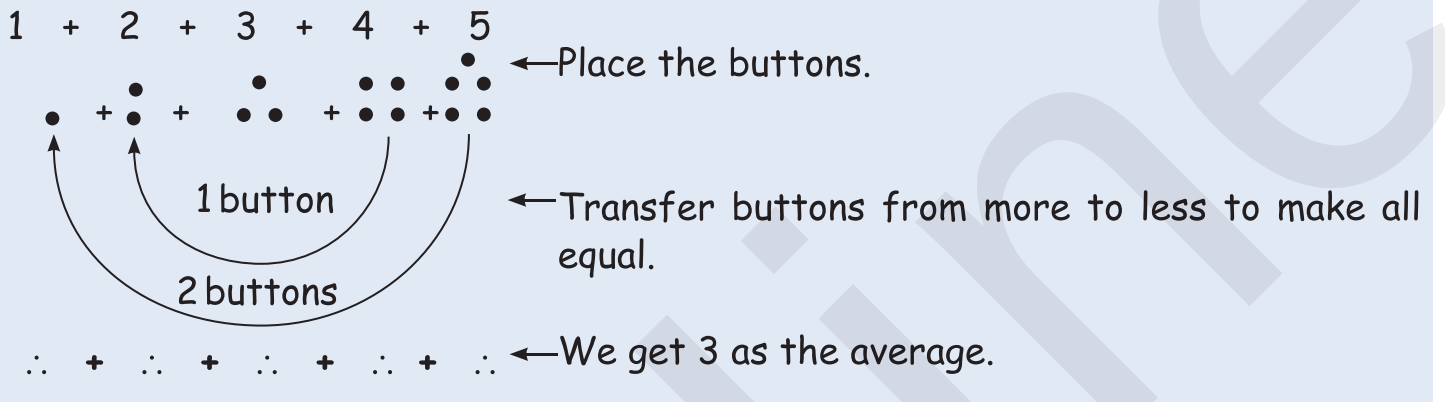
1. 2, 3, 5, 7, 11.
2. All even numbers between 10 and 20.
3. All odd numbers between 1-10.
4. First four multiples of 8.
5. First six natural numbers.

Maths Lab Activity

Materials required: Buttons

Steps:

1. Write down 1st five natural numbers i.e. 1,2,3,4,5.
2. Now using the buttons, we will find the average of these numbers.

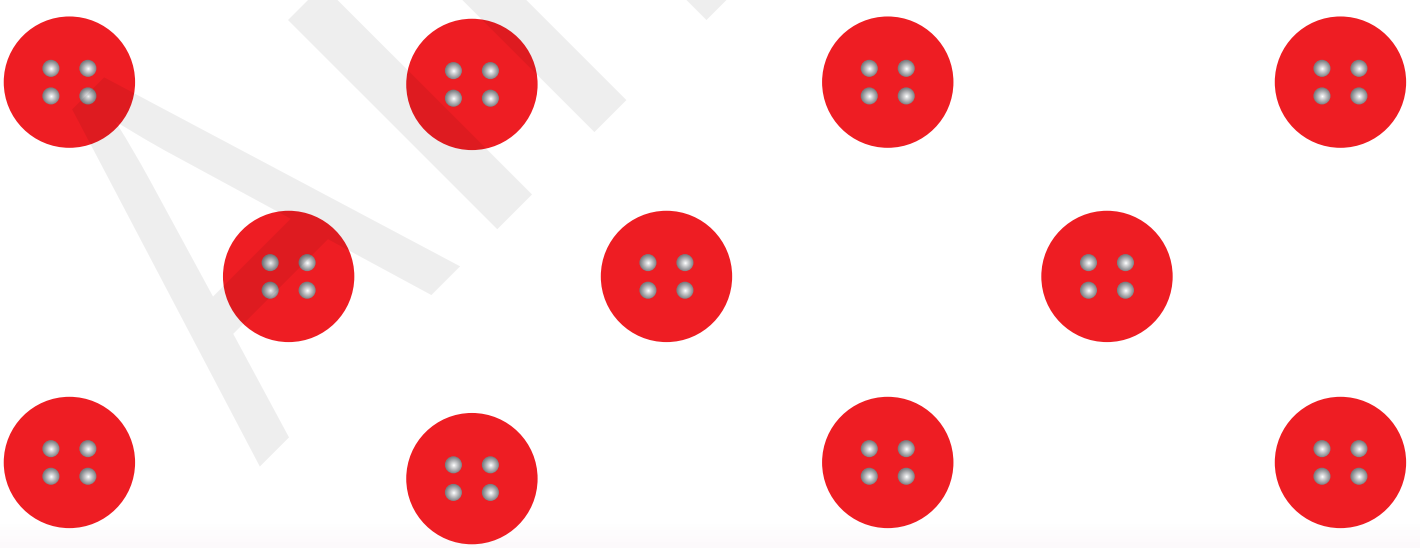


3. Now, play with the buttons and find the average of the following.

   (a) 2 + 3 + 4 + 5 + 6

   (b) 2 + 4 + 6 + 8 + 10

   (c) 9 + 12 + 15 + 18 + 21



9 Percentage

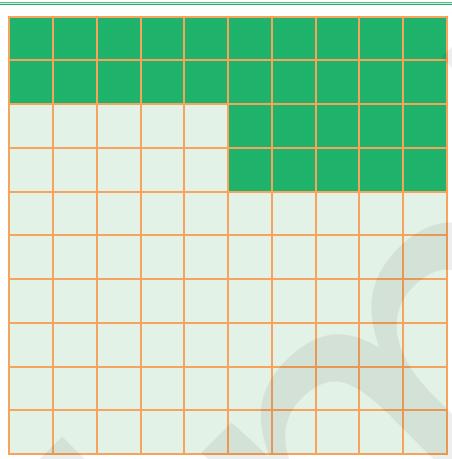
Learning Objectives

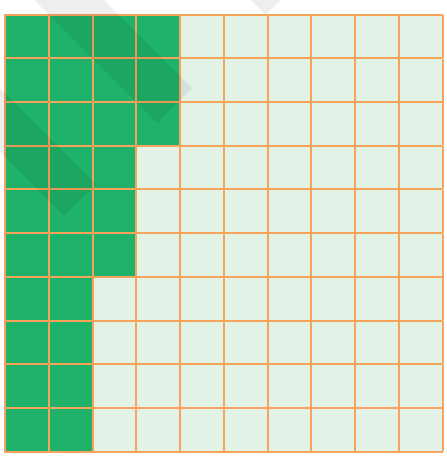
At the end of this lesson, students will be able to:

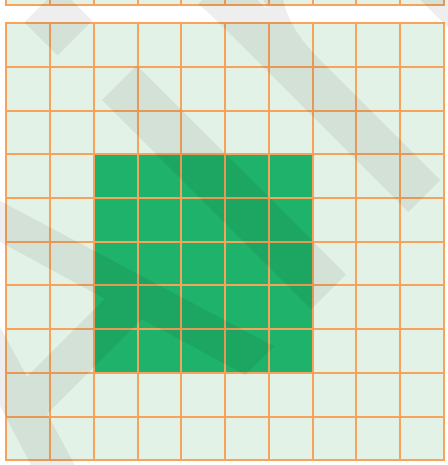
- Convert percentage to a fraction or decimal and vice-versa.
- Solve story sums based on percentage.

Warm-Up

See the grid and write the fraction for the shaded part.







Teacher's Note:

Introduce to the students that ' Percent ' is a fraction with the denominator 100. Percent is denoted by the symbol % which is read as pertcent.

Quick Tip

Percentage always compares a value by 100 only.

Converting A Percentage Into A Fraction or Decimal

Solved Examples

Example 1 : Express the following as fractions.

(a) 42% (b) 75% (c) 28.5% (d) $2\frac{1}{5}\%$

Solution : (a) 42%

$$= \frac{\cancel{42}^{21}}{\cancel{100}_{50}} = \frac{21}{50}$$

(b) 75%

$$= \frac{\cancel{75}^{3}}{\cancel{100}_{4}} = \frac{3}{4}$$

(c) 28.5%

$$= \frac{28.5}{100} = \frac{285}{1000} = \frac{57}{200}$$

(d) $= 2\frac{1}{5}\% = \frac{11}{5}\% = \left(\frac{11}{5} \times \frac{1}{100}\right) = \frac{11}{500}$

Example 2 : Express the following as decimals.

(a) 92% (b) 72.5% (c) 42% (d) 93.6%

Solution : (a) 92%

$$= \frac{92}{100} = 0.92$$

(b) 72.5%

$= \frac{72.5}{100} = \frac{725}{1000} = 0.725$

(c) 42%

$= \frac{42}{100} = 0.42$

(d) 93.6%

$= = \frac{93.6}{100}$

$= \frac{936}{1000} = 0.936$

Facts to Know

Percent is from the Latin adverbial phrase per centum meaning "by the hundred."

Converting A Fraction OR A Decimal Into A Percentage

Example 3 : Express the following fractions as percent.

(a) $\frac{53}{100}$ (b) $\frac{7}{100}$ (c) $\frac{3}{5}$ (d) $\frac{12}{7}$

Solution : (a) $\frac{53}{100} \times 100 = 53\%$ (b) $\frac{7}{100} \times 100 = 7\%$

(c) $\frac{3}{\cancel{5}} \times \overset{20}{\cancel{100}} = 60\%$ (d) $\frac{12}{7} \times 100 = \frac{1200}{7} = 171\frac{3}{7}\%$

Example 4 : Express the following decimals as percentage.

(a) 0.36 (b) 0.5 (c) 0.002 (d) 3.5

Solution : (a) 0.36 $=$ $(0.36 \times 100)\%$

$= \left(\frac{36}{100} \times 100\right)\% = 36\%$

(b) 0.5 $=$ $(0.5 \times 100)\%$

$= \left(\frac{5}{10} \times 100\right)\% = 50\%$

(c) 0.002 $=$ $(0.002 \times 100)\%$

$= \left(\frac{2}{1000} \times 100\right)\%$

$= 0.2\%$

(d) 3.5 $=$ $(3.5 \times 100)\%$

$= \left(\frac{35}{10} \times 100\right)\% = 350\%$

Exercise 9.1

1. Express the following as fractions.

(a) 58% (b) 25% (c) 20.5%

(d) 32.6% (e) $2\frac{1}{6}\%$ (f) $2\frac{1}{4}\%$

(g) 40% (h) $6\frac{1}{4}\%$ (i) 12.5%

(j) 20% (k) $1\frac{1}{2}\%$ (l) 4.52%

2. Express the following as decimals.

(a) 83% (b) 56% (c) 9%

(d) 8.2% (e) 96.5% (f) 0.6%

(g) 63% (h) 90% (i) 8.5%

(j) 92% (k) 2% (l) 3.5%

3. Express the following fraction as percentage.

(a) $\frac{9}{2}$ (b) $\frac{12}{5}$ (c) $\frac{63}{100}$

(d) $\frac{11}{100}$ (e) $\frac{1}{2}$ (f) $\frac{13}{2}$

(g) $\frac{9}{25}$ (h) $\frac{3}{4}$ (i) $2\frac{3}{5}$

(j) $3\frac{1}{4}$ (k) $\frac{4}{5}$ (l) $2\frac{1}{8}$

4. Express the following decimals as percentage.

(a) 0.06 (b) 0.35 (c) 0.7

(d) 1.32 (e) 6.5 (f) 26.4

(g) 0.5 (h) 0.75 (i) 0.08

(j) 2.5 (k) 72.5 (l) 0.32

To Find Percentage of A Given Number

Solved Examples

Example 1 : Find:

(a) 62% of 550 (b) 50% of 75

(c) 5% of ₹250 (d) 11% of 440 *km*

Solution : (a) $\frac{31\cancel{62}}{\cancel{5}\ \cancel{10}\ \cancel{0}} \times \cancel{550}^{11} = 341$ (b) $\frac{\overset{25}{\cancel{50}}}{\cancel{100}_{\ 2}^{\ 4}} \times \overset{3}{\cancel{75}} = 37.5$

(c) $\frac{\cancel{5}}{\cancel{10}_{\ 2}\ \cancel{0}} \times ₹\cancel{25}\ \cancel{0} = ₹12.5$ (d) $\frac{11}{10\cancel{0}} \times ₹\ 44\cancel{0}\ km = 48.4\ km$

To find what percentage is, when one number of another is known.

Example 2 : What % is 48 of 600?

Solution : $\left(\frac{\cancel{48}^{\ 8}}{\cancel{600}\ \cancel{6}} \times \cancel{100}\right)\% = 8\%$

Example 3 : What percent is 50 of 150?

Solution : $\left(\frac{50}{150} \times 100\right)\% = 33.33\%$

Example 4 : What percent of 55 is 110?

Solution : $\left(\frac{110}{55} \times 100\right)\% = 200\%$

Example 5 : What % of 70 is 14?

Solution : $\left(\frac{14}{70} \times 100\right)\% = 20\%$

Example 6 : What is the number whose 15% is 105?

Solution : We have, 15% of the required number = 105

$\therefore \frac{15}{100} \times (\text{Required Number}) = 105$

$\therefore \text{Required Number} = \cancel{105}^{\ 7} \times \frac{100}{\cancel{15}} = 700$

Hence, 700 is the required number whose 15% is 105.

Example 7 : Write 25 paise as a percentage of a rupee.

Solution : 25 paise $= \frac{25}{100}$ of a rupee

$= \left(\frac{25}{100} \times 100\right)\%$ of a rupee

$= 25\%$ of a rupee

Example 8 : Write 50 m as a percentage of a km.

Solution : 50 $m = \frac{50}{1000}$ of a km

$= \left(\frac{50}{1000} \times 100\right)\%$ of a km

$= 5\%$ of a km.

Example 9 : What % is 4 m 24 cm of 64 m?

Solution : 4 m 24 $cm = (4 \times 100)cm + 24\ cm$

$= 400\ cm + 24\ cm$

$= 424\ cm$

64 $m = (64 \times 100)\ cm$

$= 6400\ cm$

Required% $= \left(\frac{424}{6400} \times 100\right)\%$

$= 6.625\%$

Example 10 : What percent is 2min 32seconds of 2 hours?

Solution : 2min 32seconds $= (2 \times 60)$sec + 32sec

$= 120$sec + 32sec

$= 152$sec

2hours $= (2 \times 60 \times 60)$sec

$= 7200$sec

Required % $= \left(\frac{152}{7200} \times 100\right)\%$

$= \frac{152}{72}\%$

$= 2\frac{1}{9}\%$

Exercise 9.2

1. **Find.**
   (a) 53% of 650 (b) 20% of 56 (c) 10% of 700
   (d) 6% of 8000 *kg* (e) 30% of 150 *m* (f) 70% of 490 *ℓ*
2. **What % is?**
   (a) 50 of 200 (b) ₹ 150 of ₹ 500 (c) 55 *ℓ* of 250 *ℓ*
   (d) 270 *kg* of 900 *kg* (e) 49 *g* of 700 *g* (f) 52 *m* of 250 *m*
3. **What %?**
   (a) 85 is 17 (b) 64 is 104 (c) 80 is 15
   (d) 200 is 12 (e) 75 is 150 (f) 88 is 11
4. What is the number whose 12% is 54?
5. Write 15 *mℓ* as a percentage of a *cℓ*.
6. Write 20 *g* as a percentage of *kg*.
7. Write 35 paise as a percentage of rupee.
8. Write 72 paise as a percentage of rupee.
9. What percent is 7*g* 80*cg* of 65*g*?
10. What percent is 1 min 48 seconds of 1 hour?

Word Problems

Solved Examples

Example 1 : Shorya scored 95% out of 500 marks. How many marks did he score?

Solution : Shorya's marks $= \frac{95}{\cancel{100}} \times \cancel{500}^{5}$

$= 475$

$\therefore$ Shorya scored 475 marks.

Example 2 : Mr. Raj purchased 12% more rice than Mr. Raghav. If Mr. Raghav purchased 480 *kg* rice, find how much rice did Mr. Raj purchased.

Solution : Rice purchased by Mr. Raj

$= (12\% \text{ of } 480\ kg) + 480\ kg$

$= \left(\frac{12}{100} \times 480\right) kg + 480\ kg$

$= 57.6\ kg + 480\ kg$

$= 537.6\ kg$

$\therefore$ Mr. Raj purchased 537.6 kg rice.

