Chapter 1

Unit-I : Number and Fundamental Operations

Large Numbers

Learning Objectives :

❖ Extension of Numbers ❖ 7-Digit Numbers ❖ Further Extension of Numbers in Indian System ❖ Reading and Wording Large Numbers ❖ Successor and Predecessor of Numbers ❖ Comparison of Numbers ❖ Greatest Number and Smallest Number ❖ Further Extension of Numbers in the International System ❖ Comparison Indian and International System of Numeration ❖ Rounding Off Numbers

Extension of Numbers

We have extended the numbers upto lakhs till now. In 6-digit numbers, there are periods of ones, thousands and lakhs and places are ones, tens, hundreds, thousands, ten thousands and lakhs.

7-Digit Numbers

When we add 1 to the largest 6-digit number, we get ten lakh :

$$9,99,999 + 1 = 10,00,000$$

10,00,000 is read as ten lakh. It is the smallest number of 7-digit.

Writing a 7-Digit Number in the Indian and International Place Value System

How will we write 10,00,000 in the Indian place value system ?

Periods →	Lakhs		Thousands		Ones		
Places →	TL	L	TTh	Th	H	T	O
	1	0	0	0	0	0	0

In words, 10,00,000 is written as ten lakh.

Fact File

TTh stands for ten thousands and TL stands for ten lakhs.

Example 1 : Write the number 4290516 in the place value chart.
Also write it with commas and in words.

Solution :

Lakhs		Thousands		Ones		
TL	L	TTh	Th	H	T	O
4	2	9	0	5	1	6

With commas :

42, 90, 516

Forty two lakh | Ninety thousand | Five hundred sixteen

Fact File

Digits in the same period are read together.

Use commas to separate the periods. We start from the right. We group the digits in three and then in twos.

In the International place value system, the periods are ones, thousands and millions. Three digits are placed in each period.

Periods →	Millions			Thousands			Ones		
Places →	Hundred Millions	Ten Million	Million	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones

Example 2 : Write the number 4290516 in the International place value chart. Also write it with commas and in words.

Solution :

Millions	Thousands			Ones		
Million	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
4	2	9	0	5	1	6

With Commas : 4,290,516

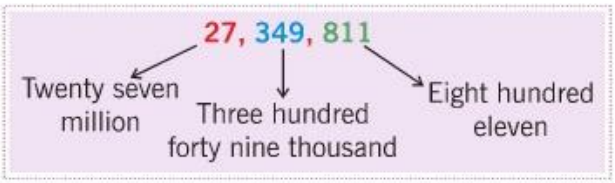
In words : four million two hundred ninety thousand five hundred sixteen

Example 3 : Write the number 27349811 in the international place value system.

Solution :

Millions		Thousands			Ones		
Ten Million	Million	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
2	7	3	4	9	8	1	1

With commas :



In words : Twenty seven million three hundred forty nine thousand eight hundred eleven.

We read the digits in the same period together.

Exercise 1.1

Put commas to show the Indian periods :

1. 6403115
2. 1001100
3. 9123312

☞ Put commas to show the international periods :

4. 2415396 **5.** 1964732 **6.** 4053612

☞ Write Indian place value of each digit in :

7. 4356213 **8.** 9720157 **9.** 6909805

☞ Write international place value of each digit in :

10. 4956243 **11.** 9208751 **12.** 3541470

☞ Write the number names in Indian Number System :

13. 4703955 **14.** 3456789 **15.** 8324967

☞ Write the number names in International Number System :

16. 6029347 **17.** 8490163 **18.** 2748955

☞ Write in numerals (Indian System) :

19. Eighteen lakh forty six thousand eight hundred thirty
20. Thirty five lakh ninety thousand five hundred sixty seven
21. Sixty four lakh eight thousand nine
22. Seventy lakh eighty thousand four hundred twenty
23. Eighty four lakh seven thousand fifty

☞ Write in numerals (International System) :

24. Four million three hundred twenty thousand _____
25. Five million seven hundred forty thousand seventy one _____
26. Eight million six hundred thousand three hundred two _____
27. Nine million eight thousand four hundred four _____

☞ Write in expanded form :

28. 19,64,732 **29.** 19,66,327 **30.** 24,25,035

☞ Write in short form :

31. 20,00,000 + 5,00,000 + 50,000 + 8,000 + 30 + 7
32. 70,00,000 + 30,000 + 6,000 + 500 + 80 + 1
33. 8,000,00 + 500,000 + 3,000 + 700 + 40
34. 4,000,000 + 800,000 + 40,000 + 5,000 + 800 + 50 + 8

➲ Further Extension of Numbers in Indian System

For numbers more than 7-digits, a period of crores is introduced to the left of the lakhs period. Unlike other periods the crores period may be have any number of places : crores, ten crores, hundred crores, thousand crores ..... .

INDIAN PLACE VALUE CHART

Crores (C)	Lakhs (L)	Thousands (Th)	Ones (O)	← Periods

Ten Thousand Crores 10000,00,00,000	Thousand Crores 1000,00,00,000	Hundred Crores 100,00,00,000	Ten Crores 10,00,00,000	Crores 1,00,00,000	Ten Lakhs 10,00,000	Lakhs 1,00,000	Ten Thousands 10,000	Thousands 1,000	Hundreds 100	Tens 10	Ones	← Places

Fact File

This is the recent system used in Indian Government and company offices. Previously hundred crores were called as Arabs and ten thousand crores as Kharabs.

We can see that the value of a place is 10 times the value of the place just to its right.
Also 100 Thousands = 1 Lakh 100 Lakhs = 1 Crore

Reading and Wording Large Numbers

First mark the commas showing the periods. The first three digits from the right form the ones period. The next two digits from the right form the thousands period. Again the next two digits from the right form the lakhs period. The remaining digits form the crores period.

For example : 537290846 is written as
53,72,90,846
To write it in words, we may put it as

In words : Fifty three crore, seventy two lakh, ninety thousand, eight hundred forty six.

Example 4 : Write the place value of each digit in the number 5197634028.
Solution : First we put commas to show the periods :

519,76,34,028

Place value of 8	=	8 ones	=	8
Place value of 2	=	2 tens	=	20
Place value of 0	=	0 hundred	=	0
Place value of 4	=	4 thousands	=	4,000
Place value of 3	=	3 ten thousands	=	30,000
Place value of 6	=	6 lakhs	=	6,00,000
Place value of 7	=	7 ten lakhs	=	70,00,000
Place value of 9	=	9 crores	=	9,00,00,000
Place value of 1	=	1 ten crores	=	10,00,00,000
Place value of 5	=	5 hundred crores	=	500,00,00,000

Exercise 1.2

☞ Put commas to show the Indian period :

1. 876543219 **2.** 36241230 **3.** 621758901

☞ Write place value (Indian System) of each digit in :

4. 34053612 **5.** 543785831 **6.** 1962451932

☞ Write in expanded form (Indian System) :

7. 23764192 **8.** 873432766 **9.** 6424250357

☞ Write the number-names in Indian System :

10. 51976342 **11.** 920875195 **12.** 2440542451

☞ Write the numerals for :

13. Five crore sixty seven lakh fifty one thousand seventy two. _____

14. Fourteen crore eighty thousand five hundred four. _____

15. Hundred ten crore seven lakh five thousand three. _____

16. Three hundred crore forty two lakh fifty seven thousand twenty. _____

17. Write the smallest and largest number of 8-digits in numerals and words.

_____

18. The estimated population of Indian was 99,66,88,326 on 13 September, 1999. Write it in words. _____

19. Lara wrote the numeral 44444 for four crore, four lakh, four thousand four hundred four. Is it correct ? If not, write the number correctly. _____

➲ Successor of Number

Successor is the number just after the given number. To get the successor of a number we add 1 to it.

For example : successor of 4,99,99,999 is 4,99,99,999 + 1 = 5,00,00,000

➲ Predecessor of Number

Predecessor is the number just before the given number. To get the predecessor of a number we subtract 1 from it.

For example : the predecessor of 43,25,00,000 is 43,25,00,000 – 1 = 43,24,99,999

➲ Comparison of Numbers

Rule 1. The number having more digits is greater. For example, take two numbers 54,35,28,693 and 9,45,69,961. The former number has 9 digits while the later has 8 digits. Therefore, the former number is greater.
54,35,28,693 > 9,45,69,761

Rule 2. If the number of digits are the same, we compare the left most digits. If they are also the same, we compare the next digits and so on.

Example 5 : Which is greater 23,25,67,189 or 23,25,76,189

Solution : Both the number have 9 digits each. Again, first four digits from the left most are also the same. So we compare the fifth digit.
Fifth digit 6 of first number > fifth digit 7 of second number.
So, 23,25,76,189 > 23,25,67,189

Example 6 : Write the following numbers in ascending order :
12,33,21,123; 13,23,21,321; 9,99,99,999

Solution : The first two numbers are of 9 digits each while the third is of 8 digits. So third is the smallest. Again, the first digits (from the left most) of first two numbers are equal, so we compare the second digits.
Second digit 2 of first number < second digit 3 of second number
So first number < second number
Thus, the ascending order is :
9,99,99,999 < 12,33,21,123 < 13,23,21,321

Greatest Number and Smallest Number

Example 7 : Write the greatest 8-digit number using the digits 0, 1, 2, 3, 4, 5, 6, 7 without repeating the digits.

Solution : Write the greatest digit on the extreme left.
Write the next greatest digit to its right, and so on.
The greatest 8-digit number is 7,65,43,210.

Example 8 : Write the smallest 8-digit number using the digits 0, 1, 2, 3, 4, 5, 6, 7 without repeating the digits.

Solution : Write the smallest digit on the extreme left.
Write the next smallest digit to its right, and so on.
The smallest number is 1,02,34,567.

Common Mistake

Smallest 5-digit number using digits 3, 1, 0, 2, 7

01237 ✗ 10237 ✓

In a number, zero at the beginning has no meaning.

Hots Questions

Write the smallest and the greatest 8-digit numbers by repeating the digits.
Use all the digits.

1. 1,3,0,4,8 2. 2,1,6,0

Exercise 1.3

Write the successor of :

1. 96543299 2. 787878999 3. 1002009999

☞ Write the predecessor of :

4. 32030400 5. 256103000 6. 1723600000

☞ Fill in > or < in the boxes :

7. 24,05,00,613 ☐ 99,75,675
8. 52,74,93,368 ☐ 52,81,11,114
9. 27,72,27,72,272 ☐ 27,72,72,27,272
10. 39,39,39,39,399 ☐ 39,39,39,29,499

☞ Write in ascending order :

11. 2,06,48,932; 2,06,88,327; 2,06,84,732
12. 24,10,88,035; 70,60,50,403; 20,40,09,008
13. 7,00,15,033; 7,30,48,950; 7,00,51,033

☞ Write in descending order :

14. 67,76,67,766; 76,67,76,677; 67,67,76,767
15. 34,12,87,877; 43,12,87,877; 33,12,87,877
16. 19,02,05,387; 19,02,03,378; 19,02,10,388
17. Write any number of 9 digits. Reverse the order of its digits and write the number thus formed. Find which of the two is greater ?
18. Form the smallest and greatest eight digit numbers using digits, 0, 1, 4, 3, 2 only.

➲ Further Extension of Numbers in the International System

In International Place Value System, each period has three places.

INTERNATIONAL PLACE VALUE CHART

Billions (B)			Millions (M)			Thousands (Th)			Ones (O)			← Periods
Hundred Billions 100,000,000,000	Ten Billions 10,000,000,000	Billions 1,000,000,000	Hundred Millions 100,000,000	Ten Millions 10,000,000	Millions 1,000,000	Hundred Thousands 100,000	Ten Thousands 10,000	Thousands 1,000	Hundreds 100	Tens 10	Ones 1	← Places

➲ Comparison of Indian and International System of Numeration

From the two place value charts we find that

1 lakh = 100 thousands 10 lakh = 1 million

1 crore = 10 million 10 crore = 100 million
100 crore = 1 billion

Example 9 : Write the international place value of digits 1 and 4 in the numeral 617773457602.
Solution : First we mark the commas to show the periods.

B	M	Th	O
617	773,	457,	602

Place value of 1 = 1 ten billions = 10,000,000,000
Place value of 4 = 4 hundred thousands = 400,000

Example 10 : Write the number name of 75845239162 in the International System.
Solution : First we mark the commas to show the periods

B	M	Th	O
75,	845,	239,	162

Number name : Seventy five billion eight hundred forty five million two hundred thirty nine thousand one hundred sixty two.

Exercise 1.4

☞ Write the number names in International System :

1. 15976342 **2.** 591875920 **3.** 5402442459

☞ Mark the commas to show the International periods :

4. 96654502 **5.** 400322334 **6.** 85432003251

☞ Write the International place value of the digit 5 in each :

7. 56342340 **8.** 765321086 **9.** 95432101234

☞ Write the successor :

10. 19,643,299 **11.** 266,399,899 **12.** 3,101,999,999

☞ Write the predecessor :

13. 800,100,900 **14.** 20,852,000 **15.** 32,100,000

☞ Put > or < in the box :

16. 60,000,237 ☐ 6,000,237 **17.** 25,469,702 ☐ 25,469,720
18. 86,430,295 ☐ 86,340,295 **19.** 93,047,999 ☐ 93,048,095

☞ Write in ascending order :

20. 35,011,184; 53,104,236; 35,004,632
21. 86,430,295; 86,340,295; 86,432,095
22. 700,015,033; 700,051,033; 700,010,533

☞ Write the numbers in International periods :

23. 14,82,04,312 **24.** 1,69,43,72,325 **25.** 94,18,41,06,027

☞ Fill in the blanks :

26. **(i)** 10 lakh = _____ million **(ii)** 10 million = _____ crore

27. **(i)** 1 billion = _____ crore **(ii)** 1 lakh = _____ thousands

28. Estimated population of India was 996488632 on 10 September, 2008. Write it in words in the International way.

29. Change this statement into International System in words :
The distance of the sun from the earth is fourteen crore ninety lakh kilometres approximately.

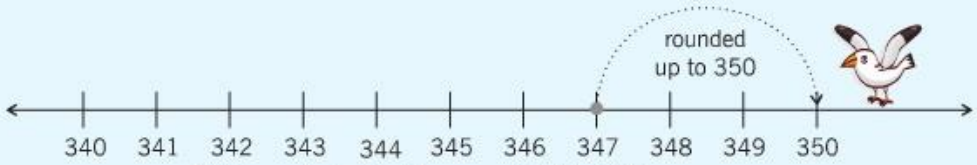
➲ Rounding Off Numbers

There are about 3000 children in our school. Our teacher told us there are 3004 children. I rounded off 3004 to the nearest ten and said 3000.

Round off to the nearest 10

Example 11 : Round off 347 to the nearest 10.

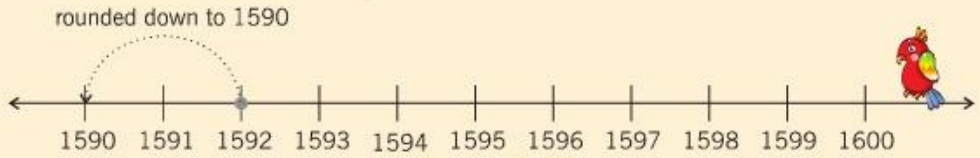
Solution : In 347, the ones digit is 7. $7 > 5$ So, we round up 347 to 350.



347 rounded off to the nearest 10 is 350.

Example 12 : Round off 1592 to the nearest 10.

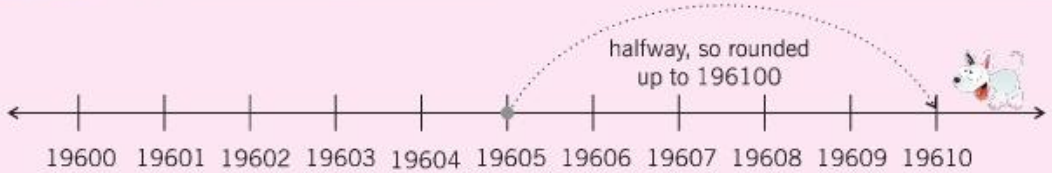
Solution : In 1592, the ones digit is 2. $2 < 5$ So, we round down 1592 to 1590.



1592 rounded off to the nearest 10 is 1590.

Example 13 : Round off 19605 to the nearest 10.

Solution : In 19605, the ones digit is 5. So, we round up 19605 to 19610.



19605 rounded off to the nearest 10 is 19610.

Round off to the nearest 100

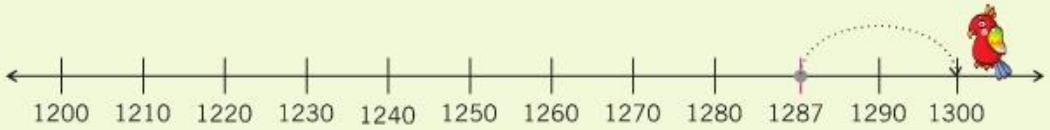
Example 14 : Round off 223 to the nearest 100.

Solution : In 223, the tens digit is 2. $2 < 5$ so, we round down 223 to 200.

223 rounded off to the nearest 100 is 200.

Example 15 : Round off 1287 to the nearest 100.

Solution : In 1287, the tens digit is 8. $8 > 5$ So, we round up 1287 to 1300.



1287 rounded off to the nearest 100 is 1300.

Example 16 : Round off 68950 to the nearest 100.

Solution : In 68950, the tens digit is 5.

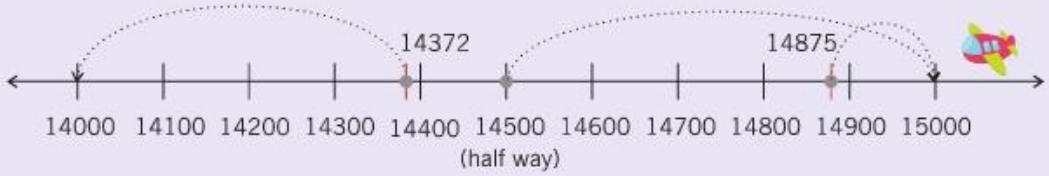
So, we round up 68950 to 69000.

Round off to the nearest 1000

Example 17 : Round off 14372, 14500 and 14875 to the nearest 1000.

Solution :

1 4 3 7 2	1 4 5 0 0	1 4 8 7 5
↓ 3 < 5	↓ 5 (halfway)	↓ 8 > 5
so rounded down to 14000	so rounded up to 15000	so rounded up to 15000



14372 rounded off to the nearest 1000 is 14000;
14500 rounded off to the nearest 1000 is 15000;
14875 rounded off to the nearest 1000 is 15000.

Exercise 1.5

☞ Round off the numbers to the nearest ten :

1. 5314	**2.** 8767	**3.** 8008	**4.** 1235
5. 10,432	**6.** 83,489	**7.** 1,00,993	**8.** 5281

☞ Round off the numbers to the nearest hundred :

9. 1135	**10.** 8150	**11.** 4608	**12.** 1271
13. 23,793	**14.** 4,00,119	**15.** 83,089	**16.** 5483

☞ Round off the numbers to the nearest thousand :

17. 4329	**18.** 9211	**19.** 28,564	**20.** 37,840
21. 65,932	**22.** 5,12,642	**23.** 7,38,197	**24.** 8,43,503

Project

Highest Peaks of the World

The heights of the world's five highest peaks in feet are given below. Find out their heights in metres. Round off the heights to the nearest 10, 100 and 1000.

HIGHEST PEAKS	HEIGHT (in feet)				HEIGHT (in metres)			
	Actual height	Rounded off to the nearest			Actual height	rounded off to the nearest		
		10	100	1000		10	100	1000
Mt Everest	29,035							
K2 (Godwin Austen)	28,250							
Kanchenjunga	28,169							
Lhotse	27,940							
Makalu	27,766							

Let's Recall

Multiple Choice Questions (MCQs) :

Tick (✓) the correct option :

1. Successor of 489153 is _____ .

   (a) 489152 **(b)** 482154 **(c)** 489154 **(d)** 489151

2. Predecessor of 1089052 is _____ .

   (a) 1089053 **(b)** 1088052 **(c)** 1089055 **(d)** 1089051

Chapter 2

Roman Numerals

Learning Objectives :

❖ Roman Numbers ❖ Writing the Numbers in Roman Numerals ❖ Basic Conversion Table from Hindu-Arabic Numerals to Roman Numerals

Roman Numbers

The numeric system represented by Roman numerals originated in ancient Rome and remained the usual way of writing numbers throughout Europe well into the Late Middle Ages. Numbers in this system are represented by combinations of letters from the Latin alphabet. Roman numerals, as used today, are based on seven symbols.

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

Fact File

No symbol can be written more than thrice continuously.

Writing the Numbers in Roman Numerals

Rule 1. Symbols I, X, C or M are written twice or thrice to multiply their value by 2 or 3.

For example,

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

Rule 2. Symbol V, L and D are not repeated.

Rule 3. To write numbers except the value of symbols, we write various symbols together.

Rule 4. Smaller value symbol after greater value symbol adds them.

For example,

6 is written as VI (5 + 1 = 6).
12 is written as XII (10 + 2 = 12).
65 is written as LXV (50 + 10 + 5 = 65).
260 is written as CCLX (200 + 50 + 10 = 260).

Rule 5. Smaller value symbol before greater value symbol means subtraction.

For example,

4 is written as IV	(5 - 1 = 4)
9 is written as IX	(10 - 1 = 9)
40 is written as XL	(50 - 10 = 40)

90 is written as XC (100 - 10 = 90)
400 is written as CD (500 - 100 = 400)
900 is written as CM (1000 - 100 = 900)

But,

(i) I can be subtracted only from V and X and only once :
IV = 5 - 1 = 4, IX = 10 - 1 = 9
Writing IL for 49 is wrong.

(ii) X can be subtracted only from L and C and only once :
XL = 50 - 10 = 40, XC = 100 - 10 = 90

(iii) C can be subtracted only from D and M and only once :
CD = 500 - 100 = 400, CM = 1000 - 100 = 900

(iv) V, L, D and M can never be subtracted.

Rule 6. With the help of the given 7 symbols, we can write the highest number 3999 only.
MMMCMXCIX
To write numbers greater than 3999, we draw a bar above some numerals to make it 1000 times.
Thus, $\overline{IV}$ = 4000, $\overline{V}$ = 5000, $\overline{X}$ = 10,000

Basic Conversion Table from Hindu-Arabic Numerals to Roman Numerals

Ones	Tens	Hundreds	Thousands
1 = I	10 = X	100 = C	1000 = M
2 = II	20 = XX	200 = CC	2000 = MM
3 = III	30 = XXX	300 = CCC	3000 = MMM
4 = IV	40 = XL	400 = CD	4000 = $\overline{IV}$
5 = V	50 = L	500 = D	5000 = $\overline{V}$
6 = VI	60 = LX	600 = DC	6000 = $\overline{VI}$
7 = VII	70 = LXX	700 = DCC	7000 = $\overline{VII}$
8 = VIII	80 = LXXX	800 = DCCC	8000 = $\overline{VIII}$
9 = IX	90 = XC	900 = CM	9000 = $\overline{IX}$
10 = X	100 = C	1000 = M	10000 = $\overline{X}$

The pattern of all the four columns is the same. Writing the table several times will help the student to write any number in Roman numerals easily.

Example 1 : Write the following numbers in Roman numerals :
48; 89; 158; 389; 490; 488; 976; 1545; 3999

Solution : 48 = XLVIII, 89 = LXXXIX, 158 = CLVIII
389 = CCCLXXXIX, 490 = CDXC, 488 = CDLXXXVIII
976 = CMLXXVI, 1545 = MDXLV, 3999 = MMMCMXCIX

Example 2 : Write the following numbers in Hindu-Arabic numerals :

(i) LXIX **(ii)** CCX **(iii)** CDXLIV **(iv)** DCCLXXIX
(v) CCCIX **(vi)** CMLXVII **(vii)** MCCCXL **(viii)** MMXXIV

Solution :

(i) LXIX = 69 **(ii)** CCX = 210 **(iii)** CDXLIV = 444
(iv) DCCLXXIX = 799 **(v)** CCCIX = 309 **(vi)** CMLXVII = 976
(vii) MCCCXL = 1340 **(viii)** MMXXIV = 2024

Exercise 2

☞ Write the following numbers in Roman numerals :

1. 25 **2.** 39 **3.** 89 **4.** 95 **5.** 145
6. 212 **7.** 348 **8.** 493 **9.** 489 **10.** 505
11. 839 **12.** 999 **13.** 1010 **14.** 1200 **15.** 1914
16. 1590 **17.** 1809 **18.** 3138 **19.** 2485 **20.** 4046

☞ Write the following numbers in Hindu-Arabic numerals :

21. XLVI **22.** CXL **23.** LXXXIX **24.** XCVIII
25. CCCXL **26.** DXXXIII **27.** DLV **28.** CDXC
29. DCCXC **30.** CMVIII **31.** DXCIV **32.** MCX
33. DCXL **34.** MCCXXVI **35.** MDCCXX **36.** MMD

☞ Add :

37. VII + III **38.** XII + III **39.** XXX + X
40. XC + X **41.** CD + CC **42.** CM + D

☞ Tick (✓) the correct Roman numeral :

43. 40 = XXXX ☐, XL ☐ **44.** 99 = IC ☐, XCIX ☐
45. 450 = CDL ☐, LD ☐ **46.** 490 = XD ☐, CDXC ☐
47. Write numbers from 140 to 150 in Roman numerals.

Let's Recall

Multiple Choice Questions (MCQs) :

Tick (✓) the correct option :

1. 'L' represent as _____ .

(a) 50 ☐ **(b)** 70 ☐ **(c)** 90 ☐ **(d)** 100 ☐

2. Roman numeral representation of 2000 is _____ .

(a) CC ☐ **(b)** XX ☐ **(c)** MM ☐ **(d)** LL ☐

Chapter 3

Fundamental Operations

Learning Objectives :
❖ Addition ❖ Subtraction ❖ Multiplication ❖ Division ❖ The Four Operations Together

Addition

For adding numbers, we write them in columns such that ones comes below ones, tens below tens and so on.

We add 7 or more digit numbers the same way as we added 6-digit numbers.

Example 1 : A city has 3848589 men, 6879385 women and 5888888 children. Find the population of the city.

Solution :

	TL	L	T-Th	Th	H	T	O	
	1	2	2	2	1	2	2	← Carry
Men		3	8,	4	8,	5	8	9
Women		6	8,	7	9,	3	8	5
Children	+	5	8,	8	8,	8	8	8
	1	6	6,	1	6,	8	6	2

Population of the city = 1,66,16,862

Exercise 3.1

Add :

1. 26, 55, 132 + 3, 24, 90, 321

2. 33, 36, 724 + 13, 46, 205

3. 64, 85, 169 + 3, 21, 04, 695

4. 6, 04, 03, 029 + 15, 09, 106 + 53, 46, 24, 162

5. 3, 80, 54, 278 + 5, 93, 17, 801 + 3, 17, 95, 615

6. 48, 25, 97, 494 + 6, 73, 24, 521 + 14, 57, 934

☞ Write in vertical form and add :

7. 6530150 + 72159 + 381018 **8.** 3485531 + 18472624 + 1483462

9. 67243331 + 34811736 + 10562431

10. 1876245 + 192650152 + 73029999

☞ Fill in the missing digits :

11.
$$\begin{array}{r} 5\,6\,8\,4\,4 \\ +\ 6\,7\,3\,1\,\square \\ \hline 1\,2\,4\,1\,6\,1 \end{array}$$

12.
$$\begin{array}{r} 9\,3\,4\,2\,1 \\ +\ \square\,1\,1\,4\,3 \\ \hline 1\,1\,4\,\square\,6\,4 \end{array}$$

13.
$$\begin{array}{r} 4\,5\,2\,\square\,1 \\ +\ 2\,4\,\square\,5\,2 \\ \hline 6\,\square\,5\,4\,3 \end{array}$$

14.
$$\begin{array}{r} 2\,1\,\square\,3\,0 \\ -\ 1\,9\,2\,4\,1 \\ \hline 2\,4\,8\,9 \end{array}$$

15.
$$\begin{array}{r} 3\,4\,2\,1\,5 \\ -\ 2\,0\,\square\,4\,2 \\ \hline 1\,3\,5\,\square\,3 \end{array}$$

16.
$$\begin{array}{r} 9\,8\,4\,5\,0 \\ -\ \square\,2\,\square\,1\,4 \\ \hline 6\,\square\,8\,3\,6 \end{array}$$

17. There are 21,45,86,513 men 17,18,53,315 women and 12,81,53,682 children in a country. What is the total population of the country ?

18. Find the sum of the greatest and the smallest 8-digit numbers.

19. The difference of two numbers is 12,45,754. If the smaller number is 11,39,658, find the larger number.

Subtraction

Subtraction of 7-digit numbers or more is similar to that of the subtraction of 6-digit numbers.

Example 2 : In an election, 50175238 votes were polled. There were three candidates in the election. Two of them got 9238238 and 20923575 votes respectively. How many votes did the third candidate get ?

Solution :

Votes got by the first candidate = 9238238

Votes got by the second candidate = 20923575

Votes got by the first and second candidates = 30161813

$$\begin{array}{r} {\scriptstyle 1\ \ 1\ \ \ 1\ \ \ 11} \\ 92,\ 38,\ 238 \\ +\ 2,\ 09,\ 23,\ 575 \\ \hline 3,\ 01,\ 61,\ 813 \end{array}$$

Total votes polled = 50175238

Votes got by the first two candidates = 30161813

Votes got by the third candidate = 20013425

$$\begin{array}{r} {\scriptstyle \ \ \ \ \ \ \ \ \ 4\ \ 12} \\ 5,\ 0\ 1,\ 7\ 5,\ 2\ 3\ 8 \\ -\ 3,\ 0\ 1,\ 6\ 1,\ 8\ 1\ 3 \\ \hline 2,\ 0\ 0,\ 1\ 3,\ 4\ 2\ 5 \end{array}$$

Exercise 3.2

☞ Subtract :

1. 84741052 − 77599328

2. 23915017 − 15795821

3. 320215106 − 242784357

☞ Find the difference :

4. 84875918 – 79877929
5. 3607975 – 2753427
6. 20000000 – 1896789
7. 472352285 – 418565679

☞ Fill in the blanks :

8.
$$\begin{array}{r} 4\,0\,2\,9\,9\,\square\,6 \\ -\,\square\,8\,8\,8\,\square\,5\,8 \\ \hline 1\,\square\,4\,\square\,2\,0\,\square \end{array}$$

9.
$$\begin{array}{r} 7\,8\,4\,3\,\square\,0\,\square \\ -\,3\,\square\,\square\,6\,5\,\square\,8 \\ \hline \square\,3\,5\,\square\,4\,9\,2 \end{array}$$

10. The total population of a country is 47,45,68,931. The number of men is 17,35,98,124 and the number of women 18,99,99,856. Find the number of children.
11. The sum of two numbers is 5,12,10,913. If one of the numbers is 2,53,61,789, find the other number.
12. A cloth mill produced 2,75,45,942 m of cloth in 2008 and 3,54,79,825 m of cloth in 2009. In which year did the mill produce more cloth and by how much ?
13. A bulb factory produced 3,59,67,851 bulbs in a certain year. Next year it produced 4,01,23,425 bulbs. Find the increase in the production of bulbs.

Multiplication

Example 3 : Multiply 4928 by 4000.

Solution : We multiply 4928 by 4 and put three zeroes after the product.

4928 × 4 = 19712

4928 × 4000 = 1,97,12,000

$$\begin{array}{r} 4928 \\ \times\ 4000 \\ \hline 1,97,12,000 \end{array}$$

Example 4 : The wholesale price of a table is ₹ 1678. A distributor sold 3807 tables this year. How much total money did he get ?

Solution : Price of 1 table = ₹ 1678

Price of 3807 tables = ₹ 1678 × 3807

	Th	H	T	O	
	1	6	7	8	
×	3	8	0	7	
	1	1	7	4	6 (1678×7)
	0	0	0	0	0 (1678×00)
1	3	4	2	4	0 0 (1678×800)
5	0	3	4	0	0 0 (1678×3000)
6	3,	8	8,	1	4 6

Money received by the distributor
= ₹ 63,88,146

Alternative method of writing

		1	6	7	8
	×	3	8	0	7
		1	1	7	4 6
		0	0	0	0 ×
	1	3	4	2	4 × ×
	5	0	3	4	× × ×
	6	3,	8	8,	1 4 6

Exercise 3.3

Multiply :

1. 400 × 300
2. 345 × 4000
3. 5000 × 3000
4. 6817 × 6000
5. 3479 × 400
6. 8716 × 5000
7. 4835 × 371
8. 1629 × 524
9. 4579 × 1953
10. 7659 × 3805
11. 7536 × 4871
12. 2405 × 3212
13. A toy factory produces 7654 toys everyday. How many toys will be produced in a year ? Number of holidays is 78.
14. Coca Cola drinks factory employs 1034 persons. Each employee gets ₹ 4575 per month as salary. Find the total money per month the factory expends on salary.
15. There are 2385 students in a school. Each one of them pays ₹ 5172 yearly to the school. How much money is collected in the year ?

Division

Example 5 : Divide 6930000 by 1000 orally.

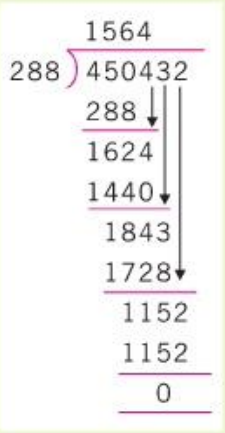
Solution : 1000 has 3 zeroes at the right most. To divide by 1000, we remove 3 zeroes from the right most of 6930000.
6930000 ÷ 1000 = 6930

Example 6 : A fruit seller bought 4,50,769 apples. 337 apples were found rotten and thrown away. Remaining apples were packed in baskets containing 288 each. How many baskets were filled ?

Solution : Good apples = 4,50,769 – 337 = 4,50,432

Number of baskets = 4,50,432 ÷ 288

1. 288 × 1 = 288
   288 × 2 = 576
2. 288 × 5 = 1440
   288 × 6 = 1728
3. 288 × 6 = 1728
   288 × 7 = 2016
4. 288 × 4 = 1152
   Number of baskets filled = 1564



Example 7 : Divide 97,28,354 by 10,000 orally.

Solution : The dividend has no zeroes at the right most.
10,000 has four places of zeroes. So the quotient will be the number formed by leaving four places of the dividend starting from the ones.
Quotient = 972
Remainder will be the number formed by the 4-digits starting from the ones.
Remainder = 8254

Exercise 3.4

☞ Divide orally :

1. 19,803 ÷ 100	**2.** 24,000 ÷ 200	**3.** 36,000 ÷ 6000
4. 3,80,000 ÷ 1900	**5.** 8,50,674 ÷ 1000	**6.** 36,785 ÷ 1000
7. 1,14,682 ÷ 10,000	**8.** 87,16,485 ÷ 10,000	**9.** 1,86,499 ÷ 10,000

☞ Divide :

10. 29,364 ÷ 187	**11.** 2,95,862 ÷ 257	**12.** 5,61,342 ÷ 446
13. 6,24,283 ÷ 409	**14.** 91,78,629 ÷ 432	**15.** 44,16,947÷ 683

16. A factory produces 16,56,000 screws in a year. 576 screws are packed in a carton. How many cartons are required to pack all these screws ?

17. 36,98,640 ball-point pens are packed in packets. If each packet can contains 144 ball-point pens, how many packets are made ?

18. The cost of 378 bicycles is ₹ 4,70,988. Find the cost of each.

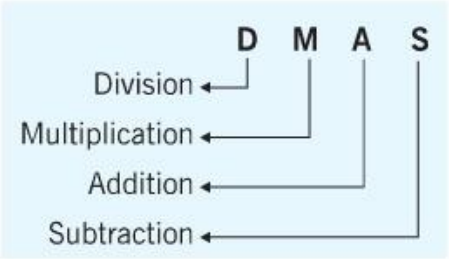
19. The total annual sale of a dairy was 23,40,321 litres of milk. If it remained closed for 6 days, what was its daily sale ? (The year was not a leap year).

The Four Operations Together

When the operations are given together in a question, follow the rules of DMAS to find the answer.

Fact File

To solve, first divide, then multiply, next add and finally subtract.



Example 8 : Simplify $10 + 8 \div 4 - 2 \times 6$.

Solution :

$10 + 8 \div 4 - 2 \times 6$	Divide	$8 \div 4 = 2$
$10 + 2 - 2 \times 6$	Multiply	$2 \times 6 = 12$
$10 + 2 - 12$	Add	$10 + 2 = 12$
$12 - 12 = 0$	Subtract	$12 - 12 = 0$

So, $10 + 8 \div 4 - 2 \times 6 = 0$

Example 9 : Simplify $30 - 14 \div 7 \times 5$.

Solution :

$30 - 14 \div 7 \times 5$	Divide	$14 \div 7 = 2$
$30 - 2 \times 5$	Multiply	$2 \times 5 = 10$
$30 - 10 = 20$	Subtract	$30 - 10 = 20$

So, $30 - 14 \div 7 \times 5 = 20$

Exercise 3.5

Simplify :

1. $8 + 12 - 6 \times 2$
2. $4 \times 5 + 30 \div 5$
3. $3 + 40 \div 10 - 3$
4. $14 + 7 \times 2 - 16 \div 2$
5. $2 + 4 \times 6 - 2 \times 6$
6. $20 \times 5 - 100 \div 100$
7. $8 + 20 \div 5 - 0 \div 3$
8. $75 \times 0 - 0 \div 75$
9. $39 - 0 + 5 \times 999$

Let's Recall

Multiple Choice Questions (MCQs) :

Tick (✓) the correct option :

1. Simon and Julie need 72 paper flowers to complete a bulletin board. They have 19 paper flowers so far. Which operation should be used in the box below to find how many more paper flowers they need ? $72 \ ? \ 19 = 53$

(a) addition **(b)** division **(c)** multiplication **(d)** subtraction

2. There are 914 students enrolled in Vidya Knowledge Park. City Look Public School has 276 fewer students enrolled. How many students are enrolled at City Look Public School ?

(a) 642 **(b)** 762 **(c)** 1190 **(d)** 638

3. The table shows the number of toys a factory made in March and April. How many more toys did the factory make in March than April.

Toys Made at a Factory

Month	Number Made
March	962,458
April	879,581

(a) 117,123 **(b)** 82,977 **(c)** 82,877 **(d)** 117,137

4. The following table shows the distance around four different planets. Which planet's distance has the numeral 3 in the ten-thousands place ?

Distance Around

Planet	Distance Around (in miles)
Jupiter	88,732
Mars	4,213
Mercury	3,032
Neptune	30,603

(a) Jupiter **(b)** Mars **(c)** Mercury **(d)** Neptune

5. Harish had 500 coins in a jar. He sorted the coins into 25 different stack. Each stack had the same number of coins. How many coins were in each stack ?

(a) 20 **(b)** 45 **(c)** 25 **(d)** 12

Chapter 4

Unit-II : Multiples and Factors

Divisibility and Factorization

Learning Objectives :

❖ Tests for Divisibility of a Number ❖ Prime Factorization

Tests for Divisibility of a Number

A test in which we check a number is dividable completely or not, is called test of divisibility.

Divisibility by 2, 5 and 10

A Number is Divisible by	If the Last Digit is	Example
2	0, 2, 4, 6 or 8	10, 22, 34, 46 and 58 are divisible by 2.
5	0 or 5	20 and 35 are divisible by 5.
10	0	30 and 40 are divisible by 10.

Divisibility by 3 and 9

A Number is Divisible by	If the Sum of Its Digits is Divisible by	Example
3	3	48 is divisible by 3 (4 + 8 = 12, divisible by 3).
9	9	63 is divisible by 9 (6 + 3 = 9, divisible by 9).

Exercise 4.1

1. Test without actual division whether each of the following numbers is divisible by 10, 5, 2, 3 and 9 respectively. If yes, put (✓) in its column, otherwise (✗) :

Number	10	5	2	3	9
79					
142					
168					
270					

914					
8030					
11,112					
4,24,242					

☞ Test without actual division whether each of the following numbers is divisible by 2 :

2. 79	**3.** 96	**4.** 132	**5.** 441
6. 1050	**7.** 154	**8.** 578	**9.** 1009
10. 2534	**11.** 6485	**12.** 9992	**13.** 46,661

☞ Test without actual division whether each of the following numbers is divisible by 3 :

14. 112	**15.** 132	**16.** 136	**17.** 168
18. 186	**19.** 226	**20.** 576	**21.** 756
22. 6005	**23.** 2,52,525	**24.** 8,02,020	**25.** 15,801

Divisibility by 4

A number is divisible by 4 if the number formed by its tens and ones digits can be divided by 4.

