

The following examples illustrate the concept of one billion:

Example 1

Read the following numbers and write them in words:

- | | |
|------------------|-----------------|
| i. 13,560,435 | ii. 435,714,901 |
| iii. 231,732,786 | iv. 131,234,500 |
| v. 1,000,000,000 | |

Solution

- | | |
|------------------|--|
| i. 13,560,435 | Thirteen million, five hundred sixty thousand, four hundred thirty five. |
| ii. 435,714,901 | Four hundred thirty five million, seven hundred fourteen thousand, nine hundred one. |
| iii. 231,732,786 | Two hundred thirty one million, seven hundred thirty two thousand, seven hundred eighty six. |
| iv. 131,234,500 | One hundred thirty one million, two hundred thirty four thousand, five hundred. |
| v. 1,000,000,000 | One billion. |

1.1.2 Write numbers upto 1,000,000,000 (one billion) in numerals and in words

Example 2

Write the following numbers in figures:

- i. Twenty five million, three hundred twenty five thousand, one hundred fifteen.
- ii. Four hundred sixty one million, one hundred thousand, seven hundred eighty two.
- iii. Six hundred twenty one million, two hundred thirty four thousand, five hundred one.
- iv. Seven hundred eighty six million, four hundred forty four thousand, one hundred eleven.
- v. One billion.

Solution

- | | | |
|------|---|---------------|
| i. | Twenty five million, three hundred twenty five thousand, one hundred fifteen. | 25,325,115 |
| ii. | Four hundred sixty one million, one hundred thousand, seven hundred eighty two. | 461,100,782 |
| iii. | Six hundred twenty one million, two hundred thirty four thousand, five hundred one. | 621,234,501 |
| iv. | Seven hundred eighty six million, four hundred forty four thousand, one hundred eleven. | 786,444,111 |
| v. | One billion | 1,000,000,000 |

Exercise 1.1**1. Read the following numbers and write them in words.**

- | | | | |
|------|-------------|-----|---------------|
| i. | 23,123,405 | ii. | 340,365,901 |
| iii. | 231,700,321 | iv. | 987,212,907 |
| v. | 975,000,864 | vi. | 1,000,000,000 |

2. Write the following numbers in figures.

- i. Seventy five million, four hundred twenty thousand, seven hundred fourteen.
- ii. Five hundred sixteen million, two hundred eighty four thousand, seven hundred.
- iii. Nine hundred twelve million, five hundred one.
- iv. Two hundred fifty million, three hundred seventy four thousand, six hundred eleven.
- v. Five hundred million.
- vi. Nine hundred ninety nine million, nine hundred ninety nine thousand, nine hundred ninety nine.
- vii. One billion.

1.2 Addition and subtraction

1.2.1 Addition of numbers of complexity and of arbitrary size

Addition of numbers upto 7, 8 or 9-digit is similar to the addition of numbers upto 6-digit. The placement of ones, thousands and millions should be under ones, thousands and millions respectively. Commas should also be under respective commas.

IMPORTANT NOTE:

Numbers of complexity means a number composed of more than one or of many parts.
Arbitrary means not bound by rule.

Consider the following examples:

Example 3

Add 31,700,621 and 3,923,405.

Solution

$$\begin{array}{r}
 \textcircled{1} \qquad \qquad \textcircled{1} \\
 3 \ 1 \ , \ 7 \ 0 \ 0 \ , \ 6 \ 2 \ 1 \\
 + \quad 3 \ , \ 9 \ 2 \ 3 \ , \ 4 \ 0 \ 5 \\
 \hline
 3 \ 5 \ , \ 6 \ 2 \ 4 \ , \ 0 \ 2 \ 6
 \end{array}$$

Example 4

Add 671,508,628 and 29,423,232.

Solution

$$\begin{array}{r}
 \textcircled{1} \ \textcircled{1} \qquad \qquad \textcircled{1} \qquad \qquad \textcircled{1} \\
 6 \ 7 \ 1 \ , \ 5 \ 0 \ 8 \ , \ 6 \ 2 \ 8 \\
 + \quad 2 \ 9 \ , \ 4 \ 2 \ 3 \ , \ 2 \ 3 \ 2 \\
 \hline
 7 \ 0 \ 0 \ , \ 9 \ 3 \ 1 \ , \ 8 \ 6 \ 0
 \end{array}$$

Example 5

Add 543234567 and 382946578.

Solution

$$\begin{array}{r}
 \textcircled{1} \qquad \textcircled{1} \qquad \textcircled{1} \ \textcircled{1} \ \textcircled{1} \ \textcircled{1} \\
 5 \ 4 \ 3 \ 2 \ 3 \ 4 \ 5 \ 6 \ 7 \\
 + \ 3 \ 8 \ 2 \ 9 \ 4 \ 6 \ 5 \ 7 \ 8 \\
 \hline
 9 \ 2 \ 6 \ 1 \ 8 \ 1 \ 1 \ 4 \ 5
 \end{array}$$

Exercise 1.2

Solve the following:

- | | | |
|---|---|---|
| 1. $\begin{array}{r} 7,212,907 \\ + 325,115 \\ \hline \end{array}$ | 2. $\begin{array}{r} 4,678,478 \\ + 325,115 \\ \hline \end{array}$ | 3. $\begin{array}{r} 12,601,504 \\ + 8,527,319 \\ \hline \end{array}$ |
| 4. $\begin{array}{r} 87,444,568 \\ + 8,027,313 \\ \hline \end{array}$ | 5. $\begin{array}{r} 103907212 \\ + 41115325 \\ \hline \end{array}$ | 6. $\begin{array}{r} 294,458,198 \\ + 48,165,305 \\ \hline \end{array}$ |
| 7. $\begin{array}{r} 1,787,092 \\ + 774,884 \\ \hline \end{array}$ | 8. $\begin{array}{r} 444,333,777 \\ + 41,347,081 \\ \hline \end{array}$ | 9. $\begin{array}{r} 896092787 \\ + 84884674 \\ \hline \end{array}$ |

Add the following:

- | | |
|--------------------------------|--------------------------------|
| 10. 10,234,781 and 832,412 | 11. 634780315 and 1304203 |
| 12. 563,191,782 and 42,564,760 | 13. 564,710,410 and 14,219,216 |
| 14. 786890326 and 3265816 | 15. 672,678,016 and 52,782,153 |

1.2.2 Subtraction of numbers of complexity and of arbitrary size

Subtraction of numbers upto 7, 8 or 9-digit is similar to the subtraction of numbers upto 6-digit. The placement of ones, thousands and millions should be under ones, thousands and millions respectively. Commas should also be under respective commas.

Consider the following examples:

Example 6

Subtract 4,700,621 from 25,623,805.

Solution

$$\begin{array}{r} \overset{4}{\text{⑩}} \\ 25,623,805 \\ - 4,700,621 \\ \hline 20,923,184 \end{array}$$

Example 7

Subtract 29423232 from 671508628.

Solution

$$\begin{array}{r}
 \begin{array}{cccccccccc}
 & 6 & \textcircled{10} & 4 & \textcircled{10} & & 5 & \textcircled{10} & & \\
 6 & \cancel{7} & 1 & \cancel{5} & 0 & 8 & \cancel{6} & 2 & 8 & \\
 - & 2 & 9 & 4 & 2 & 3 & 2 & 3 & 2 & \\
 \hline
 6 & 4 & 2 & 0 & 8 & 5 & 3 & 9 & 6 &
 \end{array}
 \end{array}$$

Exercise 1.3

Solve the following:

- | | | |
|---|---|--|
| 1. $\begin{array}{r} 6,424,907 \\ - 325,015 \\ \hline \end{array}$ | 2. $\begin{array}{r} 4,678,478 \\ - 725,615 \\ \hline \end{array}$ | 3. $\begin{array}{r} 29,661,747 \\ - 8,527,319 \\ \hline \end{array}$ |
| 4. $\begin{array}{r} 45,470,561 \\ - 8,027,313 \\ \hline \end{array}$ | 5. $\begin{array}{r} 674,526,266 \\ - 46,175,325 \\ \hline \end{array}$ | 6. $\begin{array}{r} 257,708,198 \\ - 4,816,805 \\ \hline \end{array}$ |
| 7. $\begin{array}{r} 8,556,875 \\ - 774,884 \\ \hline \end{array}$ | 8. $\begin{array}{r} 346240317 \\ - 41347081 \\ \hline \end{array}$ | 9. $\begin{array}{r} 597092787 \\ - 54884664 \\ \hline \end{array}$ |

Subtract the following:

- | | |
|-------------------------------|---------------------------------|
| 10. 832,412 from 10,234,781 | 11. 63,780,315 from 972,678,016 |
| 12. 7,165,816 from 42,564,760 | 13. 14,219,216 from 786,890,326 |
| 14. 34710410 from 563191782 | 15. 4304203 from 52782153 |

1.3 Multiplication and division

1.3.1 Multiplication of numbers upto 6-digit by 10, 100 and 1000

Product of a number i.e., 214455 by 10, 100 and 1000 is illustrated as under:

$$214455 \times 10 = 2144550$$

$$214455 \times 100 = 21445500$$

$$214455 \times 1000 = 214455000$$

We can simply place as many zeros on the right of the product as there are in the multiplier.

1.3.2 Multiplication of numbers upto 6-digit by 2-digit and 3-digit numbers

Example 8

Multiply 254268 by 45

Solution

$$\begin{array}{r} 254268 \\ \times 45 \\ \hline 1271340 \\ 10170720 \\ \hline 11442060 \end{array}$$

Example 9

Multiply 154205 by 241

Solution

$$\begin{array}{r} 154205 \\ \times 241 \\ \hline 154205 \\ 6168200 \\ 30841000 \\ \hline 37163405 \end{array}$$

Exercise 1.4

Multiply:

1. 345,627 by 10
2. 245,842 by 100
3. 258,961 by 1000
4. 346,758 by 45
5. 546,738 by 65
6. 534,070 by 60
7. 243,798 by 231
8. 234,587 by 403
9. 349,876 by 806
10. 454,776 by 342

1.3.3 Division of numbers upto 6-digit by 2-digit and 3-digit numbers

Example 10

Divide 876986 by 24. Write quotient and remainder.

Solution: $876986 \div 24$

$$\begin{array}{r}
 \overline{) 876986} \\
 \underline{-72} \\
 156 \\
 \underline{-144} \\
 129 \\
 \underline{-120} \\
 98 \\
 \underline{-96} \\
 26 \\
 \underline{-24} \\
 2
 \end{array}$$

Quotient = 36541

Remainder = 2

Example 11

Divide 453674 by 125. Write quotient and remainder.

Solution: $453674 \div 125$

$$\begin{array}{r}
 \overline{) 453674} \\
 \underline{-375} \\
 786 \\
 \underline{-750} \\
 367 \\
 \underline{-250} \\
 1174 \\
 \underline{-1125} \\
 49
 \end{array}$$

Quotient = 3629

Remainder = 49

Exercise 1.5

Divide, write quotient and remainder also.