Example 3 : A group of 140 persons went for a conference. 20% of them were females. How many females were there in the group? How many were males?

Solution : Total number of persons = 140

Number of Females = (20% of 140)

$= \left(\frac{20}{100} \times 140\right) = 28$

Number of males = 140 – 28

= 112

Exercise 9.3

1. The total population of a town is 5000. If 20% of them were children, find the number of adults and 50% of them were number of youngsters. How many are the elderly?
2. In an examination, Mini obtained 98% marks out of 500. How many marks did she score?
3. Trisha weighs 85 kg. If Urmi's weight is 15% more than Trisha's weight, then what is the weight of Urmi?
4. Mr. Tushar purchased 520 kg sugar. If Mr. Ram purchased 20% less sugar than Mr. Tushar, find how much sugar did Mr. Ram purchase?
5. In a class, there are 60 students. 40% of them are girls. How many girls and boys are there in a class?
6. Agriya scored 90% out of 500 marks. How many marks did she score?
7. A group of 80 students went for a school picnic. 20% of them were girls. How many girls were there in the group? How many were boys?
8. Sahil got 150 questions as a holiday homework. If he solved 70% of the questions, then how many questions are remain unsolved?
9. Raj earns ₹24000 per month. If he saves 28% of his salary, then how much does he spend every month?
10. In a G.K. quiz, Agriya won 12 lakhs 50 thousand rupees. If she paid 33% as income tax, then find her prize money.

Think Wisely

What is 50 % of 5 months if each month has 31 days? _____

Mental Maths

1. Find the length whose 18 % is 27 cm. _____
2. Find the amount whose 12% is Rs 15. _____
3. Find the value of the following.
   (a) 24 % of 175
   (b) 85 % of 225
   (c) 5% of 12.6
   (d) 15 % of 15

Maths Lab Activity

Materials required: Pencil.

Steps:

1. Collect the information and find various percentages for your class.

Information

No. of students in the class	=	
No. of students present	=	
No. of students who play basketball	=	
No. of students who know dance	=	
No. of students who play field games	=	
No. of girls in the class	=	
No. of boys in the class	=	

2. Find the percentage of each of the above information, prepare a chart and display in the class.

10 Profit and Loss

Learning Objectives

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

- Calculate profit and loss.
- Find out the cost price and selling price of a product.

Warm-Up

Your father has a shop, and he bought 1 kg of apples for 100 rupees, and he sold them in a hurry for 80 rupees. Did he get any benefit or did he bear a loss?

Teacher's Note:

Introduce the concept of profit and loss. Elucidate the students that the amount gained by selling a product for more than its cost price is Profit and the amount the seller incurs after selling the product less than its cost price is mentioned as a Loss.

- The terms profit (or gain) and loss are used by businessman.

The price at which businessman buys certain goods is called the Cost Price (C.P.)
The price at which businessman sells certain goods is called the Selling Price (S.P.)

If S. P. > C. P., then there is a Profit or Gain.

$\therefore$ Profit = S. P. – C. P.

If C. P. > S. P., then there is a Loss.

$\therefore$ Loss = C. P. – S. P.

Sometimes, when a businessman buys a certain goods, then he has to pay transportation cost, labour charges, salaries, etc. These charges are known as overhead expenses.

These overhead expenses are always added to the C. P. to get total C. P.

$\therefore$ Total C. P. = C. P. + Overhead Expenses

Also, $\text{Profit \%} = \frac{\text{Profit}}{\text{C.P.}} \times 100$

$\text{Loss \%} = \frac{\text{Loss}}{\text{C.P.}} \times 100$

Solved Examples

Example 1 : Mr. Ashok bought a washing machine for ₹ 6,550. He sold it for ₹ 8000. Find his profit or loss percent.

Solution : C. P. = ₹ 6550

S. P. = ₹ 8000

Since, S. P. > C. P.

$\therefore$ Mr. Ashok makes a profit.

Profit = S. P. – C. P.

= ₹ 8000 – ₹ 6550

= ₹ 1450

$$\text{Profit \%} = \frac{\text{Profit}}{\text{C. P.}} \times 100$$

$$= \frac{1450}{6550} \times 100$$

$$= ₹\ 22.14\%$$

Example 2 : Mr. Raj bought a tablet for ₹ 15,000 and sold it for ₹ 19,500. Find his profit or loss percent.

Solution : C. P. = ₹ 15,000

S. P. = ₹ 19,500

Since, S. P. > C. P.

∴ Mr. Raj makes a profit.

Profit = S. P. – C. P.

= ₹ 19,500 – ₹ 15,000

= ₹ 4,500.

$$\text{Profit \%} = \frac{\text{Profit}}{\text{C. P.}} \times 100$$

$$= \frac{4500}{15000} \times 100$$

$$= 30\%$$

Facts to Know

Profit percent and loss percent are always calculated on the cost price.

Example 3 : Mr. Gaurav bought a dinner set for ₹ 1550. He sold them for ₹ 1220. Find his profit or loss percent.

Solution : C. P. = ₹ 1550

S.P. = ₹ 1220

Since, S. P. < C. P.

∴ Mr. Gaurav suffer a loss.

Loss = C. P. – S. P.

= ₹ 1550 – ₹ 1220

= ₹ 330

$$\text{Loss\%} = \frac{\text{Loss}}{\text{C. P.}} \times 100$$

$$= \frac{330}{1550} \times 100$$

$$= 12.29\%$$

Example 4 : Manish bought a calculator for ₹ 450. As it was not working properly, he had to sell it for ₹ 300. Find his loss or gain percent.

Solution : C. P. = ₹ 450

S.P. = ₹ 300

Since, S. P. < C. P.

∴ Manish suffer a loss.

Loss = C. P. – S. P.

= ₹ 450 – ₹ 300

= ₹ 150

$$\text{Loss\%} = \frac{\text{Loss}}{\text{C. P.}} \times 100$$

$$= \frac{150}{450} \times 100$$

= 33.33%

Example 5 : Pakhi bought a chain for ₹ 210. She wants to sell it at a profit of ₹ 50. What should be the selling price of a chain?

Solution : C. P. = ₹ 210

Profit = ₹ 50

S. P. = C. P. + Profit

= ₹ 210 + 50

= ₹ 260

∴ Selling price of chain should be ₹ 260.

Example 6 : Kalpi bought a toy worth ₹ 510 at a loss of ₹ 80. What is the selling price of toy?

Solution : C. P. = ₹ 510

Loss = ₹ 80

S. P. = C. P. – Loss

= ₹ 510 – 80

= ₹ 430

∴ Selling price of toy is ₹ 430.

Example 7 : Raghav sold a microwave for ₹ 6,200 at a profit of ₹ 300. Find the cost price of microwave.

Solution : S. P. = ₹ 6200

Profit = ₹ 300

C. P. = S. P. – Profit
= 6200 – 300
= ₹ 5900

∴ Cost price of microwave is ₹ 5900.

Example 8 : Mr. Verma sold a mobile phone for ₹ 5600 at a loss of ₹ 1500. Find the cost price of mobile phone.

Solution : S. P. = ₹ 5600
Loss = ₹ 1500
C. P. = S. P. + Loss
= ₹ 5600 + ₹ 1500
= ₹ 7100

∴ Cost price of mobile phone is ₹ 7100.

Exercise 10.1

1. Find the profit or loss percent for the following.

(a) C. P. = ₹ 6000, S. P. = ₹ 7080
(b) C. P. = ₹ 8000, S. P. = ₹ 6000
(c) C. P. = ₹ 550, S. P. = ₹ 1020
(d) C. P. = ₹ 9950, S. P. = ₹ 10,000
(e) C. P. = ₹ 1,250, S. P. = ₹ 1,000
(f) C. P. = ₹ 15000, S. P. = ₹ 6600
(g) C. P. = ₹ 14000, S. P. = ₹ 18,250
(h) C. P. = ₹ 3400, S. P. = ₹ 1700
(i) C. P. = ₹ 15,500, S. P. = ₹ 20,000
(j) C. P. = ₹ 24,000, S. P. = ₹ 48,000

Quick Tip

If C.P. = S.P., then it is neither gain nor loss.

2. Sona bought a T.V. set for ₹ 15,550. She sold it for ₹ 18,000. Find her gain or loss percent.

3. Tushar sold an inverter for ₹ 15,540 and makes a profit of ₹ 1,250. Find the C. P. of the inverter.

4. Find the selling price if the C. P. = ₹ 3800 and loss = ₹ 800.

5. Find the selling price, if the C. P. = ₹ 4200 and profit = ₹ 500.

6. Mr. Umang bought a cyber shot for ₹ 5,800. He sold it for ₹ 7000. Find his gain or loss percentage.

7. Aman bought notebooks for ₹ 1500. He sell them for ₹ 1270. Find his gain or loss percent.

8. Agriya sold a laptop for ₹ 24,900 at a profit of ₹ 800. Find the price at which she bought it.

9. Shorya has a video game worth ₹ 1800. He wants to sell it at a profit of ₹ 300. What should be the selling price of video game?

10. Aastha bought a dress worth ₹ 850 at a loss of ₹ 150. Find the selling price of the dress.

11. If a table lamp was sold for ₹ 980 at a loss of ₹ 80, then find the cost price of the table lamp.

12. Find the selling price, if the cost price is ₹ 1200 and loss percent is 25%.

Formulae

i) Profit = S. P. – C. P.

ii) $\text{Profit \%} = \frac{\text{Profit}}{\text{C.P.}} \times 100$

iii) Loss = C. P. – S. P.

iv) $\text{Loss \%} = \frac{\text{Loss}}{\text{C.P.}} \times 100$

v) S.P. = C. P. + Profit

vi) S.P. = C. P. – Loss

vii) C.P = S. P. – Profit

viii) C.P = S. P. + Loss

Think Wisely

Saurabh has a lovely set of stamps worth Rs 120 which he sold to Rishabh for Rs. 130. After a while, he changed his mind and decided that he wanted his stamps back. Rishabh now insisted on being paid Rs. 150 for it. Later, Saurabh sold the set to Anurag for Rs. 160. How much did Saurabh make or lose finally? Or was there no loss or gain?

Mental Maths

Fill in the blanks

1. If the selling price is more than the cost price, there is a _____.
2. If C.P. is Rs. 7865 and the loss is Rs. 459, then S.P. is _____.
3. If S.P. is Rs. 5790 and the loss is Rs. 398, then C.P. is _____.
4. Cost price = Selling price - _____.

Maths Lab Activity

Materials required: School bag, Lunch box, Water bottle, Geometry box etc.

Steps:

1. Divide the class into two teams. One Team takes out objects and sets prices to them.
2. The teacher gives the selling price.
3. The other team finds out the loss or profit and scores a point with each correct cost price to their objects.
4. The second team picks up a slip from a box in which the teacher had put slips marked with profit or loss.

Example:

Profit	₹ 7.00	₹ 5.00	₹ 2.00
Loss	₹ 7.00	₹ 2.50	₹ 5

5. The second team has to find the selling price of the objects being sold by the first team.

   This game can be played in the same way for finding the cost price.

11 Simple Interest

Learning Objectives

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

- Know and use simple interest terminology.
- Understand when interest is paid and when it is earned.
- Know and use the formula for calculating simple interest.

Warm-Up

Mrs. Johnson deposited ₹ 50,000 in her bank account on 23rd October, 2021. She took out the money after a year and she got ₹ 58,000. Calculate the difference.

Teacher's Note:

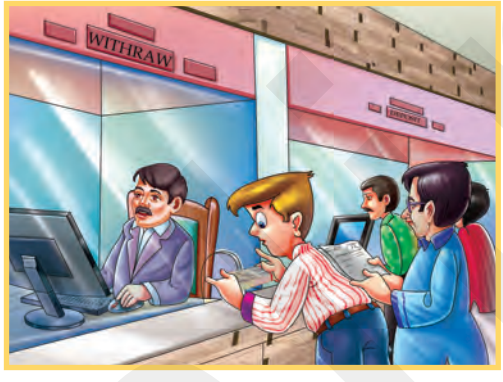
Apprise the students that the extra amount which Mrs. Johnson got is the Interest. Whenever we deposit money in the bank for safety, banks use it to give loans to other people. The bank then pays us a sum of money as interest, as compensation for having used our money.

Boy deposit
₹ 1000

He withdraw
₹ 1000
Extra money =
₹ 0

This means that when you deposit money in a piggy bank, you will get no extra money.

Boy deposit
₹ 1000



He withdraw
₹ 1100
Extra money =
₹ 100

Now, when you deposit money in a bank, you will get extra money.

The extra money that you get from the bank is known as Interest or Simple Interest, denoted by S.I.

The money that you deposit in the bank is known as Principal, denoted by P.

The number of years for which you deposit this money is known as Time, denoted by T.

The S.I. is calculated at a Rate % decided by the bank every year, denoted by R% p.a. (per year or per annum).

$$S.I. = \frac{P \times R \times T}{100}$$

The money which you get from the bank including the interest is known as Amount, denoted by A.

Amount = Principal + Interest

or $A = P + I$

Solved Examples

Example 1 : Find the simple interest and amount, if

$P = ₹\ 4000$

$R = ₹\ 5\%$ p.a.

$T = 2$ years

Solution :

$$S.I. = \frac{P \times R \times T}{100}$$

$$= \frac{4000 \times 5 \times 2}{100} = ₹\ 400$$

$$Amount = P + S.I.$$

$$= 4000 + 400 = ₹\ 4400$$

Example 2 : Mr. Anubhav deposits ₹ 5000 in the bank for 5 years at the rate of 6% p.a. What amount he will get back after 5 years?

Solution :

$P = ₹\ 5000$

$R = ₹\ 6\%$ p.a.

$T = 5$ years

$$S.I. = \frac{P \times R \times T}{100}$$

$$= \frac{5000 \times 6 \times 5}{100}$$

$$= ₹\ 1500$$

$$A = P + S.I.$$

$$₹ = (5000 + 1500)$$

$$= ₹\ 6500$$

Hence, Mr. Anubhav will get ₹ 6500 after 5 years.

Facts to Know

The official discovery of interest was found in the 16th century by Jacob Bernoulli.

Example 3 : Anuj deposits ₹ 3500 in a bank and got back an amount of ₹ 4000 after one year. Find the simple interest Anuj get.

Solution :

$P = ₹\ 3500$

$R = ₹\ 4000$

$S.I. = A - P$

$= ₹\ 4000 - 3500$

$= ₹\ 500$

Hence, Anuj got an interest of ₹ 500.

Example 4 : Rudit deposits ₹ 5000 in IDBI bank for 3 years which earns him an interest of 8%. What is the amount he gets back after 1 year, 2 years and 3 years?

Solution : For every ₹ 100, Rudit gets ₹ 8.

(∵ the rate is 8% for every 100)

∴ For ₹ 1 he gets $= ₹\frac{8}{100}$

For ₹ 5000 he gets $= 5000 \times \frac{8}{100}$

$= ₹\ 400$

Simple interest for 1 year $= ₹\ 400$

Simple interest for 2 years $= ₹\ 400 \times 2 = ₹\ 800$

Simple interest for 3 years $= ₹\ 400 \times 3 = ₹\ 1200$

∴ Amount after 1 year $= P + S.I.$

$= ₹\ (5000 + 400)$

$= ₹\ 5400$

∴ Amount after 2 years $= P + S.I.$

$= ₹\ (5000 + 800)$

$= ₹\ 5800$

∴ Amount after 3 years $= P + S.I.$

$= ₹\ (5000 + 1200)$

$= ₹\ 6200$

Example 5 : Riya invested certain amount of money and got back an amount of ₹ 4800. If the bank paid an interest of ₹ 400, find the amount Riya invested.

Solution :

$A = ₹\ 4800$

$S.I. = ₹\ 400$

$P = A - S.I.$

$= ₹\ 4800 - ₹\ 400$

$= ₹\ 4400$

∴ Riya invested ₹ 4400

Exercise 11.1

1. Find the simple interest and amount, if:

(a) P = ₹ 2000, R = 8%, T = 3 years

(b) P = ₹ 6000, R = 10%, T = 6 years

(c) P = ₹ 1500, R = 2%, T = 1 years

(d) P = ₹ 8000, R = 7%, T = 2 years

2. Ruchi deposits ₹ 8500 in the bank at the rate of 5% p.a. for 6 years. How much money did she get back after 6 years?

3. John deposits ₹ 5500 in the bank at the rate of 8.5% p.a. for 10 years. Find the amount John got after 10 years.

4. Sona deposits ₹ 3200 and got back ₹ 3600 after 2 years. Find the interest she got.

5. Vijay deposits a certain amount of money in the bank. He got back ₹ 9900. If the bank paid him ₹ 900 as an interest, then what amount did Vijay deposit in the bank?