For example : In 968, the number formed by the tens and ones digits is 68.

$68 \div 4 = 17$ [Note : Divide 68 by 4 orally here.]

As 68 is divisible by 4, so 968 is also divisible by 4. But 966 is not divisible by 4 as 66 is not divisible by 4.

Divisibility by 8

A number is divisible by 8 if the number formed by its hundreds, tens and ones digits can be divided by 8.

For example : In 7112, the number formed by its hundreds, tens and ones digits is

$112 \div 8 = 14$

As 112 is divisible by 8, so 7112 is also divisible by 8.

But 7116 is not divisible by 8 as 116 is not divisible by 8.

Exercise 4.2

☞ Test without actual division whether each of the following numbers is divisible by 4 :

1. 120	**2.** 104	**3.** 144	**4.** 134
5. 158	**6.** 216	**7.** 728	**8.** 1026
9. 2048	**10.** 76,724	**11.** 99,732	**12.** 51,310

☞ Test without actual division whether each of the following numbers is divisible by 8 :

13. 5112	**14.** 4485	**15.** 6408	**16.** 12,128
17. 47,884	**18.** 84,032	**19.** 93,000	**20.** 89,216

Divisibility by 6

A number is divisible by 6, if it is divisible by 2 as well as 3. (As $6 = 2 \times 3$)

For example : 2634 has 4 as ones digit, so it is divisible by 2.
Also $2 + 6 + 3 + 4 = 15$, so 2634 is divisible by 3.
Hence 2634 is divisible by $2 \times 3 = 6$.

Divisibility by 15

A number is divisible by 15, if it is divisible by 3 as well as 5. (As $15 = 3 \times 5$)

Divisibility by 18

A number is divisible by 18, if it is divisible by 2 as well as 9. (As $18 = 2 \times 9$)

Divisibility by 12

A number is divisible by 12, if it is divisible by 3 as well as 4. (As $12 = 3 \times 4$)

Exercise 4.3

☞ Test without actual division whether each of the following numbers is divisible by 6 :

1. 192	**2.** 125	**3.** 256	**4.** 636
5. 745	**6.** 1245	**7.** 1532	**8.** 4902
9. 9654	**10.** 7005	**11.** 38,304	**12.** 13,632

☞ Test without actual division whether each of the following numbers is divisible by 15 :

13. 390	**14.** 255	**15.** 825	**16.** 1875
17. 2345	**18.** 2715	**19.** 80,265	**20.** 24,460

☞ Test without actual division whether each of the following numbers is divisible by 18 :

21. 826	**22.** 486	**23.** 4329	**24.** 9324
25. 4626	**26.** 12,870	**27.** 39,854	**28.** 39,582

☞ Test without actual division whether each of the following numbers is divisible by 12 :

29. 528	**30.** 384	**31.** 1182	**32.** 2532
33. 3804	**34.** 5328	**35.** 19,326	**36.** 27,052

Divisibility by 11

A number is divisible by 11 if the sum of the digits in the odd places is equal to the sum of the digits in the even places or the difference of the two sums is divisible by 11.

Example 1 : Which of the following number is divisible by 11?
(i) 9163 **(ii)** 56421

Solution : **(i)** In 9163, sum of the digits in the odd places $= 9 + 6 = 15$
Sum of the digits in the even places $= 1 + 3 = 4$
Difference $= 15 - 4 = 11$
Difference is divisible by 11, so 9163 is divisible by 11.

(ii) In 56421, sum of the digits in the odd places $= 5 + 4 + 1 = 10$
Sum of the digits in the even places $= 6 + 2 = 8$
Difference $= 10 - 8 = 2$
2 is not divisible by 11, so 56421 is not divisible by 11.

Exercise 4.4

☞ Test without actual division whether each of the following numbers is divisible by 11 :

1. 1882 **2.** 2585 **3.** 3674 **4.** 4895

5. 25,145 **6.** 37,081 **7.** 6,53,422 **8.** 63,159

☞ Put smallest digits in the blanks to make the number divisible by 11 :

9. 54 ___ 37 **10.** 326 ___ **11.** ___ 3678 **12.** 426 ___ 1

☞ Put smallest digits in the blanks to make the number divisible by 9 :

13. 10 ___ 4 **14.** 57 ___ **15.** 8 ___ 242 **16.** ___ 674

☞ Test without actual division, whether each of the following numbers is divisible by the number in the box :

17. 6, 12, 79, 155	3	**18.** 4, 56, 32, 316	4
19. 10, 80, 230, 725	5	**20.** 5, 56, 23, 612	6
21. 8, 57, 43, 115	7	**22.** 22, 341, 539, 418	11
23. 11, 572, 792, 1606	11	**24.** 33, 66, 231, 1056	11

Prime Factorization

To Factorize a number, we first test it for divisibility by 2, 3, 5, 11, etc. Then we divide it by 2, 3, 5, 11, etc. Then we divide it by 7, 13, etc. of which we have no divisibility test.

Example 2 : Find the prime factors of 729.

Solution : 729 has 9 at its ones place.
So it is not divisible by 2 or 5.
7 + 2 + 9 = 18, so 729 is divisible by 3.
2 + 4 + 3 = 9, so 243 is divisible by 3.
8 + 1 = 9, so 81 is divisible by 3.

729 = 3 × 3 × 3 × 3 × 3 × 3

3	729
3	243
3	81
3	27
3	9
	3

Example 3 : Find the prime factors of 375.

Solution : 375 has 5 at its ones place.
So it divisible by 5, but not by 2.
Also 3 + 7 + 5 = 15.
So, 375 is divisible by 3.
We can start either by 3 or 5 as a divisor.
375 = 3 × 5 × 5 × 5

3	375
5	125
5	25
	5

or

5	375
5	75
5	15
	3

Note : Students should remember following multiplication facts also. It will help them to find prime factors :

7 × 7 = 49 7 × 7 × 7 = 343 11 × 11 = 121
13 × 13 = 169 17 × 17 = 289 19 × 19 = 361

$13 \times 7 = 91$	$17 \times 7 = 119$	$11 \times 13 = 143$
$11 \times 17 = 187$	$13 \times 17 = 221$	$11 \times 19 = 209$
$13 \times 19 = 247$	$19 \times 7 = 133$	

Exercise 4.5

Find prime factors of the following numbers :

1. 64	**2.** 36	**3.** 84	**4.** 96	**5.** 108
6. 126	**7.** 144	**8.** 216	**9.** 180	**10.** 243
11. 375	**12.** 343	**13.** 512	**14.** 576	**15.** 676
16. 1331	**17.** 384	**18.** 432	**19.** 1225	**20.** 324

Let's Recall

Multiple Choice Questions (MCQs) :

Tick (✓) the correct option :

1. The correct prime factorization of 99 is _____ .
   (a) $3 \times 3 \times 11$ **(b)** 3×33 **(c)** 3×11 **(d)** None of these
2. There is only one prime number between _____ .
   (a) 30 and 40 **(b)** 80 and 90 **(c)** 90 and 100 **(d)** 60 and 70
3. In a question of division, a student took 8 as a divisor instead of 3 by mistake and finds the answer 15. The correct answer is _____ .
   (a) 15 **(b)** 40 **(c)** 45 **(d)** 120
4. If 34 * 24 is divisible by 9, the number at * is _____ .
   (a) 2 **(b)** 3 **(c)** 5 **(d)** 9
5. Show 80 as the product of prime factors ?
   (a) $2 \times 2 \times 2 \times 5$ **(b)** $2 \times 2 \times 5 \times 5$
   (c) $2 \times 2 \times 2 \times 3 \times 5$ **(d)** $2 \times 2 \times 2 \times 2 \times 5$
6. Sum of all prime numbers less than 15 is _____ .
   (a) 39 **(b)** 42 **(c)** 41 **(d)** 45

MATHS FROM THE PAST

Eratosthenes was a Greek scholar who lived approximately between 275 and 195 BC. He was the first to estimate accurately the diameter of the earth. He served as the director of the famous Library of Alexandria. He was a highly regarded scholar of the ancient world. Unfortunately only fragments of his writing have survived today.

Chapter 5

Highest Common Factor (HCF)

Learning Objectives :
❖ To Find HCF by Prime Factorization ❖ To Find HCF by Long Division Method ❖ Word Problems

We have studied highest common factor (HCF) in previous class.

To Find HCF by Prime Factorization

We know the prime factors of 12 and 16.

$12 = 2 \times 2 \times 3$

$16 = 2 \times 2 \times 2 \times 2$

We see that common factors of 12 and 16 are 2 and 2. Highest common factor of 12 and 16 is the multiplication of these common factors $= 2 \times 2 = 4$

Example 1 : Find the HCF of 56, 98 and 154.

Solution : First we find the prime factors of each.

2	56
2	28
2	14
	7

2	98
7	49
	7

2	154
7	77
	11

Thus, $56 = 2 \times 2 \times 2 \times 7$

$98 = 2 \times 7 \times 7$

$154 = 2 \times 7 \times 11$

Now we look for the common factors.

Common factors in all the numbers are 2 and 7.

HCF of 56, 98 and 154 $= 2 \times 7 = 14$

To Find HCF by Long Division Method

Sometimes the numbers to be factorized are too large. Or they are not divisible by small prime numbers : 2, 3, 5, 7, 11, ... So it is time consuming or difficult to start.

We know that HCF is also called the highest common divisor. Based on this division property, there is a method for finding HCF of two or more numbers.

Example 2 : Find the HCF of 649 and 913.

Solution :

$$
\begin{array}{r}
1 \\
649 \overline{)\ 913} \\
649 \quad\ 2 \\
\hline
264 \overline{)\ 649} \\
528 \quad\ 2 \\
\hline
121 \overline{)\ 264} \\
242 \quad\ 5 \\
\hline
22 \overline{)\ 121} \\
110 \quad\ 2 \\
\hline
11 \overline{)\ 22} \\
22 \\
\hline
0
\end{array}
$$

Method :

(i) Make the bigger number the dividend and smaller the divisor. Then divide.

(ii) Make remainder the new divisor and old divisor the dividend. Again divide.

(iii) We repeat this process till remainder is zero.

(iv) The last divisor is HCF of the two numbers.

HCF of 649 and 913 = 11

Example 3 : Find the HCF of 808, 568 and 1116.

Solution : We find the HCF of any two numbers, then find the HCF of this HCF and the third number.

$$
\begin{array}{r}
1 \\
568 \overline{)\ 808} \\
568 \quad\ 2 \\
\hline
240 \overline{)\ 568} \\
480 \quad\ 2 \\
\hline
88 \overline{)\ 240} \\
176 \quad\ 1 \\
\hline
64 \overline{)\ 88} \\
64 \quad\ 2 \\
\hline
24 \overline{)\ 64} \\
48 \quad\ 1 \\
\hline
16 \overline{)\ 24} \\
16 \\
\hline
8 \overline{)\ 16} \\
16 \\
\hline
\times
\end{array}
$$

Now are find HCF of 8 and 1116.

$$
\begin{array}{r}
139 \\
8 \overline{)\ 1116} \\
8 \\
\hline
31 \\
24 \\
\hline
76 \\
72 \\
\hline
4 \overline{)\ 8\ (2} \\
8 \\
\hline
\times
\end{array}
$$

HCF of 808 and 568 is 8.

HCF of 8 and 1116 is 8.

HCF of 808, 568 and 1116 = 4

Exercise 5.1

Find the HCF of the following by prime factorization :

1. 24; 36 **2.** 32; 48 **3.** 40; 72

4. 63; 108	**5.** 70; 105	**6.** 49; 126
7. 108; 144	**8.** 216; 324	**9.** 52; 78
10. 64; 148	**11.** 315; 540	**12.** 256; 384
13. 27; 54; 18	**14.** 49; 70; 35	**15.** 70; 98; 154

☞ Find the HCF of the following by long division method :

16. 63; 108	**17.** 144; 216	**18.** 93; 111
19. 216; 630	**20.** 531; 1233	**21.** 345; 726
22. 612; 448	**23.** 901; 1272	**24.** 460; 598
25. 882; 648	**26.** 418; 380	**27.** 315; 567
28. 65; 195; 325	**29.** 168; 280; 392	**30.** 108; 144; 216

➲ Word Problems

Example 4 : The length, breadth and height of a room are 5 m 60 cm, 3 m 50 cm and 2 m 10 cm respectively. Find the length of the longest rod that can measure the room exactly.

Solution : 5 m 60 cm = 560 cm and 3 m 50 cm = 350 cm and 2 m 10 cm = 210 cm.
The length of the longest rod which can measure (divide) the dimensions of the room will be the HCF of 560 cm, 350 cm and 210 cm.

5 | 560
2 | 112
2 | 56
2 | 28
2 | 14
| 7

5 | 350
5 | 70
2 | 14
| 7

5 | 210
2 | 42
3 | 21
| 7

$560 = 5 \times 2 \times 2 \times 2 \times 2 \times 7$
$350 = 5 \times 5 \times 2 \times 7$
$210 = 5 \times 2 \times 3 \times 7$

Common factors of all the three numbers are 5, 2 and 7.
HCF = $5 \times 2 \times 7 = 70$
Length of the longest rod = 70 cm

Note : We can also find out HCF in this question by long division method.

Example 5 : Find the greatest number that will divide 967 and 1463 to leave remainder 7 in each case.

Solution : The required number will divide $967 - 7 = 960$ and $1463 - 7 = 1456$ exactly.
It will be HCF of 960 and 1456.

$960 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 5$
$1456 = 2 \times 2 \times 2 \times 2 \times 91$
HCF of 960 and 1456 $= 2 \times 2 \times 2 \times 2 = 16$

Exercise 5.2

1. The length, breadth and height of a room are 5 m 40 cm, 4 m 20 cm and 3 m respectively. Find the length of the longest tape that can measure the dimensions of the room exactly.
2. What is the longest measure that can be used to fill exactly three containers of 16, 32 and 40 litres respectively ?
3. There are two heaps of 308 and 112 marbles respectively. Marbles of each heap are packed to have equal numbers in each packet. What is the greatest number of marbles in each packet ?
4. Find the greatest number which divides 72, 96 and 136 exactly.
5. What is the greatest weight that can measure exactly two heaps containing 1050 kg and 825 kg of grains respectively.
6. Find the greatest number which divides 208 and 358 to give a remainder 8 in each case.
7. The length of a room is 6 m 40 cm and breadth 4 m 80 cm. Square tiles are to be fitted on its floor. What will be the greatest length of the tile ?
8. Two pieces of wires are 20 m 57 cm and 22 m 99 cm respectively. Pieces of how much maximum length can be cut exactly from each ?
9. Three drums have 136, 170 and 119 litres of oil respectively. What will be the greatest measure of the single container which can divide their oil exactly ?
10. Find out the greatest number that divides 396 exactly but divides 619 to give remainder 7.
11. What is the greatest number which divides 227 and 272 to give remainders 7 and 8 respectively ?
12. What will be the greatest length of the tape that can measure distances of 456 m, 612 m and 2106 m exactly ?

Let's Recall

Multiple Choice Questions (MCQs) :

Tick (✓) the correct option :

1. HCF of 121 and 1331 is _____ .

   (a) 11 **(b)** 21 **(c)** 13 **(d)** 15

2. Greatest number which divides 208 and 358 to give a remainder 8 in each case is _____ .

   (a) 40 **(b)** 50 **(c)** 60 **(d)** 55

Chapter 6

Lowest Common Multiple (LCM)

Learning Objectives :

❖ To Find LCM by Prime Factorization ❖ To Find LCM by Common Division Method ❖ Relationship between LCM and HCF of Two Numbers ❖ Word Problems

We have studied about lowest common multiple (LCM) in the previous class.

➲ To Find LCM by Prime Factorization

Example 1 : Find the LCM of 16, 24 and 36 by prime factorization.

Solution : Lowest (or Least) common multiple of the given numbers must include all the prime factors of each of them.

We find the LCM by multiplying all the prime factors of the numbers but including the common factors only once.

2 | 16
2 | 8
2 | 4
| 2

2 | 24
2 | 12
2 | 6
| 3

2 | 36
2 | 18
3 | 9
| 3

$16 = 2 \times 2 \times 2 \times 2$

$24 = 2 \times 2 \times 2 \times 3$

$36 = 2 \times 2 \times 3 \times 3$

LCM of 16, 24 and $36 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 = 144$

➲ To Find LCM by Common Division Method

Example 2 : Find the LCM of 16, 24 and 36 by common division method.

Solution :

(i) We divide the numbers by a prime factor which can divide exactly least two of the given numbers.

(ii) The undivided number should be brought down as it is.

(iii) The product of the common prime factors and the remaining quotient numbers is the LCM of the given number.

LCM of 48, 56 and $16 = 2 \times 2 \times 2 \times 2 \times 3 \times 7 = 336$

2 | 48, 56, 16
2 | 24, 28, 8
2 | 12, 14, 4
2 | 6, 7, 2
| 3, 7, 1

➲ Relationship Between LCM and HCF of Two Numbers

Product of the HCF and LCM of any two numbers is always equal to the product of both these numbers.

Consider two numbers 1044 and 1296.

$1044 = 2 \times 2 \times 3 \times 3 \times 29$

$1296 = 2 \times 2 \times 3 \times 3 \times 2 \times 2 \times 3 \times 3$

HCF of 1044 and 1296 $= 2 \times 2 \times 3 \times 3 = 36$

LCM of 1044 and 1296 $= 2 \times 2 \times 3 \times 3 \times 29 \times 2 \times 2 \times 3 \times 3 = 37{,}584$

Product of 1044 and 1296 = 13,53,024

Product of HCF and LCM of 1044 and 1296 $= 36 \times 37{,}584 = 13{,}53{,}024$

So, First number × Second number = Their HCF × Their LCM

or $\text{LCM} = \dfrac{\text{First number} \times \text{Second number}}{\text{HCF}}$ and so on.

Example 3 : For a pair of numbers, the HCF is 8 and the LCM is 96. If one of the number is 32, what is the other number ?

Solution : Other number $= \dfrac{\text{HCF} \times \text{LCM}}{\text{First number}} = \dfrac{8 \times 96}{32} = 8 \times 3 = 24$

Exercise 6.1

☞ Find the LCM of the following numbers by prime factorization method :

1. 16 and 12	**2.** 12 and 18	**3.** 27 and 36
4. 36 and 45	**5.** 24 and 40	**6.** 32 and 48
7. 70 and 98	**8.** 40 and 60	**9.** 56 and 42
10. 15; 18 and 30	**11.** 15; 25 and 30	**12.** 40; 55 and 66
13. 30; 40 and 50	**14.** 40; 32 and 60	**15.** 26; 65 and 20

☞ Find the LCM of the following numbers by common division method :

16. 72 and 96	**17.** 42 and 70	**18.** 48 and 64
19. 108 and 32	**20.** 55 and 66	**21.** 30 and125
22. 105; 135 and 150	**23.** 192; 216 and 120	**24.** 255; 340 and 425

☞ Find the HCF and LCM of the following numbers :

25. 64 and 80 **26.** 76 and 114 **27.** 204 and 255

28. For a pair of numbers, the HCF is 7 and LCM is 784. If one of the number is 49, what is the other number ?

29. The product of two numbers is 320 and the LCM is 80. What is their HCF ?

Word Problems

Example 4 : Three clocks chime at intervals of 8, 12 and 14 minutes respectively. They all chime together at 7 : 10 am. When will they next chime together ?

Solution : Each clock chime at times which are multiples of the given intervals. The clocks will chime together after common multiples of 8, 12 and 14 minutes. Therefore, the first time after 7 : 10 am when they all chime together will be after LCM of 8, 12 and 14 minutes.

LCM of 8, 12 and 14 minutes

$= 2 \times 2 \times 2 \times 3 \times 7 = 168$ minutes

$= 120 + 48 = 168$ minutes

$= 2$ hours 48 minutes

2	8, 12, 14
2	4, 6, 7
	2, 3, 7

Next time the clocks will chime together

$= 7 : 10 + 2 : 48 = 9 : 58$ am

Example 5 : Find the smallest number which is exactly divisible by each of 90, 108 and 126.

Solution : The common multiples of 90, 108 and 126 are exactly divisible by them. The smallest number exactly divisible by 90, 108 and 126 each will be their LCM.

2	90, 108, 126
3	45, 54, 63
3	15, 18, 21
	5, 6, 7

LCM of 90, 108 and 126 $= 2 \times 3 \times 3 \times 5 \times 6 \times 7 = 3780$

Exercise 6.2

1. Four bells ring together. Then they ring at intervals of 5, 10, 12 and 15 seconds respectively. After what smallest interval of time will they ring again together ?
2. Three clocks chime at intervals of 10, 15 and 20 minutes respectively. The three bells chime together first time at 12 noon. At what time will they next chime together ?
3. If separate teams of 5, 7 or 8 students are made from the students of a class, 2 students are left in each case. What can be the smallest number of students in the class ?
4. If a gardener arranges some plants in the rows of 18, 24 or 32 plants, 4 plants are left in each case. What can be the smallest number of plants in the garden ?
5. Find the smallest number exactly divisible by 36, 54 and 72 each.
6. A fruit seller arranges his apples exactly in the heaps of 12, 18 and 30 apples in each case. Find the smallest number of apples.

7. The students of a school can be arranged exactly in the rows of 10, 15 or 16 students each. What is the smallest number of students ? _____
8. Three persons step off from the same place. The measures of their steps are 50 cm, 60 cm and 55 cm respectively. At what minimum distance from the starting place will they next step together ? _____
9. Find the smallest number which when divided by 42, 56 and 35 leaves the same remainder 5. _____
10. Shabana arranges some flowers exactly in the bunches of 16, 25 and 36 respectively. How many minimum number of flowers does she have ? _____

Let's Recall

Multiple Choice Questions (MCQs) :

Tick (✓) the correct option :

1. The HCF of 16 and 24 is _____ .
   (a) 4 **(b)** 8 **(c)** 16 **(d)** 6
2. The HCF of 75, 100 and 150 is _____ .
   (a) 15 **(b)** 20 **(c)** 25 **(d)** 35
3. Which one of the following has only one factor ?
   (a) 1 **(b)** 2 **(c)** 3 **(d)** 4
4. Two numbers are said to be co-prime if their HCF is _____ .
   (a) 2 **(b)** 0 **(c)** 4 **(d)** 1
5. The LCM of 20, 30 and 50 is _____ .
   (a) 300 **(b)** 500 **(c)** 400 **(d)** 250
6. If the product of two numbers and their HCF are 306 and 18 respectively then, their LCM is _____ .
   (a) 16 **(b)** 17
   (c) 18 **(d)** None of these
7. The HCF and LCM of two numbers are 4 and 48 respectively. If one of these number is 12, the other number is _____ .
   (a) 16 **(b)** 12 **(c)** 8 **(d)** 4
8. What is the number, which when divided by 8, 12 and 15 leaves a remainder 3 in each case ?
   (a) 63 **(b)** 66 **(c)** 123 **(d)** 183
9. Three rod measuring 18 m, 27 m and 162 m are to be divided into portions all of the same lengths. If the lengths of portion are as great as possible, into how many portions will third rod be divided ?
   (a) 4 **(b)** 9 **(c)** 12 **(d)** 18

Chapter 7

Unit-III : Fractional Numbers

Common Fractions

Learning Objectives :

❖ Multiplication of a Fractional Number by a Whole Number ❖ Multiplication of a Fractional Number by a Fractional Number ❖ Multiplication of a Whole Number by a Fractional Number ❖ Properties of Multiplication of Fractional Numbers ❖ Word Problems on Multiplication of Fractional Numbers ❖ Multiplicative Inverse (or Reciprocal) of a Number ❖ Division of a Fractional Number by a Natural Number ❖ Division of a Fractional Number by a Fractional Number ❖ Division of a Whole Number by a Fractional Number ❖ Properties of Division of Fractional Numbers ❖ Word Problems on Division of Fractional Numbers.

We have studied about types of fractions and their addition and subtraction in previous class.

➲ Multiplication of a Fractional Number by a Whole Number

(i) Let us multiply $\frac{1}{3}$ by 4.

We know that multiplication is repeated addition.

So, $\frac{1}{3} \times 4 = \frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} = \frac{1+1+1+1}{3} = \frac{4}{3}$

We can write our sum as $\frac{1}{3} \times 4 = \frac{4}{3}$ or $\frac{1 \times 4}{3} = \frac{4}{3} = 1\frac{1}{3}$

$\frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} = \frac{4}{3}$ or $\frac{1}{3} \times 4 = \frac{4}{3} = 1\frac{1}{3}$

(ii) Let us now multiply $\frac{2}{5}$ by 3.

$$\frac{2}{5} \times 3 = \frac{2}{5} + \frac{2}{5} + \frac{2}{5} = \frac{2+2+2}{5} = \frac{6}{5}$$

We can write our sum as

$$\frac{2}{5} \times 3 = \frac{2 \times 3}{5} = \frac{6}{5} = 1\frac{1}{5}$$

Example 1 : Multiply $\frac{5}{8}$ by 6.

Solution : $\frac{5}{8} \times 6 = \frac{5 \times \cancel{6}^{3}}{\cancel{8}_{4}} = \frac{15}{4} = 3\frac{3}{4}$

Exercise 7.1

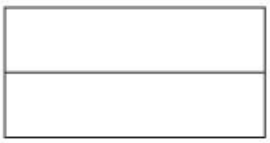
☞ Multiply :

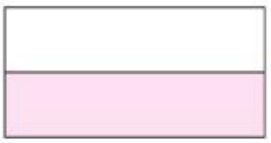
1. $\frac{3}{4}$ by 2
2. $\frac{9}{40}$ by 8
3. $\frac{12}{25}$ by 50
4. $3\frac{1}{2}$ by 4
5. $6\frac{1}{9}$ by 3
6. $2\frac{7}{10}$ by 15

☞ Find the product :

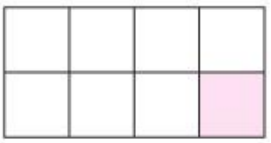
7. $\frac{1}{6} \times 5$
8. $\frac{1}{2} \times 6$
9. $\frac{1}{10} \times 5$
10. $\frac{4}{9} \times 3$
11. $\frac{2}{7} \times 7$
12. $\frac{1}{5} \times 10$

Multiplication of a Fractional Number by a Fractional Number





$\frac{1}{2}$



$\frac{1}{4}$ of $\frac{1}{2} = \frac{1}{8}$

The shaded part of second figure is $\frac{1}{2}$ of first figure. If first figure represents number 1, then second figure represents $\frac{1}{2}$ of $1 = \frac{1}{2} \times 1 = \frac{1}{2}$.

Shaded part of third figure is $\frac{1}{4}$ of the shaded part of the second figure or $\frac{1}{4}$ of $\frac{1}{2}$. Which is clearly one part of the eight equal parts, that is, $\frac{1}{8}$.

$\frac{1}{4}$ of $\frac{1}{2} = \frac{1}{8}$ or $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$

Example 2 : Multiply $\frac{2}{3}$ by $\frac{3}{4}$.

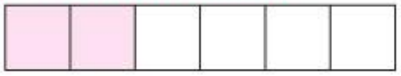
Solution : $\frac{2}{3} \times \frac{3}{4} = \frac{\overset{1}{\cancel{2}} \times \overset{1}{\cancel{3}}}{\underset{1}{\cancel{3}} \times \underset{2}{\cancel{4}}} = \frac{1 \times 1}{1 \times 2} = \frac{1}{2}$

Example 3 : Multiply $1\frac{1}{5}$ by $1\frac{2}{3}$.

Solution : $1\frac{1}{5} \times 1\frac{2}{3} = \frac{6}{5} \times \frac{5}{3} = \frac{\overset{2}{\cancel{6}} \times \overset{1}{\cancel{5}}}{\underset{1}{\cancel{5}} \times \underset{1}{\cancel{3}}} = \frac{2 \times 1}{1 \times 1} = 2$

Multiplication of a Whole Number by a Fractional Number

1



$6 \times \frac{1}{3} = 2$

$\frac{1}{3}$ means 1 part out of 3 parts or 2 parts out of 6 parts.

Shaded part of second figure is 2 parts out of 6 equal parts, that is, $\frac{2}{6}$ or $\frac{1}{3}$.

So, $6 \times \frac{1}{3} = 2$

Example 4 : Multiply 8 by $2\frac{3}{4}$.

Solution : $8 \times 2\frac{3}{4} = 8 \times \frac{11}{4} = \frac{\overset{2}{\cancel{8}} \times 11}{\underset{1}{\cancel{4}}} = \frac{2 \times 11}{1} = 22$

Exercise 7.2

Find the product :

1. $\frac{1}{9} \times \frac{9}{11}$
2. $\frac{1}{12} \times \frac{5}{9}$
3. $\frac{1}{6} \times \frac{7}{11}$
4. $\frac{1}{6} \times \frac{9}{10}$
5. $\frac{5}{8} \times \frac{3}{4}$
6. $\frac{7}{10} \times \frac{5}{7}$
7. $\frac{5}{12} \times \frac{3}{4}$
8. $\frac{9}{10} \times \frac{4}{7}$
9. $7\frac{1}{2} \times 8\frac{1}{2}$
10. $1\frac{4}{5} \times 1\frac{2}{3}$
11. $3\frac{1}{2} \times 1\frac{1}{5}$
12. $4\frac{3}{7} \times 1\frac{5}{8}$

Multiply :

13. 6 by $\frac{2}{3}$
14. 8 by $\frac{3}{10}$
15. 6 by $1\frac{5}{12}$
16. 10 by $2\frac{4}{15}$

Find :

17. $\frac{1}{3}$ of $\frac{4}{5}$
18. $\frac{1}{2}$ of $\frac{4}{7}$
19. $\frac{2}{5}$ of $1\frac{1}{4}$
20. $\frac{2}{3}$ of $2\frac{2}{5}$

Properties of Multiplication of Fractional Numbers

1. The product remains the same, in whatever order we multiply two fractional numbers.

For example : $1\frac{1}{3} \times 2\frac{1}{4} = 2\frac{1}{4} \times 1\frac{1}{3}$

2. If we multiply three or more fractional numbers together, the change of group does not change the product.

For example : $\left(1\frac{1}{2} \times 2\frac{2}{3}\right) \times 3\frac{4}{5} = 1\frac{1}{2} \times \left(2\frac{2}{3} \times 3\frac{4}{5}\right)$

3. The product of a fractional number and 1 is the fractional number itself.

For example : $5\frac{3}{4} \times 1 = 5\frac{3}{4}$

4. The product of a fractional number and zero is always zero.

For example : $5\frac{1}{2} \times 0 = 0$

Exercise 7.3

Fill in the blanks using the properties of multiplication :

1. $5 \times \frac{7}{8} =$ _____ $\times 5$
2. $\frac{3}{5} \times 2 = 2 \times$ _____
3. $4\frac{1}{2} \times$ _____ $= 5 \times 4\frac{1}{2}$
4. _____ $\times \frac{3}{4} = \frac{3}{4} \times \frac{1}{2}$
5. $6\frac{1}{2} \times 0 =$ _____
6. $\frac{1}{3} \times 1 =$ _____
7. $\frac{5}{6} \times$ _____ $= \frac{5}{6}$
8. $\frac{5}{12} \times$ _____ $= 0$
9. $7\frac{2}{3} \times 6\frac{1}{4} = 6\frac{1}{4} \times$ ___
10. $1\frac{11}{15} \times$ _____ $= 1\frac{11}{15}$
11. $3\frac{5}{9} \times$ _____ $= 0$
12. $7\frac{7}{8} \times 1 =$ _____
13. $\left(\frac{1}{3} \times \frac{2}{5}\right) \times \frac{1}{5} =$ _____ $\times \left(\frac{1}{5} \times \frac{2}{5}\right)$
14. $\left(\frac{9}{11} \times \frac{11}{17}\right) \times$ _____ $= \frac{9}{11} \times \frac{11}{17} \times \frac{13}{18}$

Word Problems on Multiplication of Fractional Numbers

Example 5 : A car covers 60 km in one hour. How many km will it cover in $2\frac{2}{5}$ hours ?

Solution : Distance covered by the car in one hour = 60 km

Time $= 2\frac{2}{5}$ hour $= \frac{12}{5}$ hour

So, the car will covered distance in $\frac{12}{5}$ hour $= 60 \times \frac{12}{5} = 144$ km

Example 6 : Amita had $\frac{3}{4}$ of a cake. She ate $\frac{5}{6}$ of it. How much part of the whole cake did she eat ?

Solution : Amita ate $\frac{5}{6}$ of $\frac{3}{4}$ of the whole cake $= \frac{5}{6} \times \frac{3}{4} = \frac{5 \times 3}{6 \times 4} = \frac{5}{8}$

Thus, Amita ate $\frac{5}{8}$ part of the whole cake.

Exercise 7.4

1. One-half of a farm is used for growing vegetables. $\frac{2}{15}$ of this portion is used for growing potatoes. What fraction of the whole farm is used for growing potatoes ? _____
2. Monika got $\frac{1}{2}$ of a cake. She ate $\frac{4}{5}$ of it. How much part of the cake did she eat ? _____
3. A school has 6 periods a day. The duration of each period is $\frac{3}{4}$ hour. What is the total duration of all the periods ? _____
4. A metre of cloth costs ₹ $20\frac{1}{2}$. Find the cost of $2\frac{1}{4}$ m of cloth. _____
5. A kilogram of apples cost ₹ $17\frac{1}{2}$. Find the cost of $1\frac{1}{5}$ kg of the apples. _____
6. A bag contains $\frac{9}{10}$ kg of salt. How much salt do 25 such bags contain ? _____
7. What will be the cost of 10 pencils if each costs ₹ $3\frac{2}{5}$? _____
8. $\frac{5}{9}$ of a class of students are boys. If the total number of students is 45, what is the number of boys ? _____
9. An aeroplane covers 500 km in an hour. How much distance will it cover in $2\frac{1}{5}$ hours ? _____
10. The daily consumption of milk of a family is $2\frac{3}{5}$ litres. Find the quantity of milk in litres consumed by the family in the month of September ? _____
11. A parking place can hold 120 cars at a time. $\frac{3}{8}$ of the parking places is full at a certain time. How many cars are there in the parking place at that time ? _____

Multiplicative Inverse (or Reciprocal) of a Number

We know that,

$$2 \times \frac{1}{2} = 1, \frac{1}{2} \times 2 = 1 \text{ and } \frac{5}{4} \times \frac{4}{5} = 1, \quad \frac{4}{5} \times \frac{5}{4} = 1$$

The product of each pair of numbers is 1. Each number in the pair is called the multiplicative inverse or reciprocal of the other number of the pair.

Thus, 2 is the reciprocal of $\frac{1}{2}$ and $\frac{1}{2}$ is the reciprocal of 2.

$\frac{4}{5}$ is the reciprocal of $\frac{5}{4}$ and $\frac{5}{4}$ is the reciprocal of $\frac{4}{5}$.

Properties of Reciprocals

1. The product of a number and its reciprocal will be always 1.
2. Reciprocal of the number 1 is 1.
3. Reciprocal of zero cannot be found.
4. Reciprocal of a proper fraction will be an improper fraction.

   For example : reciprocal of proper fraction $\frac{2}{3}$ is $\frac{3}{2}$, which is an improper fraction.
5. Reciprocal of an improper fraction will be a proper fraction.

To Find the Reciprocal of a Fractional or Whole Number

1. If the fraction is mixed, change it to improper fraction first.
2. To get the reciprocal of a proper or improper fraction; interchange the numerator and denominator of it *e.g.*, reciprocal of $\frac{8}{7}$ is $\frac{7}{8}$.
3. To get the reciprocal of a non-zero whole number, put numerator as 1 and the whole number as denominator *e.g.*, reciprocal of 5 is $\frac{1}{5}$.

Exercise 7.5

☞ Write the reciprocals of :

1. $\frac{3}{4}$ **2.** $\frac{7}{9}$ **3.** $\frac{11}{5}$ **4.** $\frac{15}{11}$ **5.** $1\frac{2}{3}$ **6.** $5\frac{7}{9}$

7. $\frac{1}{15}$ **8.** $\frac{1}{12}$ **9.** 2 **10.** 10 **11.** 17 **12.** 15

☞ Fill in the blanks :

13. $\frac{1}{15} \times 15 =$ _____ **14.** $\frac{3}{8} \times$ _____ $= 1$ **15.** $\frac{9}{16} \times \frac{16}{9} =$ _____

16. _____ $\times 3\frac{1}{2} = 1$ **17.** $5\frac{1}{4} \times \frac{4}{21} =$ _____ **18.** $4\frac{1}{2} \times$ _____ $= 1$

Division of a Fractional Number by a Natural Number

If we cut a mango into two equal halves, each is $\frac{1}{2}$ of the whole.

If we cut half of a mango into two equal parts, we have each part as one quarter.

i.e., $\frac{1}{2} \div 2 = \frac{1}{4}$

But, we have seen $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

Comparing the two expressions we find that dividing by 2 is the same as multiplying by the reciprocal of 2.

Thus, our division process becomes : $\frac{1}{2} \div 2 = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

Example 7 : Divide $\frac{6}{7}$ by 8.

Solution : $\frac{6}{7} \div 8 = \frac{\overset{3}{\cancel{6}}}{7} \times \frac{1}{\underset{4}{\cancel{8}}} = \frac{3}{28}$ (Reciprocal of 8 is $\frac{1}{8}$.)

Example 8 : Divide $8\frac{3}{4}$ by 9.

Solution : $8\frac{3}{4} \div 9 = \frac{35}{4} \div 9 = \frac{35}{4} \times \frac{1}{9} = \frac{35}{4} \times \frac{1}{9} = \frac{35}{36}$ (Reciprocal of 9 is $\frac{1}{9}$.).

➲ Division of a Fractional Number by a Fractional Number

Example 9 : Divide $\frac{7}{8}$ by $\frac{21}{32}$.

Solution : $\frac{7}{8} \div \frac{21}{32} = \frac{7}{8} \times \frac{32}{21}$ (Reciprocal of $\frac{21}{32}$ is $\frac{32}{21}$.)

$= \frac{\overset{1}{\cancel{7}}}{\underset{1}{\cancel{8}}} \times \frac{\overset{4}{\cancel{32}}}{\underset{3}{\cancel{21}}} = \frac{4}{3}$

Example 10 : Divide $4\frac{4}{5}$ by $1\frac{1}{2}$.

Solution : $4\frac{4}{5} \div 1\frac{1}{2} = \frac{24}{5} \div \frac{3}{2}$

$= \frac{\overset{8}{\cancel{24}}}{5} \times \frac{2}{\underset{1}{\cancel{3}}}$ (Reciprocal of $\frac{3}{2}$ is $\frac{2}{3}$.)

$= \frac{16}{5} = 3\frac{1}{5}$

➲ Division of a Whole Number by a Fractional Number

If we cut an apple into two equal halves, each is $\frac{1}{2}$ of the whole. Now we can ask how many halves are there in one whole ?

i.e. $1 \div \frac{1}{2} = ?$

The answer is clear, two halves

Hence, $1 \div \frac{1}{2} = 2$

The same result we get by multiplying 1 by reciprocal of $\frac{1}{4}$.

$$1 \div \frac{1}{4} = 1 \times \frac{4}{1} = 4$$

Example 11 : Divide 35 by $3\frac{1}{2}$.

Solution : $35 \div 3\frac{1}{2} = 35 \div \frac{7}{2} = 35 \times \frac{2}{7}$ (Reciprocal of $\frac{7}{2}$ is $\frac{2}{7}$.)

$$= \overset{5}{\cancel{35}} \times \frac{2}{\cancel{7}_{1}} = 5 \times 2 = 10$$

Properties of Division of Fractional Numbers

1. When a fractional number is divided by 1, the quotient is the fractional number itself.

   For example : $1\frac{1}{2} \div 1 = 1\frac{1}{2}$

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

   For example : $\frac{5}{7} \div \frac{5}{7} = 1$

3. A fractional number cannot be divided by zero.
4. When zero is divided by a fractional number, the quotient is zero.

   For example : $0 \div 1\frac{4}{9} = 0$

Exercise 7.6

Divide :

1. $\frac{2}{5}$ by 2 **2.** $\frac{3}{5}$ by 6 **3.** $1\frac{3}{5}$ by 4 **4.** $\frac{4}{7}$ by $\frac{3}{14}$ **5.** $6\frac{1}{4}$ by $2\frac{1}{2}$

6. $2\frac{1}{2}$ by $\frac{10}{11}$ **7.** 15 by $2\frac{1}{2}$ **8.** 12 by $\frac{3}{4}$ **9.** 39 by $3\frac{1}{4}$

Find the quotient :

10. $4\frac{1}{5} \div 7$, **11.** $\frac{2}{3} \div 2$ **12.** $6\frac{3}{4} \div 9$

13. $\frac{2}{5} \div \frac{7}{5}$ **14.** $8\frac{1}{2} \div 4\frac{1}{4}$ **15.** $8\frac{1}{2} \div \frac{7}{4}$

☞ Fill in the blanks :

16. $0 \div 7\frac{1}{3} =$ ____ 17. $6\frac{1}{4} \div 6\frac{1}{4} =$ ____ 18. ____ $\div 5\frac{1}{2} = 0$

19. $3\frac{5}{7} \div$ ____ $= 1$ 20. $7\frac{1}{4} \div$ ____ $= 7\frac{1}{4}$ 21. ____ $\div 9\frac{2}{7} = 1$

22. $\frac{2}{3} \div \frac{2}{3} =$ ____ 23. $\frac{4}{5} \div 1 =$ ____ 24. $4\frac{1}{5} \div 4\frac{1}{5} =$ ____

Word Problems on Division of Fractional Numbers

Example 12 : How many dresses can be made out of $20\frac{2}{5}$ m of cloth if each dress requires $5\frac{1}{10}$ m of cloth ?