1. 345673 by 13
2. 267893 by 15
3. 234561 by 26
4. 346758 by 45
5. 546738 by 65
6. 535570 by 231
7. 243798 by 231
8. 675321 by 403
9. 349876 by 215
10. 454776 by 342

1.3.4 Use mixed operations of addition & subtraction and multiplication & division

- **Mixed operations of addition & subtraction**

In mixed operations of addition and subtraction we always do addition first and then subtraction.

Let us solve (i) $92 + 35 - 62$ (ii) $92 - 62 + 35$

In mixed operations of addition and subtraction, we can simplify as follows:

$$\begin{aligned}\text{(i)} \quad & 92 + 35 - 62 \\ & = 127 - 62 \quad \text{(because } 92 + 35 = 127\text{)} \\ & = 65 \\ \text{(ii)} \quad & 92 - 62 + 35 \\ & = 92 + 35 - 62 \quad \text{(re-arranging numbers)} \\ & = 127 - 62 \quad \text{(because } 92 + 35 = 127\text{)} \\ & = 65\end{aligned}$$

Example 12

Simplify (i) $78 + 20 - 43$ (ii) $89 - 50 + 27$

Solution

$$\begin{aligned}\text{(i)} \quad & 78 + 20 - 43 \\ & = 98 - 43 \quad \text{(because } 78 + 20 = 98\text{)} \\ & = 55 \\ \text{(ii)} \quad & 89 - 50 + 27 \\ & = 89 + 27 - 50 \quad \text{(re-arranging numbers)} \\ & = 116 - 50 \quad \text{(because } 89 + 27 = 116\text{)} \\ & = 66\end{aligned}$$

1.3.5 Solution of real life problems involving mixed operations of addition, subtraction, multiplication and division

Example 14

Ali received Rs. 30 as Eidi from his parents and Rs. 20 from his uncle. How much total money did he receive?

Solution

$$\begin{aligned}\text{Eidi from parents} &= \text{Rs. } 30 \\ \text{Eidi from uncle} &= \text{Rs. } 20 \\ \text{Total amount of Eidi} &= 30 + 20 = \text{Rs. } 50\end{aligned}$$

Example 15

If price of 1 book is Rs. 25 then find the price of 6 books.

Solution

$$\begin{aligned}\text{Price of 1 book} &= \text{Rs. } 25 \\ \text{Price of 6 books} &= 25 \times 6 \\ &= \text{Rs. } 150\end{aligned}$$

Exercise 1.7

1. Monthly income of Aslam is Rs. 12,000 and the income of his father is Rs. 21,000. Find their total income.
2. Shoaib got Rs. 100 as Eidi from his parents and Rs. 70 from his elder brother. How much total money did he receive?
3. A shop keeper bought 320 pencils and sold 250 out of them. How many pencils are left?
4. Calculate the amount of electricity bill if a consumer consumed 160 units in a month at a rate of Rs. 7 per unit.
5. If the price of 15 balls is Rs. 300, then find the price of one ball.
6. If a book can be bought for Rs. 45, find the price of 5 such books.

- Mixed operations of multiplication & division**

Let us solve $92 \div 4 \times 7$

$$\begin{aligned} &92 \div 4 \times 7 \\ &= 23 \times 7 \text{ (because } 92 \div 4 = 23\text{)} \\ &= 161 \end{aligned}$$

The above example cannot be simplified as:

$$\begin{aligned} &92 \div 4 \times 7 \\ &= 92 \div 28 \\ &= 92 \times \frac{1}{28} \end{aligned}$$

Note: In mixed operations of multiplication and division, always take division first and then multiplication.

Example 13

Simplify **i.** $75 \div 15 \times 8$ **ii.** $25 \times 15 \div 3$

Solution	$75 \div 15 \times 8$	$25 \times 15 \div 3$
	$= \underline{75 \div 15} \times 8$	$= 25 \times \underline{15 \div 3}$
	$= 5 \times 8$	$= 25 \times 5$
	$= 40$	$= 125$

Exercise 1.6

Solve:

- | | | |
|---------------------------|-----------------------------|--------------------------|
| 1. $72 - 50 + 12$ | 2. $45 + 44 - 28$ | 3. $56 - 22 + 21$ |
| 4. $76 - 44 + 27$ | 5. $78 - 70 + 27$ | 6. $89 + 40 - 20$ |
| 7. $98 + 23 - 10$ | 8. $24 \div 4 \times 6$ | 9. $56 \div 7 \times 9$ |
| 10. $12 \times 32 \div 8$ | 11. $3 \times 44 \div 4$ | 12. $72 \div 9 \times 8$ |
| 13. $99 \div 11 \times 4$ | 14. $15 \times 100 \div 10$ | 15. $28 \div 4 \times 8$ |

1.4 Order of operation, BODMAS rule

1.4.1 Recognition of BODMAS rule, using only parenthesis ()

BODMAS is a useful acronym that tells us which mathematical operation is to be performed first. BODMAS rule helps us to find the correct answer.

The BODMAS rule;

B	Stands for	Brackets	()
O	Stands for	Of	Of
D	Stands for	Division	\div
M	Stands for	Multiplication	\times
A	Stands for	Addition	$+$
S	Stands for	Subtraction	$-$

Order of operation is as under:

(), of, \div , \times , $+$, $-$

Example 16

Solve $(20 - 12) \div 4 \times 5$

Solution

$$\begin{aligned} & (20 - 12) \div 4 \times 5 \\ &= 8 \div 4 \times 5 && \text{(remove the brackets)} \\ &= 2 \times 5 && \text{(perform division)} \\ &= 10 && \text{(perform multiplication)} \end{aligned}$$

1.4.2 Carryout combined operations using BODMAS rule

Example 17

Solve **i.** $(3 + 2) \text{ of } 4 \div 2 \times 4$

Solution **i.** $(3 + 2) \text{ of } 4 \div 2 \times 4$
 $= 5 \text{ of } 4 \div 2 \times 4$
 $= 20 \div 2 \times 4$
 $= 10 \times 4$
 $= 40$

ii. $10 + 20 \div 5 \times (8 - 5)$

ii. $10 + 20 \div 5 \times (8 - 5)$
 $= 10 + 20 \div 5 \times 3$
 $= 10 + 4 \times 3$
 $= 10 + 12$
 $= 22$

Exercise 1.8

Solve:

1. $20 \times 12 \div 8$

2. $24 \div 4 + 10 \text{ of } 5 - 2$

3. $98 \div 7 + 26$

4. $(18 \times 5) \div 15 + 5$

5. $(36 + 8) \times 12 \div 4 - 18$

6. $(30 \div 3) \text{ of } 8 + 6 - 12$

7. $(3 \times 44) \div 4$

8. $3 \times (44 \div 4) - 6$

9. $9 + (64 \div 16) \times 3 - 21$

10. $(12 \times 5) \div 5 + 4$

11. $(65 \div 5) \times 2 + 15 - 20$

12. $12 + (18 \div 6) \times 5 - 5$

1.4.3 Verification of distributive laws

Let us verify the distributive laws with the help of following examples:

Example 18

Verify the distributive law from each of the following.

i. $4 \times (7 + 3) = (4 \times 7) + (4 \times 3)$

ii. $(8 + 6) \times 5 = (8 \times 5) + (6 \times 5)$

iii. $11 \times (5 - 2) = (11 \times 5) - (11 \times 2)$

Solution

$$\text{i. } 4 \times (7 + 3) = (4 \times 7) + (4 \times 3)$$

$$\begin{aligned} \text{L.H.S.} &= 4 \times (7 + 3) \\ &= 4 \times 10 \\ &= 40 \dots\dots\dots(a) \end{aligned}$$

$$\begin{aligned} \text{R.H.S.} &= (4 \times 7) + (4 \times 3) \\ &= 28 + 12 \\ &= 40 \dots\dots\dots(b) \end{aligned}$$

From (a) and (b)

$$\text{L.H.S.} = \text{R.H.S.}$$

$$\text{Thus, } 4 \times (7 + 3) = (4 \times 7) + (4 \times 3)$$

$$\text{ii. } (8 + 6) \times 5 = (8 \times 5) + (6 \times 5)$$

$$\begin{aligned} \text{L.H.S.} &= (8 + 6) \times 5 \\ &= 14 \times 5 \\ &= 70 \dots\dots\dots(a) \end{aligned}$$

$$\begin{aligned} \text{R.H.S.} &= (8 \times 5) + (6 \times 5) \\ &= 40 + 30 \\ &= 70 \dots\dots\dots(b) \end{aligned}$$

From (a) and (b)

$$\text{L.H.S.} = \text{R.H.S.}$$

$$\text{Thus, } (8 + 6) \times 5 = (8 \times 5) + (6 \times 5)$$

$$\text{iii. } 11 \times (5 - 2) = (11 \times 5) - (11 \times 2)$$

$$\begin{aligned} \text{L.H.S.} &= 11 \times (5 - 2) \\ &= 11 \times 3 \\ &= 33 \dots\dots\dots(a) \end{aligned}$$

$$\begin{aligned}\text{R.H.S.} &= (11 \times 5) - (11 \times 2) \\ &= 55 - 22 \\ &= 33 \dots\dots\dots(b)\end{aligned}$$

From (a) and (b)

$$\text{L.H.S.} = \text{R.H.S.}$$

$$\text{Thus, } 11 \times (5 - 2) = (11 \times 5) - (11 \times 2)$$

Exercise 1.9

Verify distributive laws:

1. $4 \times (5 + 2) = (4 \times 5) + (4 \times 2)$
2. $(2 + 6) \times 3 = (2 \times 3) + (6 \times 3)$
3. $11 \times (2 + 7) = (11 \times 2) + (11 \times 7)$
4. $(9 - 3) \times 4 = (9 \times 4) - (3 \times 4)$
5. $12 \times (5 - 4) = (12 \times 5) - (12 \times 4)$
6. $(8 + 2) \times 10 = (8 \times 10) + (2 \times 10)$
7. $6 \times (7 + 10) = (6 \times 7) + (6 \times 10)$
8. $(22 - 8) \times 5 = (22 \times 5) - (8 \times 5)$
9. $(17 + 3) \times 5 = (17 \times 5) + (3 \times 5)$
10. $20 \times (6 - 2) = (20 \times 6) - (20 \times 2)$

Review Exercise 1

1. Four possible options have been given. Encircle the correct one.
 - i. In international place value system commas are placed after how many digits from right digit?
(a) one (b) two (c) three (d) four
 - ii. Which is the smallest 9-digit number?
(a) 999,999,999 (b) 100,000,000
(c) 900,000,000 (d) 888,888,888
 - iii. Which one of the following is one billion?
(a) 100,000 (b) 1,000,000
(c) 10,000,000 (d) 1,000,000,000