6. Ritesh deposits ₹ 2000 in Yes bank for 4 years which earns him an interest of 8%. What is the amount he gets after 1 year, 2 years, 3 years, 4 years and 5 years?

7. Kiran invested a certain amount of money and got back an amount of ₹ 7200. If the bank paid an interest of ₹ 700, find the amount that Kiran invested.

8. Pinki deposits ₹ 4500 and got back an amount of ₹ 5000 after a year. Find the simple interest she got.

9. Kriatika deposits ₹ 8000 for 4 years at a rate of 6% p.a. Find the amount she got.

10. Raghav deposits ₹ 4800 and got back an amount of ₹ 5500 after 2 years. Find the simple interest he got.

To Find Principal (P), When I, R and T Are Given:

$$P = \frac{100 \times I}{R \times T}$$

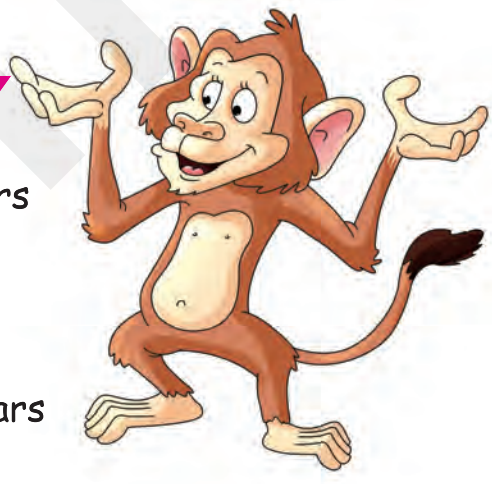
To Find Rate (R), When I, P and T Are Given:

$$R = \frac{100 \times I}{P \times T}$$

To Find Time (T), When I, P and R Are Given:

$$T = \frac{100 \times I}{P \times R}$$

Solved Examples



Example 1 : Find P, if I = ₹ 800, R = 5% p.a., T = 2 years

Solution :
$$P = \frac{100 \times I}{R \times T} = \frac{100 \times 800}{5 \times 2}$$
$$= ₹\ 8{,}000$$

Example 2 : Find R, if I = ₹ 1500, P = ₹ 5000, T = 6 years

Solution :
$$R = \frac{100 \times I}{P \times T} = \frac{100 \times 1500}{5000 \times 6}$$
$$= 5\%\ \text{p.a.}$$

Example 3 : Find T, if I = ₹ 1200, P = ₹ 7500, R = 8% p.a.

Solution :
$$T = \frac{100 \times I}{P \times R} = \frac{100 \times 1200}{7500 \times 8}$$
$$= 2\ \text{years}$$

Example 4 : Agriya borrowed a certain sum of money at the rate of 5% p.a. for 4 years. If she got ₹ 250 as interest, find the sum borrowed by her.

Solution :
$$R = 5\%$$
$$T = 4\ \text{years}$$

$I = ₹\ 250$

$P = ?$

$$P = \frac{100 \times I}{R \times T}$$

$$= \frac{100 \times 250}{5 \times 4}$$

$= ₹\ 1250$

Example 5 : Sneha lent ₹ 4000 for 5 years. If she got an interest of ₹ 800, find the rate of interest per annum at which she lent the money.

Solution :

$P = ₹\ 4000$

$T = 5$ years

$I = ₹\ 800$

$R = ?$

$$R = \frac{100 \times I}{P \times T}$$

$$= \frac{100 \times 800}{4000 \times 5}$$

$= 4\%$ p.a.

Example 6 : Shivam invested ₹ 10,000 at the rate of 3% p.a. and got an interest of ₹ 600 at the end of the some year. Find the time after which Shivam got back ₹ 10,600.

Solution :

$P = ₹\ 10{,}000$

$R = 3\%$ p.a.

$I = ₹\ 600$

$T = ?$

$$T = \frac{100 \times I}{P \times R}$$

$$= \frac{100 \times 600}{10{,}000 \times 3}$$

$= 2$ years

Exercise 11.2

1. **Find P, if:**

   (a) I = ₹ 500, R = 2%, p.a., T = 2 years

   (b) I = ₹ 660, R = 4%, p.a., T = 3 years

2. **Find R, if:**

   (a) I = ₹ 700, P = ₹ 2500, T = 1 years

   (b) I = ₹ 1000, P = ₹ 6500, T = 5 years

3. **Find T, if:**

   (a) I = ₹ 200, P = ₹ 2000, R = 5% p.a.

   (b) I = ₹ 6000, P = ₹ 24000, R = 5% p.a.

4. Sona invested ₹ 2000 for 2 years. She got an interest of ₹ 200. Find the rate of interest per annum at which she invested the money.

5. Kalpi lent a certain sum of money at the rate of 8% p.a. for 3 years. If she got ₹ 600 as interest, find the sum lent out by Kalpi.

6. Pakhi invested ₹ 4500 at the rate of 4% p.a. She got an interest of ₹ 900 at the end of some year. Find the time after which she got back ₹ 5400.

Quick Tip

i) If Time i.e. 'T' is given in months, then divide it by 12 to convert into years.

ii) If Time i.e. 'T' is given in days, then divide it by 365 to convert into years.

Solved Examples

Example 1 : Mini deposited ₹ 2500 at the rate of 6% p.a. for 7 years 4 months. Find the amount she got back.

Solution :

P = ₹ 2500

R = ₹ 6% p.a.

T = 7 years and 4 months

$= 7\frac{4}{12}$ years

$= 7\frac{1}{3}$ years

$= \frac{22}{3}$ years

$S.I. = \frac{P \times R \times T}{100}$

$= \frac{2500 \times 6 \times 22}{100 \times 3}$

$= ₹\ 1100$

$\therefore A = P + S.I.$

$= ₹\ (2500 + 1100)$

$= ₹\ 3600$

Mini got back ₹ 3600

Example 2 : Komal borrowed ₹ 4000 at the rate of 5% p.a. for 220 days. Find the interest and amount paid by Komal.

Solution :

$P = ₹\ 4000$

$R = ₹\ 5\%$ p.a.

$T = 220$ days

$= \frac{220}{365}$ years

$S.I. = \frac{P \times R \times T}{100}$

$= \frac{4000 \times 5 \times 220}{100 \times 365}$

$= ₹\ 120.55$

$\therefore A = P + S.I.$

$= ₹\ (4000 + 120.55)$

$= ₹\ 4120.55$

$\therefore$ Amount paid by Komal is ₹ 4120.55 and
Interest paid by Komal is ₹ 120.55

Exercise 11.3

1. Raj borrowed ₹ 1500 at the rate of 6% p.a. for 7 years and 3 months. Find the amount he has to pay.

2. Sajal invested ₹ 3400 at the rate of 8% p.a. for 225 days. Find the interest and amount he got back.

3. Sonal deposited ₹ 1400 at the rate of 6% p.a. for 8 years and 5 months. Find the amount she got back after 8 years and 5 months.

4. Anubhav borrowed ₹ 14,600 at the rate of 14% p.a. for 175 days. Find the amount he paid back.

Formulae

i) $S.I. = \frac{P \times R \times T}{100}$

ii) $A = I + P$

iii) $P = A - I$

iv) $I = A - P$

v) $R = \frac{100 \times I}{P \times T}$

vi) $T = \frac{100 \times I}{P \times R}$

vii) $P = \frac{100 \times I}{R \times T}$

Think Wisely

Two money-lenders lend money on the following conditions:

Ram: Rs 18,000 at the rate of 6% Raj: Rs 24,000 at the rate of 3 %

At the end of 1 year, who will get more interest and by how much?

Mental Maths

Fill in the blanks.

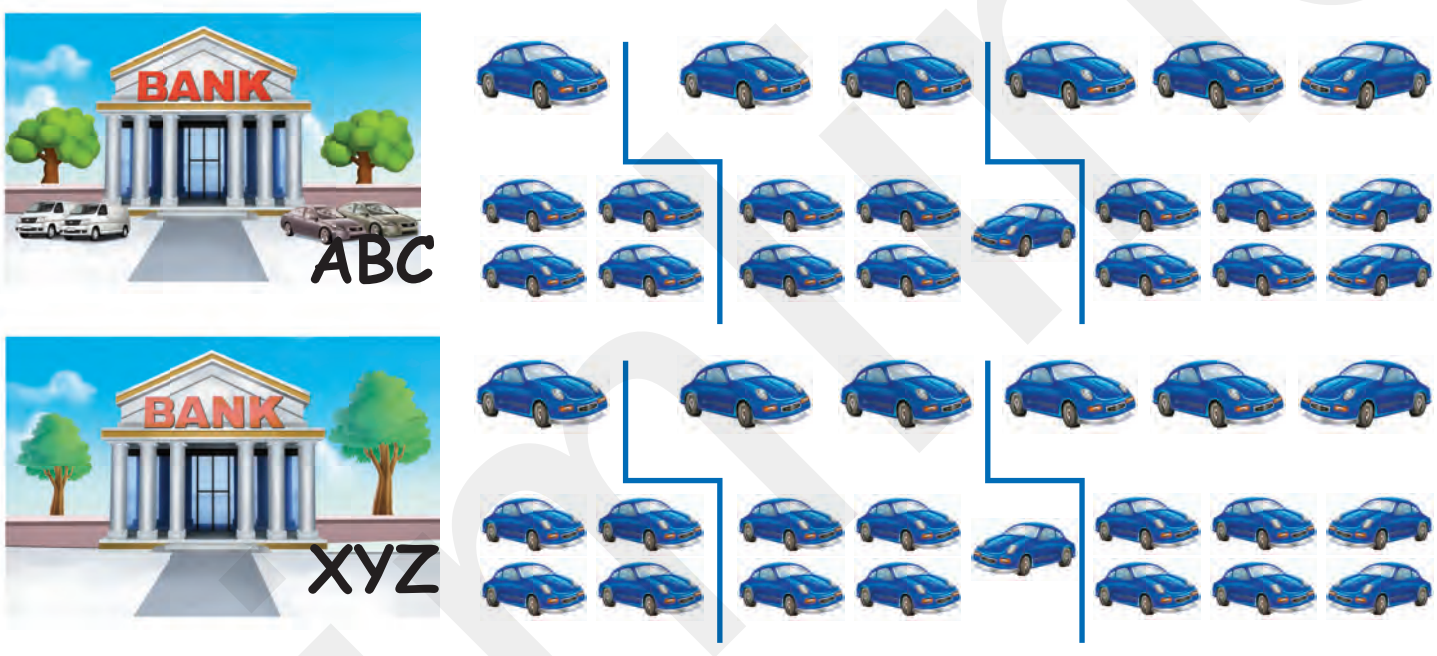
1. Write the formula of simple interest? _____.
2. The money that we _____ in a bank is known as principal.
3. The extra money that you get from the bank is known as _____.
4. Principal is denoted by _____.
5. Time is denoted by_____.
6. The number of years for which you deposit the money is known as _____.

Maths Lab Activity

Materials required: Paper, Pen, Application form.

Steps:

1. Students will need to choose 3 out of the 6 vehicles that they are interested in purchasing.
2. Students will calculate the interest and balance for the 3 vehicles from two bank offers. The teacher will give the amount and rate of interest for each vehicle.



3. After completing all calculations, students will determine which car they want to purchase. In addition, they will determine which bank will give them the best offer.
4. Students will fill out the car loan application. Make sure they use a fake address and phone number.
5. The teacher will either "approve" or "deny" their loan application based on the calculated monthly payments. If incorrect, it will be denied and the student will need to fix it.

12 Speed, Distance and Time

Learning Objectives

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

- Know the measurement unit of speed.
- Calculate speed, distance and time.
- Know the relationship between distance, time and speed.

Warm-Up

Calculate the total distance, the car needs to cover to reach the finish point.

Distance trevelled

Teacher's Note:

Guide students to calculate the distance by applying adding the kilometre.

Facts to Know

The Italian physicist Galileo Galilei is credited with the discovery of speed. Galileo first measured speed by considering the distance covered and the time it takes to cover the distance.

Speed

Mr. Ronak is driving at a speed of 60 *km/hour* and Mr. Rohit is driving at a speed of 50 *km/hour*. It means Mr. Rohit drives fast.
In the above statements, we use the word 'speed'. What do you mean by speed?
The 'speed' can be defined as "the distance covered per unit time".

$$\text{Speed} = \frac{\text{Distance Covered}}{\text{Time Taken}}$$

Or, $S = \frac{D}{T}$

Measurement Unit of Speed

If the distance covered is in kilometres (*km*) and the time taken is in hours (*hr*), then the measurement unit of speed is *km* per hour or *km/hr*.

$$i.e., \frac{D}{T} = \frac{km}{hr} = km / hr$$

If there is a short distance, i.e. in metres (*m*) and time is in minutes (*min*), then the measurement unit of speed is *m* per min or *m/min*.

$$i.e. \frac{m}{min} = m / min.$$

Similarly, measurement unit of speed be measured in m/sec.

Solved Examples

Example 1 : A car covers a distance of 180 *km* in 3 hours. Find its speed.

Solution :

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$= \frac{180\ km}{3\ hrs}$$

$$= 60\ km/hr$$

Example 2 : A cyclist covers 850 metres in 5 minutes. Find his speed.

Solution :

$$S = \frac{D}{T}$$

$$= \frac{850\ m}{5\ min}$$

$$= 170\ m/min$$

Example 3 : A car covers a distance of 240 *kms* between Agra and Delhi in 3 hours. Find its average speed.

Solution :

$$\text{Average speed} = \frac{\text{Total Distance}}{\text{Total Time taken}}$$

$$= \frac{240\ km}{3\ hrs}$$

$$= 80\ km/hr$$

Example 4 : The speed of a car is 90 *km/hr*. Find its speed in metre per second.

Solution : We know that,

$$1\ km = 1000\ m$$

and $1\ hr = 60 \times 60$ seconds

$= 3600$ seconds

$\therefore\ 90\ km = 90 \times 1000\ m$

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}} = \frac{\cancel{90}^{\,15} \times \cancel{1000}^{\,5}}{\cancel{3600}_{\,6}} = 25\ m/sec$$

Example 5 : The speed of a car is 50 metres per second. Find its speed in *km per hour*.

Solution : We know that

$$1\ m = \frac{1}{1000}\ km$$

and $1\ sec = \frac{1}{60 \times 60}\ hr = \frac{1}{3600}\ hr$

$$\therefore\ 50\ m = \frac{50}{1000}\ km$$

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$= \left(\frac{50}{1000} \div \frac{1}{3600}\right) km / hr$$

$$= \frac{50 \times 3600}{1000} km / hr$$

$$= 180\ km / hr$$

Quick Tip

- To convert a speed given in m/sec into a speed in km/hr, multiply with 18/5.
- To convert a speed given in km/hr into a speed in m/sec, multiply with 5/18.

Exercise 12.1

1. **Find the speed, if**
   (a) Distance = 80 *km*, Time = 2 hours
   (b) Distance = 240 *m*, Time = 12 minutes
   (c) Distance = 4200 *m*, Time = 30 seconds
2. A train covers a distance of 80 *km* in 4 hours. Find its speed.
3. Sakshi ran 600 metres in 50 seconds. Find her speed.
4. Sonu covers the distance of 540 *km* in 6 hours by his car. Find the speed of car.
5. A car covers a distance of 324 *kms* in 6 hours. Find its average speed.
6. A car travels at a speed of 60 *km/hr*. Find its speed in metres per second.
7. The speed of a train is 25 *m/sec*. Find its speed in *km/hr*.
8. Sakshi covers 950 *m* in 5 minutes. Find her speed in *km/hr*.

Distance

Distance = Speed × Time

or, D = S × T

Solved Examples

Example 1 : Rajat drives at a speed of 90 *km/hr*. How much distance he will cover in 2 hours.

Solution :

$S = 90$ *km/hr*, $T = 2$ hours

$D = S \times T$

$= 90 \times 2$

$= 180$ *km*

Example 2 : How much distance will be covered in 4 hours at the speed of 45000 *m/hr*?