Solution : Number of dresses $= 20\frac{2}{5} \div 5\frac{1}{10}$

$= \frac{102}{5} \div \frac{51}{10} = \frac{102}{5} \times \frac{10}{51}$ $\left(\text{Reciprocal of } \frac{51}{10} \text{ is } \frac{10}{51}.\right)$

$= \frac{\overset{2}{\cancel{102}}}{\underset{1}{\cancel{5}}} \times \frac{\overset{2}{\cancel{10}}}{\underset{1}{\cancel{51}}} = 2 \times 2 = 4$

Exercise 7.7

1. Pihu purchased 5 tickets costing ₹ $8\frac{1}{2}$ each. How much money did he spend in rupees ?

2. A piece of ribbon is $7\frac{4}{5}$ m long. If it is cut into 13 equal pieces, how long will each piece be ?

3. How many pieces of $2\frac{3}{4}$ metre each can be cut from a ribbon 33 metres long ?

4. The product of two numbers is $8\frac{2}{3}$. If one of the number is $3\frac{7}{15}$, find the other number.

5. There are 80 students in class V. If $\frac{1}{10}$ of the students were absent on a certain day, find the number of students that were present on that day.

6. The height of a pile of books one over the other is $15\frac{3}{5}$ cm. If each book is $1\frac{1}{5}$ cm thick, how many books make up the pile ?

7. $333\frac{1}{3}$ kg of rice is to be packed in bags. If each bag can hold $16\frac{2}{3}$ kg of rice, how many bags will get filled ?

8. An aeroplane takes $2\frac{1}{4}$ hours to fly 1458 km. How many km does it fly in one hour ?

9. A string, 3 metres long, is cut into eight equal parts. What is the length of each part ?

10. How many half litre bottles of milk can be filled from a can containing $17\frac{1}{2}$ litres of milk ?

11. The price of 1 kg rice is ₹ $18\frac{3}{4}$. How much rice can be purchased for ₹ 375 ?

12. There are 174 girls in a school which are $\frac{2}{5}$ of total students. Find the number of total students.

Let's Recall

Multiple Choice Questions (MCQs) :

Tick (✓) the correct option :

1. $1\frac{2}{3} \times 1\frac{3}{5} = ?$

   (a) $2\frac{2}{3}$ **(b)** $1\frac{2}{5}$ **(c)** $2\frac{2}{5}$ **(d)** $1\frac{5}{8}$

2. The product of $3\frac{1}{2}$ and $3\frac{1}{2}$ is _____ .

   (a) 7 **(b)** $9\frac{1}{2}$ **(c)** $9\frac{1}{4}$ **(d)** $12\frac{1}{4}$

3. To which of the following numbers should be multiplied into $\frac{3}{7}$ to obtain the product 24 ?

   (a) 8 **(b)** 56 **(c)** 16 **(d)** 18

4. The product of two numbers is $\frac{5}{4}$. If one number is $\frac{5}{6}$, what is the other number ?

   (a) 2 **(b)** $\frac{1}{2}$ **(c)** $\frac{3}{2}$ **(d)** $\frac{2}{3}$

Chapter 8

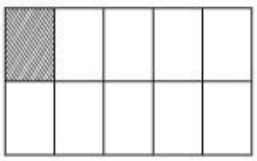
Decimal Fractions

Learning Objectives :

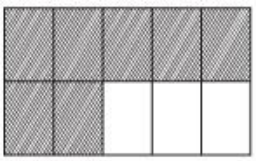
❖ What is Decimal Fractions ? ❖ Place Value Chart of Decimal Fractions ❖ Conversion of Common Fractions with Denominators 10, 100, 1000, etc. into Decimal Fractions ❖ Conversion of Decimal Fractions into Common Fractions ❖ Expanded Form of Decimal Fractions ❖ Like and Unlike Decimal Fractions ❖ Comparison and Ordering of Decimal Fractions

What is Decimal Fractions ?

A fraction where the denominator (the bottom number) is a power of ten (such as 10, 100, 1000, etc.), is called decimal fraction. We can write decimal fractions with a decimal point (and no denominator), which make it easier to do calculations like addition and multiplication on fraction.

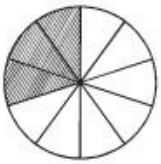


$\frac{1}{10}$ or 0.1



$\frac{7}{10}$ or 0.7

1



$\frac{3}{10}$ or $1\frac{3}{10}$ or 1.3

In the same way,

$\frac{3}{100} = 0.03$ $\quad \frac{33}{100} = 0.33$ $\quad \frac{125}{100} = 1.25$

$\frac{7}{1000} = 0.007$ $\quad \frac{17}{1000} = 0.017$ $\quad \frac{131}{1000} = 0.131$

Place Value Chart of Decimal Fractions

Like whole numbers decimal fractions also have place value chart.

Decimal Point	Tenths	Hundredths	Thousandths	Value
.	5			$\frac{5}{10}$ or 5 tenths
.	0	5		$\frac{5}{100}$ or 5 hundredths

.	0	0	5	$\frac{5}{1000}$ or 5 thousandths
.	7	6	5	$\frac{765}{1000}$ or 7 tenths 6 hundredths 5 thousands

Now, look place value chart of whole numbers and decimal numbers together.

Hundreds	Tens	Ones	Decimal point	Tenth	Hundredths	Thousandths	In Words
		1		4	5		One point four five
	1	4		0	3		Fourteen point zero three
1	2	5		4	6	9	One hundred point four six nine

Conversion of Common Fractions with Denominators 10, 100, 1000, etc. into Decimal Fractions

Method :

1. We count the number of zeros after 1 in the denominator.
2. Count an equal number of digits from the ones in the numerator and place the decimal point to the left of the digit reached.

   For example : $\frac{1306}{1000} = 1.306$; $\frac{1306}{100} = 13.06$; $\frac{1306}{10} = 130.6$
3. The number of digits in the numerator may be less than the number of zeroes in the denominator. Then we put supplementary zeroes to the left of the numerator to equal its number of digits to the number of zeroes in the denominator.

   For example : $\frac{7}{100} = 0.07$; $\frac{7}{1000} = 0.007$; $\frac{7}{10000} = 0.0007$; $\frac{49}{1000} = 0.049$

Fact File

Zero before the decimal point is not counted as it is not the decimal part.

Conversion of Decimal Fractions into Common Fractions

Method :

1. We write the given number, removing the decimal point as the numerator of the common fraction.
2. We write 1 followed by zeroes equal to the number of digits (places) after the decimal point as the denominator of the common fraction.
3. Convert it into its lowest terms if possible.

For example :

$4.356 = \frac{4356}{1000} = \frac{1089}{250}$ (Dividing the numerator and denominator each by 4)

$43.56 = \frac{4356}{100} = \frac{1089}{25}$ (Dividing the numerator and denominator each by 4)

$435.6 = \frac{4356}{10} = \frac{2178}{5}$ (Dividing the numerator and denominator each by 2)

$0.4356 = \frac{4356}{10000} = \frac{1089}{2500}$ (Dividing the numerator and denominator each by 4)

Exercise 8.1

☞ Change the following common fractions into decimal fractions :

1. $\frac{2}{10}$	**2.** $\frac{9}{10}$	**3.** $\frac{15}{10}$	**4.** $\frac{18}{10}$
5. $\frac{17}{100}$	**6.** $\frac{7}{100}$	**7.** $\frac{1}{1000}$	**8.** $\frac{2}{1000}$
9. $\frac{9}{1000}$	**10.** $\frac{15}{1000}$	**11.** $\frac{20}{1000}$	**12.** $\frac{101}{100}$
13. $3\frac{3}{10}$	**14.** $5\frac{7}{10}$	**15.** $5\frac{7}{100}$	**16.** $5\frac{7}{1000}$
17. $4\frac{19}{100}$	**18.** $3\frac{331}{1000}$	**19.** $56\frac{1}{100}$	**20.** $16\frac{19}{1000}$
21. $\frac{1256}{10}$	**22.** $\frac{1256}{100}$	**23.** $\frac{1256}{1000}$	**24.** $\frac{1256}{10000}$

☞ Change the following decimal fractions into common fractions :

25. 0.2	**26.** 0.02	**27.** 0.002	**28.** 0.0002
29. 1.5	**30.** 0.15	**31.** 0.015	**32.** 0.0015
33. 402.3	**34.** 40.23	**35.** 4.023	**36.** 0.4023
37. 640.98	**38.** 225.789	**39.** 23.965	**40.** 6.0055

Life Skills

Ashish wrote these facts about himself. But he forgot to put the decimal point. Mark the decimal point, so that the fact makes sense.

- I am about 100 years old.
- I drink 25 L water every day.
- My height is 1105 cm.
- The Apple Juice I drank today cost ₹990.
- My weight is 255 kg.
- There are 300 students in my class.

➲ Expanded Form of Decimal Fractions

Example 1 : Write the expanded form of 1735.684 in **(i)** words, **(ii)** decimal place values and **(iii)** common fractions.

Solution : **(i)** 1735.684 = 1 thousand 7 hundreds 3 tens 5 ones 6 tenths 8 hundredths 4 thousandths

(ii) $1735.684 = 1000 + 700 + 30 + 5 + 0.6 + 0.08 + 0.004$

(iii) $1735.684 = 1000 + 700 + 3 + 5 + \frac{6}{10} + \frac{8}{100} + \frac{4}{1000}$

Example 2 : Write 5 hundreds 2 tens 3 ones 1 tenth 2 hundredths 9 thousandths as decimal fraction.

Solution : We write the digits in their corresponding place value positions.

The fractional number $= 500 + 20 + 3 + \frac{1}{10} + \frac{2}{100} + \frac{9}{1000}$

$= 523.129$

➲ Like and Unlike Decimal Fractions

A group of decimal fractions with equal number of decimal places in each is called like decimal fractions.

For example : 45.213; 3.632; 15.300 are like decimal fractions.

A group of decimal fractions with different number of decimal places is called unlike decimal fractions.

For example : 0.20; 2.3; 25.327 are unlike decimal fractions.

Fact File

0.2; 0.20; 0.200 are equivalent but unlike decimal fractions.

To convert unlike decimal fractions to like decimal fractions we simply make the number of decimal places equal by adding zeroes at the right most.

For example :

Unlike Decimal Fractions	Like Decimal Fractions
6.2	6.200
316.35	316.350
2.395	2.395

➲ Comparison and Ordering of Decimal Fractions

Rules :

1. First we compare the whole number parts. The decimal fraction with greater whole number part will be greater.

For example : $7.0 > 4.789$

2. If the whole number parts are equal, we compare the tenths.

   For example : $5.3 > 5.297$

3. If the tenths parts are also equal, we compare the hundredths and so on.

   For example : $5.31 > 5.309$

   $5.357 > 5.3568$

Example 3 : Arrange the following decimal fractions in descending order :
12.065 ; 32.006 ; 12.060; 12.605

Solution :

(i) First we compare whole number parts : 32 is the greatest. So, 32.006 is the greatest.

(ii) Whole number part of rest three numbers are equal. But tenth part of 12.605 is the greatest. Therefore, 12.605 is the greatest among the rest three.

(iii) Tenth and hundredth part of rest two numbers are equal.
But thousandth part of 12.065 > that of 12.060.
Required descending order of the given decimal fractions :
32.006; 12.605; 12.065; 12.060

Common Mistake

$2.7 < 2.25$ ✗
$2.7 > 2.257$ ✓
Do'nt compare by counting the number of digits of decimal.

Exercise 8.2

Write the expanded form of the following decimal fractions in words :

1. 4.35 **2.** 51.72 **3.** 206.308 **4.** 315.287

Write the expanded form of the following fractions both in decimal place values and common fractions :

5. 23.742 **6.** 175.876 **7.** 383.929 **8.** 4524.367

Fill in the blanks :

9. 10 _____ = 1 one.

10. 35 tenths = 3 _____ + 5 _____ .

11. 10 thousandths = 1 _____ .

12. _____ hundredths = 1 tenth.

13. 45 thousandths = 4 _____ + 5 _____ .

14. 73 hundredths = _____ tenths + _____ hundredths.

☞ Write in short form as a decimal fraction :

15. $700 + 50 + 2 + \frac{1}{10} + \frac{2}{100} + \frac{5}{1000} =$ _____

16. $400 + 60 + 8 + \frac{3}{10} + \frac{0}{100} + \frac{5}{1000} =$ _____

17. $500 + 40 + 3 + 0.2 + 0.05 + 0.007 =$ _____

18. 7 tens + 0 one + 5 tenths + 7 hundredths = _____

☞ State whether the following group of decimal fractions is like or unlike :

19. 0.69; 7.123; 61.345 **20.** 300.91; 44.04; 52.99

21. 64.430; 123.123; 345.008 **22.** 8.431; 13.99; 14.0

☞ Convert each group of unlike decimal fractions to like decimal fractions :

23. 753.846; 523.1; 25.32 **24.** 0.79; 116.005; 5.1

25. 543.208; 4.52; 6.07 **26.** 7.03; 4.02; 2.001

☞ Which decimal in each of the following pairs of decimals is greater :

27. 0.67; 0.75 **28.** 6.99; 6.98 **29.** 12.5; 5.7

30. 2.1; 1.99 **31.** 2.101; 2.099 **32.** 12.68; 12.678

☞ Put > or < between the decimal fractions :

33. 18.7 ■ 18.68 **34.** 65.087 ■ 65.805 **35.** 11.358 ■ 11.36

☞ Arrange in descending order :

36. 2.001; 2.02; 2.0004; 2.003 _____

37. 1.001; 0.010; 0.101; 1.01 _____

☞ Arrange in ascending order :

38. 4.5; 4.053; 4.03; 4.005 _____

39. 30.7; 30.009; 30.17; 30.71 _____

Let's Recall

Multiple Choice Questions (MCQs) :

Tick (✓) the correct option :

1. Decimal fraction representation of $3\frac{1}{5}$ is :

(a) 4.3 ☐ **(b)** 3.2 ☐ **(c)** 4.7 ☐ **(d)** 3.6 ☐

2. Common fraction representation of 0.025 is :

(a) $\frac{1}{40}$ ☐ **(b)** $\frac{1}{30}$ ☐ **(c)** $\frac{1}{35}$ ☐ **(d)** $\frac{1}{45}$ ☐

Chapter 9

Operations in Decimal Fractions

Learning Objectives :
❖ Addition and Subtraction of Decimal Fractions ❖ Multiplication of Decimal Fractions ❖ Properties of Multiplication of Decimal Fractions ❖ Division of Decimal Fractions

➲ Addition and Subtraction of Decimal Fractions

To add or subtract decimal fractions, we first write them in columns in such a way that their decimal points are in the same column.

After addition or subtraction put the decimal point directly under the column of the decimal points.

Example 1 : The rainfall in a city on the first three days of a month was 3.75 cm, 4.8 cm and 5.694 cm. How much did it rain in all the three days ?

Solution : The given decimal fractions are unlike. So we first convert them into like decimal fractions.

Total rainfall = 3.75 + 4.8 + 5.694
= 3.750 + 4.800 + 5.694
= 14.244 cm

```
  3.750
  4.800
+ 5.694
 14.244
```

Example 2 : Mona's school is at a distance of 3.2 km from her house. She covers a distance of 2.734 km by bus and the remaining distance on foot. How far does she walk on foot ?

Solution : Distance walked by Mona on foot
= 3.2 km – 2.734 km
= 3.200 km – 2.734 km (Turning to like fractions)
= 0.466 km

```
  3.200
- 2.734
  0.466
```

Exercise 9.1

☞ Solve these :

1. 4.5 + 2.8 =
2. 7.65 + 2.493 =
3. 16.3 + 1.785 =
4. 121.5 + 96.285 =
5. 693.28 + 17.496 =

☞ Solve these :

6. 9.3 − 4.75 = _____

7. 13.2 − 9.865 = _____

8. 20.32 − 8.976 = _____

9. 42.3 − 29.785 = _____

10. 72.07 − 35.886 = _____

11. The rainfall in a city on three consecutive months was 30.56 cm, 23.20 cm and 5.7 cm. How much total did it rain into these three months ? _____

12. A barrel holds 86.7 litre of water. If 32.41 litre of water is used, how much of water is left in the barrel ? _____

13. A ration shop had 84.2 kg of rice in stock 67.750 kg of rice was sold during the day. How much of rice was left with the shop ? _____

14. A drum of 200 litre capacity has 125.4 litre of oil. How much more oil can be poured into the drum ? _____

15. Parul travelled 37.4 km by bus, 4.150 km by scooter and rest on foot. If her total journey was 42 km, how much did she travelled on foot ? _____

16. Amina bought a diary for ₹ 21.25, a pen for ₹ 8.50 and a notebook for ₹ 18.70. If she gave a ₹ 100 note to the shopkeeper, how many rupees did she get back ?

_____

17. A milk vendor had 20 L of milk. He sold 3.5 L, 4.250 L and 7 L milk to three customers respectively. How much milk is left with the milkman now ?

_____

18. Sonia bought a gents watch for ₹ 747.50 and a ladies watch for ₹ 835.75. If she gave four notes of 500 rupees to the shopkeeper, how much amount did she get back ?

_____

Multiplication of Decimal Fraction

Multiplication of Decimal Fraction by Whole Number

First we perform this multiplication as multiplying two whole numbers. Then we put the decimal point in the product so that the number of decimal places equals to the number of decimal places in the multiplicand.

Example 3 : Multiply 4.287 by 36

Solution : First we multiply 4.287 by 36.

Number of decimal places in 4.287 is three. So, we put decimal point in 154332 after three places from the right.

4.287 × 36 = 154.332

```
  4.287
×   36
-------
 25722
12861×
-------
154.332
```

Multiplication of a Decimal Fraction by 10, 100 or 1000

We simply move the decimal point in the multiplicand by one, two or three places (number of zeroes in the multiplier) to the right.

For example :

$46.159 \times 10 = 461.59$

$46.159 \times 100 = 4615.9$

$46.159 \times 1000 = 46159$

If the number of decimal places in the multiplicand is less than the number of zeroes in the multiplier we put zeroes in the product to supplement.

For example :

$46.5 \times 100 = 4650$

$46.5 \times 1000 = 46500$

Exercise 9.2

☞ Multiply :

1. 0.9 by 5	**2.** 2.3 by 13	**3.** 8.32×20	**4.** 9.5 by 7
5. 5.648×3	**6.** 28.65×25	**7.** 2.365×12	**8.** 67.39×26
9. 36.75×70	**10.** 22.12×45	**11.** 41.379×63	**12.** 5.097×57

☞ Multiply mentally :

13. 8.34×10	**14.** 3.203×100	**15.** 42.871×100	**16.** 3.428×100
17. 5.001×10	**18.** 7.3×100	**19.** 5.328×1000	**20.** 9.01×1000

☞ Fill in the blanks :

21. $2.6 \times$ _____ $= 26$

22. $6.08 \times$ _____ $= 608$

23. $0.2 \times$ _____ $= 20$

24. _____ $\times 1000 = 1235$

25. _____ $\times 100 = 42.9$

26. $0.078 \times 100 =$ _____

27. A bag contains 99.6 kg of wheat. How much wheat is contained in 1000 such bags ?

28. The weight of one litre of kerosene is 0.8 kg. Find the weight of 10 litres of kerosene.

29. Diesel costs ₹ 13.70 a litre. Find the price of 100 litres of diesel.

30. Cost of 1 kg of sugar is ₹ 15.50. Find the cost of 25 kg of sugar.

31. One metre of cloth costs ₹ 52.75. Find the cost of 12 metres of cloth.

32. What will be the weight of 65 bags of rice if each bag contains 16.75 kg of rice in it ?

Multiplication of Decimal Fraction by Decimal Fraction

We multiply the two decimal fractions as the multiplication of whole numbers. Then put the decimal point in the product after as many places from the right as there are total decimal places in both the decimal fractions together.

If the number of digits in the product are less than the total number of decimal places in both the decimal fractions together we make up with the zeroes on the left.

Example 4 : Multiply 6.754 by 3.8

Solution : First we multiply 6754 by 38.

Total number of decimal places in both the decimal fractions is $(3 + 1 = 4)$

So, we put decimal point in the product after 4 places from the right.

$6.754 \times 3.8 = 25.6652$

```
  6754
×   38
-------
 54032
20262×
-------
256652
```

Common Mistake

7.08	7.08
×15	×15
35.40	3540
7.080	7080
42.480 ✗	106.20 ✓

➲ Properties of Multiplication of Decimal Fraction

All the properties of the multiplication of common fractions also hold good for the decimal fractions.

Property 1 : Decimal fractions multiplied in any order gives the same product.

For example : $6.45 \times 2.694 = 2.694 \times 6.45$

Property 2 : The product of a decimal fraction and 1 is the decimal itself.

For example : $0.28 \times 1 = 0.28$

Property 3 : The product of a decimal fraction and zero is zero.

For example : $617.25 \times 0 = 0$

Exercise 9.3

☞ Multiply :

1. 0.2×0.3	**2.** 2.3×3.8	**3.** 0.25×0.7	**4.** 6.23×1.7
5. 3.4×1.02	**6.** 7.08×0.5	**7.** 7.28×5.4	**8.** 0.4×36.1
9. 0.02×0.03	**10.** 4.003×0.53	**11.** 2.432×4.23	**12.** 4.01×2.02

☞ Fill in the blanks :

13. $0.2 \times 0.2 \times 0.2 =$ _____ **14.** $0.01 \times 0.02 =$ _____

15. $1.3 \times 0.1 \times 0.1 =$ _____ **16.** $1.1 \times 0.2 =$ _____

17. $0.857 \times 1 =$ _____ **18.** $8.857 \times 0 =$ _____

19. $4.5 \times 7.4 = 7.4 \times$ _____ **20.** $2.25 \times$ _____ $= 4.7 \times 2.25$

21. $5.3 \times$ _____ $= 5.3$ **22.** $4.75 \times$ _____ $= 0$

23. 1 litre of milk costs ₹ 16.50. Find the cost of 1.6 litre of milk. _____

24. Cost of 1 metre shirt cloth is ₹ 48.50. Find the cost of 1.70 m of cloth. _____

25. 1 kg sugar costs ₹ 15.50. Find the cost of 10.500 kg of sugar. _____

Division of Decimal Fraction

Division of Decimal Fraction by Whole Number

We divide like whole numbers and then put decimal point in the quotient just before using the first digit of the decimal part of the dividend.

Example 5 : Divide 364.2 by 25.

Solution :

We add decimal in quotient before putting down decimal number 2.

Quotient = 14.568

```
      14.568
25 ) 364.2
     25
     ---
     114
     100
     ---
      14 2
      12 5
      ----
       17 0   → add zero
       15 0
       ----
        2 00  → add another zero
        2 00
        ----
           0
```

Example 6 : Divide 3.024 by 36.

Solution :

```
      0.084
36 ) 3.024
     0
     ---
     3 0
     0
     ---
     3 02
     2 88
     ----
      144
      144
      ---
        0
```

TO MEET

Bhaskara II (AD 1114-1185) or Bhaskaracharya was a great Indian mathematician. He was born in Bijapur, Karnataka.

He was the first to explain the complete and systematic use of the decimal number system.

Quotient = 0.084

Division of Decimal Fraction by 10, 100, 1000, etc.

We get the quotient by moving the decimal point in the dividend as many places to the left as there are zeroes in the divisor.

For example : $243.7 \div 10 = 24.37$ $243.7 \div 100 = 2.437$ $243.7 \div 1000 = 0.2437$

If there are no or less number of digits to the left of the decimal point, we make up with zeroes.

Thus, $3.4 \div 100 = 0.034$ $3.4 \div 1000 = 0.0034$

Exercise 9.4

Divide (Find the quotient) :

1. $4.2 \div 3$	**2.** $2.4 \div 4$	**3.** $4.8 \div 8$	**4.** $11.25 \div 15$
5. $112.5 \div 15$	**6.** $0.1125 \div 15$	**7.** $3.84 \div 4$	**8.** $4.23 \div 15$
9. $0.192 \div 12$	**10.** $125.086 \div 26$	**11.** $38.007 \div 9$	**12.** $12.675 \div 3$

Divide orally :

13. $21.55 \div 10$	**14.** $20.3 \div 10$	**15.** $82.6 \div 100$
16. $612.3 \div 100$	**17.** $1.4 \div 100$	**18.** $0.8 \div 10$
19. $0.036 \div 10$	**20.** $836.7 \div 1000$	**21.** $2.7 \div 1000$

22. If 15 copies of a book cost ₹ 148.50, what is the cost of one copy of the book ?

23. A ribbon 4.27 m long is cut into 7 equal pieces. What is the length of each piece ?

24. A superfast train covers a distance of 724.7 km in 10 hours. What distance does it cover in 1 hour ? Stoppage time is not counted.

25. The value of 10 gram of silver is ₹ 70.50. What will be the value of 1 gram of silver ?

26. 3.2 litres of petrol are consumed by a scooter in going 50 km. What is the consumption of petrol per km ?

27. 81 bottles of equal capacity can be filled with 29.16 litre of medicine. How much medicine (in litre) is there in each bottle ?

Division of a Decimal Fraction by a Decimal Fraction

First we convert the divisor to a whole number.

(i) If the divisor has 1 place of decimal, we multiply the divisor and dividend each by 10.

For example : $9.785 \div 0.5 = \frac{9.785 \times 10}{0.5 \times 10} = \frac{97.85}{5} = 97.85 \div 5$

Now, we can divide 97.85 by 5.

(ii) If the divisor has 3 places of decimal, we multiply the divisor and dividend each by 100.

(iii) If the divisor has 3 places of decimal, we multiply the divisor and dividend each by 1000.

Example 7 : Divide 15.625by 0.025.

Solution : Divisor 0.025 has 3 places of decimal, hence we multiply dividend and divisor each by 1000.

$$15.625 \div 0.025 = \frac{15.625}{0.025} \times \frac{1000}{1000} = \frac{15625}{25}$$

$$\begin{array}{r} 625 \\ 25\overline{)15625} \\ 150\downarrow \\ \hline 62 \\ 50\downarrow \\ \hline 125 \\ 125 \\ \hline 0 \end{array}$$

$15.625 \div 0.025 = 625$

Division of Whole Number by a Decimal Fraction

Example 8 : Divide 15375 by 12.3

Solution : $15375 \div 12.3$

$$= \frac{15375}{12.3} \times \frac{10}{10} = \frac{153750}{123}$$

$$\begin{array}{r} 1250 \\ 123\overline{)153750} \\ 123\downarrow \\ \hline 307 \\ 246\downarrow \\ \hline 615 \\ 615\downarrow \\ \hline 0 \end{array}$$

$15375 \div 12.3 = 1250$

Division of a Whole Number by a Whole Number (Quotient in Decimal Fraction) or Conversion of a Common Fraction into a Decimal Fraction

After we have divided upto the ones of the dividend, we put a decimal point and zero in the dividend. Now, we divide and put as many zeroes as required.

Example 9 : Divide 25 by 32. or Convert $\frac{25}{32}$ to a decimal fraction.

Solution :

$$\begin{array}{r} 0.78125 \\ 32\overline{)250} \\ 224 \\ \hline 260 \\ 256 \\ \hline 40 \\ 32 \\ \hline \end{array} \qquad \begin{array}{r} 80 \\ 64 \\ \hline 160 \\ 160 \\ \hline 0 \end{array}$$

Hence, $\frac{25}{32} = 0.78125$

Fact File

A whole number is also a decimal fraction with any number of zeroes after the decimal point.
For example, 35 = 35.0 = 35.00 = 35.000 = 35.0000, etc.

Exercise 9.5

Divide :

1. 16.9 ÷ 1.3
2. 7.5 ÷ 2.5
3. 4.41 ÷ 2.1
4. 1.25 ÷ 2.5
5. 7.5 ÷ 1.25
6. 26.62 ÷ 2.2
7. 11.47 ÷ 0.031
8. 0.792 ÷ 0.8
9. 70.091 ÷ 5.27
10. 120 ÷ 0.06
11. 512 ÷ 6.4
12. 7.2 ÷ 0.008
13. 21 ÷ 0.42
14. 34 ÷ 4.25
15. 31.696 ÷ 0.28

Convert into decimal fractions :

16. $\frac{15}{4}$
17. $\frac{7}{40}$
18. $\frac{7}{8}$
19. $\frac{26}{125}$
20. $\frac{13}{80}$
21. $\frac{3}{50}$

Divide :

22. 5 by 8
23. 18 by 90
24. 42 by 525
25. 34 by 25
26. 48 by 75
27. 39 by 40
28. 1.8 m of cloth is required for a shirt. How many such shirts can be made from a piece of cloth 27 m long ?
29. If Sona walks 0.6 m in one step, how many steps will she take to walk a distance of 72 m ?
30. 8.75 m of cloth cost ₹ 490. Find the cost of 1 m of cloth.
31. A packet can hold 8.75 kg of rice. How many such packets can be filled with 2187.5 kg of rice ?
32. The cost of 8 kg tomatoes is ₹ 54. Find the cost of 1 kg tomatoes.

Let's Recall

Multiple Choice Questions (MCQs) :

Tick (✓) the correct option :

1. Addition of 3.442 and 16.312 is :
   (a) 19.224 **(b)** 19.754 **(c)** 19.514 **(d)** 19.664
2. Multiplication of 60.997 × 13.14 is :
   (a) 801.36921 **(b)** 801.45418 **(c)** 801.50058 **(d)** 801.52576

Chapter

10 Metric Measures in Decimals

Learning Objectives :

❖ Metric Units ❖ Meaning of Various Units of Metric Measures ❖ Operations in Metric Measures

Metric Units

Big units and small units of Metric measures are related to each other in the powers of ten (10, 1000, ..., etc.). Therefore, it is convenient to express them in decimals. Particularly small units can be expressed in decimal fractions of the big units.

Fact File

When 10 is multiplied by 10 once, twice,....., the products are called powers of 10.

When have learnt that

1. 1 cm = 0.01 m — 1 paisa = 0.01 rupee
   4 cm = 0.04 m — 4 paise = 0.04 rupee
   10 cm = 0.10 m and so on — 10 paise = 0.10 rupee and so on
2. Also, 10 mm = 1 cm
   1 mm $= \frac{1}{10}$ cm = 0.1 cm
   4 mm = 0.4 cm and so on
3. Now , we know 1000 small units = 1 kilo unit

   1 small unit $= \frac{1}{1000}$ = 0.001 kilo unit

Thus,			
	1 g = 0.001 kg	1 m = 0.001 km	1 L = 0.001 kL
	9 g = 0.009 kg	9 m = 0.009 km	9 L = 0.009 kL
	65 g = 0.065 kg	65 m = 0.065 km	65 L = 0.065 kL
	765 g = 0.765 kg	765 m = 0.765 km	765 L = 0.765 kL
	4379 g = 4.379 kg	4379 m = 4.379 km	4379 L = 4.379 kL

4. Similarly, we know 1000 milli units = 1 unit

   1 milli unit $= \frac{1}{1000}$ = 0.001 unit

Thus,			
	1 mg = 0.001 g	1mm = 0.001 m	1 mL = 0.001 L
	2 mg = 0.002 g	2 mm = 0.002 m	2 mL = 0.002 L

25 mg = 0.025 g	25 mm = 0.025 m	25 mL = 0.025 L
125 mg = 0.125 g	125 mm = 0.125 m	125 mL = 0.125 L
4879 mg = 4.879 g	4879 mm = 4.879 m	4879 mL = 4.879 L

Rules :

1. To convert unit into kilo, move decimal point three places to left.
2. To convert kilo into unit, move decimal point three places to right.
3. To convert milli into unit, move decimal point three places to left.
4. To convert unit into milli, move decimal point three places to right.

Example 1 : Convert 543.21 cm into mm.
Solution : 543.21 cm = 5432.1 mm

Example 2 : Convert 125 mm into cm.
Solution : 125 mm = 12.5 cm

Example 3 : Convert 274 cm into m.
Solution : 274 cm = 2.74 m

Example 4 : Convert 14378 mL into L and kL.
Solution : 14378 mL = 14.378 L
= 0.014378 kL

Example 5 : Convert 3 kg 80 g into kg.
Solution : 3 kg 80 g = 3.080 kg

➲ Meaning of Various Units of Metric Measures

Kilo	Hecto	Deca	Unit	Deci	Centi	Milli
1000	100	10	1	0.1	0.01	0.001
				tenth	hundredth	thousandth

Example 6 : Convert 239457 mm into various units of metric measures.
Solution : 1239457 mm = 123945.7 cm
1239457 mm = 12394.57 deci m
1239457 mm = 1239.457 m
1239457 mm = 123.9457 deca m
1239457 mm = 12.39457 hecto m
1239457 mm = 1.239457 km

Exercise 10.1

1. Convert 976305 mL into L and kL.
2. Convert 654123 mg into g and kg.
3. Convert 53214 mm into m and km.
4. Convert 0.12 kg into grams and miligrams.
5. Convert 50.5 g into kg.

☞ Convert :

6. 2.5 L into mL.
7. 7.321 kg into g and mg.
8. 5.23 km into m and mm.
9. 7.9 m into km and mm.
10. 5.23 g into kg and mg.
11. Change 1543926 mm into various units of metric measures.

➲ Operations in Metric Measures

Example 7 : A bottle can hold 650 mL of squash. How many litres of squash will be held by 25 such bottles ?

Solution : 650 mL = 0.650 L

Quantity of squash in 25 bottles

$= 0.650 \times 25$ L

$= 16.250$ L

$$\begin{array}{r} 650 \\ \times\ 25 \\ \hline 3250 \\ 1300\times \\ \hline 16250 \end{array}$$

Example 8 : The weight of 6 L 50 mL oil is 5 kg 82 g. What is the weight of 1 litre oil ?

Solution : 6 L 50 mL = 6.050 L

5 kg 82 g = 5.082 kg

Weight of 6.050 L oil = 5.082 kg

Weight of 1 L oil = 5.082 ÷ 6.050 kg

$$= \frac{5.082}{6.050} \times \frac{1000}{1000} = \frac{5082}{6050}$$

= 0.84 kg or 0.840 kg or 840 g

$$\begin{array}{r} 0.84 \\ 6050\overline{)\ 50820} \\ 48400 \\ \hline 24200 \\ 24200 \\ \hline 0 \end{array}$$

Exercise 10.2

1. 1 bottle can hold 750 mL oil. How many litres of oil will be held by 46 such bottles ?
2. A sack contains 99.525 kg of wheat. How much wheat will such 78 bags contain ?

3. Cost of 1 metre terycot cloth is ₹ 41.50. Find the cost of 2.10 metre cloth.

4. The price of apple is ₹ 12.50 per kg. Find the price of 2 kg 200 g apples.

5. The weight of one litre spirit is 800 g. What will be the weight of 2 L 750 mL of spirit ?

6. The weight of 5 L 50 mL oil is 4 kg 40 g. Find the weight of 1 L oil ?

7. The cost of 3.2 kg ghee is ₹ 448. Find the cost of 1 kg ghee.

8. How many sheets of plywood each 0.25 cm thick are required to make a pile 1 m high ?

9. 1 kg oil measured in litres is 1 L 220 mL. How many litres are in 3 kg 50 g oil ?

10. The weight of 3.65 m metal rod is 12 kg 775 g. Find the weight of 1 m rod.

MATHS AND SOCIAL SCIENCE

Read this passage carefully.

The Himalayas extend from the Indus river in the west to the Brahmaputra river in the east. This mountain range extends for about 2500 km. Its width varies from about 400 km in the west to about 150 km in the east. The Karakoram mountain range lies between the Pamir Knot and the Indus river in Jammu and Kashmir. This range extends eastwards from the Pamir Knot for about 800 km. Now convert the units given in kilometres to hectometres, decametres and metres.

Let's Recall

Multiple Choice Questions (MCQs) :

Tick (✓) the correct option :

1. Conversion of 10.5 m into km is _____ .

   (a) 0.0105 km ☐ **(b)** 0.105 km ☐ **(c)** 1.05 km ☐ **(d)** 0.00105 km ☐

2. Conversion of 335 mL into L is _____ .

   (a) 3.35 L ☐ **(b)** 0.335 L ☐ **(c)** 0.0335 L ☐ **(d)** 0.0035 L ☐

Chapter

11 Temperature

Learning Objectives :

- Temperature
- Measuring Temperature
- Measuring Body Temperature
- Measuring Atmospheric Temperature
- To Convert Fahrenheit to Celsius Scale
- To Convert Celsius to Fahrenheit Scale
- Variation of Body Temperature
- Maximum and Minimum Temperature

Temperature

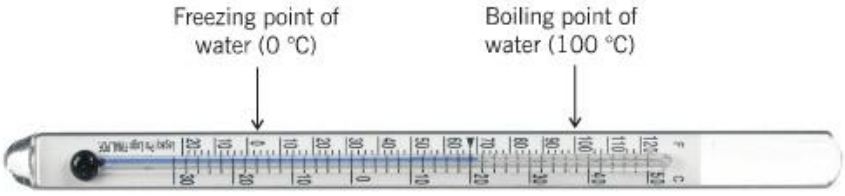
Temperature is the measure of hotness or coldness of a body, object or substance.

The thermometer is an instrument used to measure temperature.

Measuring Temperature

Two scales are commonly used for measuring temperature : the Celsius Scale (°C) and the Fahrenheit Scale (°F).

The metric system uses the Celsius Scale.



A Degree Celsius Thermometer

Fact File

°C is read as degree Celsius.
°F is read as degree Fahrenheit.

Freezing point of water = 0 °C = 32 °F

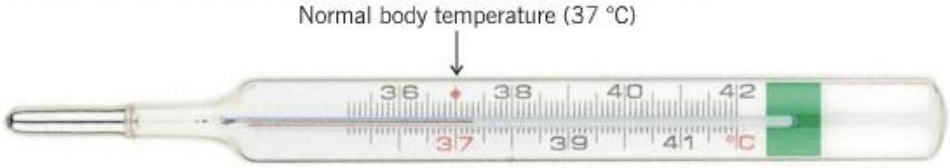
Boiling point of water = 100 °C = 212 °F

Measuring Body Temperature

A clinical thermometer is used for measuring body temperature.

The range of temperature in a clinical thermometer is 35 °C to 42 °C.

The normal body temperature of a healthy person is 37 °C.



37 °C $\xrightarrow{\text{more}}$ Fever

Measuring Atmospheric Temperature

A different thermometer with a wide range is used to measure outdoor temperature. The outdoor temperature helps in judging the weather conditions.

Temperature Conditions	Weather	Temperature Conditions	Weather
Below 0 °C	Very cold	25 °C – 30 °C	Warm
0 °C – 10 °C	Cool	30 °C – 35 °C	Hot
10 °C – 20 °C	Cool	35 °C – 40 °C	Very hot
20 °C – 25 °C	Mild	Above 40 °C	Extremely hot

Exercise 11.1

State the kind of weather you will get when the temperature is :

1. 45 °C ..... 2. 5 °C .....
3. Below 0 °C ..... 4. 21 °C .....
5. 36 °C ..... 6. 50 °C .....
7. 43 °C ..... 8. 27 °C .....

MATHS FROM THE PAST

Galileo Galilei invented a water thermometer in about 1593, which for the first time, could measure differences in temperature. In 1724, Daniel Gabriel Fahrenheit invented the first mercury thermometer, the type we use nowadays.

To Convert Fahrenheit to Celsius Scale

Subtract 32, then multiply by $\frac{5}{9}$.

Example 1 : Convert 68 °F into °C.