- iv. $3 \times (44 \div 4) - 6$ in simplified form is:
(a) 27 (b) 30 (c) 36 (d) 72
2. Read the following numbers and write them in words:
- i. 12,321,150 ii. 201,421,200
3. Write the following numbers in figures:
- i. Eight hundred thirteen million, four hundred two.
ii. Two hundred sixty million, five hundred sixty five thousand, six hundred twenty.
4. Add:
- i. 11,123,222 and 932,253
ii. 652,425,100 and 10,115,965
5. Subtract:
- i. 52,524,105 from 61,932,253
ii. 215,142,100 from 305,965,115
6. Multiply:
- i. 24105 by 253 ii. 42188 by 965
7. Divide, write quotient and remainder also:
- i. 524105 by 25 ii. 725012 by 12
8. Evaluate:
- i. $56 + 25 - 24$ ii. $36 \div 4 \times 8$
9. Evaluate:
- i. $(12 \times 5) \div 12 + 5$ ii. $(20 \div 4) \times 8 + 6 - 16$

10. Verify the distributive laws:

i. $5 \times (7 + 10) = (5 \times 7) + (5 \times 10)$

ii. $(12 - 2) \times 4 = (12 \times 4) - (2 \times 4)$

SUMMARY

- In international place value system commas are placed after every three digits from the right.
- When we add '1' in the largest 9-digit number we get 'One billion'.

$$\text{One billion} = 1,000,000,000$$

$$\text{Similarly, one billion} = \text{One thousand million}$$

$$1,000,000,000 = 1,000 \text{ million}$$

- In addition and subtraction placement of ones, thousands and millions should be under ones, thousands and millions respectively. Commas should also be under respective commas.
- In mixed operations of addition and subtraction we re-arrange the numbers (if needed) and then do addition before subtraction.
- In mixed operations of multiplication and division, always take division first and then multiplication.
- According to BODMAS rule, order of operation is:
 $()$, of, \div , \times , $+$, $-$
- $(8 + 6) \times 5 = (8 \times 5) + (6 \times 5)$ and $11 \times (5 - 2) = (11 \times 5) - (11 \times 2)$ are examples of distributive laws.

2.1 HCF

HCF is the acronym of Highest Common Factor. It is calculated for two or more numbers. **Highest Common Factor (HCF) of two or more numbers is the greatest number that divides the given numbers exactly.**

In class 4, we have learnt to find HCF of two numbers upto 2-digit by prime factorization method. Some examples for revision have been given below:

HCF by Prime Factorization Method

Let us see the given examples:

Example 1

Find HCF of 8 and 12 by prime factorization method.

Solution

Prime factors of 8 are 2 , 2 , 2

Prime factors of 12 are 2 , 2 , 3

Common factors of 8 and 12 are 2 , 2

Product of common factors = 2×2
= 4

Thus, 4 is the HCF of 8 and 12.

Example 2

Find HCF of 24 and 40 by prime factorization method.

Solution

Prime factors of 24 are 2 , 2 , 2 , 3

Prime factors of 40 are 2 , 2 , 2 , 5

Common factors of 24 and 40 are 2 , 2 , 2

$$\begin{aligned}\text{Product of common factors} &= 2 \times 2 \times 2 \\ &= 8\end{aligned}$$

Thus, 8 is the HCF of 24 and 40.

2.1.1 Finding HCF of three numbers upto 2-digit

- **By prime factorization method**

Example

Find HCF of 16, 24 and 48 by prime factorization method.

Solution

Prime factors of 16 are 2 , 2 , 2 , 2

Prime factors of 24 are 2 , 2 , 2 , 3

Prime factors of 48 are 2 , 2 , 2 , 2 , 3

Common factors of 16, 24 and 48 are 2 , 2 , 2

$$\begin{aligned}\text{Product of common factors} &= 2 \times 2 \times 2 \\ &= 8\end{aligned}$$

Thus, 8 is the HCF of 16, 24 and 48

Exercise 2.1

Find HCF by prime factorization method.

1. 10, 15, 20
2. 20, 24, 48
3. 12, 24, 40

- | | | |
|----------------|----------------|----------------|
| 4. 25, 30, 35 | 5. 15, 30, 45 | 6. 20, 40, 80 |
| 7. 24, 48, 60 | 8. 24, 48, 72 | 9. 16, 24, 64 |
| 10. 12, 36, 48 | 11. 21, 42, 63 | 12. 28, 42, 56 |

• By division method

Let us have a look at the given example:

Example 1

Find HCF of 24 and 64 by division method.

Solution

Steps of division method

- i. Divide the larger number '64' by the smaller number '24'. We get '16' as first remainder.
- ii. Divide '24' by first remainder '16'. We get the second remainder '8'.
- iii. Divide '16' by second remainder '8'. We get '0' as remainder.

$$\begin{array}{r}
 24 \overline{) 64} \quad 2 \\
 \underline{-48} \\
 16 \overline{) 24} \quad 1 \\
 \underline{-16} \\
 8 \overline{) 16} \quad 2 \\
 \underline{-16} \\
 0
 \end{array}$$

The last divisor '8' is the HCF of 24 and 64.

Thus, 8 is the HCF of 24 and 64.

Example 2

Find HCF of 20, 48 and 70 by division method.

Solution

To find HCF of three numbers by division method, we first find HCF of any two numbers, let us take '20' and '48'.

The HCF of '20' and '48' is '4'.

$$\begin{array}{r}
 20 \overline{) 48} \begin{array}{l} 2 \\ -40 \\ \hline 8 \end{array} \\
 8 \overline{) 20} \begin{array}{l} 2 \\ -16 \\ \hline 4 \end{array} \\
 4 \overline{) 8} \begin{array}{l} 2 \\ -8 \\ \hline 0 \end{array}
 \end{array}$$

Now, we find the HCF of third number '70' and calculated HCF in the first step i.e., '4'.

$$\begin{array}{r}
 4 \overline{) 70} \begin{array}{l} 17 \\ -4 \\ \hline 30 \\ -28 \\ \hline 2 \end{array} \\
 2 \overline{) 4} \begin{array}{l} 2 \\ -4 \\ \hline 0 \end{array}
 \end{array}$$

Thus, 2 is the HCF of 20, 48 and 70.

Exercise 2.2

Find HCF by division method.

- | | | |
|------------------|------------------|------------------|
| 1. 12, 21, 45 | 2. 24, 48, 120 | 3. 15, 25, 125 |
| 4. 36, 72, 160 | 5. 42, 98, 140 | 6. 45, 81, 270 |
| 7. 48, 132, 372 | 8. 28, 70, 294 | 9. 32, 96, 320 |
| 10. 24, 132, 264 | 11. 48, 112, 272 | 12. 56, 140, 308 |

2.2 LCM

LCM is the acronym of Least Common Multiple. It is calculated for two or more numbers. **Least Common Multiple (LCM) of two or more numbers is the smallest number among the common multiples.**

To find LCM, follow these steps:

- i. Find multiples of given numbers.
- ii. Choose smallest common number among the calculated multiples.
Chosen smallest common number is the required LCM.

Example

Find LCM of 8, 12 and 24.

Solution

Multiples of 8 : 8, 16, **24**, 32, ... (so on)

Multiples of 12 : 12, **24**, 36, 48, ...

Multiples of 24 : **24**, 48, 72, 96, ...

Smallest common multiple of 8, 12 and 24 is 24.

So, LCM of 8, 12 and 24 is 24

2.2.1 Finding LCM of four numbers upto 2-digit

• LCM by prime factorization method

To find LCM by prime factorization method, follow these steps:

- i. Find prime factors of all the given numbers.
- ii. Find product of common prime factors in two or more numbers and non-common prime factors.
- iii. Multiply all common and non-common prime factors.

$$\therefore \text{LCM} = \left[\begin{array}{c} \text{Product of common} \\ \text{prime factors of two} \\ \text{or more numbers} \end{array} \right] \times \left[\begin{array}{c} \text{Product of non-common} \\ \text{prime factors of two} \\ \text{or more numbers} \end{array} \right]$$

Example 1

Find LCM of 8, 12 and 24 by prime factorization method.

Solution

$$\text{Prime factorization of } 8 = 2 \times 2 \times 2$$

$$\text{Prime factorization of } 12 = 2 \times 2 \times 3$$

$$\text{Prime factorization of } 24 = 2 \times 2 \times 2 \times 3$$

$$\text{Product of common prime factors} = 2 \times 2 \times 2 \times 3 = 24$$

Hence, LCM of 8, 12 and 24 is 24

Example 2

Find LCM of 21, 27, 51 and 81 by prime factorization method.

Solution

$$\text{Prime factorization of } 21 = 3 \times 7$$

$$\text{Prime factorization of } 27 = 3 \times 3 \times 3$$

$$\text{Prime factorization of } 51 = 3 \times 17$$

$$\text{Prime factorization of } 81 = 3 \times 3 \times 3 \times 3$$

$$\text{Product of common prime factors} = 3 \times 3 \times 3 = 27$$

$$\text{Product of non-common prime factors} = 7 \times 17 \times 3 = 357$$

$$\text{Product of common and non-common prime factors} = 27 \times 357 = 9639$$

Hence, LCM of 21, 27, 51 and 81 is 9639

Exercise 2.3

Find LCM by prime factorization method.

1. 20, 25, 50

2. 24, 54, 120

3. 32, 80, 160

4. 40, 80, 140

5. 24, 48, 72, 96

6. 28, 56, 140, 420

7. 25, 40, 75, 100

8. 24, 48, 60, 96

9. 27, 36, 66, 99

10. 30, 45, 80, 125

• LCM by division method

We can also find LCM by division method of two or more numbers. This method has been explained below:

Example

Find LCM of 30, 40, 60 and 100 by division method.

Solution

- | | | | | |
|------|---|---|--|--------------------|
| i. | Write down all numbers as shown. | 2 | | 30 , 40 , 60 , 100 |
| ii. | Divide the numbers by a number which divides at least two of the given numbers. | 3 | | 15 , 20 , 30 , 50 |
| | | 5 | | 5 , 20 , 10 , 50 |
| | | 2 | | 1 , 4 , 2 , 10 |
| | | 2 | | 1 , 2 , 1 , 5 |
| iii. | Write down the quotient of each number below it. | 5 | | 1 , 1 , 1 , 5 |
| | | | | 1 , 1 , 1 , 1 |
| iv. | If a number is not divisible, then write the number as it is. | | | |
| v. | Keep on dividing until the quotient of all numbers becomes '1'. | | | |
| vi. | Multiply all the divisors to find the LCM. | | | |
- $\therefore \text{LCM} = 2 \times 3 \times 5 \times 2 \times 2 \times 5 = 600$

Exercise 2.4

Find LCM by division method.