Solution : Since the speed is in metres

We know, $1\ m = \frac{1}{1000}\ km$

$\therefore\ 45000\ m = \frac{45000}{1000}\ km$

$= 45\ km$

Distance = Speed × Time

$= (45 \times 4)\ kms$

$= 180\ kms$

Example 3 : Sahil drives at a speed of 80 *km/hr*. How much distance will be covered by Sahil in $3\frac{1}{2}$ hours?

Solution :

Speed = 80 *km/hr*

Time = $3\frac{1}{2}$ hours

$= \frac{7}{2}$ hours

Distance = Speed × Time

$= \left(80 \times \frac{7}{2}\right) kms$

$= 280\ kms$

Hence, Sahil will cover 280 *kms* in $3\frac{1}{2}$ hours.

Example 4 : How much distance will be covered in $2\frac{1}{2}$ hours at a speed of 35 *m/min*?

Solution : Since the given speed is in *m/min* and time in hours.

$\therefore$ We have to convert hours into minutes.

So, T = $2\frac{1}{2}$ hours = 2 hours + $\frac{1}{2}$ hours

= 2 hours + 30 minutes

= 2 × 60 *min* + 30 minutes

($\because$ 1 hour = 60 minutes)

= 120 *min* + 30 *min*

= 150 *min*

D = S × T

= 35 × 150

= 5250 *m*

D = 5250 *m*

= $\frac{5250}{1000}$ *km* ($\because$ 1 m = $\frac{1}{1000}$ *km*)

= 5.250 *km*

Exercise 12.2

1. **Find the distance, if**
   (a) Speed = 980 *km/hour*, Time = 3 hours
   (b) Speed = 840 *km/hour*, Time = 1 hour 30 minutes
   (c) Speed = 9200 *m/sec*, Time = 5 hours
2. Ishak drives at a speed of 110 *km/hr*. How much distance will he cover in 4 hours?
3. A frog is moving at a speed of 10 *cm* per second. Find the distance covered by frog in 30 minutes.
4. How much distance will be covered in $1\frac{1}{2}$ hours at the speed of 20 *m/minute*.
5. How much distance will be covered in 5 hours at the speed of 50,000 *m* per hour?

6. Raman drives at a speed of 250 *cm* per second. How much distance will be covered by Raman in 15.5 seconds?

7. How far will an aeroplane fly in 1 hour 50 minutes at a speed of 960 *km/hr*?

8. How much distance will be covered by an athlete in 5 hours, if he runs at a speed of 12.5 *cm/sec*?

Time

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}} \quad \text{or,} \quad T = \frac{D}{S}$$

Solved Examples

Example 1 : How much time will Rahul takes to cover the distance of 10,240 *km* at a speed of 80 *km/hr*?

Solution :

$D = 10240$ *km*

$S = 80$ *km/hr*

$$T = \frac{D}{S}$$

$$= \frac{10240}{80}$$

$= 128$ hours

Example 2 : How much time will be taken to cover the distance of 25 *km* at a speed of 500 *m/sec*?

Solution :

$D = 25$ *km*

$= 25 \times 1000$ *m* ($\because$ 1 *km* = 1000 *m*)

$= 25000$ *m*

$S = 500$ *m/sec*

$$T = \frac{D}{S} = \frac{25000}{500}$$

$= 50$ *sec*

$\therefore$ $T = 50$ seconds

Example 3 : A cyclist runs at a speed of 10 *cm* per second. How long will he take to cover 10 metres?

Solution : Time taken to cover 10 *cm* = 1 *sec*

Time taken to cover 1 *cm* $= \frac{1}{10}$ *sec*

We know, 1 *m* = 100 *cm*

then, 10 *m* = 1000 *cm*

$\therefore$ Time taken to cover 10 metre

$= \frac{1}{10} \times 1000$

= 100 seconds

Hence, the cyclist will take 100 seconds or 1 *min* 40 *sec* to cover 10 metres at the speed of 10 *cm/sec.*

Example 4 : How long will an athlete take to run a race of 600 *m* at the speed of 60 *km/hr?*

Solution : Distance = 600 *m*, Speed = 60 *km/hr*

We know, $1\ m = \frac{1}{1000}\ km$

$\therefore$ $600\ m = \frac{600}{1000}\ km = \frac{6}{10}\ km$

$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$

$= \frac{6}{10} \div 60$

$= \frac{6}{10 \times 60}$

$= \frac{1}{100}\ hr$

$\frac{1}{100}\ hr = \frac{1}{100} \times 60\ min$

$= \frac{3}{5}$ minutes

$= \frac{3}{5} \times 60$ seconds

=36 seconds

Hence, an athlete will take 36 seconds to run a race of 600 *m* at a speed of 600 *km/hr.*

Exercise 12.3

1. **Find the time taken, if**
   (a) Distance = 240 *km*, Speed = 60 *km/hr*
   (b) Distance = 300 *km*, Speed = 300 *m/sec*
   (c) Distance = 27810 *km*, Speed = 90 *km/hr*
2. A cyclist covers a distance of 5999 *km* at a speed of 70 *km/hr*. Find the time taken.
3. How much time does Riya take to cover the distance of 900 *km* at a speed of 45 *km/hr*?
4. A train runs at a speed of 50 *km/hr*. How much time it will take to cover the distance of 11250 *km*?
5. A cockroach runs at a speed of 10 metres per second. How much time will it take to cover a distance of 1 *km*?
6. How long will Rahul take to run a race of 500 *m* at the speed of 500 *km* per hour?
7. How long an aeroplane takes to cover a distance of 7150 *km* at a speed of 780 *km/hr*?
8. How long will the cyclist takes to cover a distance of 8 *m* at the speed of $8\frac{2}{5}$ *cm/sec*?

Formulae

i) $\text{Speed} = \frac{\text{Distance}}{\text{Time}}$

or, $S = \frac{D}{T}$

ii) Distance = Speed × Time

or, D = S × T

iii) $\text{Time} = \frac{\text{Distance}}{\text{Speed}}$

or, $T = \frac{D}{S}$

Think Wisely

There is one scooter which has 2 tyres and one Stepney (i.e. a total of 3 tyres). Each tyre can run up to a maximum of 5 km at a speed of 5 km/hr. How long will the scooter run?

Mental Maths

Find the speed in each of the following cases.

1. Rahul ran 350 m in 38 seconds. _____
2. Ashish cycled 756 m in 1 minute 24 seconds. _____
3. Farhan rowed 1 km 400 m in 350 seconds. _____

Maths Lab Activity

Materials required:

- Stop watch (app on a phone is fine)
- A measured distance
- Pen/pencil
- This worksheet to fill in tables

Steps:

1. Pick your lab partner for this activity.
2. Your teacher has measured out a distance of 10 meters.
3. You and you partner will take turns travelling this distance while being timed by the other person.
4. First, you will walk the distance. Record the time and repeat 2 times (3 total trials).
5. Switch with your partner.

6. Secondly, you will run the distance. Record your time and repeat 2 more times (3 total trials).

7. Switch with your partner.

8. Lastly, choose a movement you would like to use to travel the distance (skipping, hopping, etc.) Fill in the "other" blank with what movement you chose. Record your time and repeat 2 more times (3 total trials).

9. Switch with your partner.

10. Calculate the averages for each movement and record in the average time column.

11. Use the formula given to calculate your speed for each movement.

12. DON'T FORGET YOUR UNITS (metres and seconds).

13. Answer the questions below the table.

Movement	Trial 1	Trial 2	Trial 3	Average time	Speed
Walking					
Running					
Other					

1. Which movement resulted in the fastest speed? _____

2. Who was fastest overall? You or your partner? _____

13 Concept of Angles

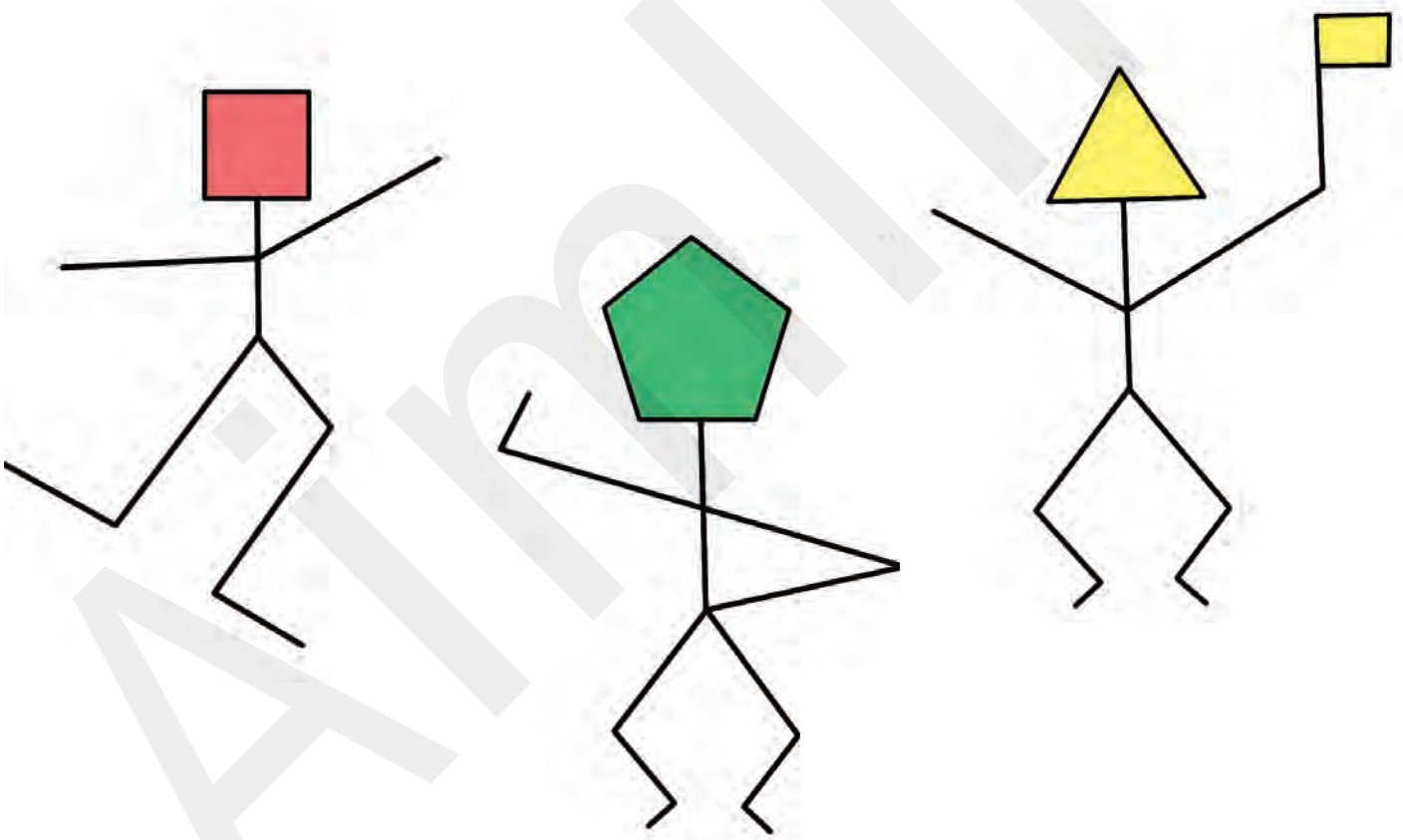
Learning Objectives

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

- Classify angles.
- Measure and draw angles using a protractor.

Warm-Up

Look at the dancing figures and mark the angles. Draw two more dancing pictures.



Teacher's Note:

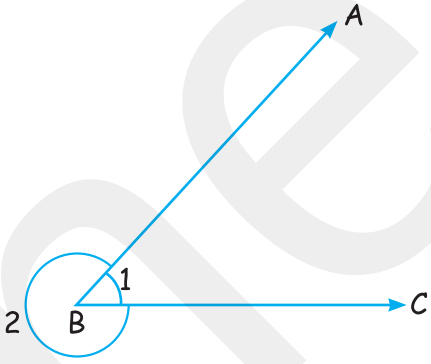
Ask the students to notice how the hands of the clock are positioned at different times of the day.

As we know that,

The figure formed by joining two rays having same initial point, is known as an angle.

Here, $\angle 1$ is known as interior angle because it lies inside the arms AB and AC.

$\angle$ 2 is known as exterior angle because it lies outside the arms AB and BC.



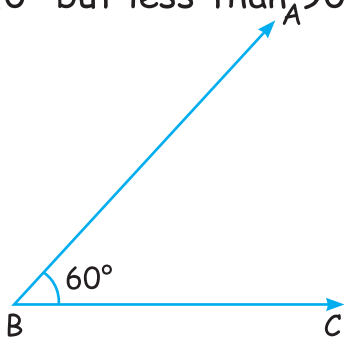
Classification Of Angles

1. **Acute Angle:** If the measure of an angle is more than 0° but less than 90°, then it is known as an acute angle.

In the given figure,

$\angle ABC = 60° < 90°$.

$\therefore$ $\angle ABC$ is an acute angle.

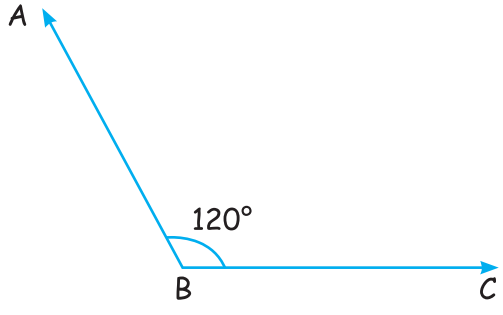


2. **Obtuse Angle:** If the measure of an angle is more than 90° but less than 180°, then it is known as an obtuse angle.

In the given figure,

$\angle ABC = 120° < 180°$.

$\therefore$ $\angle ABC$ is an obtuse angle.

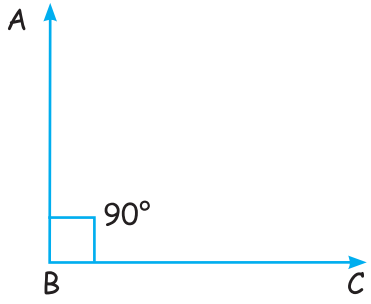


3. Right Angle : If the measure of an angle is equal to 90°, then it is known as right angle.

In the given figure,

$\angle ABC = 90°$

$\therefore$ $\angle ABC$ is a right angle.

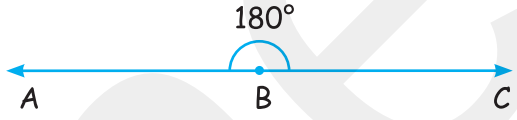


4. Straight Angle : If the measure of an angle is 180°, then it is known as straight angle.

In the given figure,

$\angle ABC = 180°$

$\therefore$ $\angle ABC$ is a straight angle.

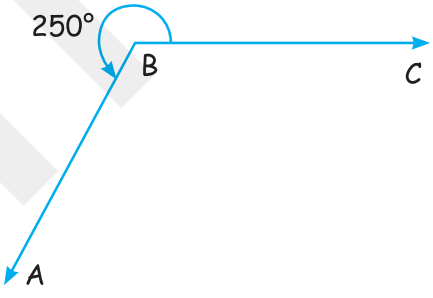


5. Reflex Angle : If the measure of an angle is more than 180° but less than 360°, then it is known as reflex angle.

In the given figure,

$\angle ABC = 250° < 360°$

$\therefore$ $\angle ABC$ is a reflex angle.



6. Complete Angle : If the measure of an angle is 360°, then it is known as complete angle.

In the given figure,

$\angle ABC = 360°$

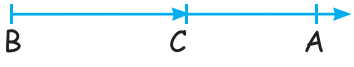
$\therefore$ $\angle ABC$ is a complete angle.

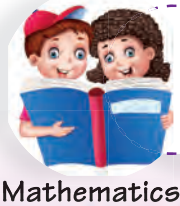
7. Zero Angle : When the two arms of an angle overlap each other, they form an angle of 0°. Such angles are known as zero angle.

In the given figure,

$\angle ABC = 0°$

$\therefore$ $\angle ABC$ is a zero angle.



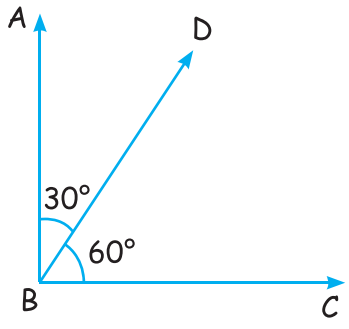


Facts to Know

The word angle comes from the Latin word angulus, meaning "corner".