Solution :

$$68 - 32 = 36$$

$$\overset{4}{\cancel{36}} \times \frac{5}{\cancel{9}_{1}} = 20\ °C$$

To Convert Celsius to Fahrenheit Scale

Multiply by $\frac{9}{5}$, then add 32.

Example 2 : Convert 40 °C to °F.

Solution :

$$= \overset{8}{\cancel{40}} \times \frac{9}{\cancel{5}_{1}} = 72$$

$$72 + 32 = 104\ °F$$

Variation of Body Temperature

1. Body temperature varies during the day. It is lowest in the morning and highest in the evening when it rises by about 1.8 °F (1°C).
2. When we have fever our body temperature is more than 98.6 °F.
3. A human being does not have a temperature below 94 °F and above 108 °F.

Maximum and Minimum Temperature

Listen to the television broadcast of daily weather. For weather purposes they count the day from a sunrise to the next sunrise. In the morning news, they announce the minimum temperature of the day, that is in the late night (early morning). In the evening news, they announce the maximum temperature of the day, that is in the noon or afternoon.

Example 3 : The maximum temperature on a day is 37 °C and the minimum temperature is 27 °C. Change the difference of these temperatures in Fahrenheit scale.

Solution : Difference of maximum and minimum temperature :

$$= 37\ °C - 27\ °C = 10\ °C$$

$$= \overset{2}{\cancel{10}} \times \frac{9}{\cancel{5}_{1}} = 18$$

$$= 18 + 32 = 50\ °F$$

Exercise 11.2

1. Fill in the blanks :

(i) Freezing point of water = _____ °C.

(ii) Boiling point of water = _____ °C.

(iii) Normal body temperature of an adult = _____ °F.

(iv) The temperature of a human being during a day varies by _____ °F.

(v) The liquid, the thermometer bulb contains is usually _____ .

(vi) The level of mercury in the thermometer _____ when the temperature rises.

2. Convert these temperatures to Celsius Scale :

(i) 95 °F **(ii)** 104 °F **(iii)** 122 °F **(iv)** 176.9 °F

3. Convert these temperatures to Fahrenheit Scale :

(i) 20 °C **(ii)** 45 °C **(iii)** 100 °C **(iv)** 95.5 °C

4. The body temperature of a patient is 4.5 °F above the normal temperature. What is his body temperature in °F and °C ?

5. The maximum temperature on a day was 40 °C and the minimum temperature was 25 °C. Find the difference of these temperatures in Fahrenheit Scale.

6. Convert these temperatures into the other scale :

(i) 113 °F **(ii)** 40 °C **(iii)** 25 °C **(iv)** 131 °F.

Chapter 12

Unit-IV : Estimation

Simplification of Numerical Expressions

Learning Objectives :

❖ Sequence of Operations ❖ The Operation 'of' ❖ Use of Grouping Symbols

Sequence of Operations

Let us consider the following problem.

Mona had 60 marbles. She gave $\frac{1}{4}$ part of the marbles to her brother and 5 marbles each to her 4 friends. His brother returned 5 marbles to her. How many marbles does she have now ?

We can write this problem in numerical expression as :

Number of marbles with Mona

$$= 60 - 60 \div 4 - 5 \times 4 + 5$$

We see that this problem has all the four fundamental operations.

To simplify the numerical expressions having two or more operations, we follow a definite order (sequence) of the operations : Division, Multiplication, Addition, Subtraction.

In short we call this order as DMAS.

Now the above expression

$= 60 - 60 \div 4 - 5 \times 4 + 5$ (We divided 60 by 4)

$= 60 - 15 - 5 \times 4 + 5$ (We multiplied 5 by 4)

$= 60 - 15 - 20 + 5$

$= 60 + 5 - 15 - 20$

$= 65 - 15 - 20$ (We added 5 to 60)

$= 50 - 20$ (We subtracted 15 from 65)

$= 30$ (We subtracted 20 from 50)

Thus, Mona has 30 marbles now.

The Operation 'of'

We could have written a part of this problem as follows :

$$\frac{1}{4} \text{ of the marbles} = \frac{1}{4} \text{ of } 40$$

Then the expression would have been $40 - \frac{1}{4}$ of $40 - 5 \times 4 + 4$

In such cases, we have the order of operations as ODMAS : Of, Division, Multiplication, Addition, Subtraction.

The operator 'of' is changed into the operator 'multiply'. But we perform this multiplication before division. We complete this full operation before division.

Now, the above expression

$= 60 - \frac{1}{4}$ of $60 - 5 \times 4 + 5$

$= 60 - \frac{1}{\cancel{4}} \times \overset{15}{\cancel{60}} - 5 \times 4 + 5$ (We changed 'of' into multiply.)

$= 60 - 15 - 5 \times 4 + 5$ (We multiplied 5 by 4.)

$= 60 - 15 - 20 + 5$

$= 60 + 5 - 15 - 20$ (We added 5 to 60.)

$= 65 - 15 - 20$ (We subtracted 15 from 65.)

$= 50 - 20$ (We subtracted 20 from 50.)

$= 30$

Example 1 : Simplify : $3\frac{2}{5} \div \frac{4}{5}$ of $\frac{3}{2} + \frac{1}{4} \times \frac{2}{3} - \frac{3}{2}$

Solution : $3\frac{2}{5} \div \frac{4}{5}$ of $\frac{3}{2} + \frac{1}{4} \times \frac{2}{3} - \frac{3}{2}$

$= 3\frac{2}{5} \div \frac{\overset{2}{\cancel{4}}}{5} \times \frac{3}{\underset{1}{\cancel{2}}} + \frac{1}{4} \times \frac{2}{3} - \frac{3}{2}$ (We changed 'of' to multiply.)

$= 3\frac{2}{5} \div \frac{6}{5} + \frac{1}{4} \times \frac{2}{3} - \frac{3}{2}$

$= \frac{17}{5} \times \frac{5}{6} + \frac{1}{\underset{2}{\cancel{4}}} \times \frac{\overset{1}{\cancel{2}}}{3} - \frac{3}{2}$ (We divided.)

$$= \frac{17}{6} + \frac{1}{6} - \frac{3}{2} \quad \text{(We multiplied.)}$$
$$= \frac{17+1}{6} - \frac{3}{2} \quad \text{(We added.)}$$
$$= \frac{18}{6} - \frac{3}{2}$$
$$= 3 - \frac{3}{2}$$
$$= \frac{3}{1} - \frac{3}{2}$$
$$= \frac{6-3}{2}$$
$$= \frac{3}{2} = 1\frac{1}{2}$$

Example 2 : Simplify : $2.5 \times 4.2 \div 2.1 + 8 \times 1.25 \div 0.05$

Solution : $2.5 \times 4.2 \div 2.1 + 8 \times 1.25 \div 0.05$

$= 2.5 \times 2 + 8 \times 25$ (We divided.)

$= 5.0 + 200$ (We multiplied.)

$= 5 + 200$

$= 205$

Exercise 12.1

Simplify :

1. $13 \times 4 + 10 \div 5$
2. $14 - 8 \div 4 + 5 \times 3$
3. $128 \div 8 \times 5 - 7 + 4 \times 12$
4. $2 \times 10 - 3 + 15 \div 3$
5. $15 \times 10 \div 5 - 4$
6. $25 - 4 \times 5 + 9$
7. $\frac{1}{2} + \frac{3}{10} \div \frac{3}{5} - \frac{1}{3} \times \frac{5}{2}$
8. $70 \div 10 \times 2 + 6 - 3$
9. $5 \times 1 - \frac{1}{2} \times \frac{1}{3} \div 2$
10. $1\frac{1}{2} + \frac{5}{8}$ of $\frac{3}{4} \div \frac{1}{2} \times 1\frac{1}{2}$
11. $5\frac{1}{4} + 3\frac{1}{8} \div 1\frac{1}{4} - 1\frac{1}{4}$
12. $1\frac{1}{2} + 2\frac{5}{7} \times \frac{7}{19} - \frac{1}{2} \div 2$
13. $11\frac{1}{4} \div 3\frac{3}{5}$ of $2\frac{6}{7} + \frac{1}{4}$
14. $3\frac{1}{4} + 4\frac{1}{8} \div 2\frac{3}{4} - 3\frac{1}{8}$
15. $0.01 + 2 \times 1.02 \div 0.2 - 0.5$
16. $0.03 + 5 \times 1.04 \div 0.4 - 0.4$

17. $9\frac{4}{5} \div 3\frac{3}{20} - 1\frac{5}{6}$ **18.** $10\frac{4}{9} - 3\frac{2}{3} \div 1\frac{1}{5}$

19. $2.6 + 1.34 - 1.07 \times 2.7 \div 0.9$ **20.** $7.2 \div 12 \times 10 + 0.32 - 1.5$

➲ Use of Grouping Symbols

If a group of numbers joined by certain operation symbol (s) is to be operated upon by another number or group of numbers, then we use grouping symbols.

Grouping symbols are of 4 kinds :

1. Square brackets	[ ]	Before and after the numbers
2. Braces	{ }	Before and after the numbers
3. Parenthesis	( )	Before and after the numbers
4. Bar	—	Above the numbers

For example : Riya had 48 marbles. Her brother gave him 7 marbles more. She shared all the marbles with her 11 friends. How many marbles does each get ?

The operations can be represented with the help of grouping symbol as follows :

Number of marbles each got

$$= (48 + 7) \div 11$$
$$= 55 \div 11 = 5$$

Whenever two or more grouping symbols appear in an expression, we simplify them in the following order (sequence) : Bar, Parenthesis, Braces, Square brackets.

Fact File

(i) A numerical expression within a grouping symbol is solved in the order ODMAS.
(ii) If there is no sign of operation between a number and a grouping symbol, we take the sign as multiplication.

Example 3 : Simplify : $5 - [4 - \{3 - (2 - 1)\}]$

Solution : $5 - [4 - \{3 - (2 - 1)\}] = 5 - [4 - \{3 - 1\}]$
$= 5 - [4 - 2] = 5 - 2 = 3$

Example 4 : Simplify : $3\frac{1}{12} - \left[1\frac{3}{4} + \left\{2\frac{1}{2} - \left(1\frac{1}{2} - \frac{1}{3}\right)\right\}\right]$

Solution : $3\frac{1}{12} - \left[1\frac{3}{4} + \left\{2\frac{1}{2} - \left(1\frac{1}{2} - \frac{1}{3}\right)\right\}\right]$

$$= 3\frac{1}{12} - \left[1\frac{3}{4} + \left\{2\frac{1}{2} - \left(\frac{3}{2} - \frac{1}{3}\right)\right\}\right]$$
$$= 3\frac{1}{12} - \left[1\frac{3}{4} + \left\{2\frac{1}{2} - \frac{9-2}{6}\right\}\right]$$
$$= 3\frac{1}{12} - \left[1\frac{3}{4} + \left\{\frac{5}{2} - \frac{7}{6}\right\}\right]$$
$$= 3\frac{1}{12} - \left[1\frac{3}{4} + \frac{15-7}{6}\right]$$
$$= 3\frac{1}{12} - \left[\frac{7}{4} + \frac{8}{6}\right]$$
$$= 3\frac{1}{12} - \left[\frac{7}{4} + \frac{4}{3}\right]$$
$$= 3\frac{1}{12} - \frac{21+16}{12} = \frac{37}{12} - \frac{37}{12} = 0$$

Example 5 : Simplify : $0.8 - [0.95 - \{1.8 - (0.3 \div 0.12 \times 0.4)\}]$

Solution : $0.8 - [0.95 - \{1.8 - (0.3 \div 0.12 \times 0.4)\}]$

$$= 0.8 - \left[0.95 - \left\{1.8 - \left(0.3 \times \frac{1}{0.12} \times 0.4\right)\right\}\right]$$
$$= 0.8 - [0.95 - \{1.8 - 1\}]$$
$$= 0.8 - [0.95 - 0.8] = 0.8 - 0.15 = 0.65$$

Exercise 12.2

Simplify :

1. $\{5 - (4 - 3)\} \div 2$
2. $(15 - 6) \div (9 \div 3)$
3. $10 - (9 - 5)$
4. $30 \div (7 - 1) \times 5$
5. $3 + [2 + \{3 + (2 + 3)\}]$
6. $3 - [2 - \{3 - 2(3 - 2)\}]$
7. $2 - [2 - \{2 - (2 - 1)\}]$
8. $7\frac{1}{4} - \left\{2\frac{3}{4} \div \frac{5}{6} \text{ of } \frac{3}{5}\right\}$
9. $5\frac{1}{2} - \left[4\frac{1}{2} - \left\{3\frac{1}{2} - \left(2\frac{1}{2} - \frac{1}{2}\right)\right\}\right]$
10. $5 - \left[\frac{1}{2} - \left\{\frac{1}{3} + \left(\frac{1}{4} + \frac{1}{6} - \frac{1}{12}\right)\right\}\right]$
11. $4 + \left[4\frac{1}{4} - \left\{2\frac{3}{4} - \left(1\frac{1}{2} - 2\frac{1}{4} - 1\frac{1}{8}\right)\right\}\right]$
12. $3\frac{1}{2} - \left[1 + \left\{2\frac{1}{2} - \left(\frac{1}{4} - \frac{1}{5}\right)\right\}\right]$
13. $4\frac{1}{5} + \left\{1\frac{1}{4} \div \left\{\frac{1}{4} - \frac{1}{2}\left(\frac{2}{3} - \frac{3}{8}\right)\right\}\right\}$
14. $7 + \left[1\frac{1}{2} \times \left\{9 - \left(1\frac{2}{3} \div 2\frac{1}{2}\right)\right\}\right]$

15. $4.5 + \{(3.6 - 1.75) \times 5\}$

16. $0.2 + [0.14 \div \{0.25 - (0.2 - 0.02)\}]$

17. $[2 + 5 \times \{1.5 + (0.7 - 0.01)\}] - 1.5$

18. $4 - [3.6 - \{2.8 - (2.5 - 1.8) - 1.2\}]$

19. $2.5 + [7.95 - \{(8.4 - 5.25) \div 0.7 + 0.3\}]$

20. $8 - [17.1 - \{3.25 + (5.1 - 6.32) + 7.20\}]$

Let's Recall

Multiple Choice Questions (MCQs) :

Tick (✓) the correct option :

1. If $178 \times 34 = 6052$, what is $60.52 \div 17.8 = ?$

(a) 34 **(b)** 3.4 **(c)** 0.34 **(d)** 0.034

2. The simplification of $1 + \frac{1}{10} + \frac{1}{100} + \frac{1}{1000}$ in decimal form is _____ .

(a) 1.0001 **(b)** 1.111 **(c)** 1.001 **(d)** 0.111

3. Value of $2 - 3 + 4 + 3 - 3 - 2$ is equal to _____ .

(a) 1 **(b)** 2 **(c)** 3 **(d)** 4

4. Value of $2(12 - 3) + 4(10 - 7)$ is _____ .

(a) 18 **(b)** 30 **(c)** 54 **(d)** 66

Chapter 13

Approximation (Rounding Off)

Learning Objectives :

- Rounding off Large Numbers
- Rounding off Decimal Fractions
- Accurate Value and Value of Proximate (Nearest) Rupee

If we ask age of someone, he does not reply 12 years 7 months 10 days 15 hours 10 minutes. He simply says, 'I am 12.' Similarly, if the number of students in a school are 654, the Principal may remember it *exactly* but a guardian says, 'There are about 700 students in the school.

Thus, when exact numbers are not needed we give approximate numbers instead. To convert the exact numbers into approximate numbers is called approximation or rounding off. It makes easy to remember large numbers by rounding them properly. The numbers are rounded to the nearest tens, hundreds, thousands, etc., depending upon the requirement.

Example 1 : Lima has 83 toffees. Round the number 83 to the nearest (proximate) ten.

Solution : 83 has 3 ones and 8 tens. The next tens is 9 tens. We can display it on the number line as follows :

We can see that 83 is nearer to 80 than to 90.

If we consider other tens also, 60, 50,... downwards and 80, 90, 100,... upwards, we will say that 83 is nearest to 80.

So we say that 83 is about 80 to the nearest ten. Thus, we can say Lima has about 80 toffees.

Example 2 : Monu has 37 marbles. Round the number 37 to the nearest ten.

Solution : Find 37 in the number line. 37 comes exactly half way between 30 and 40. Half way numbers are rounded upwards conventionally.

So we can say Monu has about 40 marbles.

Example 3 : Round each number from 71 to 79 to the nearest ten.

Solution : Observe the number line. Find the numbers that are nearer to 70 and those are nearer to 80.

Number	71	72	73	74	75	76	77	78	79
Rounded Value	70	70	70	70	80	80	80	80	80

Rule for Approximation : To round a number to a required place, we look at the digit just right to the required place. If the digit is less than 5, we leave it and if it is 5 or more than 5 we add 1 to the digit at the required place. In each case, we put zeroes in place of all digits to the right of the required place.

Example 4 : 1475 people viewed a film on its first show. A news reporter wants to note this number to the nearest hundred. Find the number he writes for it.

Solution : In 1475, the number at the hundreds place is 4. The digit just right to it is 7.
So we add 1 at hundreds place, 4 + 1 = 5
So 1475 rounded to the nearest hundred = 1500
The news reporter will note, about 1500 people viewed the first show of the film.

Example 5 : The population of a village is 27,328. Round it to the nearest thousand.

Solution : The digit at thousands place = 7
The digit just right to thousands place = 3, leave it.
So the rounded number = 27,000
The population of the village = about 27,000

➲ Rounding Off Large Numbers

Example 6 : The population of India was 1,34,25,12,706 in 2017. Round it to the nearest (i) crores, (ii) millions.

Solution : **(i)** The digit at crores place = 134
The digit just right to the crores place = 2, leave it
The rounded number = 1,3400,00,000
The population of India was about 134 crore in 2017.

(ii) 1,34,25,12,706 is written as 1,342,512,708 in International System.
The digit at millions place = 342
The digit just right to millions place = 52
So we add 1 at millions place 342 + 1 = 343
The rounded number = 1,343,000,000
The population of India was about 1,343 million in 2017.

Exercise 13.1

1. Round off to the nearest 10 :
   (i) 83 (ii) 117 (iii) 335 (iv) 996 (v) 6882
2. Round off to the nearest 100 :
   (i) 140 (ii) 150 (iii) 1059 (iv) 4749 (v) 13,219
3. Round off to the nearest 1000 :
   (i) 4400 (ii) 5140 (iii) 10,532 (iv) 16,700 (v) 1,82,735
4. Round off to the nearest 10,000 :
   (i) 11,492 (ii) 14,384 (iii) 25,500 (iv) 83,245 (v) 2,38,695
5. Population of 5 villages is given as follows. Round each off to the nearest 1,000 :
   (i) Ranipur 5,584 (ii) Sagarpur 38,695 (iii) Sherkot 8,842
   (iv) Bunda 12,384 (v) Sinoli 22,792
6. Round off these prices to the nearest ₹100 :
   (i) ₹1132 (ii) ₹2650 (iii) ₹8594 (iv) ₹18,432
7. The heights of some mountain peaks of the Himalayas are given as follows :
   (i) Nanda Devi 7816 m (ii) Annapurna 8091 m
   (iii) Kanchenjunga 8597 m (iv) Mt Everest 8848 m
   Round each off to the nearest 100 m.
8. Round off 3473643 to the nearest :
   (i) ten thousands, (ii) lakhs.
9. Population of some states in 2011 was as follows :
   (i) Bihar 10,38,04,637 (ii) Uttar Pradesh 19,98,12,341
   (iii) Karnataka 6,11,03,704 (iv) West Bengal 9,13,47,736

   Round each off to the nearest crore.
10. The distance of the sun from the earth is 14,88,00,000 km. Round this distance to the nearest :
    (i) crore km (ii) million km.

Rounding Off Decimal Fractions

TABLE OF PLACE VALUES

Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths
				First place of decimal	Second place of decimal	Third place of decimal

The rules of approximation (rounding off) for decimal fractions are the same as for the whole numbers. Conventionally we call the tenths, hundredths and thousandths places as first, second and third places of decimal.

Example 7 : Round 9.56 to the nearest whole number (ones).

Solution : The digit at ones place = 9

The digit just right to ones place = 5

So we add 1 to 9 = 10

9.56 rounded to the nearest one = 10.00 = 10

Example 8 : Round 93.14695 to the nearest : (i) first, (ii) second, (iii) third place of decimal.

Solution : **(i)** The digit at first place of decimal = 1

The digit just right to the first place of decimal = 4, leave it

93.14695 rounded to the nearest first place of decimal

= 93.10000 = 93.1

(ii) The digit at second place of decimal = 4

The digit just right to the second place of decimal = 6

So add 1 to 4 = 5

Thus, 93.14695 rounded to the nearest second place of decimal = 93.15000

= 93.15

(iii) The digit at the third place of decimal = 6

The digit just right to the third place of decimal= 9

So add 1 to 6 = 7

Thus, 93.14695 rounded to the nearest third place of decimal = 93.14700

= 93.147

Accurate Value

The approximate (rounded off) value to the nearest of a particular place of decimal is also called as accurate value to that particular place of decimal. In example 8 above, we have three approximate values of 93.14695 after rounding off to different places.

(i) Value of 93.14695 accurate to the first place of decimal = 93.1

(ii) Value of 93.14695 accurate to the second place of decimal = 93.15

(iii) Value of 93.14695 accurate to the third place of decimal = 93.147

We see that the value rounded to more places of decimals is more accurate.

When we convert a common fraction to decimal fraction, sometimes, an exact quotient is not obtained.

For example : $\frac{3}{7} = 0.4285...$

Value of $\frac{3}{7}$ accurate (rounded) to first place of decimal = 0.4

Value of $\frac{3}{7}$ accurate to second place of decimal = 0.43

Value of $\frac{3}{7}$ accurate to third place of decimal = 0.429

Note : Find the quotient to one decimal place more than the required number of places and then round off.

Example 9 : Convert $\frac{2}{3}$ into decimal fraction accurate to the second place of decimal.

Solution : We divide 2 by 3 to get quotient to 2 + 1 = 3 places of decimal.

$$\frac{2}{3} = 0.666 = 0.67$$

Decimal fraction of $\frac{2}{3}$ accurate to second place of decimal = 0.67

```
   0.666
3 ) 20
    18
    20
    18
    20
    18
     2
```

Note : We also write it as decimal fraction of $\frac{2}{3}$ correct to 2 places of decimal = 0.67

Value of Proximate (Nearest) Rupee

When we deal in big amounts of money or short of small coins, we find the value to the nearest rupee.

Example 10 : The price of 1 kg apples is ₹18. Find the cost of 2.550 kg of apples to the nearest rupee.

Solution : Cost of 2.550 kg of apples = ₹ 45.900

= ₹ 45.90

Cost to the nearest rupee = ₹ 46

```
  2.550
  × 18
45.900
```

Exercise 13.2

1. Round off to the nearest whole number (ones) :

(i) 6.4 **(ii)** 90.7 **(iii)** 100.65 **(iv)** 513.74 **(v)** 1031.499

2. Round off to the nearest first place of decimal :
   (i) 2.46 **(ii)** 13.35 **(iii)** 35.123 **(iv)** 525.184 **(v)** 1234.234
3. Round off to the nearest second place of decimal :
   (i) 23.145 **(ii)** 8.007 **(iii)** 7.494 **(iv)** 37.098 **(v)** 463.796
4. Round off to the nearest third place of decimal :
   (i) 52.1794 **(ii)** 46.0055 **(iii)** 29.7726 **(iv)** 18.9641 **(v)** 42.1695
5. Multiply and then round off your product to the nearest second place of decimal :
   (i) 25.5 ×1.25 **(ii)** 15.19 × 2.7 **(iii)** 4.21 × 6.9
6. Change these common fractions into decimal fractions and round off your quotients to the nearest third place of decimal :
   (i) $\frac{1}{3}$ **(ii)** $\frac{1}{6}$ **(iii)** $\frac{8}{9}$ **(iv)** $\frac{4}{11}$ **(v)** $\frac{3}{7}$
7. The length and breadth of a carpet are 2.33 m and 1.15 m respectively. Find its area accurate to second place of decimal. _____
8. Price of 1 metre of cloth is ₹ 17.50. Find the cost of 2.65 metre of cloth **(i)** to the nearest paise, **(ii)** to the nearest rupee. _____

Let's Recall

Multiple Choice Questions (MCQs) :

Tick (✓) the correct option :

1. The nearest thousands of 29789 will be written as _____ .
   (a) 29000 **(b)** 29700 **(c)** 29800 **(d)** 30000
2. Round 40.438 to the nearest hundredth place _____ .
   (a) 40.43 **(b)** 40.44 **(c)** 40.4 **(d)** 41
3. 84.6 when rounded to the nearest one is _____ .
   (a) 84 **(b)** 90 **(c)** 85 **(d)** 84.1
4. When 22.54 is rounded to the nearest one, we get _____ .
   (a) 23 **(b)** 22 **(c)** 22.6 **(d)** 22.5

Chapter 14

Average

Learning Objectives :
- Average

Average

Average represents the approximate value of a group of numbers by one number. It gives an idea about the level of status and performance of a group. Thus, we can compare the levels of different groups. These groups usually are persons, things or events.

For example : Pinki earned ₹ 40, ₹ 40, ₹ 50, ₹ 10, ₹ 40, ₹ 70, ₹ 30 respectively on seven different days of a week.

Pinki sometimes earns more, and sometimes less, so his earnings are not stable. However, his total earnings for one week (7 days)

$$= ₹ (40 + 40 + 50 + 10 + 40 + 70 + 30) = ₹ 280$$

If she would have earned equally on everyday it would be $₹ \frac{280}{7} = ₹ 40$

This is called her average income for the week.

Average income denotes a group of 7 days' income in the form of one day's income.

$$\text{Average} = \frac{\text{Sum of quantities of a group}}{\text{Number of quantities in the group}}$$

Example 1 : The attendance of pupils in class V on 6 days of a week is given below :

Monday : 39	Tuesday : 39	Wednesday : 43
Thursday : 40	Friday : 42	Saturday : 37

Find the average daily attendance of the class for 6 days.

Solution : Total of attendance of all the 6 days

$$= 39 + 39 + 43 + 40 + 42 + 37 = 240$$

Average daily attendance of the class for 6 days

$$= \frac{240}{6} = 40$$

Example 2 : A cricket team scored 212, 170, 210 260 and 398 runs respectively in 5 cricket matches. What was the average number of runs in the five matches ?

Solution : Total runs of 5 matches

$$= 212 + 170 + 210 + 260 + 398 = 1250$$

Average number of runs in the 5 matches

$$= \frac{1250}{5} = 250$$

Example 3 : In a cricket match, team *A* scored 279 runs off 9 members and team *B* scored 224 runs off 7 members. Which team performed better average ?

Solution : Average score of team *A* of 9 members $= \frac{279}{9} = 31$

Average score of team *B* of 7 members $= \frac{224}{7} = 32$

Score of the team *B* (32) > score of the team *A* (31)

So the team *B* performed better average.

Example 4 : The temperature (°Celsius) of two cities in a certain week of winter was as follows :

	Mon	Tues	Wed	Thu	Fri	Sat	Sun
City *A*	8	10	11	12	9	5	8
City *B*	9	11	6	6	7	9	8

Solution : Total of the temperatures of 7 days in city *A*

$$= 8 + 10 + 11 + 12 + 9 + 5 + 8 = 63$$

Average daily temperature of city *A* in the week $= \frac{63}{7} = 9\,°C$

Total of the temperature of 7 days in city *B*

$$= 9 + 11 + 6 + 6 + 7 + 9 + 8 = 56$$

Average daily temperature of city *B* in the week $= \frac{56}{7} = 8\,°C$

Average daily temperature of city *B* was less, so city *B* was more cold in that week.

Example 5 : Out of 24 boys average height of 10 boys is 175 cm, average height of 8 boys is 160 cm and average height of the rest 6 boys is 147 cm. What is the average height of all of them ?

Solution : $\text{Average} = \frac{\text{sum of quantities of a group}}{\text{number of quantities in a group}}$

$\therefore$ Sum of quantities = Average $\times$ Number of quantities

Sum of heights of 10 boys $= 175\text{ cm} \times 10 = 1750\text{ cm}$

Sum of heights of 8 boys $= 160\text{ cm} \times 8 = 1280\text{ cm}$

Sum of heights of 6 boys $= 147\text{ cm} \times 6 = 882\text{ cm}$

Total height of all the 24 boys $= 3912$ cm

Average height of all the 24 boys $= \frac{3912}{24}$ cm $= 163$ cm

Exercise 14

1. The temperature (in °C) of a town during a week was 43, 40, 39, 40, 36, 43 and 39. What was the average daily temperature of the town for the week ?
2. Neeru took part in a high jump competition. In three attempts, she jumped 160 cm, 162 cm and 164 cm high. Find the average height of the three jumps.
3. In a school, the number of students in class I to V are respectively 39, 36, 33, 34 and 28. What is the average number of students in a class ?
4. The rainfall recorded for the months of half the year in a town was 2.7 cm, 5.3 cm, 8.5 cm, 4.8 cm, 5.5 cm and 3.2 cm. What was the monthly average rainfall for the period ?
5. In eight innings, a batsman makes the following scores : 22, 15, 0, 23, 8, 45, 11, 52 runs. What is his average score ?
6. Heights of Shilpa, Shipra, Shaila, Shaifali and Seema are 1 m 10 cm, 1 m 3 cm, 1 m 15 cm, 1 m 7 cm, 1 m 5 cm respectively. What is their average height ?
7. The weights of 7 travellers of a boat are 91.2 kg, 72.5 kg, 53.9 kg, 78.4 kg, 64.8 kg, 81.6 kg and 89.6 kg. Find their average weight.
8. The daily attendance of class IV and V on the days of a week is as follows :

	Mon	Tues	Wed	Thu	Fri	Sat
Class IV	40	40	38	43	40	33
Class V	49	35	37	41	39	45

   Find that which class's average attendance is more.
9. A train runs for 3 hours at a speed of 65 km per hour and for next 2 hours at a speed of 70 km per hour. Find the average speed of the train for the 5 hours journey.
10. The total sales of a cooperative store for 6 days is ₹7374. What is the average daily sale of the store during the 6 days ?
11. The weekly consumption of sugar in two families during 4 weeks of a month was as follows :

	First week	Second week	Third week	Fourth week
Family *A*	3.2 kg	3.5 kg	3 kg	3.1 kg
Family *B*	2.3 kg	3.2 kg	3.2 kg	2.5 kg

Which family consumed more sugar on an average during the four weeks ?

_____

12. The daily minimum temperature (in degree celsius) of two towns *A* and *B* during a week of winter is given below :

	Mon	Tues	Wed	Thu	Fri	Sat	Sun
Town *A*	3	6	8	9	10	8	5
Town *B*	4	7	8	10	11	13	10

Which town was colder during the week ? _____

13. The average height of child in a group of 5 is 1 m 10 cm. If the 6th child's height is 1 m 40 cm, find the new average of a child in a group of 6. _____

14. The average price of three chairs is ₹ 130. The price of two of them is ₹ 125 and ₹ 140. Find the price of the third chair. _____

15. The average salary of each officer in a group of 6 officers in a company is ₹ 3500, if average salary of each officer in a group of 7 officers is ₹ 3300, what is the salary of the 7th officer ? _____

Let's Recall

Multiple Choice Questions (MCQs) :

Tick (✓) the correct option :

1. The average of first five prime numbers is _____ .

(a) 2.2 **(b)** 3.6 **(c)** 5 **(d)** 5.6

2. The average of the first five even numbers is _____ .

(a) 4 **(b)** 5 **(c)** 6 **(d)** 7

3. The average of four numbers is 30. If the sum of first three numbers is 85, the fourth number is _____ .

(a) 30 **(b)** 35 **(c)** 45 **(d)** 55

4. The average of first five multiples of 3 is _____ .

(a) 3 **(b)** 6 **(c)** 9 **(d)** 12

Chapter 15

Percentage

Learning Objectives :

❖ What is Percentage ? ❖ Conversion of a Fraction into Percentage ❖ Percentage in Metric Measures ❖ Conversion of Percentage into Fraction ❖ Word Problems on Percentage

What is Percentage ?

A percentage is number or ratio expressed as a fraction of 100. It is often denoted using the per cent sign '%'.

Thus, $\frac{8}{100} = 8\%$, $\frac{35}{100} = 35\%$, $\frac{75}{100} = 75\%$

Fact File

The term 'per cent' has come from the Latin word 'per centum' meaning per hundred. In Rome, the Latin word for 100 was 'centum' and the symbol 'C'.

Percentages are used for comparing. We have compared two fraction by changing them to equivalent fractions with common denominators. We also found that decimal fractions are more easy to compare. Comparison of percentages are easier than the common fractions or decimal fractions. Here we do not confuse with the denominators or the place of decimal.

Conversion of a Fraction into Percentage

To convert a fraction into percentage, we multiply the given fraction by 100 and put the symbol (%) of per cent.

In clear and easier terms, the symbol of per cent means $\frac{1}{100}$.

Example 1 : Convert $\frac{13}{25}$ into percentage.

Solution : $\frac{13}{25} = \frac{13 \times 4}{25 \times 4} = \frac{52}{100} = 52\%$

Other Method $\frac{13}{25} = \frac{13}{\cancel{25}_{1}} \times \cancel{100}^{4}\% = 52\%$

Example 2 : Convert 0.635 into percentage.

Solution : $0.635 = 0.635 \times \frac{100}{100} = 0.635 \times 100\% = 63.5\%$

To Express a Number as a Percentage of Another Number

Example 3 : What percentage of 1 hour is 15 minutes ?

Solution : 1 hour = 60 minutes

$$15 \text{ minutes} = \frac{15}{60} \text{ of 1 hour}$$

$$15 \text{ minutes} = \frac{15}{60} \times \frac{100}{100} \text{ of 1 hour}$$

$$= \frac{\cancel{15}^{1}}{\cancel{60}_{4}} \times \cancel{100}^{25}\% \text{ of 1 hour} = 25\% \text{ of 1 hour}$$

Percentage in Metric Measures

(i) We know 100 paise = 1 rupee

1 paise $= \frac{1}{100}$ of a rupee = 1% of a rupee

7 paise = 7% of a rupee

10 paise = 10% of a rupee

(ii) 100 cm = 1 m

1 cm $= \frac{1}{100}$ m = 1% of a metre

9 cm = 9% of a metre

10 cm = 10% of a metre

(iii) 1000 m = 1 km

1 m $= \frac{1}{1000}$ km $= \frac{1}{1000} \times 100\%$ of 1 km

$= \frac{1}{10}\%$ of 1 km = 0.1% of 1 km

7 m = 0.7% of 1 km

10 m = 1% of 1 km

100 m = 10% of 1 km

435 m = 43.5% of 1 km

(iv) 1000 g = 1 kg

1 g $= \frac{1}{1000}$ kg = 0.1% of 1 kg

8 g = 0.8% of 1 kg

	10 g	= 1% of 1 kg
	100 g	= 10% of 1 kg
	469 g	= 46.9% of 1 kg
(v)	1000 mL	= 1 L
	$1 \text{ mL} = \frac{1}{1000}\text{L}$	= 0.1% of 1 L
	6 mL	= 0.6% of 1 L
	10 mL	= 1% of 1 L
	100 mL	= 10% of 1 L
	635 mL	= 63.5% of 1 L

➲ Conversion of Percentage into Fraction

Example 1 : Convert 40% into common fraction.

Solution : $40\% = \frac{40}{100} = \frac{2}{5}$

Example 2 : Convert $8\frac{1}{3}\%$ into common fraction.

Solution : $8\frac{1}{3}\% = 8\frac{1}{3} \times \frac{1}{100} = \frac{\overset{1}{\cancel{25}}}{3} \times \frac{1}{\underset{4}{\cancel{100}}} = \frac{1}{12}$

Example 3 : Convert 7.5% into decimal fraction.

Solution : $7.5\% = \frac{7.5}{100} = 0.075$

To Calculate Percentage of Given Number

Example 4 : Find the value of 24% of 25.

Solution : $24\% \text{ of } 25 = \frac{24}{100} \text{ of } 25 = \frac{\overset{6}{\cancel{24}}}{\underset{4}{\cancel{100}}} \times \overset{1}{\cancel{25}} = 6$

To Calculate the Number When its Percentage is Given

Example 5 : Find the number, 20% of which is 66.

Solution : 20% of the number = 66

or $\frac{20}{100}$ of the number = 66

$\therefore$ The number $= 66 \div \frac{20}{100}$

$= 66 \times \frac{\cancel{100}^{5}}{\cancel{20}_{1}} = 330$

Exercise 15.1

Convert the following fractions into percentage :

1. $\frac{16}{25}$ 2. $\frac{3}{5}$ 3. $\frac{5}{8}$ 4. $\frac{7}{16}$

5. 0.235 6. 0.15 7. 0.757 8. 0.023

Fill in the blanks with percentages :

9. 25 paise = ____ % of 1 rupee
10. 100 g = ____ % of 1 kg
11. 30 minutes = ____ % 1 hour
12. 5 paise = ____ % 1 rupee
13. 35 cm = ____ % of 1 m
14. 40 mL = ____ % of 1 L
15. 125 m = ____ % of 1 km
16. 5 mm = ____ % of 1 cm
17. 4 cm = ____ % of 1 m
18. 5 g = ____ % of 1 kg

Convert the following percentages into common fractions :

19. 64% 20. 40% 21. 54% 22. $12\frac{1}{3}\%$

Convert the following percentages into decimal fractions :

23. 8% 24. 12.5% 25. 12% 26. 3.5%

Find the value of :

27. 10% of ₹ 350
28. 12.5% of 320 g
29. 5% of 900 m
30. 18% of 250 mL

Which of the two is more ?

31. 20% of 60 or 30% of 50
32. 15% of 300 or 25% of 200

Show by calculation that :

33. 20% of 60 g = 40% of 30 g
34. 25% of 400 g = 40% of 250 g
35. Find length, 30% of which is 15 m.
36. What percentage of 85 is 17 ?
37. Find the number, 12% of which is 18.

Word Problems on Percentage

Example 6 : Kavita answered 12 questions correctly out of 20 questions. How many per cent of her answers were correct ?

Solution : Total questions = 20

Questions answered correctly = 12

Fraction of questions correctly answered = $\frac{12}{20}$

Percentage of questions answered correctly = $\frac{12}{20} \times \frac{100}{100} = \frac{12}{\cancel{20}_{1}} \times \cancel{100}^{5}\% = 60\%$

Example 7 : Out of 650 mangoes in a basket 130 were rotten. What is the percentage of good mangoes ?

Solution : Total mangoes = 650

Rotten mangoes = 130

Good mangoes = 520

Fraction of good mangoes = $\frac{520}{650}$

Percentage of good mangoes = $\frac{520}{650} \times \frac{100}{100} = \frac{\cancel{520}^{4}}{\cancel{650}_{5\ 1}} \times \cancel{100}^{20}\% = 80\%$

Example 8 : Riya spends 15% of her monthly income on rent, 45% on food and 10% on clothes. If she saves ₹1500 per month, what is her monthly income in rupees ?

Solution : Total percentage of expenditure = 15 + 45 + 10 = 70%

Percentage of savings = 100 – 70 = 30%

Hence, 30% of income = ₹1500

Income = ₹1500 ÷ 30% = ₹1500 ÷ $\frac{30}{100}$ = ₹ $\cancel{1500}^{50} \times \frac{100}{\cancel{30}_{1}}$ = ₹ 5000

Exercise 15.2

1. John got 85% marks. The maximum marks for the examination were 700. How many marks did he get ?
2. A cricket team won 70% of the 10 games played by it. How many games did it win ? How many games did it lose ?
3. The students of a class collected ₹2500 for flood victims. Manju alone contributed 15% of the amount. How many rupees did Manju contribute ?
4. The weight of a tin box is 8 kg. The weight of a suitcase is 40% less than the weight of the tin box. What is the weight of the suitcase ?

5. Jaya weighs 35 kg. Her brother weighs 20% more. How many kilograms does her brother weigh ?
6. Pari went to the market with ₹244. She spent 75% of her money in the market. How much money is left with her ?
7. 96 students appeared in an examination. Out of them 36 passed and the rest failed. What percentage of students passed ? What percentage of students failed ?
8. A student scored 870 marks out of 1000 marks in the annual examination. What percentage of marks did he score ?
9. A student has to get 36% of the total marks to pass. If he has obtained 440 marks and failed by 100 marks, find the maximum marks.
10. There are 45% women in a village. If the number of men is 11,495, find the total population.
11. 96% students are present in a school and 20 students are absent. Find the number of total students.
12. The air fare from Delhi to Kolkata is ₹2250 plus a 10% tax. Find the total air fare of a round trip.
13. *ABC* Company announced a bonus of 15% of annual salary to its all employees. What amount of bonus Mr Brown gets if his salary is ₹3000 per month ?
14. A shopkeeper gives a rebate of ₹125 on a cooler costing ₹2000. What is the percentage of rebate ?
15. Students of *ABC* English School planted 600 plants. Out of which only 420 were grown up. How many percentage of plants were grown up ?