- | | | | |
|----|------------------|-----|-----------------|
| 1. | 10, 20, 30 | 2. | 25, 30, 50 |
| 3. | 20, 30, 50, 60 | 4. | 25, 40, 50, 75 |
| 5. | 15, 25, 40, 80 | 6. | 25, 50, 75, 100 |
| 7. | 24, 48, 60, 96 | 8. | 27, 36, 72, 144 |
| 9. | 28, 56, 112, 140 | 10. | 18, 54, 90, 180 |

2.3 Solve real life problems involving HCF and LCM

Example 1 (HCF)

Find the maximum length of a measuring tape that can exactly measure 18, 24 and 30 metre of wires?

Solution

We have to find HCF of 18, 24 and 30 to calculate the exact length of measuring tape

$$\text{Prime factorization of } 18 = 2 \times 3 \times 3$$

$$\text{Prime factorization of } 24 = 2 \times 2 \times 2 \times 3$$

$$\text{Prime factorization of } 30 = 2 \times 3 \times 5$$

$$\text{Common factors of } 18, 24 \text{ and } 30 = 2, 3$$

$$\begin{aligned} \text{Product of common factors} &= 2 \times 3 \\ &= 6 \end{aligned}$$

Thus, 6 metre long measuring tape is required to measure 18, 24 and 30 metre of wires exactly.

Example 2 (LCM)

How much minimum distance can exactly be measured with 10, 20, 25 and 30 metre long strings?

Solution

We have to find LCM to calculate the required distance:

$$\text{LCM} = 2 \times 5 \times 2 \times 3 \times 5 = 300$$

So, required distance is 300 metre

2	10, 20, 25, 30
5	5, 10, 25, 15
2	1, 2, 5, 3
3	1, 1, 5, 3
5	1, 1, 5, 1
	1, 1, 1, 1

Exercise 2.5

1. Find the greatest number which exactly divides 20, 25 and 125.
2. Find the greatest number which exactly divides 45, 135 and 180.
3. Find the smallest number which is exactly divisible by 40, 50 and 60.
4. Find the smallest number that is exactly divisible by 45, 135 and 225.
5. Amina has some amount that she wants to distribute among needy people. If she distributes Rs. 5, 10, 15 and 20 per person, the amount can be distributed exactly. What is the minimum amount of money that she has?
6. There are some bananas in a basket. If they are distributed at the rate of 4, 6, 8 and 12 bananas among children, they can be distributed exactly. What is the minimum number of bananas in the basket?

Review Exercise 2

1. Four possible options are given. Encircle the correct one.
 - i. Prime factors of 18 are:
(a) 2, 2, 3 (b) 2, 3, 3 (c) 2, 3, 4 (d) 2, 2, 5
 - ii. HCF of 12, and 18 is:
(a) 6 (b) 12 (c) 18 (d) 30
 - iii. LCM of 4 and 16 is:
(a) 8 (b) 12 (c) 16 (d) 24
2. Find HCF by prime factorization method:
 - i. 8, 16, 48 ii. 15, 45, 60 iii. 25, 75, 100

3. Find HCF by division method:
 - i. 24, 72, 116
 - ii. 57, 95, 114
 - iii. 63, 117, 153
4. Find LCM by prime factorization method:
 - i. 15, 18, 36
 - ii. 12, 36, 54
 - iii. 18, 90, 15
5. Find LCM by division method:
 - i. 34, 51, 85
 - ii. 28, 42, 56
 - iii. 57, 76, 95
6. Find the greatest number which exactly divides 48, 56 and 80.
7. Find the smallest number which is exactly divisible by 30, 60 and 90.
8. What is the minimum number of candies that can be divided among 25, 50 and 125 students exactly?
9. Three drums contain 40, 70 and 120 litres of petrol. What will be the maximum capacity of the container that can measure all these different quantities exactly?

SUMMARY

- HCF (Highest Common Factor) is the largest number that divides the given numbers exactly.
- There are two methods to find HCF i.e., prime factorization method and division method.
- LCM (Least Common Multiple) is the smallest number among the common multiples of the given numbers.
- There are two methods to find LCM i.e., prime factorization method and division method.
- To find LCM, the following formula is applied:

$$\text{LCM} = \left[\begin{array}{c} \text{Product of common} \\ \text{prime factors of two} \\ \text{or more numbers} \end{array} \right] \times \left[\begin{array}{c} \text{Product of non-common} \\ \text{prime factors of two} \\ \text{or more numbers} \end{array} \right]$$

3.1 Addition and Subtraction

3.1.1 Addition and Subtraction of two fractions with different denominators

In addition and subtraction of fractions with different denominators, we have to make denominators of fractions equal. For this we need to find just the LCM of denominators.

For example we add $\frac{1}{2}$ and $\frac{1}{3}$

The LCM of 2 and 3 is 6.

Change the denominator 2 of $\frac{1}{2}$ to 6 by multiplying denominator and numerator by 3.

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

Change the denominator 3 of $\frac{1}{3}$ to 6 by multiplying denominator and numerator by 2.

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

$$\begin{aligned}\text{So, } \frac{1}{2} + \frac{1}{3} &= \frac{3}{6} + \frac{2}{6} \\ &= \frac{3+2}{6} = \frac{5}{6}\end{aligned}$$

Similarly, subtraction is done in the same way

$$\begin{aligned}\frac{1}{2} - \frac{1}{3} &= \frac{3}{6} - \frac{2}{6} \\ &= \frac{3-2}{6} \\ &= \frac{1}{6}\end{aligned}$$

Let us take following examples:

Solve: $\frac{3}{5} + \frac{2}{9}$

The LCM of 5 and 9 is 45.

$$\frac{3}{5} = \frac{3 \times 9}{5 \times 9} = \frac{27}{45} \quad \left| \quad \frac{2}{9} = \frac{2 \times 5}{9 \times 5} = \frac{10}{45} \right.$$

$$\begin{aligned} \text{So, } \frac{3}{5} + \frac{2}{9} &= \frac{27}{45} + \frac{10}{45} \\ &= \frac{27 + 10}{45} \\ &= \frac{37}{45} \end{aligned}$$

Solve: $\frac{6}{11} - \frac{3}{22}$

The LCM of 11 and 22 is 22.

$$\begin{aligned} \text{So, } \frac{6}{11} - \frac{3}{22} &= \frac{6 \times 2}{11 \times 2} - \frac{3 \times 1}{22 \times 1} \\ &= \frac{12}{22} - \frac{3}{22} \\ &= \frac{12 - 3}{22} = \frac{9}{22} \end{aligned}$$

Exercise 3.1

Solve:

- | | | | |
|------------------------------------|-------------------------------------|-----------------------------------|-----------------------------------|
| 1. $\frac{1}{6} + \frac{2}{9}$ | 2. $\frac{2}{9} + \frac{4}{15}$ | 3. $\frac{5}{9} + \frac{2}{11}$ | 4. $\frac{7}{24} + \frac{5}{36}$ |
| 5. $\frac{2}{3} + \frac{1}{5}$ | 6. $\frac{5}{13} + \frac{1}{26}$ | 7. $\frac{7}{8} + \frac{5}{32}$ | 8. $\frac{1}{14} + \frac{2}{21}$ |
| 9. $\frac{3}{20} + \frac{4}{30}$ | 10. $\frac{1}{2} - \frac{1}{3}$ | 11. $\frac{5}{6} - \frac{2}{9}$ | 12. $\frac{5}{13} - \frac{3}{26}$ |
| 13. $\frac{3}{4} - \frac{1}{3}$ | 14. $\frac{15}{17} - \frac{25}{34}$ | 15. $\frac{5}{13} - \frac{5}{26}$ | 16. $\frac{3}{7} - \frac{1}{8}$ |
| 17. $\frac{7}{10} - \frac{13}{20}$ | 18. $\frac{7}{20} - \frac{7}{30}$ | | |

- **Addition and Subtraction of more than two fractions with different denominators**

The addition and subtraction of more than two fractions is similar to the process of addition and subtraction of two fractions.

Example 1Solve $\frac{1}{2} + \frac{1}{3} + \frac{1}{4}$ **Solution**

The LCM of 2, 3 and 4 is 12 the denominator of each fraction must be 12.

$$\begin{aligned}
 \text{So, } \frac{1}{2} + \frac{1}{3} + \frac{1}{4} &= \frac{1 \times 6}{2 \times 6} + \frac{1 \times 4}{3 \times 4} + \frac{1 \times 3}{4 \times 3} \\
 &= \frac{6}{12} + \frac{4}{12} + \frac{3}{12} \\
 &= \frac{6 + 4 + 3}{12} \\
 &= \frac{13}{12} = 1\frac{1}{12}
 \end{aligned}$$

Example 2Solve $\frac{2}{3} + \frac{3}{4} + \frac{4}{5}$ **Solution**

The LCM of 3, 4 and 5 is 60.

$$\begin{aligned}
 \text{So, } \frac{2}{3} + \frac{3}{4} + \frac{4}{5} &= \frac{2 \times 20}{3 \times 20} + \frac{3 \times 15}{4 \times 15} + \frac{4 \times 12}{5 \times 12} \\
 &= \frac{40}{60} + \frac{45}{60} + \frac{48}{60} \\
 &= \frac{40 + 45 + 48}{60} \\
 &= \frac{133}{60} \\
 &= 2\frac{13}{60}
 \end{aligned}$$

Example 3Solve $\frac{1}{2} - \frac{1}{5} - \frac{1}{4}$ **Solution**

The LCM of 2, 4 and 5 is 20.

$$\begin{aligned}
 \text{So, } \frac{1}{2} - \frac{1}{5} - \frac{1}{4} &= \frac{1 \times 10}{2 \times 10} - \frac{1 \times 4}{5 \times 4} - \frac{1 \times 5}{4 \times 5} \\
 &= \frac{10}{20} - \frac{4}{20} - \frac{5}{20} \\
 &= \frac{10 - 4 - 5}{20} \\
 &= \frac{1}{20}
 \end{aligned}$$

Exercise 3.2

Solve:

- | | | | | | |
|-----|---|-----|--|-----|--|
| 1. | $\frac{1}{2} + \frac{1}{4} + \frac{1}{6}$ | 2. | $\frac{1}{2} - \frac{1}{4} - \frac{1}{6}$ | 3. | $\frac{1}{5} + \frac{1}{6} + \frac{2}{3}$ |
| 4. | $\frac{2}{3} - \frac{1}{4} - \frac{1}{6}$ | 5. | $\frac{1}{7} + \frac{1}{3} + \frac{1}{6}$ | 6. | $\frac{5}{8} - \frac{1}{4} - \frac{1}{6}$ |
| 7. | $\frac{2}{3} + \frac{4}{5} + \frac{1}{9}$ | 8. | $\frac{9}{10} - \frac{1}{2} - \frac{1}{5}$ | 9. | $\frac{3}{10} + \frac{1}{4} + \frac{5}{6}$ |
| 10. | $\frac{13}{14} - \frac{1}{3} - \frac{1}{5}$ | 11. | $\frac{4}{5} + \frac{5}{6} + \frac{1}{3}$ | 12. | $\frac{6}{7} - \frac{1}{3} - \frac{1}{2}$ |