Pairs Of Angles

1. Complementary Angles : If the sum of the measure of two angles is 90°, then they are known as complementary angles.



The one angle is said to be the complement of the other.

In the given figure,

$\angle DBC = 60°$, $\angle ABD = 30°$

$\therefore \quad \angle DBC + \angle ABD = 60° + 30° = 90°$

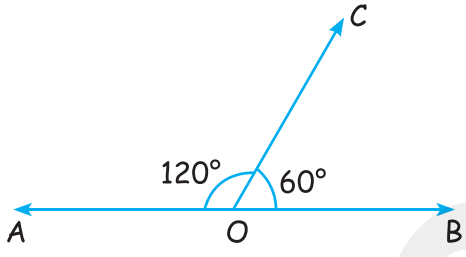
$\therefore$ $\angle DBC + \angle ABD$ are known as complementary angles.

We can also say that,

$\angle DBC$ is complement of $\angle ABD$.

or, $\angle ABD$ is complement of $\angle DBC$.

2. Supplementary Angles : If the sum of the measure of two angles is 180°, then they are known as supplementary angles.



The one angle is said to be the supplement of the other.

In the given figure,

$\angle BOC = 60°$, $\angle AOC = 120°$

$\angle BOC + \angle AOC = 60° + 120° = 180°$

$\therefore$ $\angle BOC$ and $\angle AOC$ are known as supplementary angles.

We can also say that,

$\angle BOC$ is supplement of $\angle AOC$.

or, $\angle AOC$ is supplement of $\angle BOC$.

Quick Tip

It is not correct to write 'angle $\angle$ BOC'. We should write either "angle BOC" Or $\angle$ BOC.

Solved Examples

Example 1 : Find the complement of an angle of 40°.

Solution : Complement of 40° = 90° – 40°

= 50°

Example 2 : Find the complement of an angle of 32°.

Solution : Complement of 32° = 90° – 32°

= 58°

Example 3 : Find the supplement of an angle of 100°.

Solution : Supplement of 100° = 180° – 100°

= 80°

Example 4 : Find the supplement of an angle of 102°.

Solution : Supplement of 102° = 180° – 102°

= 78°

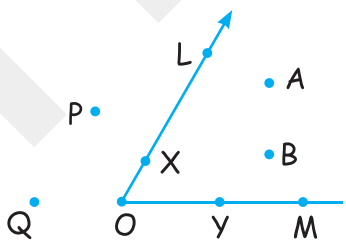
Exercise 13.1

1. List the points which lie on

(a) the interior of ∠LOM

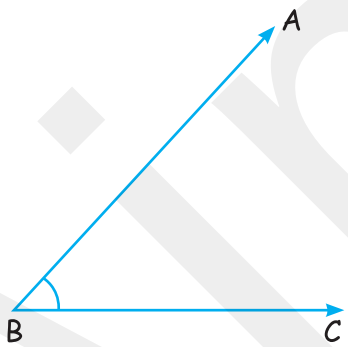
(b) the exterior of ∠LOM.

(c) ∠LOM

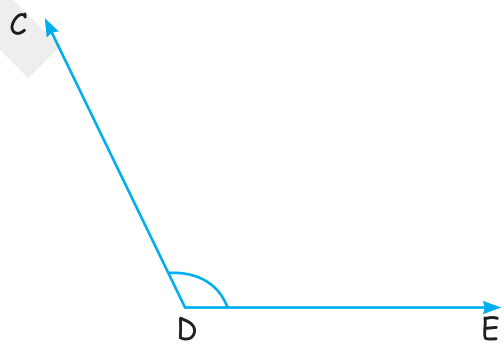


2. Without measuring, classify the following angles as acute, obtuse, right, reflex, Straight and complete:

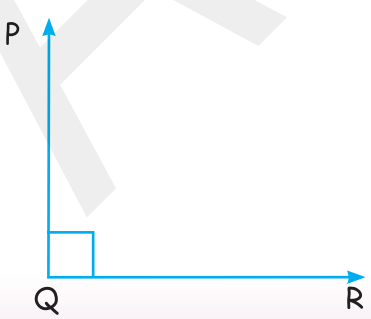
(a)



(b)

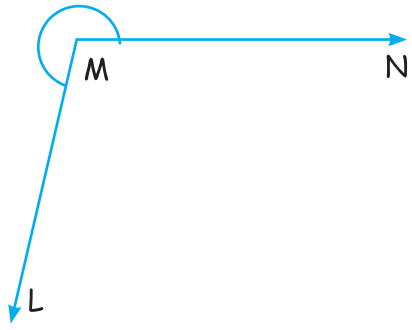


(c)

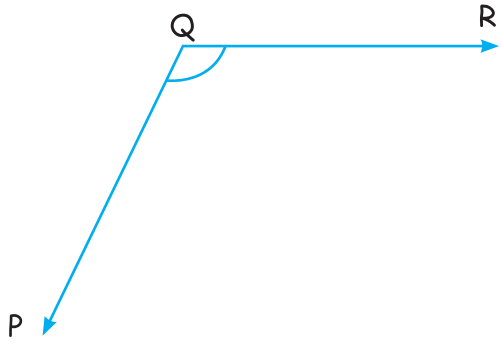


(d)

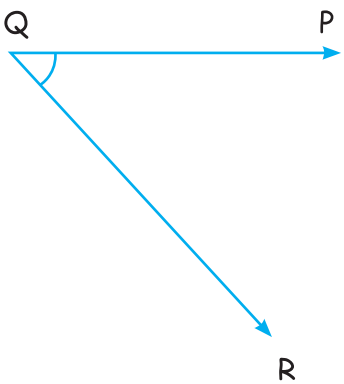
(e)



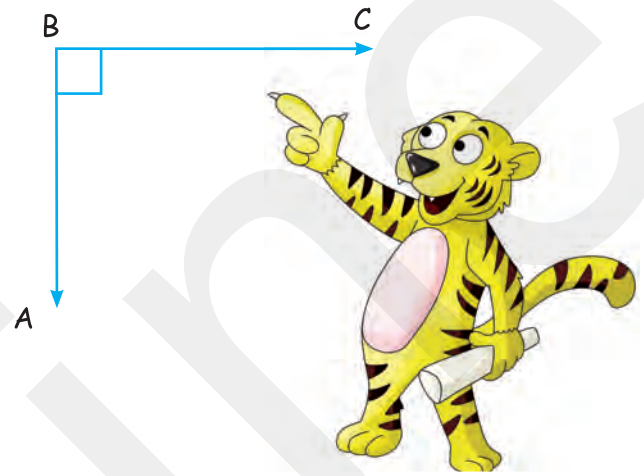
(f)



(g)

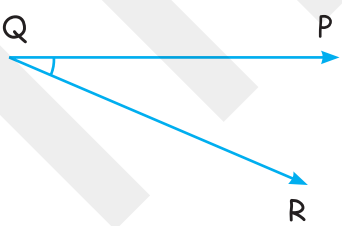


(h)



(i)

(j)



3. Classify the following angles as acute, obtuse, right, straight, reflex, complete and zero.

(a)	40°	(b)	0°	(c)	180°
(d)	90°	(e)	130°	(f)	360°
(g)	250°	(h)	92°	(i)	86°
(j)	196°	(k)	150°	(l)	12°

4. Identify which of the following pairs of angles are complementary angles or supplementary angles.

(a)	30°, 150°	(b)	35°, 55°	(c)	70°, 110°
(d)	20°, 70°	(e)	115°, 65°	(f)	45°, 45°
(g)	100°, 80°	(h)	120°, 60°	(i)	15°, 75°
(j)	110°, 70°	(k)	50°, 40°	(l)	32°, 58°

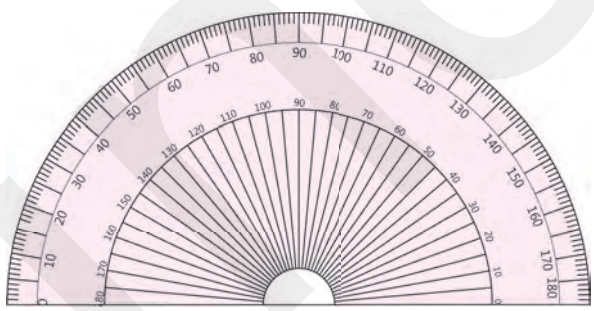
5. **Find the complement angles of each of the following angles.**

(a) 80°	(b) 25°	(c) 35°	(d) 42°
(e) 15°	(f) 43°	(g) 29°	(h) 68°

6. **Find the supplement angles of each of the following angles.**

(a) 112°	(b) 58°	(c) 40°	(d) 125°
(e) 83°	(f) 59°	(g) 108°	(h) 90°

Measuring Angles Using Protractor

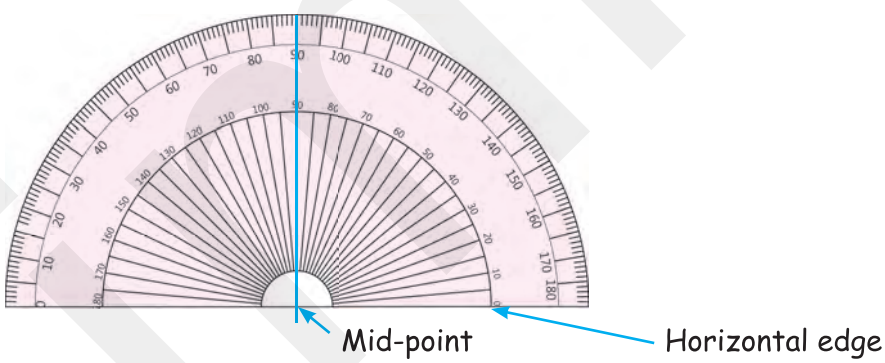


Protractor is an instrument used for constructing or measuring angles.

It is found in our geometry boxes. It is a semi-circular piece of plastic and is also known as **Dee**.

We measure angles in degrees.

A complete round in a protractor is divided into 360 equal parts (or points). Each part is denoted by 1°



The mid-point on the horizontal edge of the protractor is known as central point of the protractor.

A protractors has two scales:

- inner
- outer

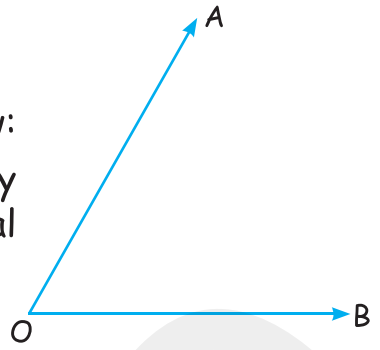
The one scale begins with 0° on the right and runs towards left to 180°. The other scale begins with 0° on the left and runs towards right to 180°.

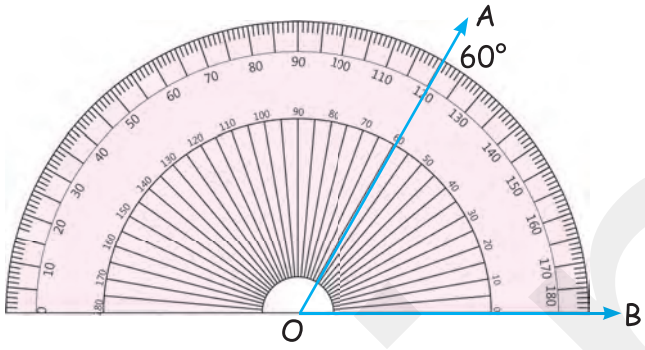
Solved Examples

Example 1 : Measure $\angle AOB$.

Solution : To measure angle, follow the steps given below:

Step 1 : Place the protractor on the angle in such a way that its central point, lies on O and horizontal edge lies on arm OB.





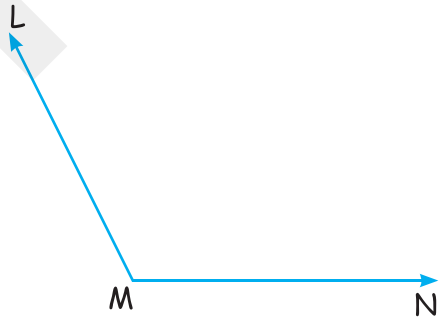
Step 2 : Observe the protractor and see that arm OA passes through 60°.

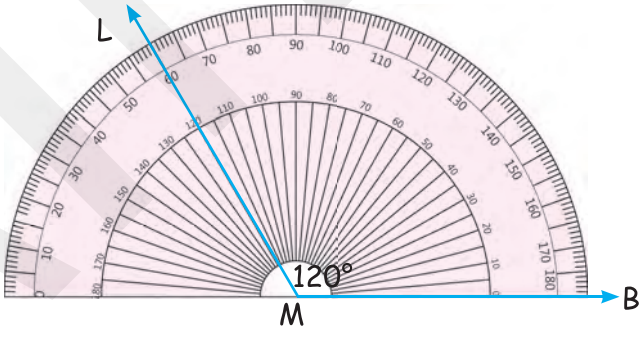
$\therefore$ Measure of $\angle AOB = 60°$.

Example 2 : Measure $\angle LMN$.

Solution :

Step 1 : Place the protractor on the angle in such a way that its central point lies on M and horizontal edge lies on are MN.

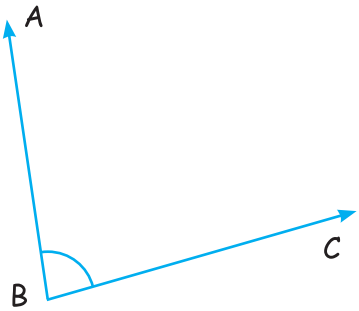


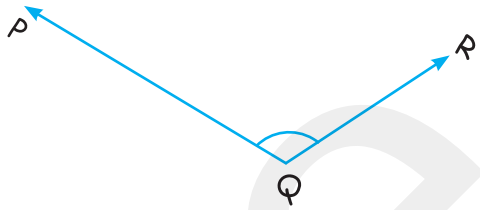


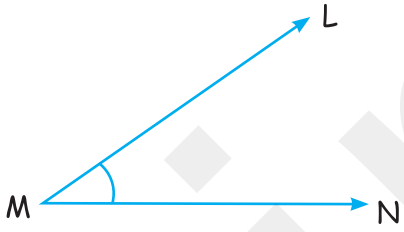
Step 2 : Observe the protractor and see that arm LM passes through 120°

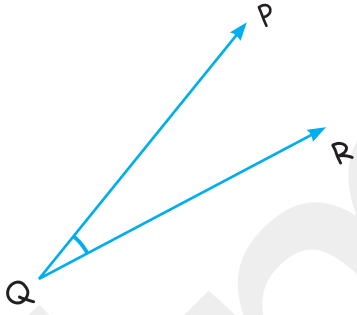
$\therefore$ Measure of $\angle LMN = 120°$.

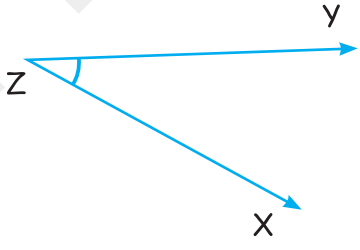
Note : Sometimes, we have to measure an angle given in any of the positions given below.