Let's Recall

Multiple Choice Questions (MCQs) :

Tick (✓) the correct option :

1. 48% in its lowest term can be expressed as _____ .

   (a) $\frac{24}{50}$ **(b)** $\frac{12}{25}$ **(c)** $\frac{4}{5}$ **(d)** None of these

2. What per cent of 70 is 14 ?

   (a) 20% **(b)** 12% **(c)** 17% **(d)** 13%

3. A total of 20,000 votes were polled in an election contested by two candidates. The winning candidate got 60% of the total votes polled. How many votes did the defeated candidate got ?

   (a) 800 **(b)** 1200 **(c)** 8000 **(d)** 12000

4. In a bus, 55 persons were travelling. Out of them, 11 persons were left standing then the per cent of the persons who seated is _____ .

   (a) 20% **(b)** 80% **(c)** 25% **(d)** 75%

Chapter 16

Profit and Loss

Learning Objectives :
❖ What is SP and CP ? ❖ Overhead Expenses ❖ To Find SP and CP ❖ To Find Profit or Loss Per Cent ❖ Formulae

What is SP and CP ?

The price given by a buyer for an item is called the cost price of that item for the buyer. The price at which an item is sold by a seller is called the selling price of that item for the seller.

We write, cost price as CP and selling price as SP in short.

A shopkeeper purchases a table at ₹1500 and sells it at ₹1800 to a customer. Then the cost price for the shopkeeper is ₹1500 and selling price ₹1800. For the customer the cost price is ₹1800 .

When the seller sells the goods at a price higher than its cost price, he makes a profit or gain.

$$\text{Profit} = \text{SP} - \text{CP}$$

Every shopkeeper tries to make profit. But under certain circumstances he has to sell goods at a price lower than its cost price. Then he suffers a loss.

$$\text{Loss} = \text{CP} - \text{SP}$$

Example 1 : A shopkeeper bought 60 chocolate bars for ₹8 each. He sold them all for ₹510. What profit or loss did he make?

Solution : CP of chocolates = ₹60 × 8 = ₹480
SP of chocolates = ₹510
SP > CP, so he makes a profit.
Profit = SP – CP
= ₹510 – ₹480 = ₹30

Example 2 : Mehul purchased an old cycle for ₹1300. He could sell it for ₹900. Find his profit or loss.

Solution : CP = ₹1300 SP = ₹900

CP > SP, so Mehul suffered a loss

Loss = CP – SP

= ₹1300 – ₹900 = ₹400

Overhead Expenses

Besides paying price for goods, a shopkeeper has to pay for packing, labour, transportation, etc. Overhead expenses are added to the price of goods to determine the cost price.

For example : a shopkeeper purchased sugar for ₹25,000. He spent ₹500 for transporting to and unloading at his shop. Then the

(Total) cost price of sugar = ₹25000 + ₹500

= ₹25,500

Example 3 : A shopkeeper purchased 6 almirahs for ₹ 18,000. He paid ₹600 on transporting them to his shop. He sold them for ₹20,000. Find his profit or loss.

Solution : Total cost price = 18,000 + ₹600 = ₹18,600

SP = ₹20,000

SP > CP, so he makes a profit.

Profit = SP – CP

= ₹ 20,000 – ₹18,600 = ₹1,400

Exercise 16.1

Fill in the blanks :

1. CP = ₹ 50, SP = ₹ 56, Profit = ₹ _____
2. SP = ₹ 700, CP = ₹ 600, Profit = ₹ _____
3. CP = ₹ 198, SP = ₹ 220, Profit = ₹ _____
4. CP = ₹ 500, SP = ₹ 491, Loss = ₹ _____
5. CP = ₹ 679, SP = ₹ 663, Loss = ₹ _____

Find the profit or loss in each of the following :

6. Cost price = ₹ 565, Selling price = ₹ 515 _____
7. Cost price = ₹ 700, Selling price = ₹ 800 _____
8. Selling price = ₹ 850, Cost price = ₹ 760 _____
9. Selling price = ₹ 32.50, Cost price = ₹ 29 _____
10. Cost price = ₹ 37, Selling price = ₹ 35.25 _____

11. Abdul bought 20 dozens of bananas for ₹ 100. He sold the bananas at the rate of ₹ 5.50 per dozen. Find his gain or loss. _____
12. Arnav bought 20 pencils for ₹ 80 and sold them each for ₹ 5. What was his profit or loss ? _____
13. A milkman bought 12 litre of milk at ₹ 15 per litre. He added 2 litres of water to it and sold the mix at ₹ 18 per litre. What was his profit ? _____
14. Raman bought 40 chairs at the rate of ₹ 72 each. He kept 4 chairs for his use and sold the others at the rate of ₹ 84 each. Find his profit or loss. _____
15. Shobha bought a TV for ₹ 2325 and gave ₹ 75 for transport. She sold it for ₹ 2350. Find her profit or loss. _____

To Find SP and CP

A shopkeeper buys a table for ₹ 1460. He wants to make a profit of ₹ 150 on it. At what price should he sell the table ? Clearly, he should sell it for ₹ (1460 + 150) = ₹ 1610

$$\text{Selling price} = \text{Cost price} + \text{Profit}$$
$$SP = CP + \text{Profit}$$

In case of a loss,

$$SP = CP - \text{Loss}$$

Similarly,

$$CP = SP - \text{Profit}$$
$$CP = SP + \text{Loss}$$

Example 4 : Sikha bought 20 dozens of bananas at the rate of ₹ 18.25 per dozen. By selling all the bananas she earned a profit of ₹ 50. Find the selling price of 20 dozens of bananas.

Solution : CP of 20 dozens of bananas= ₹ 18.25 × 20 = ₹ 365.00

Profit = ₹ 50

SP = CP + Profit

= ₹ 365.00 + ₹ 50 = ₹ 415.00

Example 5 : Roma purchased a bicycle for ₹ 1760 and sold it at a loss of ₹ 375. What is the selling price of the bicycle ?

Solution : SP = CP – Loss

= ₹ 1760 – ₹ 375 = ₹ 1385

Exercise 16.2

Fill in the blanks :

1. SP = ₹ 480, Profit = ₹ 30, CP = ₹ _____
2. CP = ₹ 500, Profit = ₹ 70, SP = ₹ _____

3. SP = ₹ 890, Loss = ₹ 40, CP = ₹ _____
4. CP = ₹ 900, Loss = ₹ 60, SP = ₹ _____
5. CP = ₹ 789, Profit = ₹ 99, SP = ₹ _____
6. Swati bought a VCR for ₹ 9500 and sold it at a profit of ₹ 1250. Find his SP.

_____

7. Jai earned a profit of ₹ 1050 by selling a refrigerator for ₹ 7200. What was the cost price of the refrigerator ?

_____

8. A table was bought for ₹ 785. At what price should it be sold to gain ₹ 75 ?

_____

9. Rajan bought 100 washing cakes. He sold them at the rate of ₹ 9.50 each and made a profit of ₹ 40. Find the purchasing rate of each cake.

_____

10. A car was sold by a car dealer for ₹ 51,000 making a profit of ₹ 3000. Find the cost price of the car.

_____

11. A TV was sold for ₹ 10,900 at a loss of ₹ 850. What was its cost price ?

_____

12. Find the cost price of a saree sold for ₹ 3075 at a profit of ₹ 275.

_____

To Find Profit or Loss Per Cent

Profit or loss per cent is calculated to compare one sale with another.

For example : Raman bought a watch for ₹ 1500 and sold for ₹ 1650. Another person bought another watch for ₹ 1200 and sold for ₹ 1350.

$$\text{Profit in first case} = ₹\,1650 - ₹\,1500 = ₹\,150$$

$$\text{Profit in second case} = ₹\,1350 - ₹\,1200 = ₹\,150$$

Profit is the same in both cases. But in the first case the person has to spend ₹ 1500 and in the second case only ₹ 1200 to make the same profit.

So we calculate percentage of profit in each case to compare.

The first person spends ₹ 500 to earn a profit of ₹ 100.

$$₹\,1 \text{ to earn a profit of } ₹\,\frac{150}{1500}$$

$$₹\,100 \text{ to earn a profit of } ₹\,\frac{150}{1500} \times 100 = ₹\,10 \text{ or } 10\%$$

The second person spends ₹ 1200 to earn a profit of ₹ 150

$$₹\,1 \text{ to earn a profit of } ₹\,\frac{150}{1200}$$

$$₹\,100 \text{ to earn a profit of } ₹\,\frac{150}{1200} \times 100 = ₹\,12.5 \text{ or } 12.5\%$$

Thus, we can say that the profit percentages are different.

Formulae

$$\text{Profit percentage} = \frac{\text{Profit}}{\text{Cost price}} \times 100\%$$

$$\text{Loss percentage} = \frac{\text{Loss}}{\text{Cost price}} \times 100\%$$

Fact File

Profit or loss percentage is always calculated on every ₹ 100 of the cost price.

Example 6 : Sikhar bought a cricket bat for ₹ 700. He sold it for ₹ 840. Find his profit per cent.

Solution :

$$\text{Profit} = \text{SP} - \text{CP}$$
$$= ₹\,840 - ₹\,700 = ₹\,140$$
$$\text{Profit percentage} = \frac{\text{Profit}}{\text{CP}} \times 100\%$$
$$= \frac{140}{700} \times 100 = 20\%$$

Example 7 : Shalu bought a cooler for ₹ 4500. She had to sell it for ₹ 3600. Find her loss per cent.

Solution :

$$\text{Loss} = \text{CP} - \text{SP}$$
$$= ₹\,4500 - ₹\,3600 = ₹\,900$$
$$\text{Loss percentage} = \frac{\text{Loss}}{\text{CP}} \times 100\%$$
$$= \frac{900}{4500} \times 100 = 20\%$$

Exercise 16.3

Find percentage of profit or loss :

1. CP = ₹ 1200, SP = ₹ 1080
2. CP = ₹ 500, SP = ₹ 625
3. CP = ₹ 800, Profit = ₹ 160
4. SP = ₹ 480, Profit = ₹ 80
5. SP = ₹ 480, Loss = ₹ 20

Fill in the blanks with one of the words given in the brackets :

6. SP – CP = _____ (*Profit/Loss*)
7. CP – SP = _____ (*Profit/Loss*)
8. SP = CP – _____ (*Profit/Loss*)
9. SP = CP + _____ (*Profit/Loss*)
10. Mrs Broota purchased a clock for ₹ 250. She had to sell it for ₹ 225. Find her loss per cent.

_____

11. Loss or Profit percentage is calculated on _____ (*SP/CP*).
12. Reena sold a painting for ₹ 300. She had bought it for ₹ 250. Find her profit per cent.

_____

13. A fruit-seller bought apples for ₹ 20 per dozen. He sold them for ₹ 24 per dozen. What is his profit per cent ?

_____

14. Arun bought a mobile phone for ₹ 12,500. He sold it for ₹ 13,500. Find his profit percentage.

_____

15. Mehul bought a motorcycle for ₹ 25,000. He had to sell it for ₹ 22,000. Find his loss percentage.

_____

16. Sania bought oranges at the rate of 20 for ₹ 5. She sold them at the rate of 15 for ₹ 6. Find her profit or loss per cent.

_____

17. Pari purchased a watch for ₹ 570. She spend ₹ 30 on its repair. If she sold it for ₹ 630, find her profit per cent.

_____

Let's Recall

Multiple Choice Questions (MCQs) :

Tick (✓) the correct option :

1. The relation between SP and CP for loss is _____ .

   (a) SP < CP ☐ **(b)** SP = CP ☐ **(c)** SP > CP ☐ **(d)** None of these ☐

2. Profit is earned when _____ .

   (a) SP < CP ☐ **(b)** SP > CP ☐ **(c)** SP = CP ☐ **(d)** None of these ☐

3. Abhinav sold a book worth ₹ 850 at a loss of ₹ 180. The selling price of that book is _____ .

   (a) ₹ 670 ☐ **(b)** ₹ 590 ☐ **(c)** ₹ 770 ☐ **(d)** ₹ 570 ☐

4. We can calculate the profit in percentage by the formula _____ .

   (a) $\frac{\text{Profit}}{\text{SP}} \times 100$ ☐ **(b)** $\frac{\text{Profit} - \text{SP}}{\text{SP}} \times 100$ ☐

   (c) $\frac{\text{Profit}}{\text{CP}} \times 100$ ☐ **(d)** $\frac{\text{SP}}{\text{CP}} \times 100$ ☐

Chapter 17

Simple Interest

Learning Objectives :
- Interest and Its Kinds
- Calculation of Simple Interest

Interest and Its Kinds

Sometimes we have to borrowed money for a period of time. Then we pay some extra money as charges for using the borrowed money. The extra money paid for using the money is called interest.

When the interest is paid at regular interval agreed upon it is called simple interest. If the interest is not paid on time, further interest is charged on this interest. Then the total interest is called compound interest.

The money borrowed is called the principal. Total money (principal + interest) returned is called amount.

Thus,

$$\text{Amount} = \text{Principal} + \text{Interest}$$
$$\text{Interest} = \text{Amount} - \text{Principal}$$

The interest on every ₹ 100 for 1 year is called the rate per cent of interest. When the time is not mentioned, the rate is understood as per year.

The time after which the principal is returned with interest is called the time period of interest.

Calculation of Simple Interest

Principal, rate per cent and time period determines the interest.

$$\text{Simple Interest} = \text{Principal} \times \text{Rate per cent} \times \text{Time}$$
$$= \text{Principal} \times \frac{\text{Rate}}{100} \times \text{Time}$$
$$= \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

Fact File

The rate per cent and time period must be in the same unit of years or months or days.

These are the different forms of the formula to calculate interest.

Example 1 : Find simple interest on ₹ 800 for 2 years at a rate of 8% per year.

Solution : Here rate % and time both are in years.

Simple Interest = Principal × Rate per cent × Time

$= ₹\ 800 \times 8\% \times 2 = ₹\ 800 \times \frac{8}{100} \times 2 = ₹\ 128$

Example 2 : Find simple interest on ₹ 600 for 2 year at a rate of 2% per month.

Solution : Here rate % is per month and time period is in years. So we change time period into months.

2 years = 24 months

Simple Interest = Principal × Rate per cent × Time

$= ₹\ 600 \times 2\% \times 24 = ₹\ 600 \times \frac{2}{100} \times 24 = ₹\ 288$

Example 3 : Atul borrowed ₹ 25,000 at the rate of 12% interest per year for 4 years from a bank. How much amount will he have to pay after 4 years ?

Solution : Principal = ₹ 25,000, Rate = 12% per year, Time = 4 years

Simple Interest = Principal × Rate per cent × Time

$= ₹\ 25,000 \times 12\% \times 4$

$= ₹\ 25,000 \times \frac{12}{100} \times 4 = ₹\ 12,000$

Amount = Principal + Interest

= ₹ 25,000 + ₹ 12,000 = ₹ 37,000

He shall return ₹ 37,000 to the bank.

Exercise 17

☞ Find simple interest when :

1. Principal = ₹ 320, Rate Interest = 2% per month, Time = $1\frac{1}{2}$ years
2. Principal = ₹ 400, Rate Interest = 5% per year, Time = 2 years
3. Principal = ₹ 550, Rate Interest = 12% per year, Time = 4 years
4. Principal = ₹ 1200, Rate Interest = 18% per year, Time = 6 months
5. Principal = ₹ 5000, Rate Interest = $1\frac{1}{2}$% per month, Time = 10 months
6. Shikha deposited ₹ 1000 in a bank for 3 years. The bank gives a simple interest on her money at the rate of 11% per annum (year). What amount will she get back from the bank at the end of 3 years ?
7. Mona deposits ₹ 2120 in a savings bank. If the savings bank gives $4\frac{1}{2}$ % interest per year, how much interest will she earn in 6 months ?
8. Riya deposits ₹ 6000 in a bank account. How much money will be in her account after $6\frac{1}{2}$ years. The bank pays at $12\frac{1}{2}$% rate of interest ?

9. Priya invests ₹ 20,000 in a company. The company pays interest at 15% per annum. Find the total amount that she will get back from the company at the end of 5 years and 5 months.

10. Mr Verma borrowed ₹ 4500 from a bank at a rate of interest $1\frac{1}{4}$% per month. How much interest will he pay after $1\frac{1}{4}$ years ?

11. Usman borrowed ₹ 1200 from his friend at 8% per annum of interest. He returned the money after 8 months. What interest did he pay to his friend ? Also find the amount.

12. Rahul lended ₹ 4000 for 3 years at the rate of 14% per year. Vipin lended ₹ 3500 for $2\frac{1}{2}$ years at the rate of 18% interest per year. Who will get more interest ?

13. Abdul deposited ₹ 4500 for $1\frac{1}{2}$ years in a bank which gives $7\frac{1}{2}$% interest on it. How much amount will he receive after $1\frac{1}{2}$ year ?

14. Zeba deposited ₹ 5000 in a bank at 10% rate of interest. How much amount will be in her account after 1 year, 2 years and 3 years respectively ?

15. A man borrowed ₹ 500 at 15% per annum. At the end of 3 years 4 months he paid back an amount of ₹ 450 and his radio for the balance amount. Find the cost of the radio.

Let's Recall

Multiple Choice Questions (MCQs) :

Tick (✓) the correct option :

1. A woman borrows a sum of ₹ 3000 from a friend. She promises to return the amount after 1 year with simple interest of 8% per annum. The total amount required to return will be _____ .

   (a) ₹ 3008 **(b)** ₹ 3024 **(c)** ₹ 3240 **(d)** ₹ 3420

2. If the simple interest on ₹ 500 for 2 years at a certain rate is ₹ 100, then what is the interest for 5 years on the same amount at the same rate ?

   (a) ₹ 110 **(b)** ₹ 150 **(c)** ₹ 250 **(d)** ₹ 300

3. The simple interest on ₹ 300 at 6% per annum for $2\frac{1}{2}$ years is equal to _____ .

   (a) ₹ 18 **(b)** ₹ 36 **(c)** ₹ 40 **(d)** ₹ 45

Chapter 18

Unit-VI : Geometry and Patterns

Line

Learning Objectives :

- Basic Concepts of Geometry
- Plane
- Intersecting Lines
- Parallel Lines
- Perpendicular Lines
- Perpendicular Bisector of Line Segment

Basic Concepts of Geometry

Point

A point shows an exact location. It has no length, breadth or height. It is the basic unit of geometry. A point is represented by a dot. It is usually named with a capital letter.

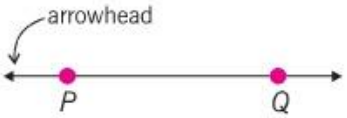
Line Segment

A line segment is the shortest distance and a straight path between two points. It has a definite length. It is named by its endpoints. The symbol for a line segment is $\overline{\quad}$.

This is the line segment AB or BA. It is written as $\overline{AB}$ or $\overline{BA}$.

Line

A line goes along a straight path in both directions. It has no end. Since a line is never-ending it has arrowheads on both sides. A line has no definite length. A line is named by two points on it. The symbol for a line is $\leftrightarrow$.



This is the line PQ or QP. It is written as $\overleftrightarrow{PQ}$ or $\overleftrightarrow{QP}$.

Fact File

A line segment is a part of a line.

Ray

A ray is a part of a line. A ray begings at a point and goes on endlessly in the other direction. The direction is indicated by an arrowhead. It has no fixed length.

A ray is named by two points on it. The symbol for a ray is $\rightarrow$.

This is the ray RS. it is written as $\overrightarrow{RS}$. R is the starting point.

The ray goes on in the direction of S. $\overrightarrow{RS}$ is different from $\overrightarrow{SR}$. Do you know why ?

Differences between a Line Segment, a Line and a Ray

S. No.	A Line Segment	A Line	A Ray
1.	A line segment has a definite (limited) length.	A line does not have a definite (limited) length.	A ray does not have a definite (limited) length.
2.	We can draw a line segment on a paper.	We cannot draw a line on a paper but can represent it by a diagram.	We cannot draw a ray but can represent it by a diagram.
3.	A line segment has two end-points.	A line has no end-point.	A ray has only one end-point.
4.	We can name a line segment (above) both as line segment *AB* or line segment *BA*.	We can name a line (above) both as line *AB* or line *BA*.	We cannot name a ray (above) both as ray *AB* and ray *BA*. We can name it only as ray *AB*.
5.	$\overline{XY}$ represents a line segment *XY*.	$\overleftrightarrow{XY}$ represents a line *XY*.	$\overrightarrow{XY}$ represents a ray *XY*.

Plane

If we imagine a flat surface extended in all the four directions infinitely, the extended flat surface is called a plane. What we draw or show on a paper is a part of a plane only and not the plane itself.

Table-top, a page the face of a wall or blackboard, etc. are all examples of the part of a plane.

Fact File

Conventionally, we use the world 'line' for 'a line segment' and the word 'plane' for 'a part of a plane.'

Exercise 18.1

1. Fill in the blanks :

(i) A _____ has no end-points.

(ii) A ray _____ be drawn on a paper.

(iii) A line segment has _____ end-points.

(iv) A _____ has a definite length.

(v) A paper represents a part of a _____ .

2. Match the columns :

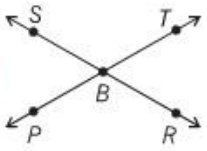
A line segment	no end-point
A ray has	be drawn on a paper
A line has	represents a part of a plane
A face of a wall	has a definite length
A line cannot	only one end-point

3. Write the following in symbols :

(i) line AB **(ii)** line segment CD **(iii)** ray EF

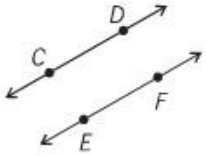
Intersecting Lines

$\overleftrightarrow{SR}$ and $\overleftrightarrow{PT}$ cross at point B. Lines which cross each other at a point are called intersecting lines. The point at which they cross is called the point of intersection.



Parallel Lines

$\overleftrightarrow{CD}$ and $\overleftrightarrow{EF}$ do not cross each other. The lines in a plane that never meet and are always at an equal distance from each other are called parallel lines.



Fact File

The horizon is an example of a line.

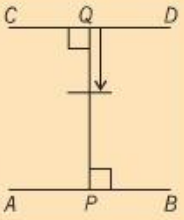
Fact File

Railway tracks are parallel lines.

Example 1 : Draw a line segment 6.5 cm long. Now draw a line segment parallel to it above at a distance of 2 cm.

Construction : We draw a line segment AB 6.5 cm long.

Take a point P say 4.0 cm from A. Draw a perpendicular $PQ = 4$ cm using set square or protractor, At Q we draw line segment CD perpendicular to PQ. AB and CD are parallel to each other.



Perpendicular Lines

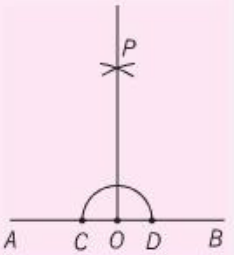
To Draw Perpendicular with the help of Compass and Scale

If two lines are at right angles (90°) to each other they are called mutual perpendicular lines. We have drawn perpendiculars with the help of set square or protractor.Now, we shall draw a perpendicular with the help of compass and scale.

To Draw a Perpendicular on a Line Segment from a Point Lying on it

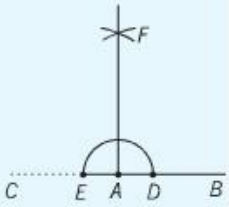
Example 2 : Draw a line segment $AB = 5$ cm. Take a point R on it such that $AO = 3$ cm, Draw a Perpendicular on AB from the point O.

Construction : We draw $AB = 5$ cm. Mark point O such that $AD = 3$ cm. Now take O as centre and draw an arc taking any radius which meets AB at C and D. Take point C as centre and draw an are with radius more than half of CD. Then take D as centre and draw another arc with the same radius which meets the first arc at P. Join O to P. OP is the required perpendicular to AB.



Example 3 : Draw a line segment $AB = 6$ cm and draw a perpendicular on AB from A.

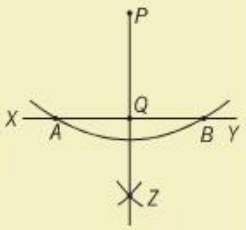
Construction : Draw $AB = 6$ cm and extend BA to C. Take A as centre and draw an arc of any radius which meets BA at D and AC at E.
Now take D as centre and draw arc of any radius (more than half of DE). Takes E as centre and draw another arc with the same radius which meets the first arc at F. Join AF.
AF is the required perpendicular on AB.



To Draw a Perpendicular on a Line Segment from a Point Given Outside

Example 4 : Draw a line segment $XY = 5$ cm, Draw a perpendicular on XY from a point P given outside.

Construction : Take P as centre and draw an arc with a radius that the arc meets XY on points A and B. Now take A and B as centres respectively and draw two arcs of the same radius which meets each other at Z. Join PZ which meets XY at Q.
PQ is the required perpendicular on XY.

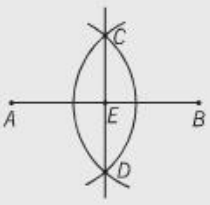


➲ Perpendicular Bisector of Line Segment

A line segment perpendicular on the mid-point of a line segment is called the perpendicular bisector of that line segment.

Example 5 : Draw a line segment 5.6 cm. Now draw its perpendicular bisector.

Construction : Draw $AB = 5.6$ cm. Take A and B as centres and draw two arcs with a radius more than half of AB. The arcs meet at C and D. Join CD.
CD is the perpendicular bisector of AB.



Exercise 18.2

1. Draw a line segment $PQ = 7$ cm. Take a point R such that $PR = 3.9$ cm. Draw a perpendicular from point R on PQ.
2. Draw a line segment $AB = 8.1$ cm. Draw another line segment parallel to AB at a distance of 4 cm.
3. Draw a line segment $XY = 6.9$ cm. Draw another line segment parallel to XY at a distance of 5.2 cm. At X draw a perpendicular to XY and check the distance between the two lines.
4. Draw a line segment $AB = 6.5$ cm. Take a point C such that $CB = 2.5$ cm. Draw a perpendicular from C on AB.
5. Draw a line segment $KL = 4.2$ cm. Draw a perpendicular from point K on it.
6. Draw a perpendicular from point B on a line segment $AB = 7.7$ cm.
7. Draw the perpendicular bisector of a line segment $MN = 9$ cm.
8. Draw a line segment $CD = 6.2$ cm. Now draw a perpendicular on it from any point outside it.

Chapter

19 Angle

Learning Objectives :

- Angle
- Naming an Angle
- Types of Angles
- Pairs of Different Kinds of Angles
- Bisector of an Angle
- Construction of Some Angles Using Compass and Scale
- Identify Measures of Half, Quarter, Three-Fourth and Full Rotations.

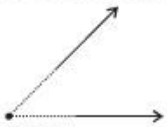
Angle

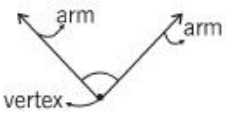
Extend (on the dotted lines) the two rays shown here. What do you get ? You get an angle. Two rays having a common end-point form an angle.

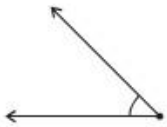
The two rays are called the arms of the angle.

The common end-point is called the vertex of the angle.

The symbol of an angle is $\angle$.



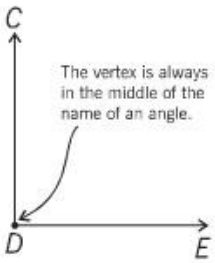




Naming an Angle

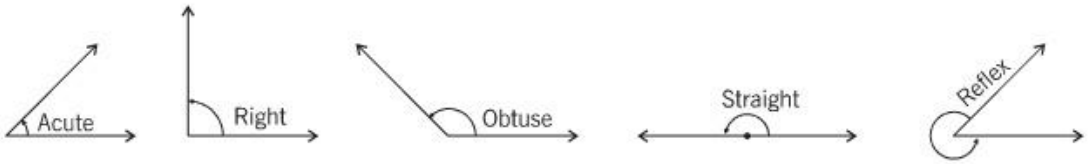
In the figure given alongside, the rays $\overrightarrow{DC}$ and $\overrightarrow{DE}$ make an angle. The name of this angle is $\angle CDE$ or $\angle EDC$. An angle can also be named sometimes by the vertex. So, this angle can also be named as $\angle D$.

The arms of this angle are DC and DE, and the vertex is D.



Types of Angles

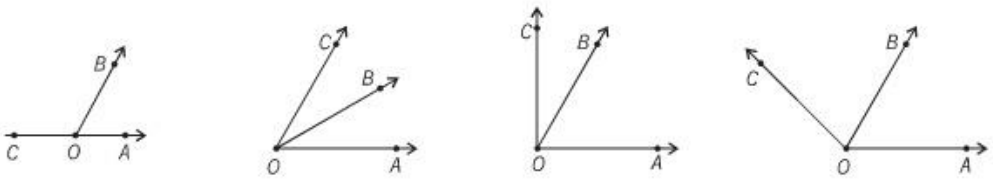
Acute angle	:	measuring between 0° and 90°
Right angle	:	measuring 90°
Obtuse angle	:	measuring between 90° and 180°
Straight angle	:	measuring 180°
Reflex angle	:	measuring between 180° and 360°



Pairs of Different Kinds of Angles

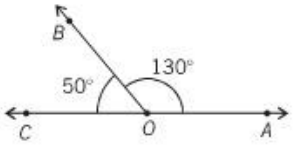
Adjacent Angle

The two angles which have the same vertex, a common arm and having other arms of them on the opposite sides of the common arm are called adjacent to each other.



In each figure, $\angle AOB$ and $\angle BOC$ are adjacent angles, O is the common vertex and OB the common arm. Other arms OA and OC are on opposite sides of OB.

Supplementary Angels

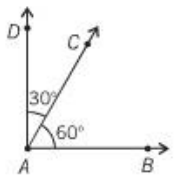


When the sum of two angles is 180°, they are called supplementary to each other.

Here $\angle AOB + \angle BOC = 130° + 50° = 180°$

$\therefore$ $\angle AOB$ and $\angle BOC$ are supplementary angles.

Complementary Angles

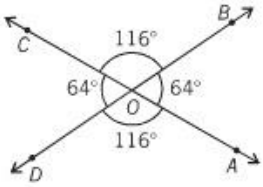


When the sum of two angles is 90°, they are called complementary to each other.

Here $\angle BAC + \angle CAD = 60° + 30° = 90°$

$\therefore$ $\angle BAC$ and $\angle CAD$ are complementary angles.

Vertically Opposite Angles



When two lines intersect at a point, they form two pairs of opposite angles with the same vertex. Each pair of these opposite angles is called vertically opposite angles.

Vertically opposite angles are always equal.

Here $\angle AOB = \angle COD = 64°$

$\therefore$ $\angle AOB$ and $\angle COD$ are vertically opposite angles.

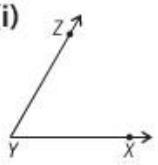
Similarly, $\angle BOC = \angle AOD = 116°$

$\therefore$ $\angle BOC$ and $\angle AOD$ are vertically opposite angles.

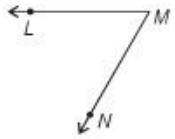
Exercise 19.1

1. Name the vertex and the arms of each of the angles shown in the following figures :

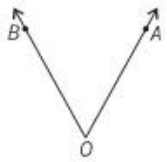
(i)



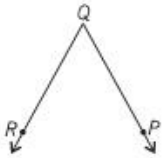
(ii)



(iii)



(iv)

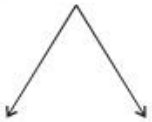


2. Which of the following figures represent an angle ?

(i)

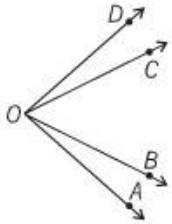
(ii)

(iii)



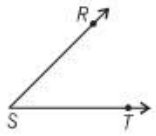
(iv)

3. In the side figure, six angles are formed :
Name all the six angle.

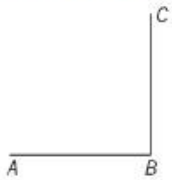


4. Name the angles in the following figures :

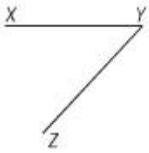
(i)



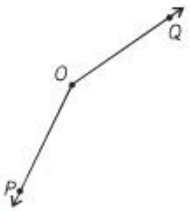
(ii)



(iii)

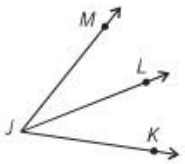


(iv)

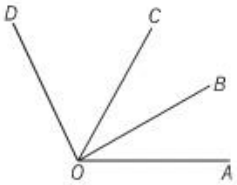


5. How many angles are formed in each of the figures given below :

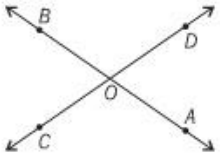
(i)



(ii)



(iii)



6. Draw the angles of the following measures :

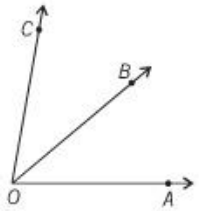
(i) 30° **(ii)** 43° **(iii)** 65° **(iv)** 94° **(v)** 137°

7. Classify the following angles as acute, right or obtuse :

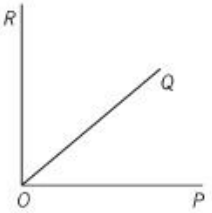
(i) 90° **(ii)** 47° **(iii)** 130° **(iv)** 91° **(v)** 80°

8. Name all the pairs of adjacent angles in each of the following figures :

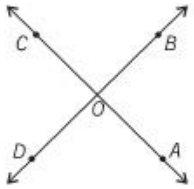
(i)



(ii)

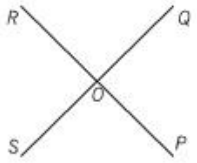


(iii)

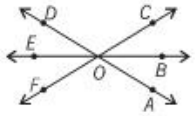


9. Name all the pairs of vertically opposite angles in each of the following figures :

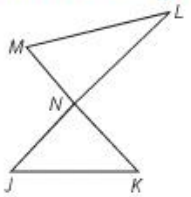
(i)



(ii)



(iii)



10. Write the complementary of the following angles :

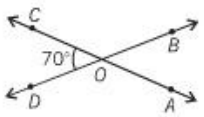
(i) 20° **(ii)** 40° **(iii)** 54° **(iv)** 77° **(v)** 89°

11. Write the supplementary of the following angles :

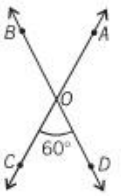
(i) 30° **(ii)** 50° **(iii)** 165° **(iv)** 90° **(v)** 179°

12. Write the measure of $\angle AOB$ in each of the following figures :

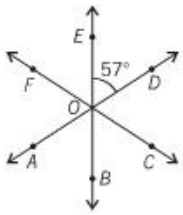
(i)



(ii)

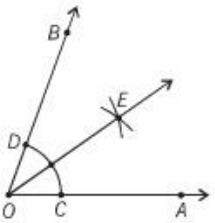


(iii)



➲ Bisector of an Angle

A ray (or line segment) which divides the given angle in two equal parts, is called bisector of that angle.



To Bisect a Given Angle

Draw an angle of 70° with the help of a protractor. Now draw its bisector with the help of compass and scale. Measure each part of the divided angle.

Construction : First, we draw $\angle AOB$ 70° with a protractor. Now with O as centre and taking any radius, draw an arc cutting OA and OB at C and D respectively.

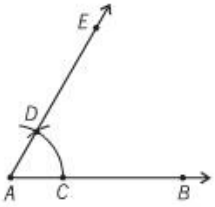
Now take C as centre and draw an arc with a radius more than half of CD. Then take D as centre and draw another arc with the same radius which meets the first arc at E. Join OE.

Ray OE is the required bisector of $\angle OAB$.

Measure $\angle AOE$ and $\angle EOB$ with a protractor. We see $\angle AOE = \angle EOB = 35°$

Construction of Some Angles Using Compass and Scale

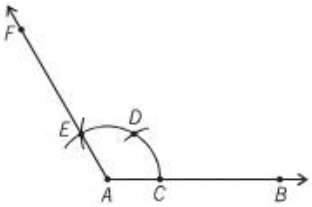
Construction of an Angle of 60°



First,we draw a ray AB using a scale. With A as centre and taking any radius we draw an arc which meets AB at C. Now take C as centre and with the same radius draw another arc which meets the first arc at D.

Join A to D and extend. $\angle BAE = 60°$

Construction of an Angle of 120°

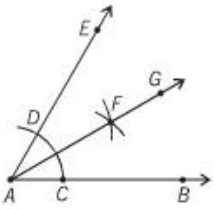


We draw a ray AB. Take A as centre and draw an arc with any radius which meets AB at C. Now take C as centre and draw an arc with the same radius which meets the first arc at D.

Take D as centre and draw one more arc with the same radius which meets the first arc at E.

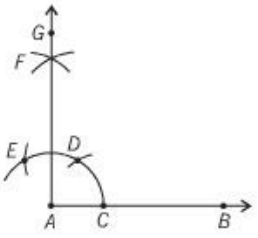
Join A to E and extend. $\angle BAF = 120°$

Construction of an Angle of 30°



We draw $\angle BAE = 60°$ and bisect it. $\angle EAG = 30°$

Construction of an Angle 90°



Draw a ray AB. Take A as centre and taking any radius draw an arc which intersects AB at C. With C as centre draw another arc with the same radius which intersects the first arc at D.

Now take D as centre and again an arc with the same radius which intersects the first arc at E. Extend this arc. Now take E as centre and draw another arc with the same radius which meets the last arc at F. Join AF and extend.

$\angle BAG = 90°$

Exercise 19.2

1. Construct the angles of the following measures with the help of compass and scale :
   (i) 60° **(ii)** 90° **(iii)** 45° **(iv)** 120° **(v)** 30° **(vi)** 15°
2. Draw the following angles with the help of a protractor and bisect each :
   (i) 80° **(ii)** 76° **(iii)** 90° **(iv)** 130°

➲ Identify Measures of Half, Quarter, Three-Fourth and Full Rotations

Rotation is moving clockwise or anticlockwise about a fixed point. Consider the following figures :

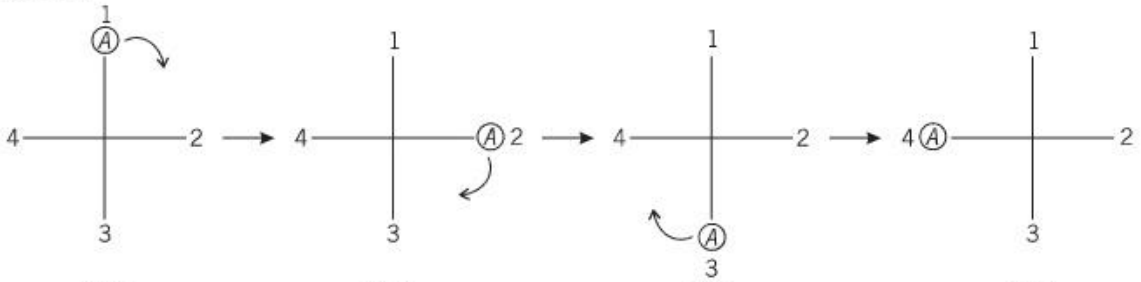


Fig. 1 Fig. 2 Fig. 3 Fig. 4

Letter '*A*' is at position 1 at the start. If we rotate to point *A* by 90° in the clockwise direction, we observe that the position of *A* will be at 2. Such a turn is called quarter rotation as, $90° = \frac{1}{4}$ of 360° (see Fig.2).

On rotating the point '*A*' by 180° in the clockwise or anticlockwise direction from position 1, the final position is 3. Such a turn is called half rotation, as $180° = \frac{1}{2}$ of 360° (Fig. 3).

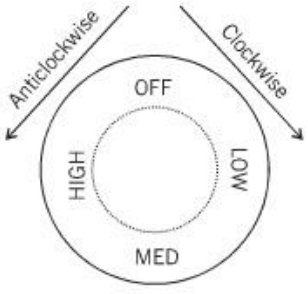
And if we rotate the point '*A*' by 270° in the clockwise direction from position 1 we reach position 4 and this is a three-fourth turn, as $270° = \frac{3}{4}$ of 360°.

If we rotate the point '*A*' by 360° in the clockwise direction the final position of *A* will be the same as the starting point 1.