3.1.2 Verification of Commutative property of Addition of fractions with same denominators

Example 1

Verify that: $\frac{1}{3} + \frac{2}{3} = \frac{2}{3} + \frac{1}{3}$

Solution

$$\begin{aligned}\frac{1}{3} + \frac{2}{3} &= \frac{2}{3} + \frac{1}{3} \\ \text{L.H.S} &= \frac{1}{3} + \frac{2}{3} \\ &= \frac{1+2}{3} = \frac{\cancel{3}}{\cancel{3}} \\ &= 1 \quad \text{.....(i)}\end{aligned}$$

$$\begin{aligned}\text{R.H.S} &= \frac{2}{3} + \frac{1}{3} \\ &= \frac{2+1}{3} = \frac{\cancel{3}}{\cancel{3}} \\ &= 1 \quad \text{.....(ii)}\end{aligned}$$

From (i) and (ii)

$$\text{L.H.S} = \text{R.H.S}$$

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

Example 2

Verify that: $\frac{2}{3} + \frac{4}{3} = \frac{4}{3} + \frac{2}{3}$

Solution

$$\begin{aligned}\frac{2}{3} + \frac{4}{3} &= \frac{4}{3} + \frac{2}{3} \\ \text{L.H.S} &= \frac{2}{3} + \frac{4}{3} \\ &= \frac{2+4}{3} = \frac{\cancel{6}^2}{\cancel{3}_1} \\ &= 2 \quad \text{.....(i)}\end{aligned}$$

$$\begin{aligned}\text{R.H.S} &= \frac{4}{3} + \frac{2}{3} \\ &= \frac{4+2}{3} = \frac{\cancel{6}^2}{\cancel{3}_1} \\ &= 2 \quad \text{.....(ii)}\end{aligned}$$

From (i) and (ii)

$$\text{L.H.S} = \text{R.H.S}$$

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

3.1.3 Verification of the Associative Property of Addition of Fractions with same Denominators

Example Verify that: $\left(\frac{1}{8} + \frac{2}{8}\right) + \frac{4}{8} = \frac{1}{8} + \left(\frac{2}{8} + \frac{4}{8}\right)$

Solution $\left(\frac{1}{8} + \frac{2}{8}\right) + \frac{4}{8} = \frac{1}{8} + \left(\frac{2}{8} + \frac{4}{8}\right)$

$$\begin{aligned} \text{L.H.S} &= \left(\frac{1}{8} + \frac{2}{8}\right) + \frac{4}{8} \\ &= \left(\frac{1+2}{8}\right) + \frac{4}{8} \\ &= \frac{3}{8} + \frac{4}{8} \\ &= \frac{3+4}{8} \\ &= \frac{7}{8} \quad \text{.....(i)} \end{aligned}$$

$$\begin{aligned} \text{R.H.S} &= \frac{1}{8} + \left(\frac{2}{8} + \frac{4}{8}\right) \\ &= \frac{1}{8} + \left(\frac{2+4}{8}\right) \\ &= \frac{1}{8} + \frac{6}{8} \\ &= \frac{1+6}{8} \\ &= \frac{7}{8} \quad \text{.....(ii)} \end{aligned}$$

From (i) and (ii)
L.H.S = R.H.S

Exercise 3.3

Verify that:

1. $\frac{3}{8} + \frac{4}{8} = \frac{4}{8} + \frac{3}{8}$

2. $\frac{1}{7} + \frac{5}{7} = \frac{5}{7} + \frac{1}{7}$

3. $\frac{3}{14} + \frac{6}{14} = \frac{6}{14} + \frac{3}{14}$

4. $\frac{5}{9} + \frac{3}{9} = \frac{3}{9} + \frac{5}{9}$

5. $\frac{3}{17} + \frac{13}{17} = \frac{13}{17} + \frac{3}{17}$

6. $\frac{11}{20} + \frac{5}{20} = \frac{5}{20} + \frac{11}{20}$

7. $\frac{3}{8} + \left(\frac{7}{8} + \frac{5}{8}\right) = \left(\frac{3}{8} + \frac{7}{8}\right) + \frac{5}{8}$

8. $\frac{1}{3} + \left(\frac{2}{3} + \frac{5}{3}\right) = \left(\frac{1}{3} + \frac{2}{3}\right) + \frac{5}{3}$

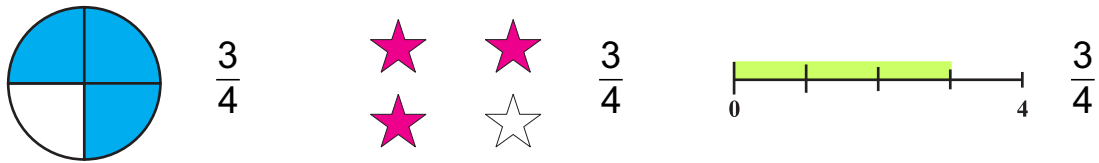
9. $\frac{3}{7} + \left(\frac{1}{7} + \frac{2}{7}\right) = \left(\frac{3}{7} + \frac{1}{7}\right) + \frac{2}{7}$

10. $\frac{3}{19} + \left(\frac{7}{19} + \frac{5}{19}\right) = \left(\frac{3}{19} + \frac{7}{19}\right) + \frac{5}{19}$

3.2 Multiplication

3.2.1 Multiplication of fraction by a number and demonstration with the help of diagrams

A fraction can be represented by many different ways. For example $\frac{3}{4}$ can be represented by following ways.



Multiplication of fraction by a number means number of times addition of that fraction.

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

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

If $\frac{1}{3} =$  then

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



 $+$

 $+$





 $+$


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

 $+$


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

 $+$


Because


 $+$

 $+$

 $=$



$1\frac{1}{3}$ means one complete figure having three equal parts and one part out of three equal parts of the other figure.





In Multiplication of a fraction by a number, simply multiply the numerator by the number while denominator remains the same.




Example 2




Multiply $\frac{2}{3}$ with 4

Solution $\frac{2}{3} \times 4 = \frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3}$

If $\frac{2}{3} =$  Then

$$\frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} =$$





$$2 + \frac{2}{3} =$$




$$2\frac{2}{3} =$$




Because




 $=$




Two whole figures and a 2-third of a figure.




Example 3



Demonstrate multiplication of $\frac{2}{5}$ with 3 using diagram.



Solution

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

If $\frac{2}{5} =$  Then

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




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



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



Exercise 3.4

Multiply the following fractions by the numbers using diagrams.

1. $\frac{1}{5} \times 3$

2. $\frac{3}{4} \times 6$

3. $\frac{2}{8} \times 4$

4. $\frac{5}{12} \times 3$

5. $\frac{2}{7} \times 3$

6. $\frac{3}{5} \times 4$

7. $\frac{2}{3} \times 5$

8. $\frac{2}{3} \times 5$

9. $\frac{5}{9} \times 8$

10. $\frac{1}{3} \times 5$

3.2.3 Multiplication of two or more fractions (proper, improper and mixed) involving brackets

In multiplication of fractions, we simply multiply the numerator with the numerator and the denominator with the denominator.

Example 1 Solve $\frac{2}{3} \times \frac{1}{3}$

Solution

$$\frac{2}{3} \times \frac{1}{3} = \frac{2 \times 1}{3 \times 3} = \frac{2}{9}$$

Example 2 Solve $\frac{2}{3} \times \frac{1}{5} \times \frac{4}{6}$

Solution

$$\frac{2}{3} \times \frac{1}{5} \times \frac{4}{6} = \frac{2 \times 1 \times 4}{3 \times 5 \times 6} = \frac{8}{90}$$

If brackets are involved in multiplication of fractions then we have to multiply fractions present within the brackets first.

Example 3 Solve $\frac{2}{3} \times \left(\frac{4}{5} \times \frac{1}{3}\right)$

Solution

$$\begin{aligned} & \frac{2}{3} \times \left(\frac{4}{5} \times \frac{1}{3}\right) \\ &= \frac{2}{3} \times \left(\frac{4 \times 1}{5 \times 3}\right) \\ &= \frac{2}{3} \times \frac{4}{15} \\ &= \frac{2 \times 4}{3 \times 15} = \frac{8}{45} \end{aligned}$$

Example 4 Solve $2\frac{2}{3} \times \left(1\frac{4}{7} \times 3\frac{1}{2}\right)$

Solution

$$\begin{aligned} 2\frac{2}{3} \times \left(1\frac{4}{7} \times 3\frac{1}{2}\right) &= \frac{8}{3} \times \left(\frac{11}{7} \times \frac{7}{2}\right) \\ &= \frac{8}{3} \times \frac{11}{2} \\ &= \frac{\cancel{8}^4 \times 11}{3 \times \cancel{2}_1} \\ &= \frac{44}{3} = 14\frac{2}{3} \end{aligned}$$

Solve:**Exercise 3.5**

1. $\frac{1}{2} \times \left(\frac{2}{3} \times \frac{3}{4}\right)$
2. $\frac{1}{5} \times \left(\frac{3}{4} \times \frac{2}{7}\right)$
3. $\frac{1}{5} \times \left(\frac{5}{8} \times \frac{5}{7}\right)$
4. $\frac{3}{2} \times \left(\frac{8}{3} \times \frac{7}{4}\right)$
5. $\frac{7}{3} \times \left(\frac{1}{7} \times \frac{3}{2}\right)$
6. $\frac{1}{12} \times \left(\frac{4}{3} \times \frac{8}{5}\right)$
7. $\left(1\frac{2}{3} \times 3\frac{2}{3}\right) \times 2\frac{3}{4}$
8. $\left(2\frac{2}{9} \times 3\frac{4}{5}\right) \times 2\frac{3}{4}$
9. $\frac{6}{5} \times \left(1\frac{3}{4} \times \frac{2}{5}\right)$

3.2.3 Verification of Commutative Property of Multiplication of Fractions**Example 1** Show that $\frac{1}{7} \times \frac{4}{5} = \frac{4}{5} \times \frac{1}{7}$ **Solution:**

$$\begin{aligned} \text{L.H.S} &= \frac{1}{7} \times \frac{4}{5} \\ &= \frac{1 \times 4}{7 \times 5} \\ &= \frac{4}{35} \quad \text{.....(i)} \end{aligned}$$

$$\begin{aligned} \text{R.H.S} &= \frac{4}{5} \times \frac{1}{7} \\ &= \frac{4 \times 1}{5 \times 7} \\ &= \frac{4}{35} \quad \text{.....(ii)} \end{aligned}$$

From (i) and (ii)