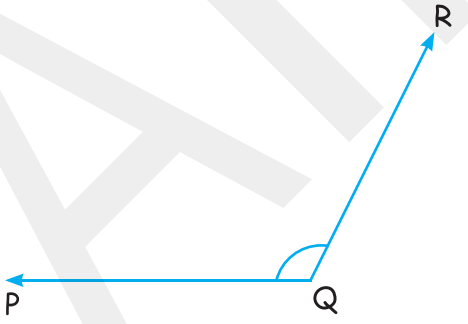




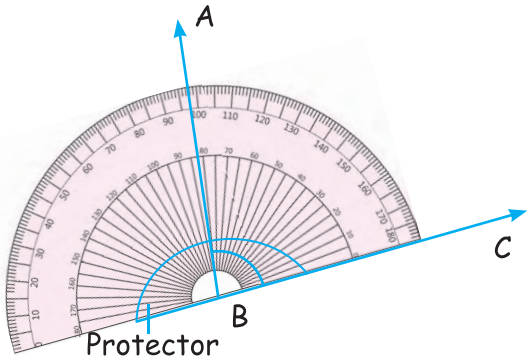


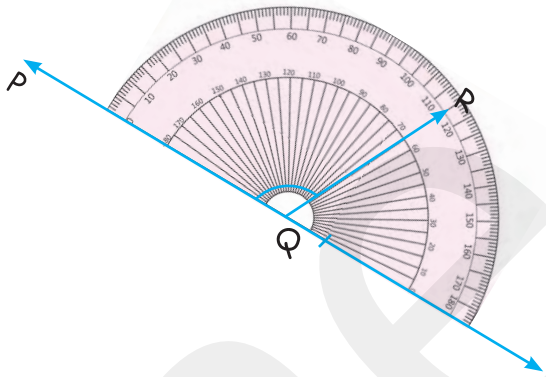


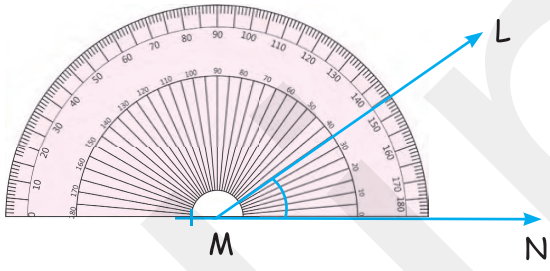


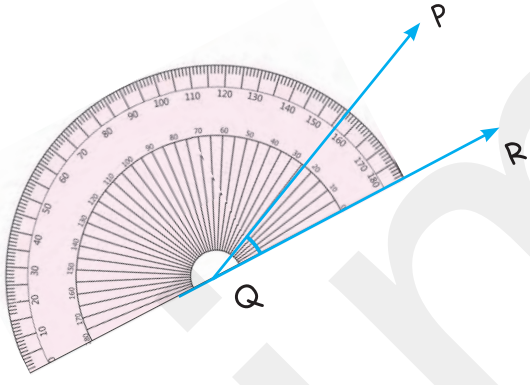


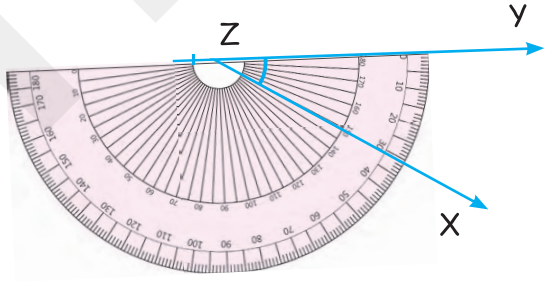
For this, place the central point of the protractor on the angle.
Thus, in the given positions, protractor can be placed in the directions as shown.

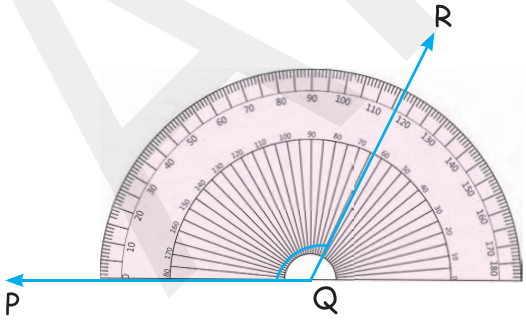








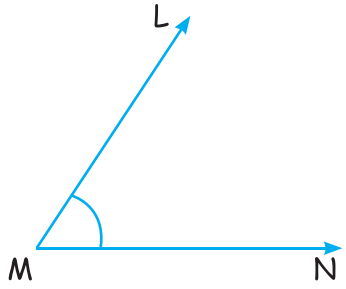




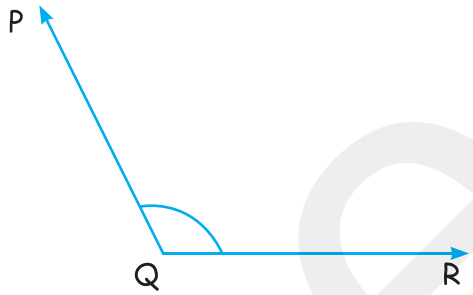
Exercise 13.2

1. Measure the following angles using a protractor.

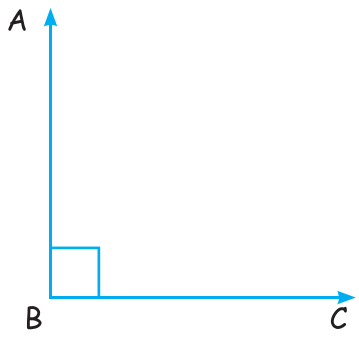
(a)



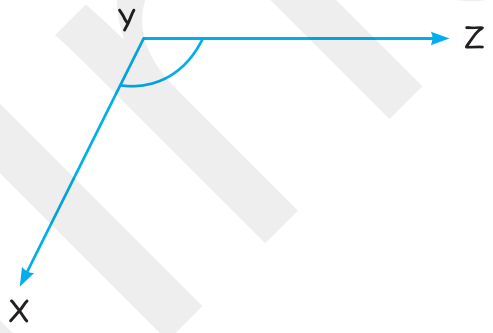
(b)



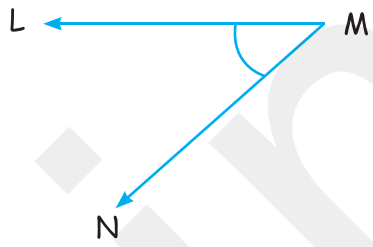
(c)



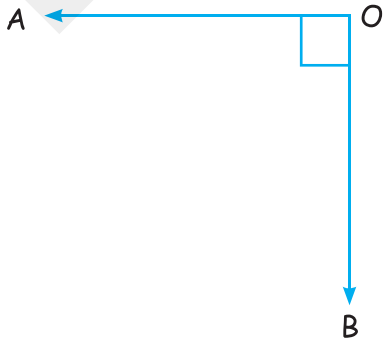
(d)



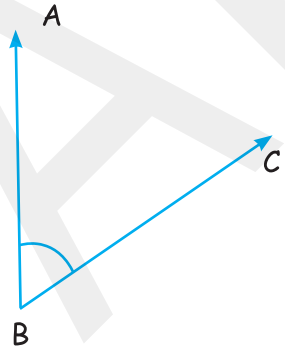
(e)



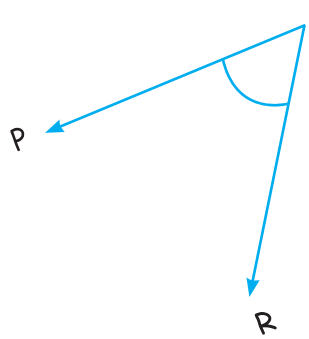
(f)



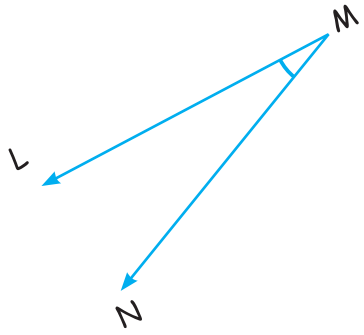
(g)



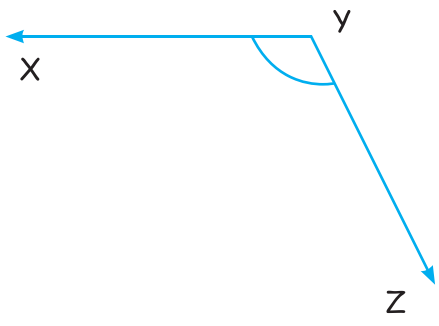
(h)



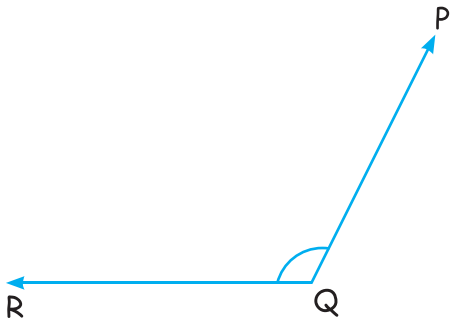
(i)



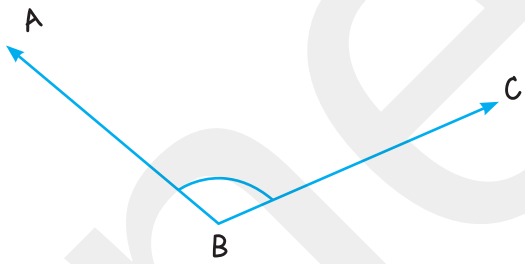
(j)



(k)



(l)



Drawing Angles Using Protractor

Solved Examples

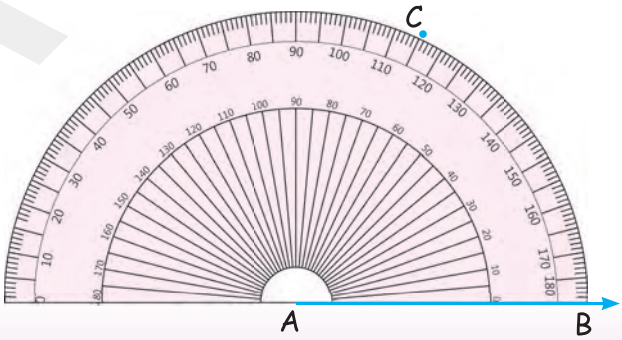
Example 1 : Draw an angle of 65° using ruler and protractor.

Solution : To construct an angle of 65°, follow the steps given below:

Step 1 : Draw a ray $\overrightarrow{AB}$.

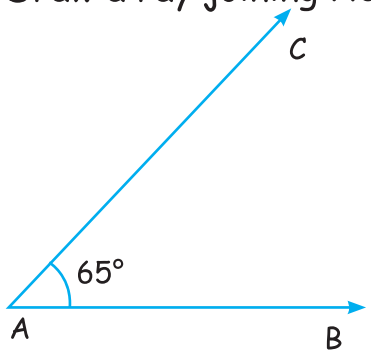
Step 2 : Place the protractor on the ray $\overrightarrow{AB}$ in such a way that its central point lies on point A and its horizontal edge lies on AB.

Step 3 : Mark the point on 65° and mark it as C.



Step 4 : Remove the protractor.

Step 5 : Draw a ray joining AC using ruler.



$\angle CAB$ is the required angle, such that $\angle CAB = 65°$.

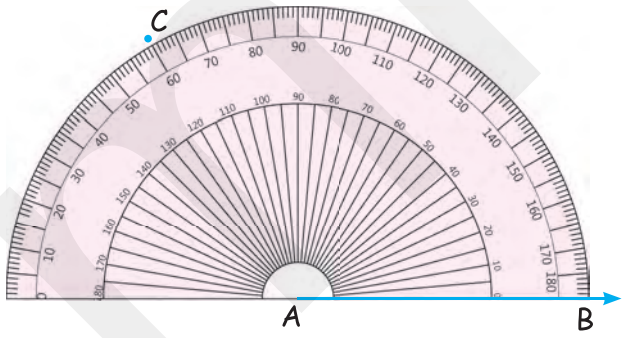
Example 2 : Draw an angle of 120° using ruler and protractor.

Solution : To construct an angle of 120°, follow the steps given below.

Step 1 : Draw a ray $\overrightarrow{AB}$.

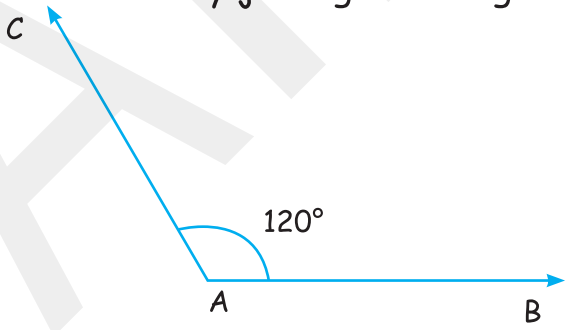
Step 2 : Place the protractor on the ray $\overrightarrow{AB}$ in such a way that its central point lies on point A and its horizontal edge lies on AB.

Step 3 : Mark the point on 120° and mark it as C.



Step 4 : Remove the protractor.

Step 5 : Draw a ray joining AC using ruler.



$\therefore \angle CAB$ is the required angle, such that $\angle CAB = 120°$.

Exercise 13.3

1. Use protractor to construct the following angles.

(a) 75°	(b) 120°	(c) 85°
(d) 125°	(e) 90°	(f) 100°
(g) 50°	(h) 29°	(i) 150°
(j) 57°	(k) 20°	(l) 170°

Think Wisely

The hands of a clock form a right angle at 9 pm.

At what time again will a right angle be formed by the hands? _____

Mental Maths

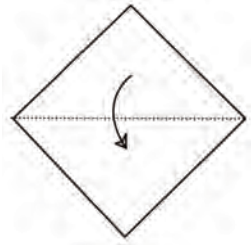
Answer the following in one word.

1. An instrument used for constructing or measuring angles. _____
2. Angles are measured in _____.
3. The measure of an angle is more than 0° but less than 90°. _____
4. An angle that measures less than a right angle. _____
5. An angle that measures equal to 90°. _____

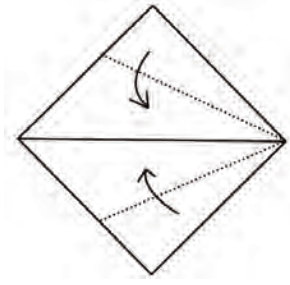
Maths Lab Activity

Materials required: Square sheet of origami paper (about 12 cm x 12 cm) with one blue and one side black.

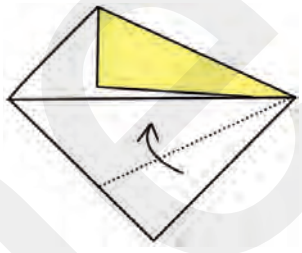
Steps:



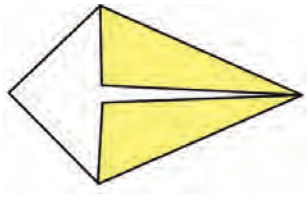
1 Fold and unfold to make a centre crease.



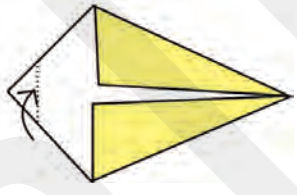
2 Fold along the dotted lines to the centre line.



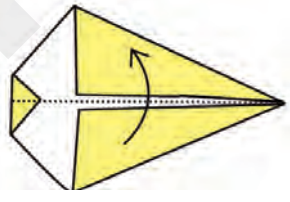
3 .... like this



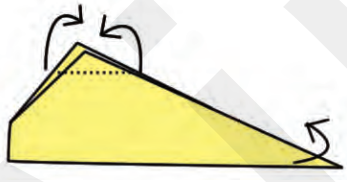
4 .... like this



5 Fold the left corner along the dotted line.

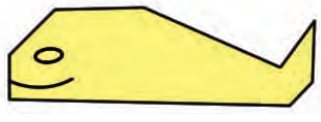


6 Fold in half along the dotted line.



7 Fold both the upper tips inside and fold the right tip backwards to make the tail.

8 .... like this



9 Draw an eye and mouth. Your whale is ready.

How many right, acute and obtuse angles can you see in the whale? _____

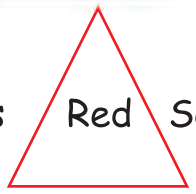
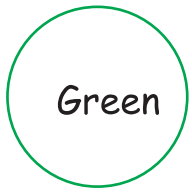
14 Circles

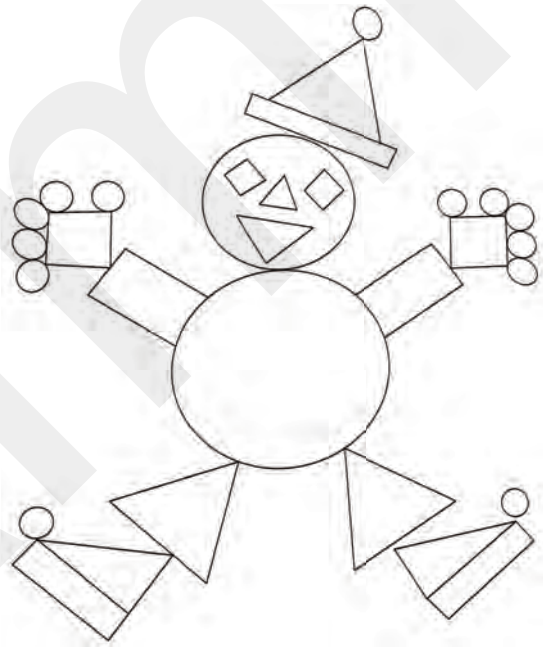
Learning Objectives

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

- Know the terms related to the circle.
- Draw a circle with the help of a compass.
- Find the radius, diameter and circumference of a circle.