Hence, a turn of 360° is termed as one full rotation.

The following solved example will help you understand the above terms better.

Here is a dial of a ceiling fan. There are three settings as well as an 'off' position, as shown. The following will be the settings beside the arrow for different rotations.

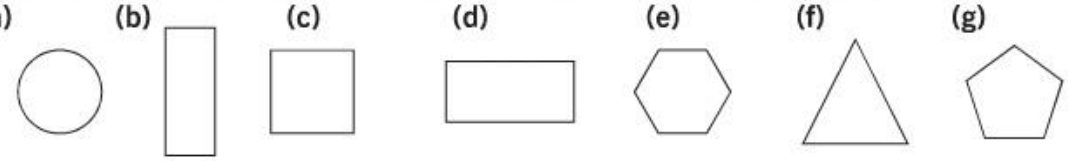


Rotation	Setting	Degree of Rotation
1/4 turn clockwise	Low	$90° = \frac{1}{4}$ of 360°
1/2 turn clockwise	Medium	$180° = \frac{1}{2}$ of 360°
3/4 turn anticlockwise	Low	$270° = \frac{3}{4}$ of 360°
A full revolution anticlockwise	Off	360°

Exercise 19.3

1. Guess which of the shapes below would look the same after half a turn :

(a) **(b)** **(c)** **(d)** **(e)** **(f)** **(g)**



2. Using the fact that a full rotation or a turn is equal to 360°. What is the size of the following ?

(a) Half rotation
(b) Quarter turn
(c) Three-quarter turn
(d) One-eight rotation

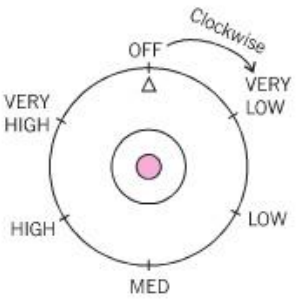
3. Find out which letters in the English alphabet look the same after half a turn.

4. A washing machine has a knob as shown.

It has five settings and can only be turned clockwise.

(a) There are six equal divisions on the dial.
How many degrees in each division worth ?

(b) How many degrees does each of the following rotations require ?
(i) Off to medium
(ii) Off to very high
(iii) High to off.



5. Which of these English words reads the same on half a turn ?
ZOOM, MOW, SWIMS, SIS, NOON

Chapter

20 Triangle

Learning Objectives :

❖ Plane Figures ❖ Polygon ❖ Triangle ❖ Parts of a Triangle ❖ Classification of Triangles According to Angles ❖ Classification of Triangles According to Sides ❖ Angle Sum Property of a Triangle ❖ Construction of Triangles

➲ Plane Figures

A plane has infinite points. Joining 2 or more points, we can make figures in that plane. Plane figures are of many types. A figure in a plane which begins and ends at the same point and do not cross itself is called a simple closed plane figure.

Simple closed plane figures may be regular or irregular. Regular ones are of two types : polygons and circle.

➲ Polygon

A plane figure with at least three straight sides and angles and typically five or more is called polygon.

Line segments which form a polygon are called its sides. The points of intersection of the sides of a polygon are called its vertices.

➲ Triangle

A closed figure bounded by three line segments is called a triangle.

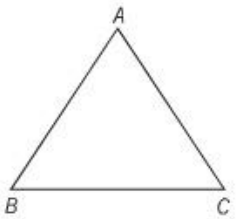
➲ Parts of a Triangle

A triangle has 3 angles, 3 sides and 3 vertices, tri means 3.

3 angles, 3 sides and 3 vertices are called parts of a triangle.

A triangle can be drawn by joining 3 points which are not on the same line. In the side figure, ABC is a triangle.

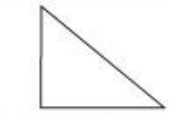
Part	Number	Name
Vertices	3	A, B, C
Sides	3	AB, BC, CA
Angles	3	$\angle A, \angle B, \angle C$



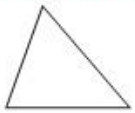
Full names of $\angle A$, $\angle B$ and $\angle C$ are $\angle CAB$, $\angle ABC$ and $\angle BCA$. In the full name of an angle the vertex comes in the middle.

Triangle ABC is written as ΔABC. Δ is the symbol for triangle.

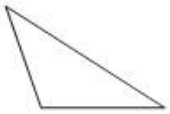
Classification of Triangles According to Angles



(i) Right-angled triangle
(one angle is right angle)

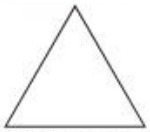


(ii) Acute-angled triangle
(all 3 angles acute)

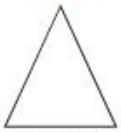


(iii) Obtuse angled triangle
(one angle is an obtuse angle)

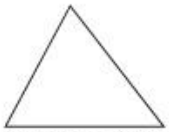
Classification of Triangles According to Sides



(i) Equilateral triangle
(all sides equal)



(ii) Isosceles triangle
(2 equal sides)



(iii) Scalene triangle
(all sides unequal)

The angles also follow the sides of a triangle in equality :

Equilateral triangle	:	All sides and all angles equal
Isosceles triangle	:	2 sides and 2 angles (opposite to these sides) equal
Scalene triangles	:	All sides and all angles unequal

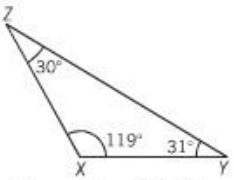
Angle Sum Property of a Triangle

Experiment : Draw a triangle. Measure each of its angles. Add their measures. What do you get ? Now draw 2 more different triangles. Measure their angles and add separately.

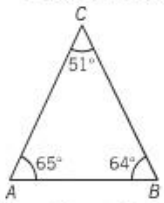
Result : We get the total 180° in each case.

The sum of the measures of the three angle of a triangle is always 180°.

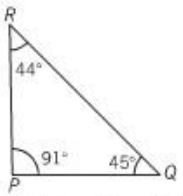
180° = 2 Right angles



(i) $\angle X = 119°$
$\angle Y = 31°$
$\angle Z = 30°$
$180°$



(ii) $\angle A = 65°$
$\angle B = 64°$
$\angle C = 51°$
$180°$



(iii) $\angle P = 91°$
$\angle Q = 45°$
$\angle R = 44°$
$180°$

Example 1 : Two angles of a triangle are of 70° each. What kind of triangle is it ?

Solution : It is an isosceles triangle as its two angles are equal.
Sum of all the three angles = 180°

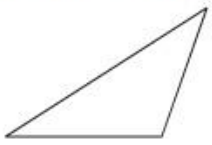
Sum of two angles = 70° + 70° = 140°
Third angle = 180° − 140° = 40°
All the three angles are acute (70°, 70°, 40°)
So the triangle is an isosceles acute-angled triangle.

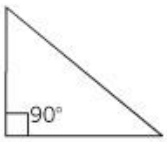
Example 2 : Each angle of a triangle is 60°. What kind of triangle is it ?
Solution : It is an equilateral triangle as all of its angles are equal.
Again, it has every angle as acute angle. So it is acute-angled.
The triangle is an equilateral acute-angled triangle.

Example 3 : Explain : **(i)** Can a triangle have two right angles ?
(ii) Can a triangle have two obtuse angles ?
(iii) Can a triangle have one obtuse and one right angle ?
Solution : **(i)** The sum of the 3 angles is always 180°. Sum of the two right angles will be 180°. Therefore, the triangle will have only two angles which is impossible. So a triangle cannot have two right angles.
(ii) An obtuse angle is more than 90°. Sum of two obtuse angles will be more than 180° which is impossible. Because all the three angles of a triangle sum up to 180°. So a triangle cannot have 2 obtuse angles.
(iii) All the three angles of a triangle always sum up to 180°. The sum of one obtuse and one right angle will be more than 180° which is impossible. So a triangle cannot have one obtuse and one right angle.

Exercise 20.1

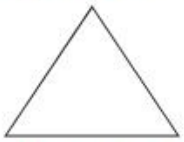
1. Observe the following triangles. Estimate virtually whether they are right-angled, acute-angled or obtuse-angled. Now measure their angles and classify them :

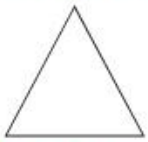
(i) 

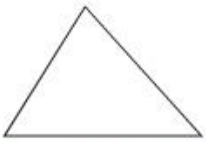
(ii) 

(iii) 

2. Observe the following triangles. Estimate virtually the lengths of their sides and classify them. Then measure their sides and classify them :

(i) 

(ii) 

(iii) 

3. Measures of the angles of some triangle are given. Classify them (a) according to angles, (b) according to sides :

(i) 42°, 48°, 90° **(ii)** 60°, 60°, 60° **(iii)** 54°, 72°, 54°
(iv) 30°, 80°, 70° **(v)** 50°, 80°, 50° **(vi)** 29°, 90°, 61°

4. The lengths of the sides of some triangles are given. Classify them :

(i) 2.9 cm, 3.1 cm, 2.6 cm **(ii)** 4.1 cm, 3.9 cm, 3.9 cm

(iii) 3 cm, 3 cm, 3 cm **(iv)** 2.3 cm, 2.8 cm, 2.3 cm

5. Two of the angles of a triangle are given in each of the following. Find the third angle :

(i) 29° and 73° **(ii)** 75° and 90° **(iii)** 118° and 30°

6. In ΔABC if :

(i) $\angle A = \angle B = 65°$, then find $\angle C$.

(ii) $\angle A = \angle B$ and $\angle C = 90°$, then find $\angle A$ and $\angle B$.

(iii) $\angle A = 70°$, $\angle B = 5°$, then find $\angle C$.

(iv) $\angle A = \angle B = \angle C$, then find each angle of the triangle.

(v) $\angle ABC = 100°$, $\angle BCA = 35°$, then find $\angle BAC$.

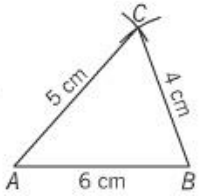
7. In which of the following cases is a triangle possible with the given group of angles :

(i) 75° ; 75° ; 29° **(ii)** 30° ; 60° ; 90° **(iii)** 87° ; 20° ; 74°

Construction of Triangles

To Construct a Triangle when its Three Sides are Given

Construct a triangle ABC in which $AB = 6$ cm, $AC = 5$ cm and $CB = 4$ cm.

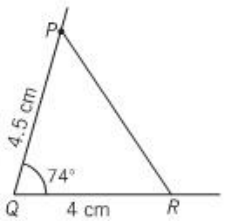


Construction : We draw a line segment $AB = 6$ cm. Now taking centres A and B respectively draw two arcs of radii 5 cm and 4 cm. They intersect at C. Join AC and CB.

ΔABC is the required triangle.

To Construct a Triangle when two Sides and Included Angle are Given

Draw a triangle PQR in which $PQ = 4.5$ cm, $QR = 4$ cm and $\angle Q = 74°$.

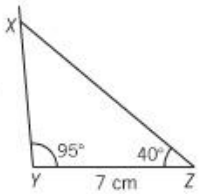


Construction : Construct an angle of 74°, using protractor. Name the vertex of the angle as Q. Cut off $QR = 4$ cm from one arm and $PQ = 4.5$ cm from the other arm. Join P to R.

ΔPQR is the required triangle.

To Construct a Triangle when One Side and Two Angles are Given

Draw a triangle XYZ in which $YZ = 7$ cm, $\angle Y = 95°$ and $\angle Z = 40°$



Construction : Draw a line segment $YZ = 7$ cm. Construct an angle of 95° at point Y of YZ and 40° at point Z of YZ. Extend the sides of the two angles which meet at X.

ΔXYZ is the required triangle.

Exercise 20.2

1. Construct an equilateral triangle of side 7.2 cm each. Measure its angles. Are all these angles equal ?
2. Construct a triangle having sides 4.5 cm, 5.5 cm and 6.5 cm.
3. Construct a triangle having sides 5 cm, 7 cm and 8 cm. Measure its angles. Are they equal ?
4. Construct a right angled triangle in which two arms of the right angle are 6 cm and 7 cm respectively.
5. Construct a triangle PQR in which $QR = 7.5$ cm, $\angle Q = 30°$, $\angle R = 85°$.
6. Construct ΔEFG in which $EF = 4.7$ cm, $EG = 5.6$ cm and $\angle GEF = 60°$.
7. Construct a triangle ABC, in which $AB = 6.2$ cm, $BC = 7$ cm, $CB = 6.2$ cm. Measure its angles. Which angles are equal ?
8. Construct a triangle XYZ in which $XY = 4.9$ cm, $YZ = 5.3$ cm and $\angle Y = 68°$.
9. Construct a ΔABC in which $BC = 5.5$ cm, $AB = AC = 7.5$ cm.
10. Construct ΔMNO in which side $MN = 6.3$ cm, $\angle OMN = 55°$ and $\angle MNO = 65°$.

Chapter

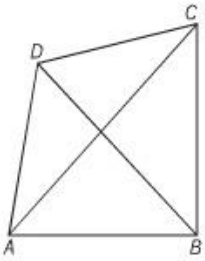
21 Quadrilateral

Learning Objectives :

❖ Parts of Quadrilateral ❖ The Sum of the Angles of Quadrilateral ❖ Special Quadrilaterals

Quadrilateral is a simple closed plane polygon formed by four line segments. Each line segment is called its side (quadri means four, lateral means side).

➲ Parts of Quadrilateral



In a quadrilateral $ABCD$, we have

4 Sides : AB, BC, CD, DA

4 Vertices : A, B, C, D

4 Angles : $\angle BAD, \angle ABC, \angle BCD, \angle CDA$

2 Diagonals : AC, BD

A line segment joining a pair of opposite vertices is called a diagonal.

➲ The Sum of the Angles of Quadrilateral

The sum of the angles of quadrilateral $ABCD = \angle A + \angle B + \angle C + \angle D$

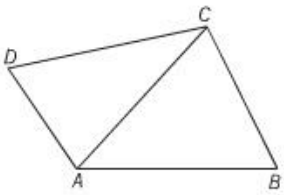
Join A to C. AC is a diagonal. Now quadrilateral $ABCD = \Delta ABC + \Delta CDA$

$\angle A$ is divided into two angles $\angle CAD + \angle CAB$

$\angle C$ is divided into two angles $\angle BCA + \angle ACD$

$\angle CAD$ and $\angle ACD$ are angles of ΔACD.

$\angle CAB$ and $\angle BCA$ are angles of ΔABC.



Obviously sum of the angles of quadrilateral $ABCD$

= Sum of the angles of ΔABC + Sum of the angles of ΔCDA

$= 180° + 180° = 360°$

$\therefore$ Sum of the measures of the 4 angles of a quadrilateral is always 360°.

Example 1 : Three angles of a quadrilateral are 85°, 100° and 65°. Find its fourth angle.

Solution : Sum of all the 4 angles of a quadrilateral = 360°

Sum of 3 angles = $85° + 100° + 65° = 250°$

Fourth angle = $360° - 250° = 110°$

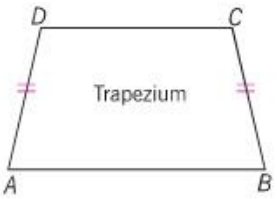
Example 2 : If all the four angles of a quadrilateral are equal, what is the measure of each angle ?

Solution : Sum of all the four equal angles of a quadrilateral = 360°

∴ Each equal angle of the quadrilateral = 360° ÷ 4 = 90°

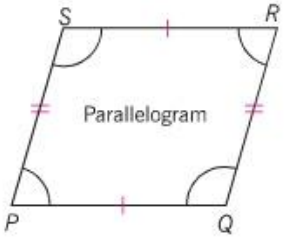
➲ Special Quadrilaterals

A trapezium has only one pair of equal sides and another pair of parallel sides.



Side figure *ABCD* is a trapezium. *BC* and *AD* are equal but not parallel. *AB* is parallel to *DC* but not equal.

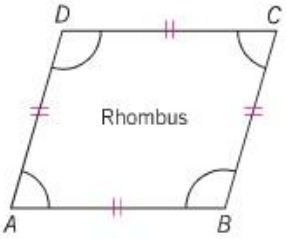
A parallelogram has only opposite sides equal and parallel and opposite angles equal.



In parallelogram *PQRS* (side figure), sides *PQ* and *SR* are equal and parallel. Sides *PS* and *QR* are equal and parallel.

$$\angle P = \angle R \text{ and } \angle Q = \angle S$$

A rhombus has all the four sides equal. The opposite sides are parallel and opposite angles equal.



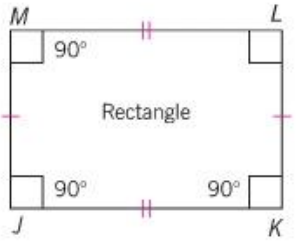
In rhombus *ABCD* (side figure),

Side $AB = BC = CD = DA$

Side *AB* and *DC* are parallel. Sides *DA* and *CB* are parallel.

$$\angle A = \angle C \text{ and } \angle B = \angle D$$

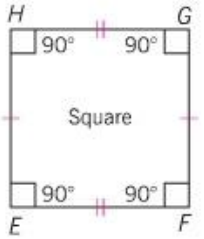
A rectangle has only opposite sides equal and parallel with all the four angles of 90° each.



In the rectangle *JKLM* (side figure), side *JK* and *ML* are equal and parallel, sides *MJ* and *LK* are equal and parallel.

$$\angle J = \angle K = \angle L = \angle M = 90°$$

A square has all the four sides equal. The opposite sides are parallel and each angle 90°.



In the square *EFGH* (side figure),

Side $EF = FG = GH = HE$

Sides *EF* and *HG* are parallel.

Sides *HE* and *GF* are parallel.

$$\angle E = \angle F = \angle G = \angle H = 90°$$

Exercise 21

1. $PQRS$ is a quadrilateral. Write the names of all its parts.
2. In a quadrilateral $ABCD$, $\angle A = 90°$, $\angle B = 60°$, $\angle C = 40°$, find $\angle D$.
3. In a quadrilateral $ABCD$, $\angle A = \angle B = \angle D = 90°$; find $\angle C$.
4. In a quadrilateral $PQRS$, $\angle Q = 110°$, $\angle R = 120°$, $\angle S = 80°$, find $\angle P$.
5. State True (**T**) or False (**F**) :
   - **(i)** Only one pair of opposite sides of a trapezium are parallel.
   - **(ii)** All sides of a rectangle are equal.
   - **(iii)** All the angles of a square are equal.
   - **(iv)** Sum of the angles of a rhombus is 360°
   - **(v)** Opposite angles of a trapezium are equal.
6. Fill in the blanks :
   - **(i)** _____ and _____ are quadrilaterals with only opposite sides equal.
   - **(ii)** _____ and _____ are quadrilaterals with all sides equal.
   - **(iii)** _____ and _____ are quadrilaterals with only opposite angles equal.
   - **(iv)** _____ and _____ are quadrilaterals with all angles equal.

Chapter

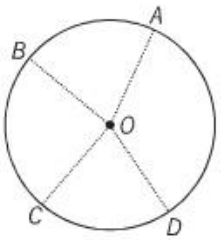
22 Circle

Learning Objectives :

- Elements of Circle
- To Find the Circumference of a Circle
- Relation between Circumference and Diameter
- Designs with Circles

A circle is a simple plane closed curve. We can draw circles with the help of compass. A rupee coin or bangles can also be used to draw circles. Place a coin on a paper. Move the fine tip of a pencil along the curved edge of the coin. A circle is drawn.

➲ Elements of Circle



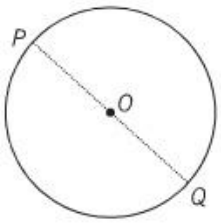
Centre of a circle : To draw a circle, we keep the pin of the compass on a point, called centre and move the pencil tip around.

Centre is the fixed point at equal distance from each point of a circle.

Radius of a circle : A line segment joining the centre to any point on a circle is called a radius of the circle.

All the radii of the circle are equal.

In the side figure, $OA = OB = OC = OD = ...$



Diameter of a circle : A line segment which passes through the centre of a circle with its end-points on the circle is called the diameter of the circle.

PQ is the diameter in the side figure.

A large number of diameters of a circle can be drawn.

Each diameter passes through the centre of the circle. All the diameters are of equal length.

Also OP and OQ are two radii of the circle.

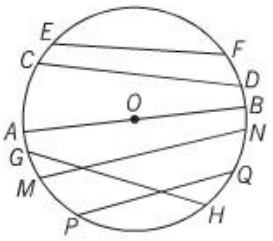
$\therefore \quad OP = OQ$

Thus, $\quad PQ = 2 \times OP$

$$\text{Length of the diameter} = 2 \times \text{length of the radius}$$

or $$\text{Length of the radius} = \frac{1}{2} \times \text{length of the diameter}$$

Chord of a circle : A line segment having its end-points on the circle is called a chord of the circle.



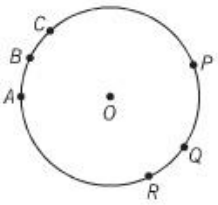
A chord may or may not contain the centre of the circle.

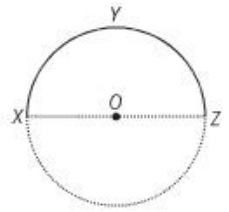
Diameter of a circle is its biggest chord.

In the side figure, *AB* (diameter) *CD*, *EF*, *GH*, *PQ*, *MN* are all chords.

We can draw a large number of chords. Any two of them may or may not be equal.

Arc of a circle : Any part of a circle is called an arc of the circle.We name an arc by three points of the arc—two end-points and another point in between them.

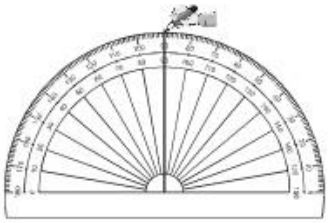




In the side figure, *ABC* and *PQR* are arcs of the circle.

Semi-circle : Just half of a circle is called a semi-circle.

In the side figure, *XYZ* is a semi-circle. Semi-circle is also an arc.



Take a protractor and keep it on a sheet of paper (side figure). Move the tip of a pencil along the curved edge of the protractor.

The curve traced is a semi-circle.

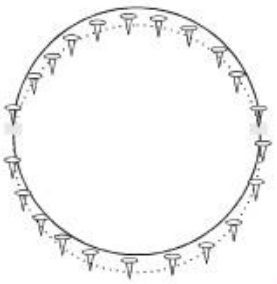
Circumference of a circle : Draw a circle on a card paper and cut it out. Run your finger round its edge. Length of the curved edge is called circumference of the circle.

The distance covered to go around a circle once is called the circumference. In short, length of a circle is called its circumference.

➲ To Find the Circumference of a Circle

We cannot find the length of a circle with a scale.We can find the approximate length of a circle with the help of a thread.

We draw a circle on a cardboard. Fix up the pins on the circle as shown in the side figure. Tie one end of a thread to one of the pins. Wrap the thread along the pins till we reach the tied pin. Cut the thread at the point where it touches the first pin again. Measure the length of the wrapped thread on a scale. This is the length of the circle or circumference.



➲ Relation between Circumference and Diameter

The circumference of a circle is $\frac{22}{7}$ or 3.14 times its diameter.

Example 1 : Find the circumference of a circle having diameter 42 cm.

Solution : Circumference $= \frac{22}{7} \times$ diameter

$$= \frac{22}{\cancel{7}_{1}} \times \cancel{42}^{6} = 132 \text{ cm.}$$

Example 2 : Circumference of a circle is 44 cm. Find its diameter.

Solution : $\frac{22}{7} \times$ diameter = circumference

$\therefore$ Diameter = circumference $\div \frac{22}{7}$

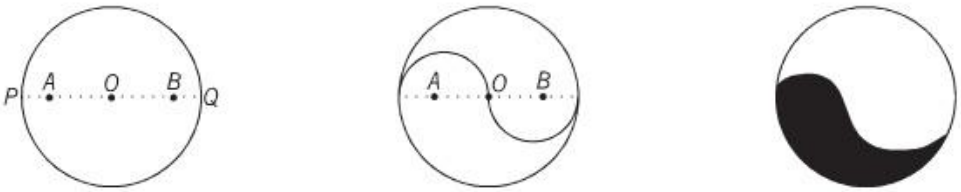
$$= 44 \div \frac{22}{7} = \cancel{44}^{2} \times \frac{7}{\cancel{22}_{1}} = 14 \text{ cm}$$

Designs with Circles

Some designs can be drawn using circles as follows :

1. **(a)** We draw a circle with centre *O*. Draw a diameter *POQ*. Find mid-points *A* and *B* of *OP* and *OQ*.

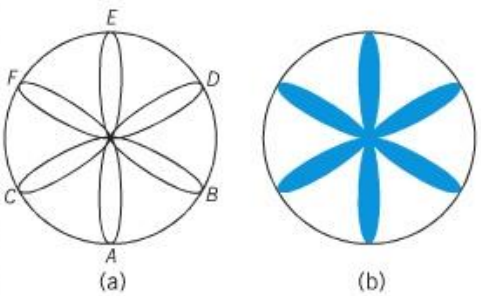
   (b) Taking *A* and *B* as centres draw two semi-circles with radius *AO* and *BO*.



(a) (b) (c)

   (c) Erase the diameter. Shade or colour the design.

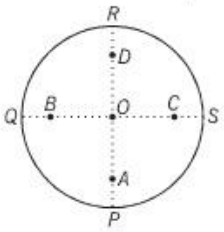
2. **(a)** Draw a circle with any radius. Now put the pin of the compass at any point *A* of the circle and draw an arc *COB* with the same radius to cut the circle at *B* and *C*. Put the pin of the compass at *B* and with the same radius draw the arc *AOD*. Now put the pin of the compass at *C* and with the same radius draw the arc *AOF*. Proceeding in the same way, make arcs with centres *D*, *F* and *E*.



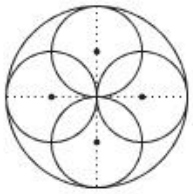
(a) (b)

   (b) Shade or colour the design.

3. **(a)** Draw a circle. Draw its two diameters *PR* and *QS* perpendicular to each other. Find the mid-points *A*, *B*, *C* and *D* of *OP*, *OQ*, *OR* and *OS*.



(a)


(b)


(c)

(b) Taking *A*, *B*, *C* and *D* as centres and radius *OA* draw four circles.

(c) Erase the diameters. Shade or colour the design.

Exercise 22

1. Fill in the blanks :

(i) The longest chord of the circle is the _____ .

(ii) Any part of a circle is called an _____ .

(iii) Each diameter passes through the _____ of the circle.

(iv) The radius is _____ of the diameter.

(v) A line segment joining any two points on a circle is called a _____ .

(vi) _____ is the fixed point at equal distance from each point of the circle.

(vii) Circumference = diameter × _____ .

(viii) The lengths of all radii of a circle are _____ .

(ix) There are _____ semi-circle of a circle.

(x) The centre of a circle always lies on its _____ .

2. Using compass, draw circles of the following radii :

(i) 5 cm **(ii)** 5.6 cm **(iii)** 4.5 cm **(iv)** 7.2 cm

3. Find the diameter of a circle, radius of which is :

(i) 5 cm **(ii)** 7.5 cm **(iii)** $4\frac{1}{2}$ cm **(iv)** 8.2 cm

4. Find the radius of a circle, diameter of which is :

(i) 8 cm **(ii)** $10\frac{1}{2}$ cm **(iii)** 11 cm **(iv)** 4.66 cm

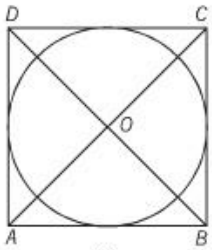
5. Find the circumference with the given diameter :

(i) 35 cm **(ii)** 56 cm **(iii)** 49 cm **(iv)** 63 m

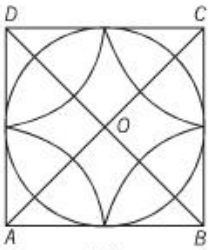
6. Find the diameter with the given circumference :

(i) 66 cm **(ii)** 22 cm **(iii)** 132 cm **(iv)** 55 m

7. Watch and follow the figures to make the design on your note book :



(i)



(ii)


(iii)

8. With the same centre, draw four circles of radii 2.5 cm, 3 cm, 3.5 cm and 4 cm.

9. Take a line segment XY of length 7 cm. With centres X and Y and radii 3 cm and 4 cm respectively, draw two circles. Do the two circles touch each other ?

10. State whether each of the following statements is true (**T**) or false (**F**) :

(i) If we join any two points on a circle, we get a chord of the circle.

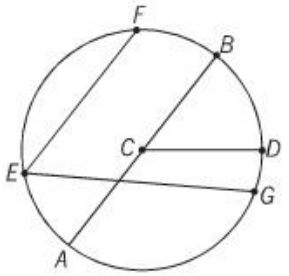
(ii) A semi-circle is not an arc.

(iii) The centre of a circle lies only on one of its diameters.

(iv) A diameter is the longest chord of a circle.

(v) Circumference = diameter $\div \frac{22}{7}$

11. Watch the figure and fill in the blanks :



(i) The radii of the circle are _____, _____ and _____ .

(ii) The chords of the circle are _____ , _____ and _____ .

(iii) The diameter of the circle is _____.

(iv) _____ and _____ are semi-circles.

(v) AB = _____ $\times CD$.

Chapter

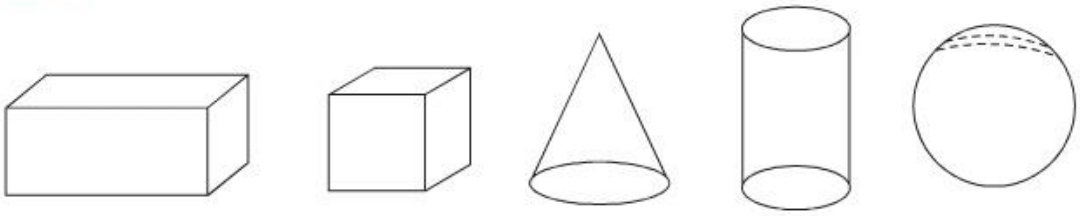
23 Symmetry and Pattern

Learning Objectives :

❖ 2D and 3D Objects ❖ Faces, Edges and Vertices ❖ Reflective Symmetry ❖ Rotational Symmetry ❖ Representing 3D in 2D ❖ Patterns

2D and 3D Objects

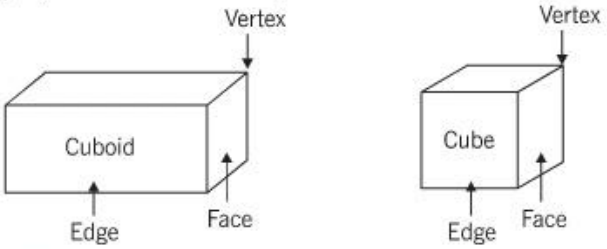
In day-to-day life, we come across various objects such as books, balls, geometry boxes, ice-cream cones, pencils. The one common thing among all these objects is that they all have three dimensions : length, breadth and height. As compared to objects like a sheet of paper (2D object) these objects have an additional dimension (height) and hence are classified as 3D objects. Various 3D objects are given below :



Cuboid Cube Cone Cylinder Sphere

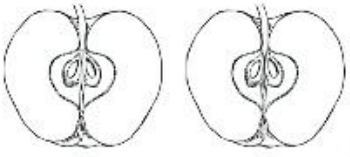
Faces, Edges and Vertices

In the figures of this cube/cuboid, the eight corners are referred to as its vertices. The 12 sides are called its edges, and the six flat square surfaces are its faces.

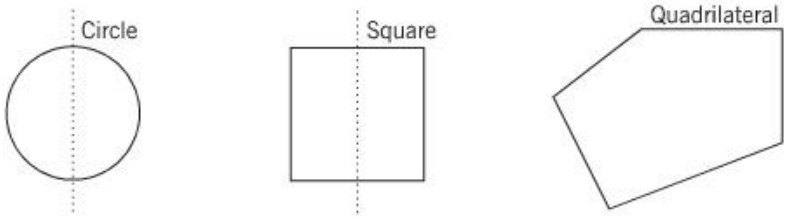


Reflective Symmetry

In the figure, an apple is cut into two pieces and both the pieces, are exactly the same. This is so because they have a line of symmetry. Now, you will like to know about symmetry.



Symmetry is an important geometrical concept. If we are able to draw a line which will divide the object into two identical parts then we say the object is symmetrical about that line. Also the line is said to be the axis of symmetry for that object.



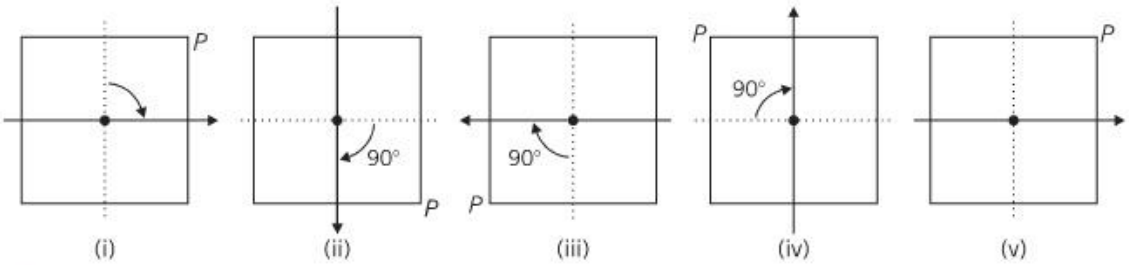
In the above figures, we can see that in circle and square, there is at least on line about which if the figure is folded, its one part exactly overlaps the other part. Hence circle and square are symmetric.

However, for the quadrilateral, we observe that we cannot fold the shape in any manner where both the parts exactly overlap. Thus, the quadrilateral is not symmetric.

Rotational Symmetry

A figure is said to have rotational symmetry if the figure looks the same even after it has been rotated by an angle less than 360°. Here is an example of rotational symmetry.

Consider a square with *P* as one of its corners and let up perform quarter turns about the centre of the square marked.

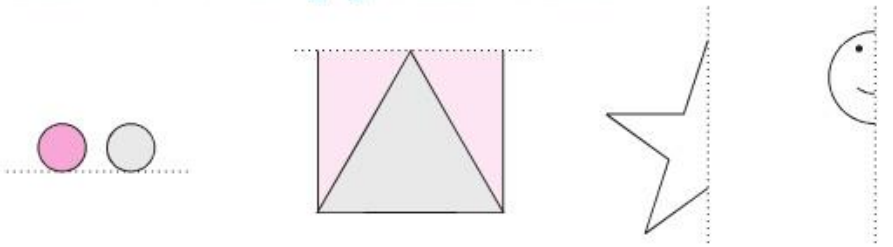


- Fig. (i) is the initial position. Rotation by 90° about the centre leads to Fig. (ii).
- Note the position of *P* now. Rotate again through 90° and you get Fig. (iii).
- In this way, when you complete four quarter turns, the square reaches its original position.
- All the figure look the same as Fig. (i) inspite of the rotation. This can be seen with the help of the positions taken by *P*.

Thus, a square has rotational symmetry.

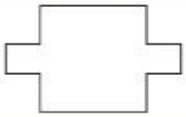
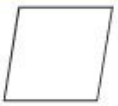
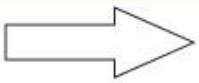
Exercise 23.1

1. Draw reflection of the following figure about the dotted line :



(a) (b) (c) (d)

2. What will the following figures look like when they are rotated in the following angles ?

Figure	At 90° clockwise	At 90° anticlockwise	At 180° degrees
			
			
			
			
			

3. Match the following things with their shapes :

Things	Football	Pipe	Dice	Match box	Birthday cap
Shapes	Cylinder	Cube	Cone	Sphere	Cuboid

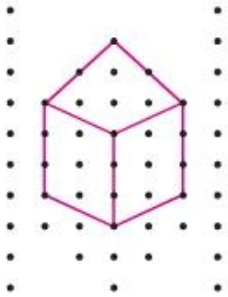
4. How many faces and edges has a cuboid ?

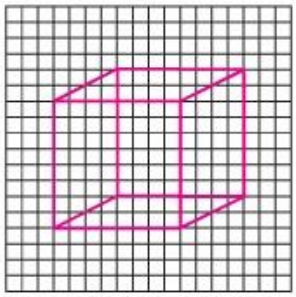
Representing 3D in 2D

Most of the objects around us such as a geometry box, birthday cap, dice, etc. are 3D objects or solid objects.

We cannot draw them on paper. We can only draw their 2D (Plane) representations. In this section, we will explore how to draw 3D shapes either on square paper or on isometric paper.

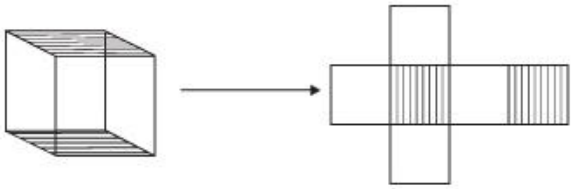
We can draw a cube as shown below :



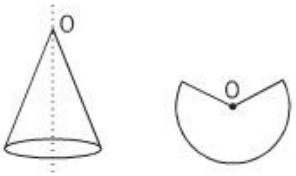


Nets for Building 3D Shapes

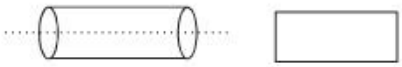
Open a cardboard box along its edges to lay it flat. You will get a cardboard of shape as given alongside. This is called a net of the cube. It can be appropriately joined to get the same cube back.



Similarly, you can get a net for a cone by cutting a slit along its slant surface.



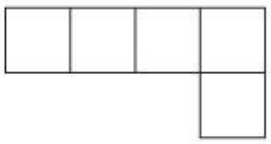
Similarly, you get a net for cylinder as shown.



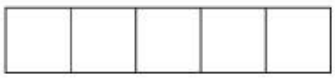
Exercise 23.2

1. Find out which of these shapes can be folded to make an open box :

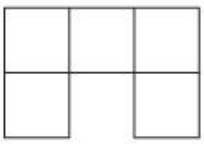
(a)



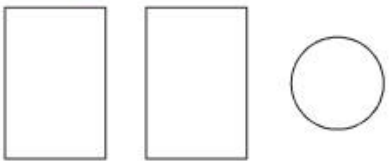
(b)

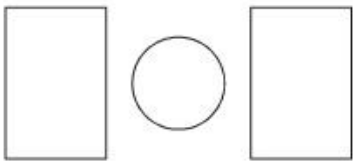


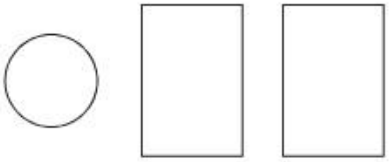
(c)

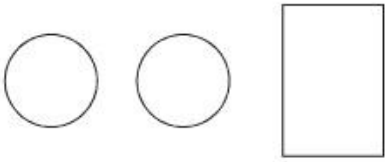


2. Which of the following represents correct front, top and side views of a cylinder respectively ?

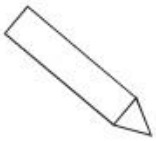
(a) 

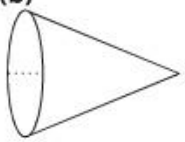
(b) 

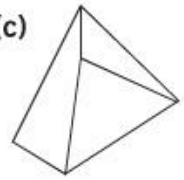
(c) 

(d) 

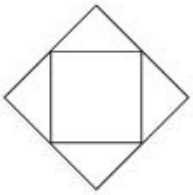
3. All boxes are not cubes. Here are some different kinds of boxes. Match each shape below with a box into which it will fold.

(a) 

(b) 

(c) 

(d) 

(i) 

(ii) 

(iii) 

(iv) 

4. A birthday cap has the shape of a cone. When we see it from above, it looks like a circle and from front it looks like a triangle.
   Now, you are looking at the cuboid from the top. What geometrical figure will you see ?
5. Dice are cubes with dots on each face. A die is shown. Can the net at the side be for a die ? The numbers 1 to 6 indicate the number of dots on each face.
   Make a similar net on a rough paper and check if a die can be formed.

Patterns

A pattern is a sequence of repeated objects or numbers. Patterns can be observed in nature too. Look at the leaves on a branch or at the arrangement of petals in a flower.

Number Pattern

Identify the pattern and fill in the blanks.