L.H.S = R.H.S

Example 2 Verify that $1\frac{2}{3} \times 2\frac{4}{5} = 2\frac{4}{5} \times 1\frac{2}{3}$ **Solution:**

$$\begin{aligned} \text{L.H.S} &= 1\frac{2}{3} \times 2\frac{4}{5} \\ &= \frac{5}{3} \times \frac{14}{5} \\ &= \frac{\cancel{5}^1 \times 14}{3 \times \cancel{5}_1} = \frac{14}{3} \\ &= 4\frac{2}{3} \quad \text{.....(i)} \end{aligned}$$

$$\begin{aligned} \text{R.H.S} &= 2\frac{4}{5} \times 1\frac{2}{3} \\ &= \frac{14}{5} \times \frac{5}{3} \\ &= \frac{14 \times \cancel{5}^1}{\cancel{5}_1 \times 3} = \frac{14}{3} \\ &= 4\frac{2}{3} \quad \text{.....(ii)} \end{aligned}$$

From (i) and (ii) it is clear that L.H.S = R.H.S

Exercise 3.6

Verify that:

$$1. \quad \frac{5}{7} \times \frac{6}{11} = \frac{6}{11} \times \frac{5}{7}$$

$$3. \quad \frac{2}{3} \times \frac{2}{7} = \frac{2}{7} \times \frac{2}{3}$$

$$5. \quad 1\frac{1}{11} \times 2\frac{3}{4} = 2\frac{3}{4} \times 1\frac{1}{11}$$

$$7. \quad 2\frac{1}{3} \times 3\frac{4}{5} = 3\frac{4}{5} \times 2\frac{1}{3}$$

$$9. \quad 4\frac{1}{4} \times 1\frac{4}{5} = 1\frac{4}{5} \times 4\frac{1}{4}$$

$$2. \quad \frac{1}{12} \times \frac{5}{8} = \frac{5}{8} \times \frac{1}{12}$$

$$4. \quad 1\frac{2}{5} \times \frac{7}{9} = \frac{7}{9} \times 1\frac{2}{5}$$

$$6. \quad 3\frac{2}{3} \times \frac{1}{9} = \frac{1}{9} \times 3\frac{2}{3}$$

$$8. \quad 4\frac{1}{5} \times 2\frac{4}{5} = 2\frac{4}{5} \times 4\frac{1}{5}$$

$$10. \quad 1\frac{1}{2} \times 1\frac{1}{3} = 1\frac{1}{3} \times 1\frac{1}{2}$$

3.2.4 Verification of Associative Property of Multiplication of fractions

Example 1 Show that: $\frac{2}{3} \times \left(\frac{1}{3} \times \frac{5}{7}\right) = \left(\frac{2}{3} \times \frac{1}{3}\right) \times \frac{5}{7}$

Solution: $\frac{2}{3} \times \left(\frac{1}{3} \times \frac{5}{7}\right) = \left(\frac{2}{3} \times \frac{1}{3}\right) \times \frac{5}{7}$

$$\begin{aligned} \text{L.H.S} &= \left(\frac{2}{3} \times \frac{1}{3}\right) \times \frac{5}{7} \\ &= \left(\frac{2 \times 1}{3 \times 3}\right) \times \frac{5}{7} \\ &= \frac{2}{9} \times \frac{5}{7} \\ &= \frac{2 \times 5}{9 \times 7} \\ &= \frac{10}{63} \dots\dots\dots(ii) \end{aligned}$$

$$\begin{aligned} \text{R.H.S} &= \left(\frac{2}{3} \times \frac{1}{3}\right) \times \frac{5}{7} \\ &= \left(\frac{2 \times 1}{3 \times 3}\right) \times \frac{5}{7} \\ &= \frac{2}{9} \times \frac{5}{7} \\ &= \frac{2 \times 5}{9 \times 7} \\ &= \frac{10}{63} \dots\dots\dots(ii) \end{aligned}$$

From (i) and (ii)
L.H.S = R.H.S

Example2: Verify that: $1\frac{2}{3} \times \left(2\frac{1}{3} \times \frac{4}{5}\right) = \left(1\frac{2}{3} \times 2\frac{1}{3}\right) \times \frac{4}{5}$

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

$$\begin{aligned} \text{L.H.S} &= 1\frac{2}{3} \times \left(2\frac{1}{3} \times \frac{4}{5}\right) \\ &= \frac{5}{3} \times \left(\frac{7}{3} \times \frac{4}{5}\right) \\ &= \frac{5}{3} \times \frac{28}{15} \\ &= \frac{\cancel{5}^1 \times 28}{3 \times \cancel{15}_3} = \frac{28}{9} \\ &= 3\frac{1}{9} \quad \dots\dots(i) \end{aligned}$$

$$\begin{aligned} \text{R.H.S} &= \left(1\frac{2}{3} \times 2\frac{1}{3}\right) \times \frac{4}{5} \\ &= \left(\frac{5}{3} \times \frac{7}{3}\right) \times \frac{4}{5} \\ &= \frac{\cancel{5}^7 \times 7}{9} \times \frac{4}{\cancel{5}_1} \\ &= \frac{28}{9} \\ &= 3\frac{1}{9} \quad \dots\dots(ii) \end{aligned}$$

From (i) and (ii) it is clear that L.H.S = R.H.S

Thus, the product of any three fractions remains the same when multiplied in any order.

Exercise 3.7

Verify that:

1. $\frac{1}{2} \times \left(\frac{3}{5} \times \frac{3}{7}\right) = \left(\frac{1}{2} \times \frac{3}{5}\right) \times \frac{3}{7}$

2. $\frac{2}{5} \times \left(\frac{1}{3} \times \frac{3}{7}\right) = \left(\frac{2}{5} \times \frac{1}{3}\right) \times \frac{3}{7}$

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

4. $1\frac{2}{5} \times \left(2\frac{2}{3} \times \frac{7}{9}\right) = \left(1\frac{2}{5} \times 2\frac{2}{3}\right) \times \frac{7}{9}$

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

6. $\frac{4}{3} \times \left(\frac{3}{7} \times \frac{4}{9}\right) = \left(\frac{4}{3} \times \frac{3}{7}\right) \times \frac{4}{9}$

3.3 Division

3.3.1 Division of a fraction by another fraction (proper, improper and mixed)

In the process of division of a fraction by another fraction, we take the reciprocal of the second fraction and then multiply the fractions.

Example 1 Solve: $\frac{2}{3} \div \frac{1}{2}$

Solution $\frac{2}{3} \div \frac{1}{2}$

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

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

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

[Reciprocal of $\frac{1}{2}$ is $\frac{2}{1}$]

Example 2 Solve: $\frac{4}{5} \div \frac{7}{5}$

Solution: $\frac{4}{5} \div \frac{7}{5}$

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

$$= \frac{4 \times \cancel{5}}{\cancel{5} \times 7}$$

$$= \frac{4}{7}$$

Example 3 Solve: $4\frac{1}{5} \div \frac{7}{2}$

Solution: $4\frac{1}{5} \div \frac{7}{2} = \frac{21}{5} \times \frac{2}{7}$

$$= \frac{\overset{3}{\cancel{21}} \times 2}{5 \times \cancel{7}_1}$$

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

$$= \frac{6}{5}$$

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

Exercise 3.8

Solve the following:

1. $\frac{3}{10} \div \frac{3}{5}$

2. $\frac{2}{3} \div \frac{1}{3}$

3. $\frac{7}{9} \div \frac{5}{6}$

4. $\frac{4}{7} \div 2\frac{1}{10}$

5. $\frac{2}{3} \div 1\frac{1}{3}$

6. $\frac{7}{4} \div 1\frac{1}{2}$

7. $2\frac{3}{4} \div 4\frac{1}{5}$

8. $1\frac{1}{2} \div 1\frac{1}{3}$

9. $3\frac{1}{5} \div 2\frac{2}{3}$

3.3.2 Simplification of expressions involving fractions using BODMAS rule

Example Solve $1\frac{1}{3} + \{(5\frac{1}{3} \div 2) - \frac{1}{4}\}$

Solution

$$\begin{aligned}
 & 1\frac{1}{3} + \{(5\frac{1}{3} \div 2) - \frac{1}{4}\} \\
 &= \frac{4}{3} + \{(\frac{16}{3} \div 2) - \frac{1}{4}\} \\
 &= \frac{4}{3} + \{(\frac{16}{3} \times \frac{1}{2}) - \frac{1}{4}\} \\
 &= \frac{4}{3} + \{\frac{8}{3} - \frac{1}{4}\} \\
 &= \frac{4}{3} + \{\frac{32-3}{12}\}
 \end{aligned}$$

$$\begin{aligned}
 & \Rightarrow \frac{4}{3} + \frac{29}{12} \\
 &= \frac{16+29}{12} \\
 &= \frac{45}{12} = \frac{15}{4} \\
 &= 3\frac{3}{4}
 \end{aligned}$$

Exercise 3.9

Solve the following:

1. $2\frac{1}{3} \times (\frac{2}{3} + \frac{3}{5}) \div \frac{2}{5}$

3. $1\frac{2}{3} \times (\frac{4}{9} + \frac{2}{3}) \div (2\frac{2}{5} \times \frac{1}{2})$

5. $[\{(\frac{9}{10} \div 3) + \frac{7}{10}\} - \frac{1}{5}]$

7. $2\frac{2}{3} \times \{1\frac{1}{4} + (3\frac{1}{3} - 2\frac{1}{2})\}$

2. $(\frac{1}{2} + \frac{1}{5}) \div (\frac{3}{3} \times \frac{1}{2})$

4. $4\frac{1}{3} + \{(3\frac{3}{5} + 1\frac{3}{4}) \times 4\}$

6. $\frac{1}{4} + \{\frac{1}{3} \div \frac{1}{2} \times (\frac{1}{5} - \frac{1}{10})\}$