Warm-Up Colour the clown as instructed.

Triangles  Red Squares  Yellow Rectangles  Blue Circles  Green



Count the number of Circles in the above clown - _____

Teacher's Note: Ask students to list some objects around them which are circular in shapes such as a lid of a water bottle or a bangle etc.

A circle is a closed curve whose all the points are at the same distance from a fixed point inside it.

Terms Related To Circle

Centre

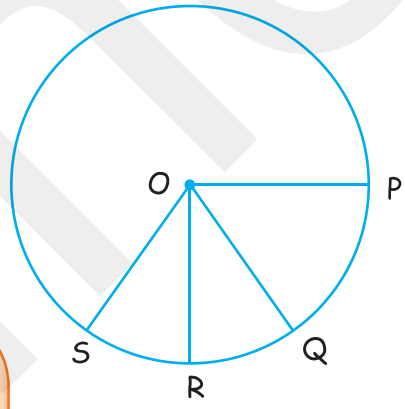
The fixed point inside the circle is known as centre of the circle.

In the given figure, O is the centre of the circle.

Radius

The fixed distance from the centre of the circle to any point on the circle is known as its radius.

In the given figure, OP is the radius of the circle.



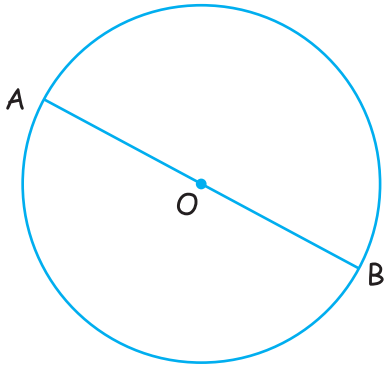
Also, OQ = OR = OS are the radii of the circle.

Plural of radius is radii.

Diameter

The line segment passing from the centre of the circle having its end points on the circle, is known as the diameter of the circle.

All the diameters of a circle are of equal length. In the given figure, AB is the diameter of a circle.



Clearly, AB = OA + OB

But, OA = OB (∵ Radius of circle)

∴ AB = 2 × OA

∴ Diameter = 2 × Radius

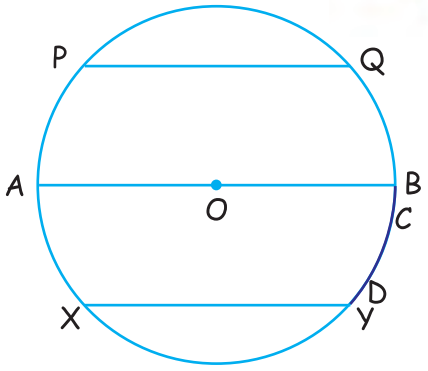
Chord:

The line segment having its end points on the circle, is known as chord of the circle.

All the chords of a circle may or may not be of equal length.

In the given figure, PQ, AB, CD and XY are the chords of the circle.

Infact, diameter is the longest chord of the circle.

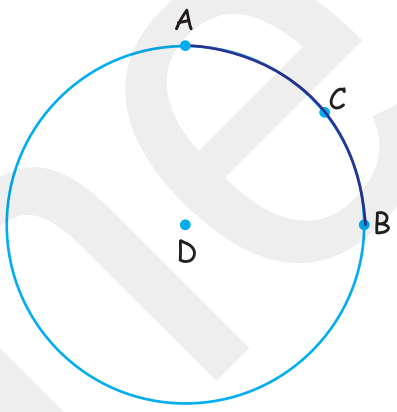


Arc:

Any part of a circle is known as an arc of a circle.

Usually, we name the arc by 3 points.

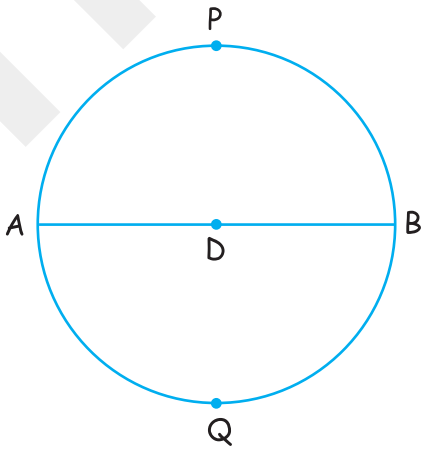
In the givern figure, ACB is an arc of a circle.



Semi-Circle:

The diameter of a circle divides the circle into two equal parts. Each part is known as semi-circle i.e. half of the circle.

In the given figure, APB and AQB are two semi-circles.



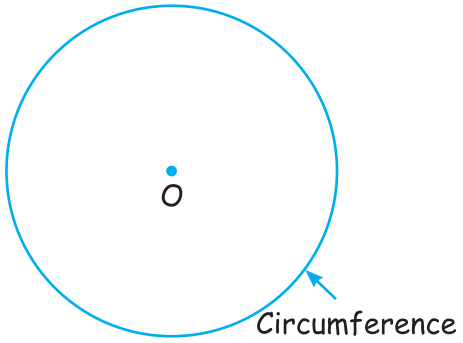
Circumference:

The length of the boundary of the circle (i.e. perimeter of the circle) is known as the circumference of the circle.

Circumference of a circle
= π × Diameter of a circle
= 2 π × Radius of a circle
= 2 π r

π is read as pie.

The value of pie is $\frac{22}{7} = 3.14$



Facts to Know

A circle has the shortest perimeter of all shapes with the same area.

Concentric Circles:

Circle within the circle, having the same centre but different radii are known as concentric circles.

Formulae

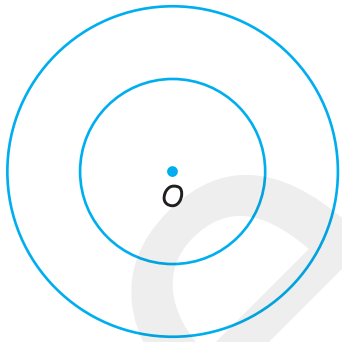
Circumference = $\pi \times$ Diameter
= $2 \times \pi \times$ Radius

Radius = $\frac{\text{Diameter}}{2}$

Radius = $\frac{\text{Circumference}}{2\pi}$

Diameter = $2 \times$ Radius

Diameter = $\frac{\text{Circumference}}{\pi}$



Solved Examples

Example 1 : Find the radius of a circle, if diameter is 10 *cm*.

Solution : Diameter = 10 *cm*

Radius = $\frac{\text{Diameter}}{2}$

= $\frac{10}{2}$ *cm*

= 5 *cm*

Example 2 : Find the diameter of a circle, if radius is 3 *cm*.

Solution : Radius = 3 *cm*

Diameter = $2 \times$ Radius

= 2×3 *cm*

= 6 *cm*

Example 3 : Find the circumference of the circle, if its radius is 7 *cm*.

(Take $\pi = \frac{22}{7}$)

Solution : Radius = 7 *cm*

Circumference = $2\pi r$

= $2 \times \frac{22}{7} \times 7$

= 44 *cm*

Example 4 : Find the circumference of the circle, whose radius is 12 *cm*. (Take $\pi = 3.14$)

Solution : Radius = 12 *cm*

Circumference = $2\pi r$

$= 2 \times 3.14 \times 12$

$= 75.36$ *cm*

Example 5 : Find the radius of the circle, if the circumference is 24 *cm*. (Take $\pi = 3.14$)

Solution : Circumference = 24 *cm*

$$\text{Radius} = \frac{\text{Circumfrence}}{2\pi} = \frac{24}{2 \times 3.14}$$

$$= \frac{12}{3.14}$$

$= 3.82$ *cm*

Exercise 14.1

1. Find the radius of a circle, if

(a) Diameter = 14 *cm*

(b) Diameter = 9 *cm*

(c) Circumference = 44 *cm* (Take $\pi = \frac{22}{7}$)

(d) Circumference = 31.4 *cm* (Take $\pi = 3.14$)

2. Find the diameter of a circle, if

(a) Radius = 4.2 *cm*

(b) Radius = 8 *cm*

(c) Circumference = 44 *cm* (Take $\pi = \frac{22}{7}$)

(d) Circumference = 28.26 *cm* (Take $\pi = 3.14$)

3. Find the circumference of a circle, if diameter is as follows.

(a) 42 *cm* (b) 63 *cm* (c) 5.6 *cm* (d) 14.70 *cm*

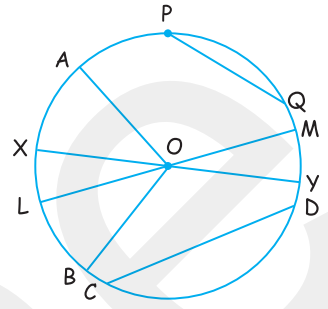
(Take $\pi = \frac{22}{7}$ in each case)

4. Find the circumference of a circle, if radius is as follows.

(a) 6 *cm* (b) 15 *cm* (c) 53 *cm* (d) 21 *cm*

(Take π = 3.14 in each case)

5. The following figure shows a circle with centre 'O'. Classify the line segments drawn in the circle as radius, chord, diameter and arc.



(a) OA = ... (f) OX = ...

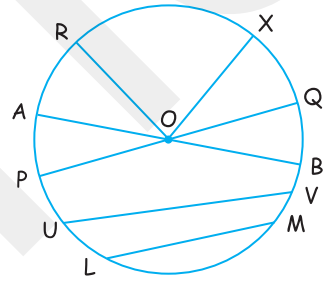
(b) OB = ... (g) CD = ...

(c) PQ = ... (h) OY = ...

(d) XY = ... (i) LM = ...

(e) BCD = ... (j) MYD = ...

6. In the given circle, name the following.



(a) Centre of the circle (b) Radii of the circle

(c) Diameters of the circle (d) Chords of the circle

Drawing A Circle With The Help of A Compass

This is a compass. It is used to draw circles.

You will find compass in your geometry box.

Solved Examples

Example 1 : Draw a circle of radius 4 *cm*.

Solution :

Objective : To draw a circle of r = 4 *cm*.

Material Required:

- Sharp pencil
- Ruler
- Compass

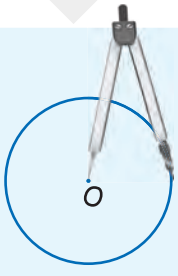
Steps of construction:

Step 1 : Fix a sharp pointed pencil in the pencil holder of the compass firmly.

Step 2 : Fix the metal tip of the compass on the ruler at 0 *cm* and open out the compass in such a way that its pencil tip is on 4 *cm*.

Step 3 : Mark a point 'O' as a centre of the circle on the plain paper.

Step 4 : Firmly fix the metal tip of the compass on the centre '0' of the circle and move the pencil point around to draw a circle of radius 4 *cm*.



Example 2 : Draw a circle of diameter 6 *cm*.

Solution :

Objective : To draw a circle of diameter 6 *cm*. We have to find its radius.

$$\text{Radius} = \frac{\text{Diameter}}{2}$$

$$\text{Radius} = \frac{6}{2} = 3 \text{ cm}$$

Quick Tip

It should be taken care that the pencil lead is aligned with the compass's needle.

Material Required:

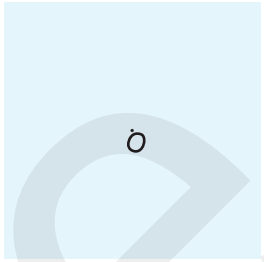
- Sharp pencil
- Ruler
- Compass

Steps of construction:

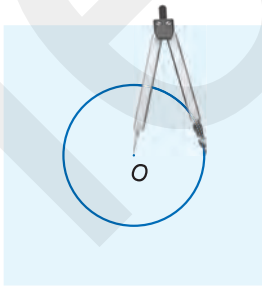
Step 1 : Fix a sharp pointed pencil in the pencil holder of the compas firmly.

Step 2 : Fix the metal tip of the compass on the ruler at 0 *cm* and open out the compass in such a way that its pencil tip is on 3 *cm*.

Step 3 : Mark a point 'O' as a centre of the circle on the plain paper.



Step 4 : Move the pencil point around to draw the circle of radius 3 cm after fixing metal tip of the compass on the centre 'O'..



Exercise 14.2

1. Draw the circles of follwing radius.

(a) 3 *cm* (b) 3.2 *cm* (c) 2.5 *cm* (d) 5.3 *cm*

(e) 5 *cm* (f) 4 *cm* (g) 4.5 *cm* (h) 2.2 *cm*

2. Draw the circles whose diameter is as follows.

(a) 10 *cm* (b) 15 *cm* (c) 12 *cm* (d) 14.4 *cm*

(e) 8 *cm* (f) 15.2 *cm* (g) 7 *cm* (h) 7.4 *cm*

Think Wisely

The Parliament House in New Delhi is a circular building with a radius of about 85.5 metres. What is the diameter of the building?

Mental Maths

Fill in the blanks.

1. The length of the boundary of the circle is _____.
2. Half of a circle is called a _____.
3. Any part of a circle is known as an _____ of a circle.
4. Diameter is the longest _____ of the circle.
5. The distance around a circle is called _____.

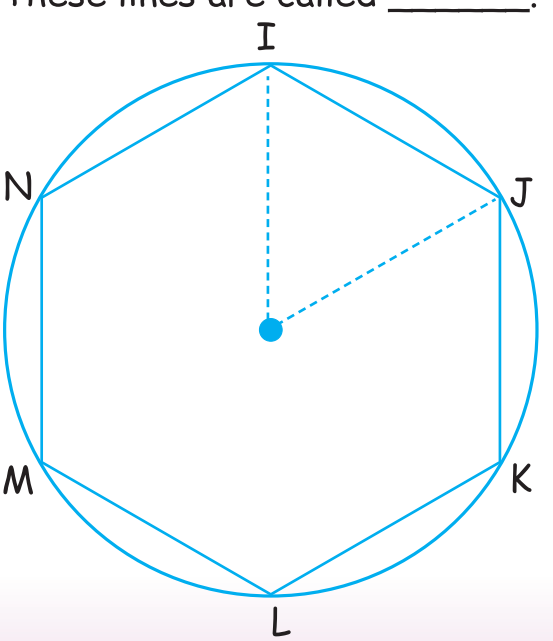
Maths Lab Activity

Materials required: Pencil, a compass and a sheet of paper.

Steps:

Draw a circle with any convenient radius. Using the same radius and starting from any point I on the circumference, draw an arc to intersect the circle at six different points (see figure). Answer the question given below.

1. Join point to point to get six different _____.
2. Mark the centre. Join each point to the centre. These lines are called _____.
3. IOJ is a _____.
4. There are _____ triangles in the design.
5. IOL is the _____ of the circle.
6. Measure of IO = _____.
7. Measure of IOJ = _____.
8. All angles at O, together measure _____.
9. Which lines are parallel in the circle?
10. Colour each part in a different colour.



15 Area and Volume

Learning Objectives

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

- Find the area of square and rectangle.
- Calculate the volume of cube and cuboid.
- Know the units of area and volume.

Warm-Up

Observe the picture and read the given information carefully.

What is the Perimeter of the zoo? _____

Teacher's Note:

Draw two shapes A and B on the blackboard. Ask the students which shape covers more surface on the blackboard and introduce the concept of Area.

Area

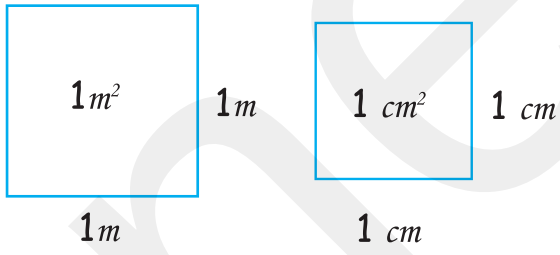
The measure of the amount of surface enclosed by closed boundaries is known as area of that surface.

Units of Area

Area is always measured in square units.

For example: m^2 or $sq\ m$,

cm^2 or $sq\ cm$, etc.



Conversion

(i) If 1 m = 100 cm

then, 1 $sq\ m$ = 100 × 100 $sq\ cm$

= 10,000 $sq\ cm$

(ii) If 1 cm = 100 mm

then, 1 $sq\ cm$ = 10 × 10 $sq\ mm$

= 100 $sq\ mm$.

Similarly, we can do for other conversions.