1. $37 \times 3 = 111$
$37 \times 6 = 222$
$37 \times 9 = 333$
$37 \times$ _____ $= 444$
$37 \times 15 =$ _____
$37 \times 18 =$ _____

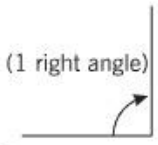
2. $222222222 \times 9 = 1999999998$
$333333333 \times 9 = 2999999997$
$444444444 \times 9 = 3999999996$
$555555555 \times 9 =$ _____
$666666666 \times 9 =$ _____

3. $1 + 3 = 4 = 2 \times 2$
$1 + 3 + 5 = 9 = 3 \times 3$
$1 + 3 + 5 + 7 = 16 = 4 \times 4$
$1 + 3 + 5 + 7 + 9 = 25 =$ _____
$1 + 3 + 5 + 7 + 9 + 11 =$ _____ $=$ _____
_____ $=$ _____ $=$ _____

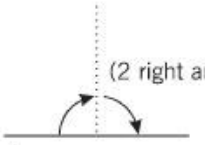
4. $11 \times 11 = 121$
$111 \times 111 = 12321$
$1111 \times 1111 = 1234321$
$11111 \times 11111 =$ _____
$111111 \times 111111 =$ _____

Turns

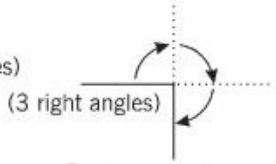
You can also make patterns by turning a shape $\frac{1}{4}, \frac{1}{2}, \frac{1}{8}, \frac{1}{3}$ or $\frac{1}{6}$.



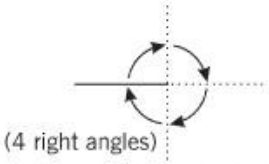
$\frac{1}{4}$ of a turn is 90°.



$\frac{1}{2}$ of a turn is 180°.



$\frac{3}{4}$ of a turn is 270°.



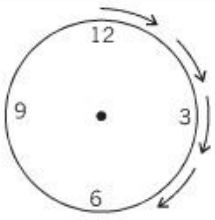
1 complete turn is 360°.

1. Right angle makes a ..... turn.
2. Right angles make a ..... turn.
3. Right angles make a ..... turn.

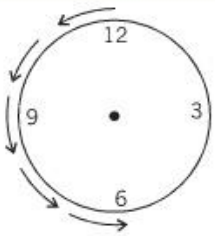
Turns can be in the clockwise or anticlockwise directions.

Fact File

4 right angles are the same as one complete turn.



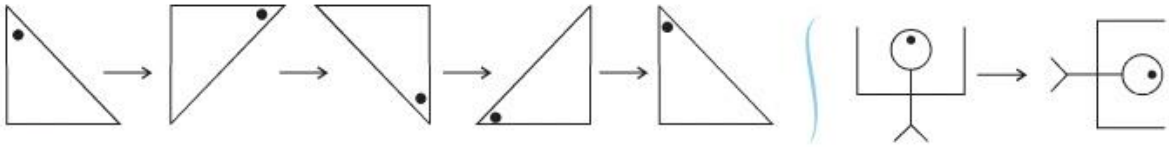
Clockwise direction



Anticlockwise direction

Quarter Turn $\left(\frac{1}{4}\text{ turn}\right)$

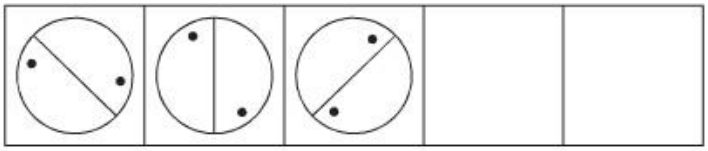
A quarter turn means $\frac{1}{4}$ turn. Observe the dot on the shape. The shape turns $\frac{1}{4}$ at each step.



Exercise 23.3

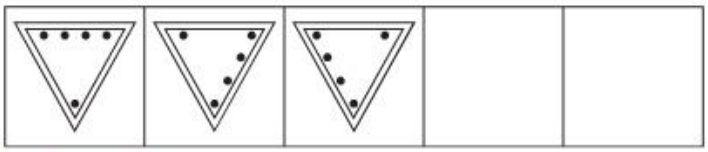
What should come next ?

1.

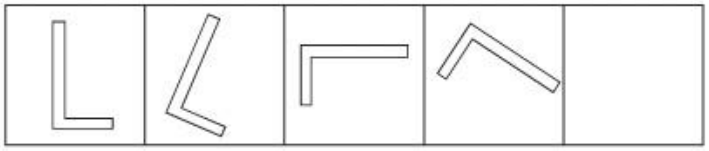


2.

3.



4. See this pattern

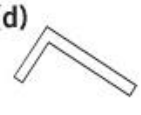


The rule of this pattern is–turning by 45° each time.
Which will be the next ? Tick (✓) the right one :

(a) 

(b) 

(c) 

(d) 

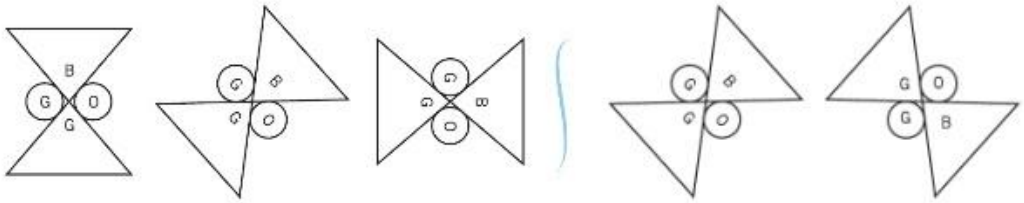
☞ Some patterns are given below on the left side of the pink line. For each pattern, write the rule. Then choose what comes next from the right side of the line and tick.

5.

Rule : _____

_____

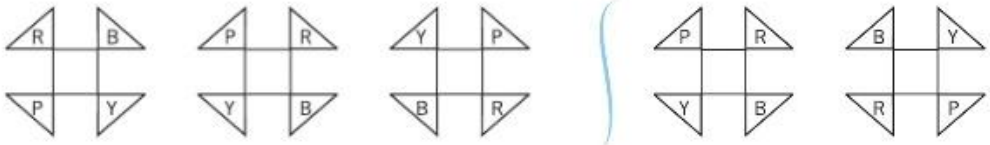
6.



Rule : _____

_____

7.



Rule : _____

_____

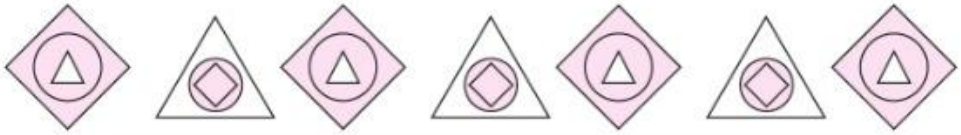
☞ Look for a pattern and mark that picture which is breaking the rule. Also correct it :

8.

9.

10.

11.

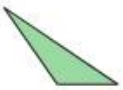


☞ Give each shape a quarter turn to complete the pattern :

	Shape	$\frac{1}{4}$ Turn	$\frac{1}{4}$ Turn	$\frac{1}{4}$ Turn
12.				
13.				
14.				
15.				
16.				
17.				
18.				

☞ Give each shape half a turn.

19. 

20. 

21. 

22. 

23. 

24. 

Chapter 24

Unit-VII : Mensuration

Area

Learning Objectives :

❖ What is Area ? ❖ Unit of Area ❖ To Find Area by Counting Squares ❖ To Find Area by Dividing Figure into Rectangles and Squares

What is Area ?

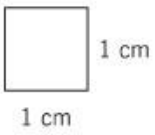
Area is the quantity that expresses the extent of two dimensional figure or shape or planer lamina in the plane.

In common usage, we say 'measure of the area of a surface' instead of 'measure of a surface'.

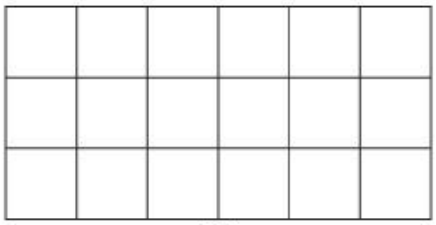
Unit of Area

A portion of a plane has length and breadth both. So we choose a closed plane figure 'square' as a unit because it has both length and breadth and both are equal.

Small Unit : We use a square of side 1 cm to measure area. Area of this square is 1 square centimetre written as 1 sq cm.



(i)



(ii)

Fig. (ii) shows a rectangle 6 cm × 3 cm. We can see it as a set of 18 squares of 1 cm × 1 cm.

Area of a rectangle = length × breadth

= 6 cm × 3 cm = 18 sq cm

Similarly, Area of a square = side × side

Big Unit : A square of side 1 m is a big unit of area. The area of this square is 1 sq m. sq m unit is used in measuring the area of houses, fields, grounds. etc.

1 sq m = 1 m × m

= 100 cm × 100 cm = 10,000 sq cm

Example 1 : Find the area of a rectangle of length 6 m 40 cm and breadth 4 m 70 cm.

Solution : Length of the rectangle = 6 m 40 cm = 6.40 m

Breadth = 4 m 70 cm = 4.70 m

Area of a rectangle = Length × Breadth

= 6.40 m × 4.70 m = 30.08 sq m

Example 2 : Find the area of a square of side 3 m 35 cm.

Solution : Side of the square = 3 m 35 cm = 3.35 m

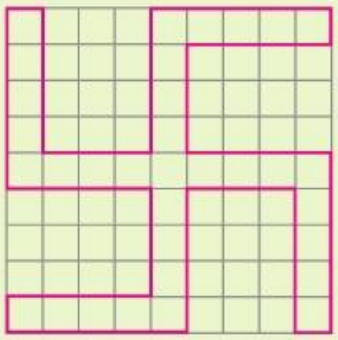
Area of the square = side × side

= 3.35 m × 3.35 m = 11.2225 sq m

➲ To Find Area by Counting Squares

1. To find the area of a regular closed plane figure, we draw the figure on a centimetre squared paper and then count the number of squares enclosed by the figure.

Example 3 : Find the area of the following figure on squared paper : (each square = 1 cm^2)



Solution : The area of the symbol swastik above = 33 sq cm

2. To find the approximate area of an irregular figure (which cannot be divided into exact squares), we adopt the following procedure :

Example 4 : Find the area of the following figure on the squared paper.

Solution : **(i)** We count the squares enclosed completely.

(ii) We count the squares enclosed more than half.

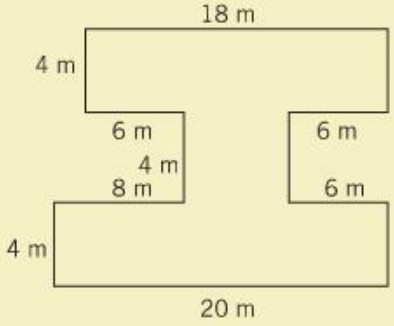
(iii) We leave the squares enclosed less than half.

The area of the above figure is = 11 + 17

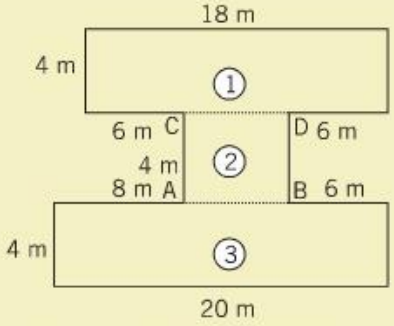
= 28 sq cm (approximately)

➲ To Find Area by Dividing Figure into Rectangles and Squares

Example 5 : Find the area of the following figure :



Solution :



We join the points A to B and C to D to divide the figure into rectangles (1), (2) and (3).

Area of rectangle (1) = 4 m × 18 m = 72 sq m

Area of rectangle (2) = 6 m × 4 m = 24 sq m

Area of rectangle (3) = 4 m × 20 m = 80 sq m

Area of the above figure = 176 sq m

Example 6 : The side of a square tile is 12 cm. How many tiles can be fixed on a wall 4 m long and 3.6 m wide ?

Solution :

Length of the wall = 4 m = 4 × 100 cm = 400 cm

Breadth of the wall = 3.6 m = 3.6 × 100 cm = 360 cm

Area of the wall = Length × Breadth

= 400 cm × 360 cm

Area of one tile = 12 cm × 12 cm

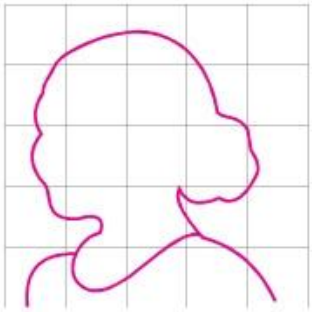
$$\text{Number of tiles used} = \frac{400\text{ cm} \times 360\text{ cm}}{12\text{ cm} \times 12\text{ cm}} = 1000$$

Exercise 24

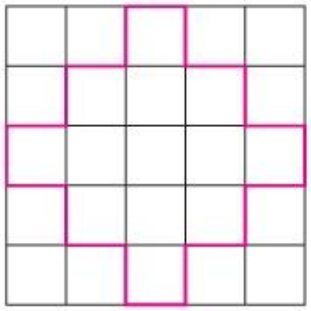
☞ Find the area of the following figures :

Consider area of 1 box = 1 cm^2

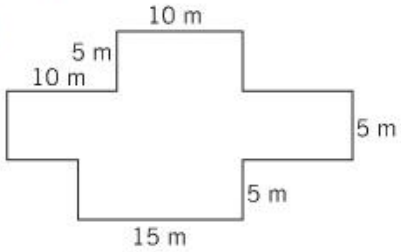
1.



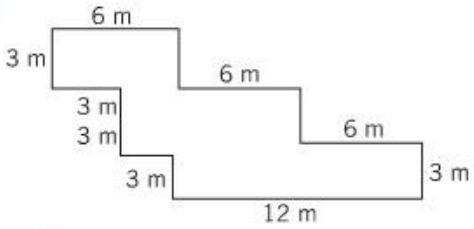
2.



3.



4.



☞ Find the area of the square having each side :

5. 13 cm **6.** 6 cm **7.** 1 m 50 cm **8.** 3 m 60 cm

☞ Find the area of the following rectangles :

9. length = 18 cm and breadth = 10 cm _____

10. length = 25 cm and breadth = 22 cm _____

11. length = 130 m and breadth = 65 m _____

12. length = 1 m and breadth = 50 cm _____

13. length = 4 m 35 cm and breadth = 3 m _____

14. A playground is 145 m long and 64 m wide. Another ground is 132 m long and 72 m wide. Which of the grounds is bigger ? _____

15. The side of a square tile is 10 cm. How many tiles can be fixed on a floor 4.5 m long and 3 m wide ? _____

16. How many stone blocks, each 25 cm long and 20 cm wide, will be required to lay a path 250 m long and 6.3 m wide ? _____

17. Find cost of tiling of a courtyard 40 m long and 25 m broad at the rate of ₹ 50 per sq m. _____

18. A carpet is 5 m long and 3.5 m wide. Find its cost at ₹ 100 per square metre.

19. A garden is 165 metre long and 56 m wide. Find its area.

20. The side of a square field is 125 m. Find the cost of planting grass at the rate of ₹ 2 per square metre.

Let's Recall

Multiple Choice Questions (MCQs) :

Tick (✓) the correct option :

1. What is the area of a rectangle whose breadth is 5 m and its length is double to its breadth ?

   (a) 10 m^2 **(b)** 15 m^2 **(c)** 30 m^2 **(d)** 50 m^2

2. If the perimeter and the area of a square are numerically equal, then the length of a side of that square is _____ .

   (a) 8 units **(b)** 2 units **(c)** 4 units **(d)** 6 units

3. A floor of room measures (5 m × 4 m). How many tiles will be required to cover the floor if each tiles measures 80 cm × 50 cm ?

   (a) 40 **(b)** 100 **(c)** 50 **(d)** 60

4. The area of a square is equal to the area of rectangle measuring 16 cm length and 9 cm breadth. The perimeter of the square will be _____ .

   (a) 24 cm **(b)** 25 cm **(c)** 48 cm **(d)** 50 cm

Chapter

25 Volume

Learning Objectives :

❖ Unit of Volume ❖ To Find Volume of Cubes and Cuboids by Counting Cubes ❖ Volume of a Cube

Volume is the amount of space enclosed or occupied by an object.

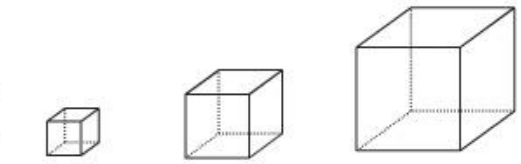
A Cuboid A Cube A Cone A Cylinder A Sphere

The solids shown above all occupy space and thus have volume.

If we have an empty box or bucket, we can fill it with water or other liquid. Water and other liquids also occupy space.

➲ Unit of Volume

Cubes of edges 1 mm, 1 cm or 1m are taken as the units of measuring the volume. Length, breadth and height of a cube are equal.

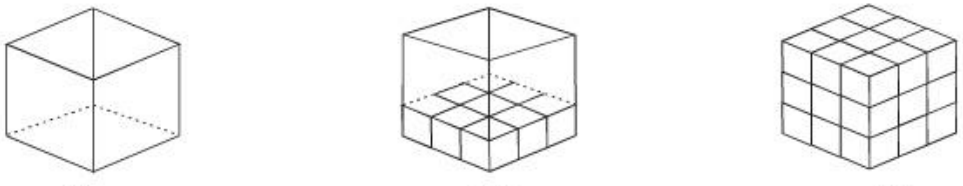


1-mm Cube 1-cm Cube 1-m Cube

Fill an empty box with a number of suitable cubes. Fit the cubes together. They will fill up completely the space available in the box.

➲ To Find Volume of Cubes and Cuboids by Counting Cubes

We find the number of unit cubes which together make the given solid or fill up the entire space occupied by the solid.



(i) (ii) (iii)

We have an empty box 3 cm long, 3 cm broad and 3 cm high.

To cover the base area we require $3 \times 3 = 9$ cubes.

This forms 1 layer of cubes [Fig. (ii)].

To fill the entire box we need 3 layers of 9 cubes each.

We need $9 \times 3 = 27$ cubes in all.

It means volume of the box = 27 cubic in all

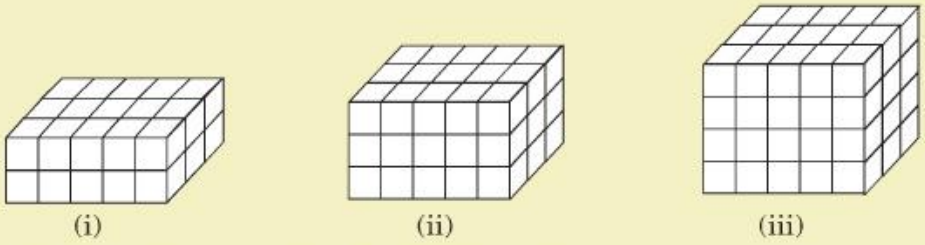
It means volume of the box = 27 cubic cm

or 27 cu cm (in short)

Thus, number of cubes = length × breadth × height

or Volume of a cuboid or cube = length × breadth × height

Example 1 : Find the volume of the following cubids (each cube of 1 cm side) :



(i) (ii) (iii)

Solution : **(i)** Volume of the cuboid = Number of cubes
= length × breadth × height
= 5 cm × 3 cm × 2 cm = 30 cm^3

(ii) Volume of the cuboid = Number of cubes
= length × breadth × height
= 5 cm × 3 cm × 3 cm = 45 cm^3

(iii) Volume of the cube = Number of cubes
= length × breadth × height
= 5 cm × 4 cm × 3 cm = 60 cm^3

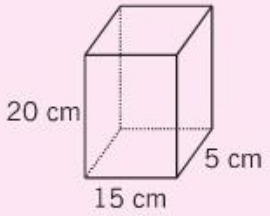
Volume of a Cube

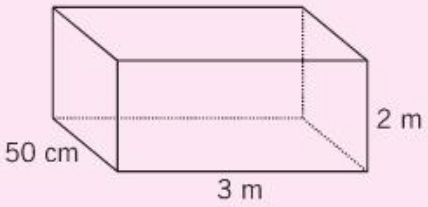
Volume of a cube = length of an edge × length of an edge × length of an edge
= side × side × side (in short)
= $(side)^3$

If the length of an edge of a cube = a

Then, Volume of a cube = a^3

Example 2 : Find the volumes of the following cuboids (rectangular solids) :





Solution : **(i)** Volume of the cuboid = length × breadth × height

= 15 cm × 5 cm × 20 cm = 1500 cm^3

(ii) Volume of the cuboid = length × breadth × height

= 3 m × 50 cm × 2 m

= 3 m × 0.5 m × 2 m = 3 m^3

Example 3 : A soap-cake measures 7 cm in length, 5 cm in breadth and 2.5 cm in thickness (height). How many soap-cakes can be placed in a cardboard box having length, breadth and height as 56 cm, 40 cm and 25 cm respectively?

Solution : Volume of the box = length × breadth × height

= 56 cm × 40 cm × 25 cm

Volume of a soap-cake = length × breadth × height

= 7 cm × 5 cm × 2.5 cm

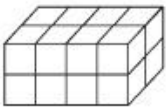
Number of soap-cakes which can be placed in the box

$$= \frac{56\text{ cm} \times 40\text{ cm} \times 25\text{ cm}}{7\text{cm} \times 5\text{ cm} \times 2.5\text{ cm}} = 8 \times 8 \times 10 = 640$$

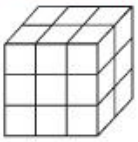
Exercise 25

Find the volume of the following cuboids (each cube of 1 cu cm) :

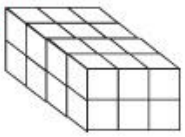
1.



2.

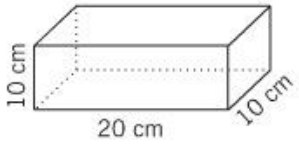


3.

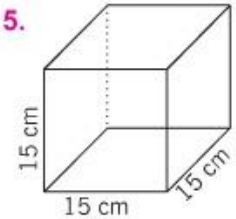


Find the volume of the following rectangular solids (cuboids and cube) :

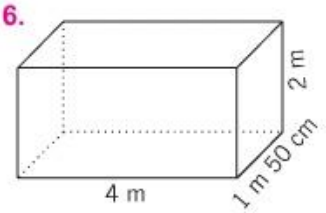
4.



5.



6.



7. Find the volume of a tea packet 6 cm in length, 4 cm in breadth and 10 cm in height.
8. Find the volume of a cuboid having length 1 m, breadth 50 cm and height 25 cm.
9. Find the volume of oil that can be poured into a cuboidal tin of internal dimensions 20 cm × 8 cm × 50 cm.
10. Find the volume of a box having length, breadth and height 40 cm, 25 cm and 20 cm respectively.
11. Find the volume of a box having each edge 9 cm long.
12. Find the volume of air in a hall 22 m long, 14 m wide and 4.5 m high.
13. An empty glass-box is 50 cm long, 25 cm wide and 20 cm high. How many cubic cm of water will it hold ?
14. The length, breadth and height of a wooden block are 5.5 cm, 4 cm and 2.5 cm respectively. Find its volume.
15. A brick is 21 cm long, 8 cm wide and 6 cm high. Find its volume.
16. Find the volume of a cube of edge 2.3 cm.
17. A brick measures 25 cm long, 10 cm wide and 7.5 cm thick. How many such bricks will be required to make a wall 5 m long, 2.5 m high and 37.5 cm thick ?
18. A cuboid is 8 cm long, 5 cm broad and 5 cm high and a cube has an edge of 6 cm. Which one has a greater volume ?
19. The length, breadth and height of an ice-cream block is 3 cm, 4 cm and 5 cm and of another 4 cm, 4 cm and 4 cm. Which has greater volume of ice-cream ?

Let's Recall

Multiple Choice Questions (MCQs) :

Tick (✓) the correct option :

1. How many 5 cm cubes can be cut from a cube whose edge is 20 cm ?
   (a) 100 **(b)** 64 **(c)** 32 **(d)** 4
2. What is the volume of a box whose each edge measures 3 metre in length ?
   (a) 54 cubic metre **(b)** 27 cubic metre
   (c) 18 cubic metre **(d)** 9 cubic metre
3. A 20 m long and 10 m wide rectangular tank contains water upto the depth of 2m. The water was transferred to another rectangular tank measuring 10 m long and 5 m wide. In the new tank water will measure upto a depth of _____ .
   (a) 8 m **(b)** 6 m **(c)** 4 m **(d)** 2 m
4. The height of a cuboid is 2 m. The breadth and length are two times and three times of its height respectively. The volume of the cuboid is _____ .
   (a) 48 m^3 **(b)** 7 m^3 **(c)** 12 m^3 **(d)** 24 m^3

Chapter

26 Circle Graph and Bar Graph

Learning Objectives :

❖ Worm Up ❖ Representing Data As Circle Graph ❖ Bar Graphs

➲ Worm Up

The circle graph given below shows the activities chosen by 40 students of Class 5. Look at the graph to answer these questions.

1. Which is the most popular activity ? _____
2. What fraction of students have chosen this activity ? _____
3. What fraction of students have chosen
   a. art ? _____ **b.** music ? _____ **c.** dance ? _____
4. Find the number of students who have chosen
   a. dance. _____ **b.** music. _____
   c. art. _____ **d.** basketball. _____

➲ Representing Data As Circle Graph

Example 1 : Below is given the data of the games the students of class 4 like to play.

Games	Carrom	Chess	Chinese Checkers	Scrabble
Number of students	5	5	20	10

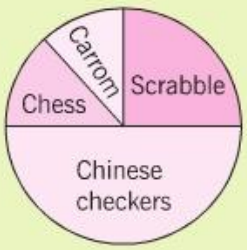
Solution : **Step 1.** To show the data on the circle graph, find the fraction of students that like to play each game.

$$\text{Carrom} = 5 \text{ out of } 40 = \frac{5}{40} = \frac{1}{8}$$

$$\text{Chess} = 5 \text{ out of } 40 = \frac{5}{40} = \frac{1}{8}$$

$$\text{Chinese checkers} = 20 \text{ out of } 40 = \frac{20}{40} = \frac{1}{2}$$

$$\text{Scrabble} = 10 \text{ out of } 40 = \frac{10}{40} = \frac{1}{4}$$



Step 2. Fill in the circle graph according to the fractions.

Exercise 26.1

1. The teacher asked 100 students of Class 5 the name of their favourite colour. The data collected is shown below. Represent this data in the circle graph by finding the fractions :

Favourite colour	Pink	Purple	Orange	Yellow
Number of students	35	45	15	5
Fraction				

2. Rohit conducted a survey. He asked 80 children which kind of storybooks they liked. The data is given below. Find the fractions and fill in the circle graph :

Kind of Storybooks	Number of students	Fractions
Adventure	20	
Mystery	30	
Horror	20	
Moral-based	10	

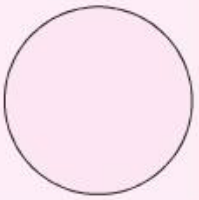
3. The data shows the number of students who scored full marks in Mathematics, Science and English. Fill in the information in the given circle graph by finding the fractions :

Subject	Number of Students	Fraction
Mathematics	12	
Science	18	
English	6	

Project

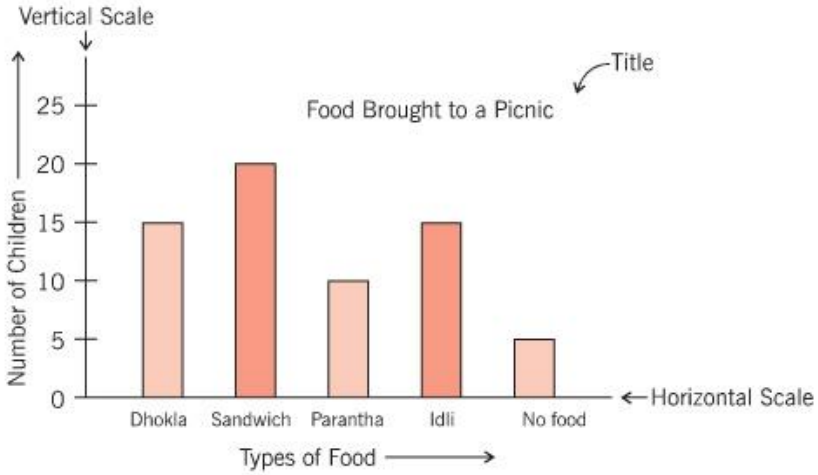
For a week make a note of the number of hours you spend on playing, watching TV, reading and colouring. Represent this information on a circle graph.

Activity	Playing	Watching TV	Reading	Colouring
Number of Hours				
Fraction				



Bar Graphs

Given here is a bar graph. This graph represents the food some children brought to a picnic.



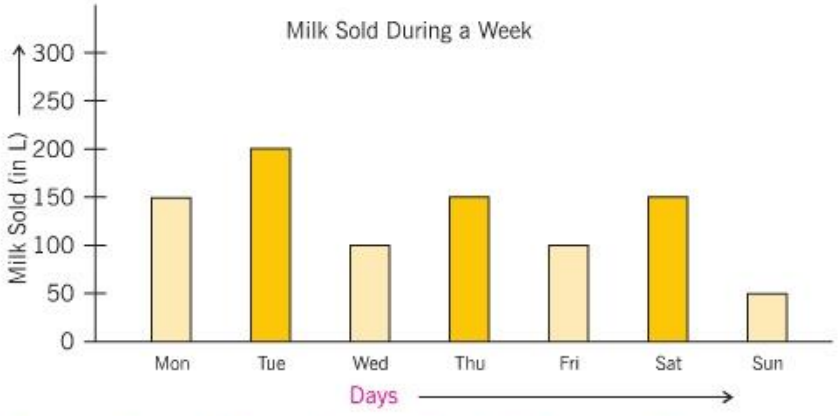
From the graph, you get the following information.

- Most children brought Sandwiches for the picnic.
- 5 children did not bring any food for the picnic.
- The least number of children brought Paranthas.
- An equal number of children brought Dhokla and Idli.
- The number of children who went for the picnic is

$$15 + 20 + 10 + 15 + 5 = 65$$

Exercise 26.2

1. This bar graph shows the quantity of milk sold by a dairy during a week.



Read the bar graph carefully and answer the following questions.

(a) On which day was the most quantity of milk sold ? _____

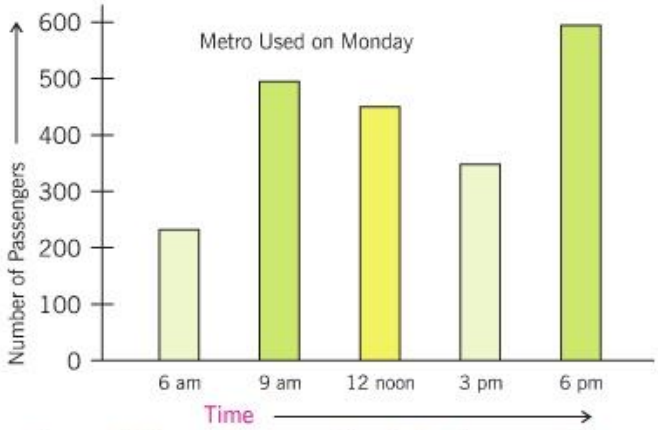
(b) On which day was the least quantity of milk sold ? _____

(c) How much more milk was sold on Thursday compared to Wednesday ? _____

(d) How much milk was sold on Saturday and Sunday together ? _____

(e) What was the quantity of milk sold during the week ? _____

2. This bar graph shows the number of people who used the Metro on Monday :



Read the bar graph carefully and answer the following questions :

(a) At what time was the Metro most crowded ? _____

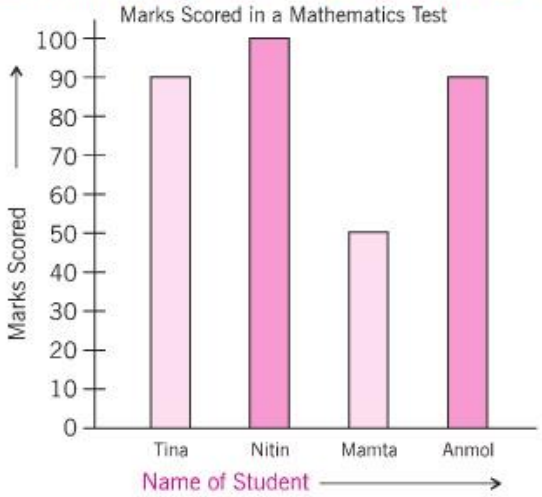
(b) At what time did the least number of people use the Metro ? _____

(c) What was the difference in the number of passengers at 12 noon and 3 pm ? _____

(d) How many people used the Metro on Monday ? _____

(e) At what time in the morning did the number of passengers double ? _____

3. This bar graph shows the marks Tina, Nitin, Mamta and Anmol scored in a Mathematics Test:



Read the bar graph carefully and answer the following questions :

(a) How many marks did Nitin get ? _____

(b) Who scored the highest marks ? _____

(c) Who scored the lowest marks ? _____

(d) Which two children got the same marks ? _____

(e) Who got more marks – Nitin or Mamta ? _____
How much more ?

Project

Read the weather report in the newspaper carefully. Record the maximum temperature of the capital cities. Represent the data as a bar graph. Also repeat this activity for the minimum temperature of these cities.

HALF YEARLY Test Paper

(Based on Chapter From 1 to 13)

Time : _____

Marks : _____

Note : All questions are compulsory.

(Multiple Choice Questions) :

1. Tick (✓) the correct answer

(i) The product of two numbers is $\frac{5}{4}$. If one number is $\frac{5}{6}$, then what is the other number ?

(a) 2 ☐ **(b)** $\frac{1}{2}$ ☐ **(c)** $\frac{3}{2}$ ☐ **(d)** $\frac{2}{3}$ ☐

(ii) Freezing point of water is :

(a) 100 °C ☐ **(b)** 0 °C ☐ **(c)** 273 °C ☐ **(d)** None of these ☐

(iii) The nearest thousands of 29789 will be written as :

(a) 29000 ☐ **(b)** 29700 ☐ **(c)** 29800 ☐ **(d)** 30000 ☐

(iv) 84.6 when rounded to the nearest ones is :

(a) 84 ☐ **(b)** 90 ☐ **(c)** 85 ☐ **(d)** 84.1 ☐

2. Write True or False :

(i) 2 cm = 0.02 m _____

(ii) $13 \times 4 \div 10 \div 5 = 55$ _____

(iii) LCM of 56 and 42 is 168. _____

(iv) $572 \div 6.4 = 88$ _____

(v) Normal body temperature of an adult = 98.6 °F. _____

3. Fill in the blanks :

(i) $0.078 \times 1000 =$ _____

(ii) $2.6 \times$ _____ $= 26$

(iii) 35 tenths = 3 _____ + 5 _____ .

(iv) Boiling point of water = _____ °C.

(v) The liquid, the thermometer bulb contains is usually = _____ .

4. A fruit seller bought 4,50,769 oranges. 337 oranges were found rotten and thrown away. Remaining oranges were packed in baskets containing 288 each. How many baskets were filled ?

_____

5. In an election 50175238 votes were polled. There were three candidates. Two of them got 9238238 and 20923575 votes respectively. How many votes did the third candidate get ?

_____

6. Three persons step off from the same place. The measures of their steps are 50 cm, 60 cm and 55 cm respectively. At what minimum distance from the starting place will they next step together ?

7. Find the greatest number which divides 208 and 358 to give a remainder 8 in each case.

8. Divide :

(i) $2\frac{1}{2} \div \frac{10}{11}$ (ii) $1\frac{3}{5} \div 4$ (iii) $60 \div 1\frac{7}{8}$

9. Find the product :

(i) $\frac{9}{10} \times \frac{4}{7}$ (ii) $1\frac{4}{5} \times 1\frac{2}{3}$ (iii) $10 \times 2\frac{4}{15}$

10. Cost of 1 metre cloth is ₹ 48.50. Find the cost of 1.70 m of cloth.

11. Change the following decimal fractions into common fractions :

(i) 1.5 (ii) 0.4023 (iii) 3.75 (iv) 23.965

12. Parul travelled 37.4 km by bus, 4.150 km by scooter and rest on foot. If her total journey was 42 km, how much did she travelled on foot ?

13. Find the value of :

(i) 5% of 900 m (ii) 12.5% of 320 g

14. Simplify :

(i) $1\frac{1}{2} + \frac{5}{8}$ of $\frac{3}{4} \div \frac{1}{2} \times 1\frac{1}{2}$ (ii) $5 - \left[\frac{1}{2} - \left\{\frac{1}{3} + \left(\frac{1}{4} + \frac{1}{6} - \frac{1}{12}\right)\right\}\right]$

15. Population of Karnataka in 2018 was 4,48,17,398. Round it off :

(i) to the nearest crore (ii) to the nearest million

16. The maximum temperature on a day was 40 °C and the minimum temperature was 25 °C. Find the difference of these temperatures in Fahrenheit Scale.

17. Three drums have 136, 170 and 119 litres of oil respectively. What will be the greatest measure of the single container which can divide their oil exactly ?

ANNUAL Test Paper

(Based on Chapter From 1 to 26)

Time : _____

Marks : _____

Note : All questions are compulsory.

(Multiple Choice Questions) :

1. Tick (✓) the correct answer

(i) Abhinav sold a book worth ₹ 850 at a loss of ₹ 180. The selling price of that book is :

(a) ₹ 670 ☐ **(b)** ₹ 590 ☐ **(c)** ₹ 770 ☐ **(d)** ₹ 570 ☐

(ii) If the perimeter and the area of a square are numerically equal, then the length of a side of that square is :

(a) 8 units ☐ **(b)** 2 units ☐ **(c)** 4 units ☐ **(d)** 6 units ☐

(iii) How many 5 cm cubes can be cut from a cube whose edge is 20 cm ?

(a) 100 ☐ **(b)** 64 ☐ **(c)** 32 ☐ **(d)** 4 ☐

2. Fill in the blanks :

(i) The money borrowed is called the _____ .

(ii) The lengths of all radii of a circle are _____ .

(iii) Symmetry is an important _____ concept.

(iv) Volume of a cuboid or cube = _____ × _____ × height.

3. Write the following numbers in Hindu-Arabic numerals :

(i) CXL **(ii)** DLV **(iii)** MCX **(iv)** $\overline{V}$DCCXCV

4. Find the HCF of 56, 98 and 154 by prime factorization. _____

5. Find the HCF of 649 and 913 by long division method. _____

6. When I have travelled 20 km, I have $\frac{3}{5}$ of my journey left. What is the length of my journey ? _____

7. 1 kg oil measured in litres is 1 L 210 mL. How many litres are of 3 kg 90 g oil ?

_____

8. Simplify : $3\frac{2}{5} + \frac{4}{5}$ of $\frac{3}{2} \div \frac{1}{4} \times \frac{2}{3} - \frac{3}{2}$

9. In a cricket match, team *A* scored 279 runs off 9 members and team *B* scored 224 runs off 7 members. Which team performed better average ? _____

10. The fare for air journey from Delhi to Mumbai is ₹ 3200 plus 10% tax. Find the total fare.

_____

11. Find the circumference of a circle with the given diameter 49 cm.

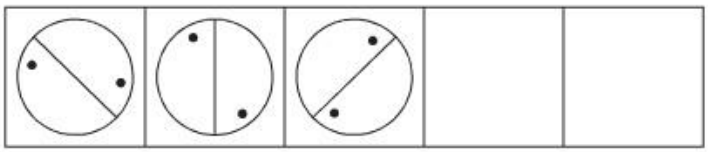
12. A carpet is 5 m long and 23.5 m wide. Find its cost at ₹ 100 per sq m.

13. The side of a square tile is 10 cm. How many tiles can be fixed on a floor 4.5 m long and 3 m wide ?

14. A brick measures 25 cm long, 10 cm wide and 7.5 cm thick. How many such bricks will be required to make a wall 5 m long, 2.5 m high and 37.5 cm thick ?