8. $[2\frac{4}{9} - \{\frac{4}{9} - (\frac{5}{9} - \frac{1}{3})\} \times 9]$

Review Exercise 3

1. Four options are given for each question. Encircle the correct answer:

(i) $\frac{1}{3} + \frac{1}{3}$

(a) $\frac{1}{3}$

(b) $\frac{2}{3}$

(c) $\frac{3}{3}$

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

(ii) $\frac{7}{9} - \frac{4}{9}$

(a) $\frac{11}{9}$

(b) $\frac{28}{9}$

(c) $\frac{3}{9}$

(d) $\frac{1}{9}$

(iii) $\frac{2}{3} \times \frac{5}{7} = ?$

(a) $\frac{7}{10}$

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

(c) $\frac{10}{21}$

(d) $\frac{14}{15}$

(iv) $\frac{5}{9} \div \frac{1}{9}$

(a) 9

(b) 5

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

(d) $\frac{1}{5}$

2. Solve:

i. $\frac{7}{8} + \frac{5}{8}$

ii. $\frac{1}{3} + 2\frac{1}{3}$

iii. $1\frac{7}{9} + 1\frac{1}{9}$

iv. $\frac{7}{9} - \frac{5}{9}$

v. $1\frac{1}{3} - \frac{2}{3}$

vi. $3\frac{1}{12} - 1\frac{1}{12}$

vii. $\frac{1}{4} + \frac{3}{4} + \frac{5}{4}$

viii. $\frac{5}{7} + \frac{1}{7} + \frac{3}{7}$

ix. $\frac{2}{3} + \frac{1}{3} + 1\frac{1}{3}$

x. $\frac{1}{3} \times 2\frac{1}{3}$

xi. $2\frac{3}{4} \times \frac{1}{4}$

xii. $\frac{2}{7} + (\frac{3}{7} + \frac{4}{7})$

xiii. $\frac{2}{3} \times (\frac{2}{3} \times \frac{1}{3})$

xiv. $3\frac{1}{2} \div \frac{1}{4}$

xv. $4\frac{1}{5} \div 1\frac{1}{5}$

xvi. $\frac{7}{20} - \frac{7}{30}$

Summary

- To add or subtract two or more fractions with different denominators we have to make denominators of fractions equal by converting fractions to equivalent fractions.
- Multiplication of fraction by a number means number of times addition of that fraction.
- To multiply a fraction by a whole number, simply multiply the numerator by the whole number.
- To multiply two or more fractions, multiply their numerators to get numerator and multiply their denominators to get denominator of the required product.
- $\frac{1}{2} + \frac{1}{3} = \frac{1}{3} + \frac{1}{2}$ is called commutative property of addition of fractions.
- $\frac{1}{4} \times \frac{1}{3} = \frac{1}{3} \times \frac{1}{4}$ called commutative property of multiplication of fractions.
- $(\frac{1}{7} + \frac{2}{7}) + \frac{3}{7} = \frac{1}{7} + (\frac{2}{7} + \frac{3}{7})$ is called associative property of addition of fractions.
- $(\frac{1}{5} \times \frac{2}{5}) \times \frac{4}{5} = \frac{1}{5} \times (\frac{2}{5} \times \frac{4}{5})$ is called associative property of multiplication of fractions.

4.1 Decimals

A decimal is a number that is written using the base-ten place value system. A decimal point separates the ones and tenths digits.

4.1.1 Add and subtract decimals

Addition of decimals

You have learnt addition of decimals upto two decimal places in class 4.

Let us review it.

Example 1

Add: 32.14 and 18.92

Solution

$$\begin{array}{r} \textcircled{1} \textcircled{1} \\ 32.14 \\ + 18.92 \\ \hline 51.06 \end{array}$$

Example 2

Find $417.46 + 58.9$

Solution

$$\begin{array}{r} \textcircled{1} \textcircled{1} \\ 417.46 \\ + 58.90 \\ \hline 476.36 \end{array} \quad \leftarrow \text{Write zero as a placeholder}$$

We have seen that in addition of decimals the following points are kept in mind.

- i. We line up the decimal point.
- ii. The decimals are made equal decimal places by adding zeros.
- iii. We add the decimals as we add the whole numbers.
- iv. The decimal points are in column.

We proceed ahead to learn the addition of decimal up to four places.

Example 1Solve: $57.3851 + 62.5764$ **Solution**

$$57.3851 + 62.5764$$

Writing in the vertical form

$$\begin{array}{r}
 \textcircled{1} \textcircled{1} \\
 57.3851 \\
 + 62.5764 \\
 \hline
 119.9615
 \end{array}$$

Example 2Solve: $318.533 + 721.6454$ **Solution**

$$318.533 + 721.6454$$

Writing in the vertical form

$$\begin{array}{r}
 \textcircled{1} \textcircled{1} \\
 318.5330 \\
 + 721.6454 \\
 \hline
 1040.1784
 \end{array}$$

Subtraction of decimals

We have learnt subtraction of decimals upto two decimal places in class 4. Let us review it.

Example 1

Subtract: 34.87 from 65.29

Solution

$$65.29 - 34.87$$

Writing in the vertical form

$$\begin{array}{r}
 \textcircled{10} \\
 6^4 \cancel{5} . 29 \\
 - 34 . 87 \\
 \hline
 30 . 42
 \end{array}$$

Example 2Solve: $334.20 - 86.48$ **Solution**

$$334.20 - 86.48$$

Writing in the vertical form

$$\begin{array}{r}
 \textcircled{10} \textcircled{10} \textcircled{10} \textcircled{10} \\
 2^2 \cancel{3}^2 \cancel{4}^1 . 2^0 \\
 - 86 . 48 \\
 \hline
 247 . 72
 \end{array}$$

We have seen that in subtraction of decimals the following points are kept in mind.

- i. We line up the decimal points.

- ii. The decimals are made equal decimal places by adding zeros.
- iii. We subtract the decimals as we subtract the whole numbers.
- iv. The decimal points are in column.

We proceed ahead to learn the subtraction of decimals upto four decimal places.

Example 1 Solve: $751.64 - 384.3545$

Solution $751.64 - 384.3545$

Writing in the vertical form.

$$\begin{array}{r}
 \overset{6}{\cancel{7}} \overset{4}{\cancel{5}} \overset{10}{1} . \overset{5}{\cancel{6}} \overset{3}{\cancel{4}} \overset{10}{0} \overset{9}{\cancel{0}} \overset{10}{0} \leftarrow \text{Write zeros as place holder} \\
 - 384 . 3545 \\
 \hline
 367 . 2855
 \end{array}$$

Example 2 Subtract: 875.3678 from 986.2598

Solution $986.2598 - 875.3678$

Writing in the vertical form.

$$\begin{array}{r}
 98 \overset{5}{\cancel{6}} . \overset{10}{\cancel{2}} \overset{10}{5} 98 \\
 - 875 . 3678 \\
 \hline
 110 . 8920
 \end{array}$$

Exercise 4.1

1. Solve:

- | | |
|--------------------------|-------------------------|
| i. $45.23 + 23.76$ | ii. $726.53 + 47.8$ |
| iii. $67.2358 + 70.5234$ | iv. $33.4035 + 65.7028$ |
| v. $45.204 + 68.3268$ | vi. $87.7201 + 64.653$ |

2. Solve:

i. $951.3745 - 802.454$

ii. $778.342 - 47.8$

iii. $138.632 - 88.3409$

iv. $537.4532 - 412.32$

4.1.2 Recognize like and unlike decimals

Consider the following decimals:

- | | | |
|-------------|---------|------------------------------|
| i. | 33.2 | It has one decimal place. |
| ii. | 124.35 | It has two decimal places. |
| iii. | 41.237 | It has three decimal places. |
| iv. | 29.1345 | It has four decimal places. |

Like decimals:

Decimals with the same number of decimal places are called like decimals.

For example, 12.345, 2.127 are like decimals, each has three decimal places.

Unlike decimals:

Decimals with different number of decimal places are called unlike decimals.

For example, 9.72, 13.5, 321.578 and 3.1245 are unlike decimals. Each has a different number of decimal places.

NOTE:

We can transform unlike decimals to like decimals by adding placeholder zeros on right side of decimal part.

Activity: Write like/unlike against each pair of decimals.

Decimals	Like/Unlike decimals
37.23 , 37.32	like
65.40 , 16.21	
29.432 , 30.43	
381.532 , 181.340	
13.1818 , 14.199	
74.1702 , 17.0004	

4.1.3 Multiplication of decimals by 10, 100 and 1000

(a) Multiplication of decimals by 10

Multiplying a decimal by 10 is equivalent to forming a new number by moving the decimal point of the given decimal to the right 1 place.

Examples

- i. $3.57 \times 10 = 35.7$ ii. $15.453 \times 10 = 154.53$
iii. $97.23 \times 10 = 972.3$ iv. $321.4 \times 10 = 3214$

(b) Multiplication of decimals by 100

Multiplying a decimal by 100 is equivalent to forming a new number by moving the decimal point of the given decimal to the right 2 places.

Examples

- i. $38.241 \times 100 = 3824.1$ ii. $4.1532 \times 100 = 415.32$
iii. $65.32 \times 100 = 6532$ iv. $987.5 \times 100 = 98750$

(c) Multiplication of decimals by 1000

Multiplying a decimal by 1000 is equivalent to forming a new number by moving the decimal point of the given decimal to the right 3 places.

Examples

i. $2.3781 \times 1000 = 2378.1$ ii. $8.23451 \times 1000 = 8234.51$

iii. $7.32 \times 1000 = 7320$ iv. $5.7 \times 1000 = 5700$

4.1.4 Division of decimals by 10, 100 and 1000**(a) Division of decimals by 10**

Dividing a decimal by 10 is equivalent to forming a new number by moving the decimal point of the given decimal to the left 1 place.

Examples

i. $51.23 \div 10 = 5.123$ ii. $321.25 \div 10 = 32.125$

iii. $7.98 \div 10 = 0.798$ iv. $0.275 \div 10 = 0.0275$

(b) Division of decimals by 100

Dividing a decimal by 100 is equivalent to forming a new number by moving the decimal point of the given decimal to the left 2 places.

Examples

i. $321.5 \div 100 = 3.215$ ii. $98.2 \div 100 = 0.982$

iii. $8.34 \div 100 = 0.0834$ iv. $0.391 \div 100 = 0.00391$

(c) Division of decimals by 1000

Dividing a decimal by 1000 is equivalent to forming a new number by moving the decimal point of the given decimal to the left 3 places.

Examples

- i. $3451.2 \div 1000 = 3.4512$ ii. $345.91 \div 1000 = 0.34591$
iii. $27.51 \div 1000 = 0.02751$ iv. $0.378 \div 1000 = 0.000378$

Exercise 4.2**1. Multiply the following decimals by 10.**

- i. 66.78 ii. 103.681 iii. 88.6734
iv. 111.22 v. 29.34 vi. 38.2

2. Multiply the following decimals by 100.

- i. 72.721 ii. 137.2351 iii. 21.82

3. Multiply the following decimals by 1000.

- i. 70.0345 ii. 31.8301 iii. 57.223

4. Divide the following decimals by 10.

- i. 83.52 ii. 172.002 iii. 0.651

5. Divide the following decimals by 100.

- i. 161.31 ii. 1472.53 iii. 0.231

6. Divide the following decimals by 1000.

- i. 3434.43 ii. 293.75 iii. 37.582

4.1.5 Multiplication of a decimal with a whole number:

Let us learn this method by taking a few simple examples

Example 1 Solve 35.2×3 **Solution** 35.2×3

$$\begin{array}{r}
 35.2 \times 3 \\
 = \frac{352}{10} \times 3 \\
 = \frac{1056}{10} \\
 = 105.6
 \end{array}$$

Example 2 Solve 2.34×15 **Solution** 2.34×15

$$\begin{array}{r}
 2.34 \times 15 \\
 = \frac{234}{100} \times 15 \\
 = \frac{3510}{100} \\
 = 35.10
 \end{array}$$

Rule:

Multiplication of the decimal by the whole number ignoring the decimal point. See the decimal point in the given decimal and mark the decimal point in the product with the same number of places.