Area of A Rectangle And A Square

Formulas: **(i)** Area of a Rectangle = (Length × Breadth) sq. units

(ii) Length = $\left(\frac{\text{Area}}{\text{Breadth}}\right)$ unit

(iii) Breadth = $\left(\frac{\text{Area}}{\text{Length}}\right)$ unit

(iv) Area of a Square = (Side × Side) sq. units

Solved Examples

Example 1 : Find the area of a rectangle whose length = 60 *cm* and breadth = 20 *cm*.

Solution : Area of a rectangle = Length × Breadth

= (60 × 20) cm^2

= 1200 cm^2

Example 2 : Find the length of a rectangular field, if its area is 6520 m^2 and breadth is 40 *m*.

Solution : Length = $\left(\frac{\text{Area}}{\text{Breadth}}\right)$

= $\frac{6520}{40}$

= 163 *m*

Example 3 : Find the breadth of a rectangular field, whose area is 1280 m^2 and length is 40 *m*.

Solution : Breadth = $\left(\frac{\text{Area}}{\text{Length}}\right)$

= $\frac{1280}{40}$

= 32 *m*

Example 4 : Find the area of a rectangular plot of land with 73 *m* length and breadth 42.5 metres.

Solution : Length of the plot = 73 *m*

Breadth = 42.5 *m*

Area = Lenght × Breadth

= (73×42.5) *sq. m.*

= 3102.5 *sq. m.*

Hence, the area of the plot is 3102.5 m^2.

Example 5 : The length of a rectangle is 2.8 metres and its breadth is 84 *cm*. Find the area of the rectangle in *sq. cm* as well as in sq metres.

Solution : (i) Area of the rectangle in *sq. cm.*

Length of the rectangle = 2.8 metres

= (2.8×100) *cm*

= 280 *cm*

Breadth of the rectangle = 84 *cm*

Area of the rectangle (in *sq. cm.*) = Lenght × Breadth

= (280×84) *sq. cm.*

= 23, 520 *sq. cm.*

(ii) Area of the rectangle in *sq. metres.*

Length of the rectangle = 2.8 metres

Breadth of the rectangle = 84 *cm*

$= \frac{84}{100} m = 0.84\ m$

Area of the rectangle (in *sq. m.*)

= (2.8×0.84) *sq. m.* = Lenght × Breadth

= 2.3520 *sq. m.*

Example 6 : Find the area of a square of side 2.5 *m*.

Solution : Area of a square = side × side

= (2.5 × 2.5) m^2

= 6.25 m^2

Example 7 : A rectangular block 30 *m* long and 20 *m* broad is to be paved with bricks of length 16 *cm* and breadth 15 *cm*. Find the number of bricks required.

Solution : Length of rectangular block = 30 *m* = (30 × 100) *cm* = 3000 *cm*

Breadth of rectangular block = 20 *m* = (20 × 100) *cm* = 2000 *cm*

Area of rectangular block = Length × Breadth

= (3000 × 2000) cm^2

Length of a brick = 16 cm

Breadth of a brick = 15 cm

Area of a brick = (16 × 15) cm^2

∴ Number of bricks required

$$= \frac{\text{Area of a rectangular block}}{\text{Area of a brick}}$$

$$= \frac{3000 \times 2000}{16 \times 15}$$

= 25,000

Hence, 25,000 bricks are required.

Quick Tip

While calculating area, both length and breadth should be expressed in the same unit.

Example 8 : Find the area of a square whose perimeter is 72 cm.

Solution : Perimeter of a square = 72 cm

Side of a square = 72 ÷ 4 = 18 cm

Area of a square = Side × Side

= (18 × 18) cm^2

= 324 cm^2

∴ Area of a square is 324 cm^2.

Example 9 : Find the cost of painting a wall of length 55 m and breadth 40 m at the rate of ₹ 2 per $sq\ m$.

Solution : Area of wall = Length × Breadth

= (55 × 40) m^2

= 2200 m^2

Cost of painting wall = 2200 × 2

= ₹ 4400

Hence, cost of painting wall is ₹ 4400.

Example 10 : Find the number of bricks to be laid in a square path of side 24 *cm*, if the side of each brick is 4 *cm*.

Solution :

Side of square path = 24 *cm*.

Area of square path = Side × Side

= (24 × 24) *sq. cm.*

Side of each brick = 4*cm*

Area of each brick = (4 × 4) *sq. cm.*

$$\text{No. of bricks} = \frac{\text{Area of square path}}{\text{Area of each brick}}$$

$$= \frac{\overset{6}{\cancel{24}} \times \overset{6}{\cancel{24}}}{\cancel{4} \times \cancel{4}}$$

= 36 bricks

Exercise 15.1

1. Find the area of a rectangle of the following length and breadth.

(a) Lenght = 15 *cm*, Breadth = 12 *cm*

(b) Length = 16.5 *cm*, Breadth = 10.2 *cm*

(c) Length = 2.6 *m*, Breadth = 70 *cm*

(d) Length = 3 *cm*, Breadth = 42 *mm*

2. Find the area of a square of the following side.

(a) Side = 18 *cm* (b) Side = 42 *m*

(c) Side = 21.50 *cm* (d) Side = 50.6 *cm*

3. Find the length of a rectangle whose.

(a) Area = 615 cm^2, Breadth = 15 *cm*

(b) Area = 1028.3 m^2, Breadth = 22.6 *m*

4. Find the breadth of a rectangle whose.

(a) Length= 18.65 *cm*, Area = 234.244 cm^2

(b) Length = 88 *m*, Area = 3960 m^2

5. Find the side of a square whose.

(a) Area = 256 cm^2 (b) Area = 324 m^2

6. Find the area of a square whose perimeter is 180 m.

7. Find the cost of painting a square board of side 48 cm at the rate of ₹ 5 per $sq.\ m$.

8. How many stone pieces of length 15 cm and 12 cm wide are required to cover a path of 240 cm long and 36 cm long?

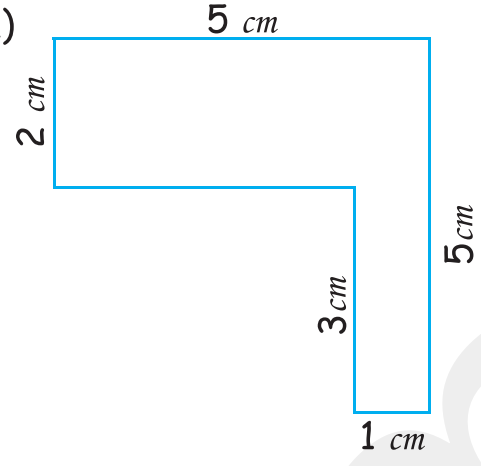
9. What is the cost of painting a wall of height 12.46 m and width 5 m at the rate of ₹ 4 per $sq.\ m$.?

10. Find the breadth of a rectangular field whose area is 285 m^2 and length is 19 m.

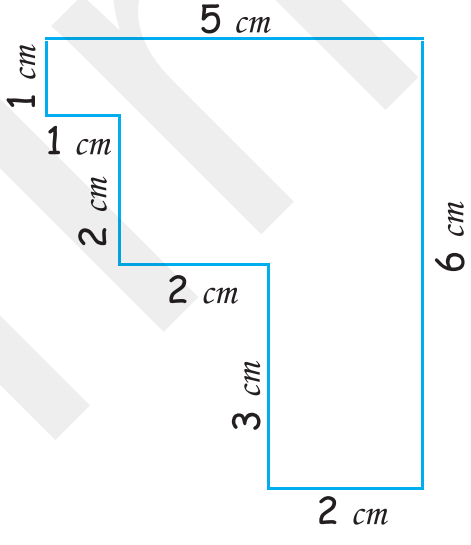
11. Find the length of a rectangle whose area is 204 cm^2 and breadth is 12 cm.

12. Find the area of the following figures.

(a)



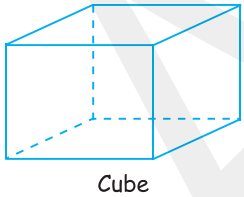
(b)



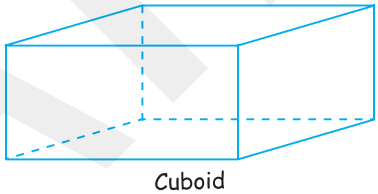
Volume

The objects that have the definite size and shape are called solids.

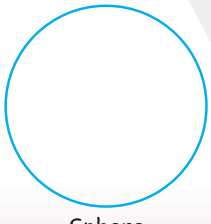
Some of the solid objects are shown below.



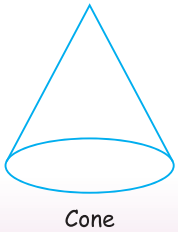
Cube



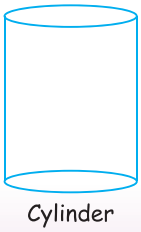
Cuboid



Sphere



Cone



Cylinder

Facts to Know

A cuboid is also called a rectangular prism

These solid objects occupies a certain amount of space, known as volume.

Units of Volume

(i) If the edge of a cube is 1 cm, then its volume is,

= 1 cubic centimeter

or, 1 $cu\ cm$

or, 1 cm^3

(ii) If the edge of a cube is 1 m, then its volume is,

= 1 cubic metre

or, 1 $cu\ m$

or, 1 m^3

Similarly, we can do for other units.

Volume of A Cuboid And A Cube

Formulas: **(i)** Volume of a Cuboid = (Length × Breadth × Height) cubic units

(ii) Volume of a cube = (Side × Side × Side) cubic units

Solved Examples

Example 1 : Find the volume of a cuboid whose length, breadth and height are 15 cm, 12 cm and 5.6 cm, respectively.

Solution : Length of a cuboid = 15 cm

Breadth of a cuboid = 12 cm

Height of a cuboid = 5.6 cm

Volume of a cuboid = Length × Breadth × Height

= 15 × 12 × 5.6 cm^3

= 1008 cm^3

Example 2 : Find the volume of a cube whose side is 12.30 cm.

Solution : Side = 12.30 cm

Volume of a cube = Side × Side × Side

$= 12.30 \times 12.30 \times 12.30\ cm^3$

$= 1860.867\ cm^3$

Example 3 : Find the volume of a cuboid whose dimensions are $15\ m \times 12\ m \times 5\ m$.

Solution : Volume of a cuboid $= 15 \times 12 \times 5\ m^3$

$= 900\ m^3$

Example 4 : How many cubical boxes of side $2\ cm$ can be accomodated in a cartoon of dimensions $50\ cm \times 38\ cm \times 24\ cm$?

Solution : Volume of cubical box = Side × Side × Side

$= 2 \times 2 \times 2\ cm^3$

Volume of a carton = Length × Breadth × Height

$= 50 \times 38 \times 24\ cm^3$

$\therefore$ Number of boxes $= \dfrac{\text{Volume of 1 carton}}{\text{Volume of 1 cubical box}}$

$= \dfrac{50 \times 38 \times 24}{2 \times 2 \times 2}$

$= 5700$

Hence, 5700 cubical boxes can be accomodated in a given cartoon.

Example 5 : Find the volume of a cuboid of dimensions $15\ cm \times 60\ mm \times 8\ cm$.

Solution : Length of a cuboid $= 15\ cm$

Breadth of a cuboid $= 60\ mm$

$= \dfrac{60}{10}\ cm$ $\quad (\because 10\ mm = 1\ cm)$

$= 6\ cm$

Height of a cuboid $= 8\ cm$

Volume of a cuboid = Length × Breadth × Height

$= (15 \times 6 \times 8)$ *cubic cm*

$= 720$ *cubic cm*

Example 6 : Find the volume of a cuboid of dimensions $22\ mm \times 0.5\ cm \times 15\ mm$ in *cubic cm*.

Solution : We know that, 10 *mm* = 1 *cm*

Length of a cuboid = 22 *mm*

$= \frac{22}{10}$ *cm* = 2.2 *cm*.

Breadth of a cuboid = 0.5 *cm*

Height of a cuboid = 15 *mm*

$= \frac{15}{10}$ *cm* = 1.5 *cm*

Volume of a cuboid = Length × Breadth × Height

= (2.2 × 0.5 × 1.5) *cubic cm.*

= 1.65 *cubic cm.*

Example 7 : How many bricks are required of each 30 *cm* long, 25 *cm* wide and 15 *cm* thick to build a wall of 15 *m* long, 4.5 *m* high and 50 *cm* thick?

Solution : Length of the wall = 15 *m*

= (15 × 100)*cm* (∵ 1*m* = 100 *cm*)

= 1500 *cm*

Breadth of the wall = 50 *cm*

Height of the wall = 4.5 *m*

= (4.5 × 100)*cm*

= 450 *cm*

Volume of the wall = Length × Breadth × Height

= (1500 × 50 × 450) *cu. cm.*

Length of a brick = 30 *cm*

Breadth of a brick = 25 *cm*

Thickness of a brick = 15 *cm*

Volume of a brick = Length × Breadth × Height

= (30 × 25 × 15) *cu. cm.*

∴ The number of bricks required $= \frac{\text{Volume of the wall}}{\text{Volume of a brick}}$

$= \frac{(1500 \times 50 \times 450)}{(30 \times 25 \times 15)}$

= 3,000

Hence, 3,000 bricks are needed.

Example 8 : How many boxes of each size 15 *cm* × 5 *cm* × 9 *cm* can be packed in a cartoon of size 75 *cm* × 60 *cm* × 45 *cm*?

Solution :

Length of the box = 15 *m*
Breadth of the box = 5 *cm*
Height of the box = 9 *cm*
∴ Volume of each box = Length × Breadth × Height
= (15 × 5 × 9) *cu. cm.*
Length of the cartoon = 75 *cm*
Breadth of the cartoon = 60 *cm*
Height of the cartoon = 45 *cm*
∴ Volume of the cartoon = Length × Breadth × Height
= (75 × 60 × 45) *cu. cm.*

$$\therefore \text{Required number of boxes} = \frac{\text{Volume of the cartoon}}{\text{Volume of each box}}$$

$$= \frac{75 \times 60 \times 45}{15 \times 5 \times 9}$$

= 300

Hence, 300 boxes can be packed in a cartoon.

Exercise 15.2

1. Find the volume of a cuboid whose dimensions are as follows.

(a) Lenght = 18 *cm*, Breadth = 15 *cm*, Height = 7 *cm*

(b) Length = 10 *cm*, Breadth = 8 *cm*, Height = 6.2 *cm*

2. Find the volume of a cube whose edge is.

(a) 12 *cm* (b) 8 *cm* (c) 6.5 *m* (d) 18.3 *m*

3. Find the volume of a cuboid whose dimensions are 17 cm × 14 cm × 4.2 *cm*.

4. A piece of wood 20 *m* × 15 *m* × 5 *m* is cut into small square pieces of size 5 *cm* each. How many such pieces can be made from it?

5. Find the volume of a cube of side 11 *cm*.

6. Find the volume of a cuboid of dimensions 14 *cm* × 50 *mm* × 10 *cm*.

7. Find the volume of a cuboid of dimensions 17 *mm* × 0.2 *cm* × 12 *mm* in *cu. cm*.

8. Find the volume of oil that can be poured into a container of dimensions 12 *cm* × 8 *cm* × 6.5 *cm*.

9. How many boxes, each of size 24 cm × 8 cm × 25 cm can be packed in a cartoon of size 18 m × 2.5 m × 40 cm?

10. How many bricks of each size 12 cm long, 8 cm wide and 6 cm thick will be required to build a partition of 60 cm long, 48 cm high and 36 cm thick?

Think Wisely

A 15 cm by 10 cm picture is put in a frame of 18 cm by 12 cm. Does the picture take up less or more of the area than the frame?

Mental Maths

Fill in the blanks.

1. The formula for the area of a rectangle is _____.
2. Volume of a cuboid = _____.
3. The area of a figure is measured in _____.
4. The objects that have a definite size and shape are called _____.

Maths Lab Activity

Materials required: Sheet of drawing paper, scale, pencil, a pair of scissors, and tape to hold the folds together.

Steps:

1. Draw the figure shown alongside, having 6 equal square surfaces of side 5 cm on a thick sheet of paper.
2. Cut along the bold lines and fold on the dotted lines to make a cube.
3. Use tape to hold the cube.
4. Now make an observation table.

   Area of all the surface = _____

   Volume of the cube = _____

   The cube can be coloured and numbered to make it look like a dice to play.