15. What should come next ?

(i)



(ii)

16. Find cost of tiling of a courtyard 40 m long and 25 m broad at the rate of ₹ 50 per sq m.

Answersheet

Revision

1. (a) 5,19,302 (b) 9,02,516 **2.** (a) 1,62,802; One lakh sixty two thousand eight hundred two (b) 8,19,909; Eight lakh nineteen thousand nine hundred nine. **3.** (a) Four hundred seventeen thousand five hundred thirty four (b) Five hundred ninety two thousand sixty seven **4.** (a) 76,335 (b) 2,55,199 **5.** (a) 40,000 + 6,000 + 700 + 40 + 3 (b) 1,00,000 + 20,000 + 5,000 + 700 + 30 + 5 **6.** (a) 79,760; 79,076; 77,609; 7,806 (b) 1,11,203; 1,11,032; 1,10,123; 1,01,321 **7.** (a) 78,759 (b) 28,106 (c) 2,38,083 (d) 84,467 (e) 1,58,393 (f) 2,93,489 (g) 427 (h) 10 (i) 0 (j) 250 **8.** 7,44,370 **9.** (a) first line 8; second line (right to left) 7 ; 7 (b) 76,738 **10.** *ABC*; ₹ 5,59,170 **11.** (a) 6,40,000 (b) 8,20,000 **12.** (a) 91,884, (b) 4,87,930 (c) 98,440 **13.** 2,28,960 **14.** ₹ 1000 **15.** 584 km **16.** (a) yes (b) no (c) no (d) yes **17.** 7, 15, 21, 55 **18.** (a) 2 (b) 15 (c) 100 (d) 1 (e) 2 **19.** (a) 1, 2, 3, 4, 6, 12 (b) 1, 3, 5, 15 (c) 1, 2, 3, 4, 6, 8, 12, 24 (d) 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60 (e) 1, 2, 4, 19, 38, 76 **20.** (a) 1 (b) 2 (c) 0 (d) 3 (e) 2 **21.** (a) 3 (b) 6 (c) 8 (d) 7 **22.** 16, composite **23.** 3m **24.** 1 minute **25.** (a) $\frac{9}{18}$ (b) $\frac{12}{18}$ (c) $\frac{8}{18}$ (d) $\frac{15}{18}$ **26.** (a) yes (b) no (c) no (d) yes (e) no **27.** (a) $\frac{16}{3}$ (b) $\frac{9}{4}$ (c) $\frac{63}{20}$ (d) $\frac{94}{17}$ (e) $\frac{49}{8}$ **28.** (a) $2\frac{6}{10}$ (b) $9\frac{1}{3}$ (c) $1\frac{7}{9}$ (d) $6\frac{1}{8}$ (e) $8\frac{1}{10}$ **29.** (a) < (b) > (c) < **30.** $6\frac{15}{28}$ **31.** $2\frac{9}{10}$ m **32.** (a) $\frac{11}{48}$ (b) $1\frac{1}{15}$ (c) $5\frac{3}{10}$ **33.** $1\frac{1}{4}$ L **34.** (a) 0.8 (b) 0.2 (c) 3.3 (d) 12.5 (e) 3 34.1 **35.** (a) $\frac{4}{5}$ (b) $\frac{9}{10}$ (c) $\frac{7}{5}$ (d) $\frac{66}{5}$ (e) $\frac{1712}{5}$ **36.** (a) 0.9 (b) 40.4 **37.** ₹ 67.50 **38.** (a) 2.108 km (b) 0.050 kg (c) 0.106 kL (d) 0.090 km **39.** 25.15 L **40.** 384.410 L **41.** (a) 10 : 15 (b) 6 : 45 (c) 3 : 04 (d) 12 : 50 **42.** (a) 0550 hours (b) 0030 hours (c) 2305 hours **43.** (a) 12 : 05 am (b) 12 : 45 am (c) 7 : 00 pm **44.** 7h 40 minute **45.** 1 year 1 month 28 days **46.** (a) ray (b) vertex (c) 90° (d) all (e) opposite **47.** (a) acute (b) obtuse (c) right (d) obtuse (e) reflex **50.** 4 rounds

1. Large Numbers

Exercise - 1.1

1. 64,03,115 **2.** 10,01,100 **3.** 91,23,312 **4.** 2,415,396 **5.** 1,964,732 **6.** 4,053,612 **7.** 3; 10; 200; 6,000; 50,000; 3,00,000; 40,00,000 **8.** 7; 50; 100; 0; 20,000; 7,00,000; 90,00,000 **9.** 5; 0; 800; 9,000; 0; 9,00,000; 60,00,000 **10.** 3; 40; 200; 6,000; 50,000; 900,000; 4,000,000; **11.** 1; 50; 700; 8,000; 0; 200,000; 9,000,000 **12.** 0; 70; 400; 1,000; 40,000; 500,000; 3,000,000 **13.** Forty seven lakh three thousand nine hundred fifty five **14.** Thirty four lakh fifty six thousand seven hundred eighty nine **15.** Eighty three lakh twenty four thousand nine hundred sixty seven **16.** Six million twenty nine thousand three hundred forty seven **17.** Eight million four hundred ninety thousand one hundred sixty three **18.** Two million seven hundred forty eight thousand nine hundred fifty five **19.** 18,46,830 **20.** 35,90,567 **21.** 64,08,009 **22.** 70,80,420 **23.** 84,07,050 **24.** 4,320,000 **25.** 5,740,071 **26.** 8,600,302 **27.** 9,008,404 **28.** 10,00,000 + 9,00,000 + 60,000 + 4,000 + 700 + 30 + 2 **29.** 10,00,000 + 9,00,000 + 60,000 + 6,000 + 300 + 20 + 7 **30.** 20,00,000 + 4,00,000 + 20,000 + 5,000 + 30 + 5 **31.** 25,58,037 **32.** 70,36,581 **33.** 8,503,740 **34.** 4,845,858

Exercise - 1.2

1. 87,65,43,219 **2.** 3,62,41,230 **3.** 62,17,58,901 **4.** 2; 10; 600; 3,000; 50,000; 0; 40,00,000; 3,00,00,000 **5.** 1; 30; 800; 5,000; 80,000; 7,00,000; 30,00,000; 4,00,00,000; 50,00,00,000 **6.** 2; 30; 900; 1000; 50,000; 4,00,000; 20,00,000; 6,00,00,000; 90,00,00,000; 100,00,00,000 **7.** 2,00,00,000 + 30,00,000 + 7,00,000 + 60,000 + 4,000 + 100 + 90 + 2 **8.** 80,00,00,000 + 7,00,00,000 + 30,00,000 + 4,00,000 + 30,000 + 2,000 + 700 + 60 + 6 **9.** 600,00,00,000 + 40,00,00,000 + 2,00,00,000 + 40,00,000 + 2,00,000 + 50,000 + 0 + 300 + 50 + 7 **10.** Five crore nineteen lakh seventy six thousand three hundred forty two **11.** Ninety two crore eight lakh seventy five thousand one hundred ninety five **12.** Two hundred forty four crore five lakh forty two thousand four hundred fifty one **13.** 5,67,51,072 **14.** 14,00,80,504 **15.** 110,07,05,003 **16.** 300,42,57,020 **17.** 1,00,00,000 one crore; 9,99,99,999 nine crore ninety nine lakh ninety nine thousand, nine hundred ninety nine **18.** Ninety nine crore sixty six lakh eighty eight thousand three hundred twenty six **19.** 4,04,04,404

Exercise - 1.3

1. 96543300 **2.** 787879000 **3.** 1002010000 **4.** 320300399 **5.** 256102999 **6.** 1723599999 **7.** > **8.** < **9.** < **10.** > **11.** 2,06,48,932; 2,06,84,732; 2,06,88,327 **12.** 20,40,09,088; 24,10,88,035; 70,60,50,403 **13.** 7,00,15,033; 7,00,51,033 7,30,48,950 **14.** 76,67,76,677; 67,76,67,766; 67,67,76,767 **15.** 43, 12, 87, 877; 34, 12, 87, 877; 33, 12, 87, 877; **16.** 19,02,10,388; 19,02,05,387; 19,02,03,378 **18.** 1,00,00,234; 4,32,10,000

Exercise - 1.4

1. Fifteen million nine hundred seventy six thousand three hundred forty two **2.** Five hundred ninety one million eight hundred seventy five thousand nine hundred twenty **3.** Five billion four hundred two million four hundred forty two thousand four hundred fifty nine. **4.** 96,654,502 **5.** 400,322,334 **6.** 85,432,003,251 **7.** 50,000,000 **8.** 5,000,000 **9.** 5,000,000,000 **10.** 19,643,300 **11.** 266,399,900 **12.** 3,102,000,000 **13.** 800,100,899 **14.** 20,851,999 **15.** 32,099,999 **16.** > **17.** < **18.** > **19.** < **20.** 35,004,632; 35,011,184; 53,104,236 **21.** 86,340,295; 86,430,295; 86,432,095 **22.** 700,010,533; 700,015,033; 700,051,033 **23.** 148,204,312 **24.** 1,694,372,325 **25.** 94, 184, 106, 027 **26.** (i) 1 (ii) 1 **27.** (i) 100 (ii) 100 **28.** Nine hundred ninety six million four hundred eight thousand six hundred thirty two **29.** One hundred forty nine million

Exercise - 1.5

1. 5310 **2.** 8770 **3.** 8010 **4.** 1240 **5.** 10.430 **6.** 83,490 **7.** 1,00,990 **8.** 5280 **9.** 1100 **10.** 8200 **11.** 4600 **12.** 1300 **13.** 23,800 **14.** 4,00,100 **15.** 83,100 **16.** 5500 **17.** 4000 **18.** 9000 **19.** 29,000 **20.** 38,000 **21.** 66,000 **22.** 5,13,000 **23.** 7,38,000 **24.** 8,44,000

Let's Recall

1. (c) **2.** (d)

2. Roman Numerals

Exercise - 2

1. XXV **2.** XXXIX **3.** LXXXIX **4.** XCV **5.** CXLV **6.** CCXII **7.** CCCXLVIII **8.** CDXCIII **9.** CDLXXXIX **10.** DV **11.** DCCCXXXIX **12.** CMXCIX **13.** MX **14.** MCC **15.** MCMXIV **16.** MDXC **17.** MDCCCIX **18.** MMMCXXXVIII **19.** MMCDLXXXV **20.** IVXLVI **21.** 46 **22.** 140 **23.** 89 **24.** 98 **25.** 340 **26.** 533 **27.** 555 **28.** 490 **29.** 790 **30.** 908 **31.** 594 **32.** 1110 **33.** 640 **34.** 1226 **35.** 1720 **36.**

2500 37. X 38. XV 39. XL 40. C 41. DC 42. MCD 43. XL 44. XCIX 45. CDL 46. CDXC 47. CXL, CXLI, CXLII, CXLIII, CXLIV, CXLV, CXLVI , CXLVII, CXLVIII, CXLIX, CL

Let's Recall

1. (a) 2. (c)

3. Fundamental Operations

Exercise - 3.1

1. 3,51,45,453 2. 46,82,929 3. 3,85,89,864 4. 59,65,36,297 5. 12,91,67,694 6. 55,13,79,949 7. 69,83,327 8. 2,34,41,617 9. 11,26,17,498 10. 26,75,56,396

11. $\begin{array}{r} 56844 \\ +\,67317 \\ \hline 124161 \end{array}$ 12. $\begin{array}{r} 93421 \\ +\,21143 \\ \hline 114564 \end{array}$ 13. $\begin{array}{r} 45291 \\ +\,24252 \\ \hline 69543 \end{array}$

14. $\begin{array}{r} 21730 \\ -\,19241 \\ \hline 2489 \end{array}$ 15. $\begin{array}{r} 34215 \\ -\,20642 \\ \hline 13573 \end{array}$ 16. $\begin{array}{r} 98450 \\ -\,32614 \\ \hline 65836 \end{array}$

17. 51,45,93,510 18. 10,99,99,999 19. 23,85,412

Exercise - 3.2

1. 71,41,724 2. 81,19,196 3. 7,74,30,749 4. 49,97,989 5. 8,54,548 6. 1,81,03,211 7. 5,37,86,606 8. Starting from ones first line 6; second line 7; 2; third line 8; 1;1 9. Starting from ones first line 0; 0; second line 0; 8; 4; third line 6; 4 10. 11,09,70,951 11. 2,58,49,124 12. Year 2009; 79,33,883 m 13. 41,55,574 bulbs

Exercise - 3.3

1. 1,20,000 2. 13,80,000 3. 1,50,00,000 4. 4,09,02,000 5. 13,91,600 6. 4,35,80,000 7. 17,93,785 8. 8,53,596 9. 89,42,787 10. 2,91,42,495 11. 3,67,07,856 12. 77,24,860 13. 21,96,698 toys 14. ₹ 47,30,550 15. ₹ 1,23,35,220

Exercise - 3.4

1. 198 R 3 2. 120 3. 6 4. 200 5. 850 R 674 6. 36 R 785 7. 11 R 4682 8. 871 R 6485 9. 18 R 6499 10. 157 R 5 11. 1151 R 55 12. 1258 R 274 13. 1526 R 149 14. 21246 R 357 15. 6466 R 669 16. 2875 cartons 17. 25,685 packets 18. ₹ 1246 19. 6519 litres

Exercise - 3.5

1. 8 2. 26 3. 4 4. 20 5. 14 6. 99 7. 12 8. 0 9. 5034

Let's Recall

1. (d) 2. (d) 3. (c) 4. (d) 5. (a)

4. Divisibility and Factorization

Exercise - 4.1

2. no 3. yes 4. yes 5. no 6. yes 7. yes 8. yes 9. no 10. yes 11. no 12. yes 13. no 14. no 15. yes 16. no 17. yes 18. yes 19. no 20. yes 21. yes 22. no 23. yes 24. yes 25. yes

Exercise - 4.2

1. yes 2. yes 3. yes 4. no 5. no 6. yes 7. yes 8. no 9. yes 10. yes 11. yes 12. no 13. yes 14. no 15. yes 16. yes 17. no 18. yes 19. yes 20. yes

Exercise - 4.3

1. yes 2. no 3. no 4. yes 5. no 6. no 7. no 8. yes 9. yes 10. no 11. yes 12. yes 13. yes 14. yes 15. yes 16. yes 17. no 18. yes 19. yes 20. no 21. no 22. yes 23. no 24. yes 25. yes 26. yes 27. no 28. yes 29. yes 30. yes 31. no 32. yes 33. yes 34. yes 35. no 36. no

Exercise - 4.4

1. no 2. yes 3. yes 4. yes 5. no 6. yes 7. yes 8. no 9. 6 10. 7 11. 7 12. 9 13. 4 14. 6 15. 2 16. 1 17. no 18. yes 19. yes 20. no 21. no 22. yes 23. yes 24. yes

Exercise - 4.5

1. $2\times2\times2\times2\times2\times2$ 2. $2\times2\times3\times3$ 3. $2\times2\times3\times7$ 4. $2\times2\times2\times2\times2\times3$ 5. $2\times2\times3\times3\times3$ 6. $2\times3\times3\times7$ 7. $2\times2\times2\times2\times3\times3$ 8. $2\times2\times2\times3\times3\times3$ 9. $2\times2\times3\times3\times5$ 10. $3\times3\times3\times3\times3$ 11. $3\times5\times5\times5$ 12. $7\times7\times7$ 13. $2\times2\times2\times2\times2\times2\times2\times2$ 14. $2\times2\times2\times2\times2\times2\times3\times3$ 15. $2\times2\times13\times13$ 16. $11\times11\times11$ 17. $2\times2\times2\times2\times2\times2\times2\times3$ 18. $2\times2\times2\times2\times3\times3\times3$ 19. $5\times5\times7\times7$ 20. $2\times2\times3\times3\times3\times3$

Let's Recall

1. (a) 2. (c) 3. (b) 4. (c) 5. (d) 6. (c)

5. Highest Common Factor

Exercise - 5.1

1. 12 2. 16 3. 8 4. 9 5. 35 6. 7 7. 36 8. 108 9. 26 10. 4 11. 45 12. 128 13. 9 14. 7 15. 14 16. 9 17. 72 18. 3 19. 18 20. 9 21. 3 22. 4 23. 53 24. 46 25. 18 26. 38 27. 63 28. 65 29. 56 30. 36

Exercise - 5.2

1. 60 cm 2. 8 3. 28 marbles 4. 8 5. 75 kg 6. 50 7. 1 m 60 cm 8. 1m 21 cm 9. 17 litres 10. 36 11. 44 12. 6 m

Let's Recall

1. (a) 2. (b)

6. Lowest Common Multiple

Exercise - 6.1

1. 48 2. 36 3. 108 4. 180 5. 120 6. 96 7. 490 8. 120 9. 168 10. 90 11. 150 12. 1320 13. 600 14. 480 15. 260 16. 288 17. 210 18. 192 19. 864 20. 330 21. 750 22. 9450 23. 8640 24. 5100 25. 16; 320 26. 38; 228 27. 51; 1020 28. 112 29. 4

Exercise - 6.2

1. 1 minute 2. 1 pm 3. 282 students 4. 292 plants 5. 216 6. 180 apples 7. 240 students 8. 33 m 9. 845 10. 3600

Let's Recall

1. (b) 2. (c) 3. (a) 4. (d) 5. (a) 6. (b) 7. (a) 8. (c) 9. (d)

7. Common Fractions

Exercise - 7.1

1. $1\frac{1}{2}$ 2. $1\frac{4}{5}$ 3. 24 4. 14 5. $18\frac{1}{3}$ 6. $40\frac{1}{2}$ 7. $\frac{5}{6}$ 8. 3 9. $\frac{1}{2}$ 10. $1\frac{1}{3}$ 11. 2 12. 2

Exercise - 7.2

1. $\frac{1}{11}$ 2. $\frac{5}{108}$ 3. $\frac{7}{66}$ 4. $\frac{3}{20}$ 5. $\frac{15}{32}$ 6. $\frac{1}{2}$ 7. $\frac{5}{16}$ 8. $\frac{18}{35}$ 9. $63\frac{3}{4}$ 10. 3 11. $4\frac{1}{5}$ 12. $7\frac{11}{56}$ 13. 4 14. $2\frac{2}{5}$ 15. $8\frac{1}{2}$ 16. $22\frac{2}{3}$ 17. $\frac{4}{15}$ 18. $\frac{2}{7}$ 19. $\frac{1}{2}$ 20. $1\frac{3}{5}$

Exercise - 7.3

1. $\frac{7}{8}$ 2. $\frac{3}{5}$ 3. 5 4. $\frac{1}{2}$ 5. 0 6. $\frac{1}{3}$ 7. 1 8. 0 9. $7\frac{2}{3}$ 10. 1 11. 0 12. $7\frac{7}{8}$ 13. $\frac{1}{3}$ 14. $\frac{13}{18}$

Exercise - 7.4

1. $\frac{1}{15}$ 2. $\frac{2}{5}$ 3. $4\frac{1}{2}$ hours 4. ₹ $46\frac{1}{8}$ 5. ₹ 216. $22\frac{1}{2}$ kg 7. ₹ 34 8. 25 9. 1100 km 10. 78 L 11. 45 cars

Exercise - 7.5

1. $\frac{4}{3}$ 2. $\frac{9}{7}$ 3. $\frac{5}{11}$ 4. $\frac{11}{15}$ 5. $\frac{3}{5}$ 6. $\frac{9}{52}$ 7. 15 8. 12 9. $\frac{1}{2}$ 10. $\frac{1}{10}$ 11. $\frac{1}{17}$ 12. $\frac{1}{15}$ 13. 1 14. $\frac{8}{3}$ 15. 1 16. $\frac{2}{7}$ 17. 1 18. $\frac{2}{9}$

Exercise -7.6

1. $\frac{1}{5}$ 2. $\frac{1}{10}$ 3. $\frac{2}{5}$ 4. $2\frac{2}{3}$ 5. $2\frac{3}{4}$ 6. $2\frac{3}{4}$ 7. 6 8. 16 9. 12 10. $\frac{3}{5}$ 11. $\frac{1}{3}$ 12. $\frac{3}{4}$ 13. $\frac{2}{7}$ 14. 2 15. $4\frac{6}{7}$ 16. 0 17. 1 18. 0 19. $3\frac{5}{7}$ 20. 1 21. $9\frac{2}{7}$ 22. 1 23. $\frac{4}{5}$ 24. 1

Exercise - 7.7

1. ₹ $42\frac{1}{2}$ 2. $\frac{3}{5}$ m 3. 12 4. $2\frac{1}{2}$ 5. 72 students 6. 13 books 7. 20 bags 8. 648 km 9. $\frac{3}{8}$ m 10. 35 bottles 11. 20 kg 12. 435

Let's Recall

1. (a) 2. (d) 3. (b) 4. (c)

8. Decimal Fractions

Exercise - 8.1

1. 0.2 2. 0.9 3. 1.5 4. 1.8 5. 0.17 6. 0.07 7. 0.001 8. 0.002 9. 0.009 10. 0.015 11. 0.020 12. 1.01 13. 3.3 14. 5.7 15. 5.07 16. 5.007 17. 4.19 18. 3.331 19. 56.01 20. 16.019 21. 125.6 22. 12.56 23. 1.256 24. 0.1256 25. $\frac{2}{10}$ 26. $\frac{2}{100}$ 27. $\frac{2}{1000}$ 28. $\frac{2}{10000}$ 29. $\frac{15}{10}$ 30. $\frac{15}{100}$ 31. $\frac{15}{1000}$ 32. $\frac{15}{10000}$ 33. $402\frac{3}{10}$ 34. $40\frac{23}{100}$ 35. $4\frac{23}{1000}$ 36. $\frac{4023}{10000}$ 37. $640\frac{98}{100}$ 38. $225\frac{789}{1000}$ 39. $23\frac{965}{1000}$ 40. $6\frac{55}{10000}$

Exercise - 8.2

1. 4 ones 3 tenths 5 hundredths 2. 5 tens 1 one 7 tenths 2 hundredths 3. 2 hundreds 6 ones 3 tenths 8 thousandths 4. 3 hundreds 1 ten 5 ones 2 tenths 8 hundredths 7 thousandths 5. $20+3+0.7+0.04+0.002$; $20+3+\frac{7}{10}+\frac{4}{100}+\frac{2}{1000}$ 6. $100+70+5+0.8+0.07+0.006$; $100+70+5+\frac{8}{10}+\frac{7}{100}+\frac{6}{1000}$ 7. $300+80+3+0.9+0.02+0.009$; $300+80+3+\frac{9}{10}+\frac{2}{100}+\frac{9}{1000}$; 8. $4000+500+20+4+0.3+0.06+0.007$; $4000+500+20+4+\frac{6}{100}+\frac{7}{1000}$ 9. tenths 10. ones; tenths 11. hundredth 12. 10 13. hundredths; thousandths 14. 7; 3 15. 752.125 16. 468.305 17. 543.257 18. 70.57 19. unlike 20. like 21. like 22. unlike 23. 753.846; 523.100; 25.320 24. 0.790; 116.005; 5.100 25. 543.208; 4.520; 6.070 26. 7.030; 4.020; 2.001 27. 0.75 28. 6.99 29. 12.5 30. 2.1 31. 2.101 32. 12.68 33. > 34. < 35. < 36. 2.02; 2.003; 2.001; 2.0004 37. 1.01; 1.001; 0.101; 0.010 38. 4.005; 4.03; 4.053; 4.5 39. 30.009; 30.17; 30.7; 30.71

Let's Recall

1. (b) 2. (a)

9. Operations in Decimal Fractions

Exercise - 9.1

1. 7.3 2. 10.143 3. 18.085 4. 217.785 5. 710.776 6. 4.55 7. 3.335 8. 11.344 9. 12.515 10. 36.184 11. 59.46 cm 12. 54.29 litres 13. 16.450 kg 14. 74.6 litres 15. 0.45 km 16. ₹ 51.55 17. 5.25 L 18. ₹ 416.75

Exercise - 9.2

1. 4.5 2. 29.9 3. 166.4 4. 66.5 5. 16.944 6. 716.25 7. 28.38 8. 1752.14 9. 2572.5 10. 995.4 11. 2606.877 12. 290.529 13. 83.4 14. 320.3 15. 4287.1 16. 342.8 17. 50.01 18. 730 19. 5328 20. 9010 21. 10 22. 100 23. 100 24. 1.235 25. 0.429 26. 7.8 27. 99,600 kg 28. 8 kg 29. ₹ 1370 30. ₹ 387.50 31. ₹ 633 32. 1088.75 kg

Exercise - 9.3

1. 0.06 2. 8.74 3. 0.175 4. 10.591 5. 3.468 6. 3.54 7. 39.312 8. 14.44 9. 0.0006 10. 2.12159 11. 10.28736 12. 8.1002 13. 0.008 14. 0.0002 15. 0.013 16. 0.22 17. 0.857 18. 0 19. 4.5 20. 4.7 21. 1 22. 0 23. ₹ 26.40 24. ₹ 82.45 25. ₹ 162.75

Exercise - 9.4

1. 1.4 2. 0.6 3. 0.6 4. 0.75 5. 7.5 6. 0.0075 7. 0.96 8. 0.282 9. 0.016 10. 4.811 11. 4.223 12. 4.225 13. 2.155 14. 2.03 15. 0.826 16. 6.123 17. 0.014 18. 0.08 19. 0.0036 20. 0.8367 21. 0.0027 22. ₹ 9.90 23. 0.61 m 24. 72.47 km 25. ₹ 7.05 26. 0.064 litre 27. 0.36 litre

Exercise - 9.5

1. 13 2. 3 3. 2.1 4. 0.5 5. 6 6. 12.1 7. 370 8. 0.99 9. 13,3 10. 2000 11. 80 12. 900 13. 50 14. 8 15. 113.2 16. 3.75 17. 0.175 18. 0.875 19. 0.208 20. 0.1625 21. 0.06 22. 0.625 23. 0.2 24. 0.08 25. 1.36 26. 0.64 27. 0.975 28. 15 29. 120 30. ₹ 56 31. 250 32. ₹ 6.75

Let's Recall

1. (b) 2. (c)

10. Metric Measures in Decimals

Exercise - 10.1

1. 976.305 L; 0.976305 kL 2. 654.123 g; 0.654123 kg 3. 53.214 m; 0.053214 km 4. 120 g; 1,20,000 mg 5. 0.0505 kg 6. 2500 mL 7. 7321 g; 73,21,000 mg 8. 5230 m; 52,30,000 mm 9. 0,0079 km; 7900 mm 10. 0.00523 kg; 5230 mg 11. 1 km 5 hm 4 decam 3 m 9 dm 2 cm 6 mm

Exercise - 10.2

1. 34.5 L 2. 7762.95 kg 3. ₹ 87.15 4. ₹ 27.50 5. 2.2 kg 6. 0.8 kg 7. ₹ 140 8. 400 9. 3.721 litre 10. 3.5 kg

Let's Recall

1. (a) 2. (b)

11. Temperature

Exercise - 11.1

1. extremely hot 2. cold 3. very cold 4. mild 5. very hot 6. extremely hot 7. extremely hot 8. warm

Exercise - 11.2

1. (i) 0 (ii) 100 (iii) 98.6 (iv) 1.8 (v) mercury (vi) rises 2. (i) 35°C (ii) 40°C (iii) 50°C (iv) 80.5°C 3. (i) 68°F (ii) 113°F (iii) 212°C (iv) 203.9°F 4. 103.1°F; 39.5°C 5. 59°F 6. (i) 45°C (ii) 104°F (iii) 77°F (iv) 55°C

12. Simplification of Numerical Expressions

Exercise - 12.1

1. 54 2. 27 3. 121 4. 22 5. 26 6. 14 7. $\frac{1}{6}$ 8. 17 9. $4\frac{11}{12}$ 10. $2\frac{29}{32}$ 11. $6\frac{1}{2}$ 12. $2\frac{1}{4}$ 13. $1\frac{11}{32}$ 14. $1\frac{5}{8}$ 15. 9.71 16. 12.63 17. $1\frac{5}{18}$ 18. $7\frac{7}{18}$ 19. 0.73 20. 4.82

Exercise - 12.2

1. 2 2. 3 3. 6 4. 25 5. 13 6. 2 7. 1 8. $1\frac{3}{4}$ 9. $2\frac{1}{2}$ 10. $5\frac{1}{6}$ 11. $3\frac{5}{8}$ 12. $\frac{1}{20}$ 13. $16\frac{1}{5}$ 14. $19\frac{1}{2}$ 15. 13.75 16. 2.2 17. 11.45 18. 1.3 19. 5.65 20. 0.13

Let's Recall

1. (b) 2. (b) 3. (a) 4. (b)

13. Approximation (Rounding Off)

Exercise - 13.1

1. (i) 80 (ii) 120 (iii) 340 (iv) 1000 (v) 6880 2. (i) 100 (ii) 200 (iii) 1100 (iv) 4700 (v) 13,200 3. (i) 4000 (ii) 5000 (iii) 11,000 (iv) 17,000 (v) 1,83,000 4. (i) 10,000 (ii) 10,000 (iii) 30,000 (iv) 80,000 (v) 2,40,000 5. (i) 6,000 (ii) 39,000 (iii) 9,000 (iv) 12,000 (v) 23,000 6. (i) ₹ 1100 (ii) ₹ 2700 (iii) ₹ 8600 (iv) ₹ 18,400 7. (i) 7800 m (ii) 8100 m (iii) 8600 m (iv) 8800 m 8. 34,70,000; 35,00,000 9. (i) 10 crore (ii) 20 crore (iii) 6 crore (iv) 9 crore 10. (i) 15 crore km; (ii) 1490 million km

Exercise - 13.2

1. (i) 6 (ii) 91 (iii) 101 (iv) 514 (v) 1031 2. (i) 2.5 (ii) 13.4 (iii) 35.1 (iv) 525.2 (v) 1234.2 3. (i) 23.15 (ii) 8.01 (iii) 7.49 (iv) 37.10 (v) 463.80 4. (i) 52.179 (ii) 46.006 (iii) 29.773 (iv) 18.964 (v) 42.170 5. (i) 31.88 (ii) 41.01 (iii) 29.05 6. (i) 0.333 (ii) 0.167 (iii) 0.889 (iv) 0.364 (v) 0.429 7. 2.68 sq m 8. (i) ₹ 46.38 (ii) ₹ 46

Lets's Recall

1. (d) 2. (b) 3. (c) 4. (a)

14. Average

Exercise 14

1. 40°C 2. 162 cm 3. 34 4. 5 cm 5. 22 runs 6. 1.08 cm 7. 76 kg 8. class V, 41 9. 67 km per hour 10. ₹ 1229 11. Family *A*, 3.2 kg 12. town *A* 13. 1 m 15 cm 14. ₹ 125 15. ₹ 2100

Let's Recall

1. (d) 2. (c) 3. (b) 4. (c)

15. Percentage

Exercise - 15.1

1. 64% 2. 60% 3. 62.5% 4. 43.75% 5. 23.5% 6. 15% 7. 75.7% 8. 2.3% 9. 25% 10. 10% 11. 50% 12. 5% 13. 35% 14. 4% 15. 12.5% 16. 50% 17. 4% 18. 0.5% 19. $\frac{16}{25}$ 20. $\frac{2}{5}$ 21. $\frac{27}{50}$ 22. $\frac{37}{300}$ 23. 0.08 24. 0.125 25. 0.12 26. 0.035 27. ₹ 35 28. 40 g 29. 45 m 30. 45 ml 31. 30% of 50 32. 25% of 200 35. 50 m 36. 20% 37. 150

Exercise - 15.2

1. 595 marks 2. win 7 games, lose 3 games 3. ₹ 375 4. 4.8 kg 5. 42 kg 6. ₹ 61 7. passed 37.5%, failed 62.5% 8. 87% 9. 1500 10. 20,900 11. 500 12. ₹ 2475 13. ₹ 5400 14. 6.25% 15. 70%

Let's Recall

1. (b) 2. (a) 3. (c) 4. (b)

16. Profit and Loss

Exercise - 16.1

1. 6 2. 100 3. 22 4. 9 5. 16 6. loss ₹ 50 7. profit ₹ 100 8. profit ₹ 90 9. profit ₹ 3.50 10. loss ₹ 1.75 11. gain ₹ 10 12. profit ₹ 20 13. ₹ 72 14. profit ₹ 144 15. loss ₹ 50

Exercise - 16.2

1. 450 2. 570 3. 930 4. 840 5. 888 6. ₹ 10,750 7. ₹ 6150 8. ₹ 860 9. ₹ 9.10 10. ₹ 48,000 11. ₹ 11,750 12. ₹ 2800

Exercise - 16.3

1. loss 10% 2. profit 25% 3. profit 20% 4. profit 20% 5. loss 4% 6. profit 7. loss 8. loss 9. profit 10. 10% 11. CP 12. 20% 13. 20% 14. 8% 15. 12% 16. profit 60% 17. 5%

Let's Recall

1. (a) 2. (b) 3. (a) 4. (c)

17. Simple Interest

Exercise - 17

1. ₹ 115.20 2. ₹ 40 3. ₹ 264 4. ₹ 108 5. ₹ 750 6. ₹ 1330 7. ₹ 47.70 8. ₹ 10,875 9. ₹ 36,250 10. ₹ 843.75 11. ₹ 64; ₹ 1264 12. Rahul ₹ 1680 13. ₹ 5006.25 14. ₹ 5500, ₹ 6000, ₹ 6500 15. ₹ 300

Let's Recall

1. (c) 2. (c) 3. (d)

18. Lines

Exercise - 18.1

1. (i) line (ii) cannot (iii) two (iv) line segment (v) plane 2. A line segment has a definite length; A ray has only one end-point; A line has no end-point; A face of a wall represents a part of a plane; A line cannot be drawn on a paper. 3. (i) $\overleftrightarrow{AB}$ (ii) $\overline{CD}$ (iii) $\overrightarrow{EF}$

19. Angles

Exercise - 19.1

1. (i) *Y; YX, YZ* (ii) *M; LM, NM* (iii) *O; OA, OB* (iv) *Q; QR, QP* 2. (i) and (iii) 3. $\angle AOB$, $\angle AOC$, $\angle AOD$, $\angle BOC$, $\angle BOD$, $\angle DOA$ 4. (i) $\angle RST$ (ii) $\angle ABC$ (iii) $\angle XYZ$ (iv) $\angle POQ$ 5. (i) 3 (ii) 6 (iii) 10 7. (i) right (ii) acute (iii) obtuse (iv) obtuse (v) acute. 8. (i) $\angle AOB$, $\angle BOC$ (ii) $\angle POQ$, $\angle QOR$ (iii) $\angle AOB$, $\angle BOC$; $\angle COD$, $\angle DOA$; 9. (i) $\angle POS$, $\angle QOR$; $\angle POQ$, $\angle ROS$ (ii) $\angle AOB$, $\angle DOE$; $\angle BOC$, $\angle EOF$; $\angle COD$, $\angle AOF$, (iii) $\angle JNK$, $\angle LNM$; $\angle KNL$, $\angle JNM$ 10. (i) 70° (ii) 50° (iii) 36° (iv) 13° (v) 1°. 11. (i) 150° (ii) 130° (iii) 15° (iv) 90° (v) 1° 12. (i) 70° (ii) 60° (iii) 57°

Exercise - 19.3

1. (a), (b), (c), (d), (e) 2. (a) 180° (b) 90° (c) 270° (d) 45° 4. (a) 60° (b) (i) 180° (ii) 300° (iii) 120°

20. Triangles

Exercise - 20.1

1. (i) obtuse-angled triangle (ii) right-angled triangle (iii) acute-angled triangle 2. (i) scalene (ii) isosceles (iii) equilateral 3. (i) right angled, scalene (ii) acute-angled, equilateral (iii) acute-angled, isosceles (iv) acute-angled, scalene (v) acute-angled, isosceles (vi) right-angled, scalene 4. (i) scalene (ii) isosceles (iii) equilateral (iv) isosceles 5. (i) 78° (ii) 15° (iii) 32°. 6. (i) 50° (ii) 45° each (iii) 105° (iv) 60° (v) 45° 7. (i) Not possible (ii) Possible (iii) Not possible

21. Quadrilaterals

Exercise - 21

1. 4 sides : *PQ, QR, RS, SP*; 4 vertices; *P, Q, R, S*; 4 angles; $\angle PQR$, $\angle QRS$, $\angle RSP$, $\angle SPQ$; 2 diagonals: *PR, QS* 2. 170° 3. 90° 4. 50° 5. (i) T (ii) F (iii) T (iv) T (v) F. 6. (i) parallelogram, rectangle (ii) rhombus, square (iii) parallelogram, rhombus (iv) rectangle and square

22. Circles

Exercise - 22

1. (i) diameter (ii) arc (iii) centre (iv) half (v) chord (vi) centre (vii) $\frac{22}{7}$ (viii) equal (ix) two (x) diameter 3. (i) 10 cm (ii) 15 cm (iii) 9 cm (iv) 16.4 cm 4. (i) 4 cm (ii) $5\frac{1}{4}$ cm (iii) 5.5 cm (iv) 2.33 cm 5. (i) 110 cm (ii) 176 cm (iii) 154 cm (iv) 198 cm 6. (i) 21 cm (ii) 7 cm (iii) 42 cm (iv) 17.5 cm 9. yes 10. (i) T (ii) F (iii) F (iv) T (v) F 11. (i) *CA, CB, CD* (ii) *EF, EG, AB* (iii) *AB* (iv) *AEFB, AGDB* (v) 2

23. Symmetry and Pattern

Exercise - 23.1

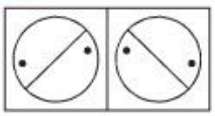
3. Football-Sphere, Pipe-Cylinder, Dice-Cube, Matchbox-Cuboid, Birthday Cap-Cone 4. 6,12

Exercise - 23.2

1. (a) 2. (b) 3. (a) (ii), (b) (iv); (c) (i); (d) (iii) 4. Rectangle 5. yes

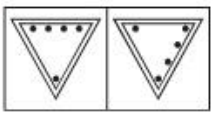
Exercise - 23.3

1.



2.

3.



4. (c) 5. turning by 45° each time, 6. turning by 45° each time, 7. turning by 90° each time,

24. Area

Exercise - 24

1. 14 sq cm (approximately) 2. 13 sq cm 3. 275 sq m 4. 81 sq m 5. 169 sq cm 6. 36 sq m 7. 2.25 sq m 8. 12.96 sq m 9. 180 sq cm 10. 550 sq cm 11. 8450 sq m 12. 0.5 sq m 13. 13.05 sq m 14. second 15. 1350 16. 31500 17. ₹ 50,000 18. ₹ 1750 19. 9240 sq m 20. ₹ 31,250

Let's Recall

1. (d) 2. (c) 3. (c) 4. (c)

25. Volume

Exercise - 25

1. 16 cm^3 2. 18 cm^3 3. 24 cm^3 4. 2000 cm^3 5. 3375 cm^3 6. 12 m^3 7. 240 cm^3 8. 1,25,000 cm^3 or 0.125 m^3 9. 8000 cm^3 10. 20,000 cm^3 11. 729 cm^3 12. 1386 m^3 13. 25,000 cm^3 14. 55 cm^3 15. 1008 cm^3 16. 12.167 cm^3 17. 2500 18. cube 19. second block

Let's Recall

1. (b) 2. (b) 3. (a) 4. (a)

26. Circle Graph and Bar Graph

Warm Up

1. Basketball 2. $\frac{1}{2}$ 3. (a) $\frac{1}{8}$ (b) $\frac{1}{8}$ (c) $\frac{1}{4}$ 4. (a) 10 (b) 5 (c) 5 (d) 20

Exercise - 26.1

1. $\frac{7}{20}, \frac{9}{20}, \frac{3}{20}, \frac{1}{20}$ 2. $\frac{1}{4}, \frac{3}{8}, \frac{1}{4}, \frac{1}{8}$ 3. $\frac{1}{3}, \frac{1}{2}, \frac{1}{6}$

Exercise - 26.2

1. (a) Tue (b) Sun (c) 50 L (d) 200 L (e) 900 L 2. (a) 6 pm (b) 6 am (c) 100 (d) 2150 (e) 9 am 3. (a) 100 (b) Nitin (c) Mamta (d) Tina and Anmol (e) Nitin, 50

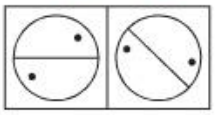
Half-Yearly Paper

1. (i) (c) (ii) (b) (iii) (d) (iv) (b) 2. (i) T (ii) F (iii) T (iv) F (v) T 3. (i) 78 (ii) 10 (iii) ones, tenths (iv) 100 (v) mercury 4. 1564 baskets 5. 2,00,13,425 6. 33 m 7. 50 8. (i) $2\frac{3}{4}$ (ii) $\frac{2}{5}$ (iii) 32 9. (i) $\frac{18}{35}$ (ii) 3 (iii) $22\frac{2}{3}$ 10. ₹ 82.45 11. (i) $\frac{15}{10}$ (ii) $\frac{4023}{10000}$ (iii) $3\frac{75}{100}$ (iv) $23\frac{965}{1000}$ 12. 0.45 km 13. (i) 45 m (ii) 40 g 14. (i) $2\frac{29}{32}$ (ii) $5\frac{1}{6}$ 15. (i) 4 crore (ii) 45 million 16. 80% 17. 42 kg

Annual Test Paper

1. (i) (a) (ii) (c) (iii) (b) 2. (i) principal (ii) equal (iii) geometrical (iv) length; breadth 3. (i) 140 (ii) 555 (iii) 1110 (iv) 5795 4. 14 5. 11 6. 50 km 7. 3.7389 litres 8. $5\frac{1}{10}$ 9. team *B* 10. ₹ 3520 11. 154 cm 12. ₹ 11750 13. 1350 14. 2500

15. (i)



(ii)

16. ₹ 50,000