More Examples**Example 3** Solve 7.324×5 **Solution** 7.324×5

$$= 7.324 \times 5 \quad [3 \text{ decimal places}]$$

$$= 36.620 \quad [3 \text{ decimal places}]$$

Example 4 Solve 1.4235×67 **Solution** 1.4235×67

$$= 1.4235 \times 67 \quad [4 \text{ decimal places}]$$

$$= 95.3745 \quad [4 \text{ decimal places}]$$

Working

$$\begin{array}{r}
 1.4235 \\
 \times \quad \quad \quad 67 \\
 \hline
 99645 \\
 854100 \\
 \hline
 95.3745
 \end{array}$$

4.1.6 Division of a decimal with a whole number

Consider the following examples:

Example 1 Divide 782.25 by 21

Solution $782.25 \div 21$

Divide as you would with whole numbers .

$$\begin{array}{r}
 37.25 \\
 21 \overline{) 782.25} \\
 \underline{-63} \\
 152 \\
 \underline{-147} \\
 52 \\
 \underline{-42} \\
 105 \\
 \underline{-105} \\
 0
 \end{array}$$

Line up decimal point in quotient with decimal point in dividend.

Stop dividing when you get a zero remainder.

Thus, $782.25 \div 21 = 37.25$

Dividend decimal has 2 decimal places.

Quotient decimal has 2 decimal places.

Example 2 Divide 725.772 by 31

Solution $725.772 \div 31$

$$\begin{array}{r}
 23.412 \\
 31 \overline{) 725.772} \\
 \underline{62} \\
 105 \\
 \underline{93} \\
 127 \\
 \underline{124} \\
 37 \\
 \underline{31} \\
 62 \\
 \underline{62} \\
 0
 \end{array}$$

Line up decimal point in quotient with decimal point in dividend.

Thus, $725.772 \div 31 = 23.412$

Dividend decimal has 3 decimal places.

Quotient decimal has 3 decimal places.

4.1.7 Multiplication of a decimal with tenth, and hundredths only

Consider the following example:

Example 1

Find the product of 7.5 and 0.6

$$\begin{aligned}\text{Solution } 7.5 \times 0.6 \\ &= \frac{75}{10} \times \frac{6}{10} \\ &= \frac{450}{100} = 4.50\end{aligned}$$

Example 2

Find the product of 12.3 and 0.5

$$\begin{aligned}\text{Solution } 12.3 \times 0.5 \\ &= \frac{123}{10} \times \frac{5}{10} \\ &= \frac{615}{100} = 6.15\end{aligned}$$

Example 3

Solve 2.3×0.05

$$\begin{aligned}\text{Solution } 2.3 \times 0.05 \\ &= \frac{23}{10} \times \frac{5}{100} \\ &= \frac{115}{1000} = 0.115\end{aligned}$$

Example 4

Solve 37.3×0.05

$$\begin{aligned}\text{Solution } 37.3 \times 0.05 \\ &= \frac{373}{10} \times \frac{5}{100} \\ &= \frac{1865}{1000} = 1.865\end{aligned}$$

4.1.8 Multiplication of decimal by a decimal (with three decimal places)

Example 1 Solve 4.2×0.004

$$\begin{aligned}\text{Solution } 4.2 \times 0.004 \\ &= \frac{42}{10} \times \frac{4}{1000} \\ &= \frac{168}{10,000} = 0.0168\end{aligned}$$

Example 2

Find the product of 15.6 and 0.423

$\begin{aligned}\text{Solution } 15.6 \times 0.423 \\ &= \frac{156}{10} \times \frac{423}{1000} \\ &= \frac{65988}{10,000} = 6.5988\end{aligned}$	<p>Working</p> $\begin{array}{r} 15.6 \\ \times 0.423 \\ \hline 468 \\ 3120 \\ 62400 \\ \hline 65988 \end{array}$
---	--

Exercise 4.3

1. Solve the following.

i. 13.2×7 ii. 37.4×12 iii. 45.31×32 iv. 3.456×23

2. Solve the following.

i. $97.29 \div 23$ ii. $185.74 \div 37$ iii. $341.88 \div 42$ iv. $252.32 \div 83$

3. Solve the following.

i. 3.75×8.4 ii. 47.31×32.56 iii. 4.381×2.4 iv. 58.32×37.02

4.1.9 Division of a decimal by a decimal (by converting decimals to fractions)

Example 1

Divide 0.8 by 0.4

Solution

$$\begin{aligned}
 &0.8 \div 0.4 \\
 &= \frac{8}{10} \div \frac{4}{10} \\
 &= \frac{8}{10} \times \frac{10}{4} \\
 &= \frac{2\cancel{8}}{\cancel{4}_1} = 2
 \end{aligned}$$

Example 2

Divide 0.05 by 0.005

Solution

$$\begin{aligned}
 &0.05 \div 0.005 \\
 &= \frac{5}{100} \div \frac{5}{1000} \\
 &= \frac{\cancel{5}^1}{1\cancel{00}} \times \frac{\cancel{1000}^{10}}{\cancel{5}_1} \\
 &= 10
 \end{aligned}$$

Example 3 Solve $1.575 \div 4.5$

Solution

$$\begin{aligned}
 &1.575 \div 4.5 \\
 &= \frac{1575}{1000} \div \frac{45}{10} \\
 &= \frac{\cancel{1575}^{315}}{\cancel{1000}^{100}} \times \frac{\cancel{10}^{10}}{\cancel{45}_9} \\
 &= \frac{35}{100} = 0.35
 \end{aligned}$$

4.1.10 Use of division to change fractions into decimals

Examples 1 Convert $\frac{1}{4}$ to decimal.

Solution

$$\begin{array}{r} 0.25 \\ 4 \overline{) 1.00} \\ \underline{- 8} \\ 20 \\ \underline{- 20} \\ 0 \end{array}$$

Thus, $\frac{1}{4} = 0.25$

Remember:

- Dividend 1 is smaller than divisor 4. We cannot divide it.
- Put decimal point on the right of 1 and put decimal point in the quotient.
- Now $4 \times 2 = 8$, we add one more zero on the right of already taken zero.
- Now we complete the division process. Leave it when remainder in zero.
- Always line up the decimal points.

Example 2

Convert $\frac{4}{5}$ to decimal.

Solution

$$\begin{array}{r} 0.8 \\ 5 \overline{) 4.0} \\ \underline{- 4.0} \\ 0 \end{array}$$

Thus, $\frac{4}{5} = 0.8$

Example 3

Convert $1\frac{3}{4}$ to decimal.

Solution $1\frac{3}{4} = \frac{7}{4}$

$$\begin{array}{r} 1.75 \\ 4 \overline{) 7.00} \\ \underline{- 4} \downarrow \\ 30 \downarrow \\ \underline{- 28} \downarrow \\ 20 \\ \underline{- 20} \\ 0 \end{array}$$

Thus, $1\frac{3}{4} = 1.75$

Example 4 Convert $3\frac{1}{8}$ to decimal.

Solution $3\frac{1}{8} = \frac{25}{8}$

$$\begin{array}{r}
 3.125 \\
 8 \overline{) 25.000} \\
 \underline{-24} \quad \downarrow \quad \downarrow \quad \downarrow \\
 10 \quad \downarrow \quad \downarrow \quad \downarrow \\
 \underline{-8} \quad \downarrow \quad \downarrow \quad \downarrow \\
 20 \quad \downarrow \quad \downarrow \quad \downarrow \\
 \underline{-16} \quad \downarrow \quad \downarrow \quad \downarrow \\
 40 \quad \downarrow \quad \downarrow \quad \downarrow \\
 \underline{-40} \quad \downarrow \quad \downarrow \quad \downarrow \\
 0
 \end{array}$$

Thus, $3\frac{1}{8} = 3.125$

Note: we can take 3 as whole number and change $\frac{1}{8}$ to decimal.

Example 5 Change $2\frac{1}{80}$ to decimal.

Solution $2\frac{1}{80} = \frac{161}{80}$

$$\begin{array}{r}
 2.0125 \\
 80 \overline{) 161.0000} \\
 \underline{-160} \quad \downarrow \downarrow \downarrow \downarrow \\
 100 \quad \downarrow \downarrow \downarrow \downarrow \\
 \underline{-80} \quad \downarrow \downarrow \downarrow \downarrow \\
 200 \quad \downarrow \downarrow \downarrow \downarrow \\
 \underline{-160} \quad \downarrow \downarrow \downarrow \downarrow \\
 400 \quad \downarrow \downarrow \downarrow \downarrow \\
 \underline{-400} \quad \downarrow \downarrow \downarrow \downarrow \\
 0
 \end{array}$$

Thus, $2\frac{1}{80} = 2.0125$

4.1.11 Simplify decimal expressions involving brackets (applying one or more basic operations)

Example 1 Simplify: $2.1 + (1.3 \times 2.1 \div 0.7)$

Solution

$$\begin{aligned} & 2.1 + (1.3 \times 2.1 \div 0.7) \\ &= 2.1 + (1.3 \times 3) \\ &= 2.1 + 3.9 \\ &= 6.0 \end{aligned}$$

Working

$$\begin{aligned} & 2.1 \div 0.7 \\ &= \frac{21}{10} \times \frac{10}{7} \\ &= 3 \end{aligned}$$

Example 2 Simplify: $8.2 - (2.2 \times 1.1 + 3.1)$

Solution

$$\begin{aligned} & 8.2 - (2.2 \times 1.1 + 3.1) \\ &= 8.2 - (2.42 + 3.1) \\ &= 8.2 - 5.52 \\ &= 2.68 \end{aligned}$$

Working

$$\begin{array}{r} 2.2 \\ \times 1.1 \\ \hline 22 \\ 220 \\ \hline 2.42 \end{array} \quad \begin{array}{r} 8.20 \\ - 5.52 \\ \hline 2.68 \end{array}$$

Example 3 Simplify: $2.2 (6.4 - 2.52 \div 2.1)$

Solution

$$\begin{aligned} & 2.2 (6.4 - 2.52 \div 2.1) \\ &= 2.2 (6.4 - 1.2) \\ &= 2.2 \times 5.2 \\ &= 11.44 \end{aligned}$$

Working

$$\begin{array}{r} 2.52 \div 2.1 \\ = \frac{252}{100} \div \frac{21}{10} \\ = \frac{252}{100} \times \frac{10}{21} \\ = \frac{12}{10} = 1.2 \end{array} \quad \begin{array}{r} 2.2 \\ \times 5.2 \\ \hline 44 \\ 1100 \\ \hline 11.44 \end{array}$$

Exercise 4.4

1. Solve:

i. $25.5 \div 0.5$ ii. $33.6 \div 1.4$ iii. $32.5 \div 2.5$ iv. $103.4 \div 4.7$

2. Change the following fractions to decimals.

i. $\frac{1}{25}$ ii. $\frac{3}{20}$ iii. $3\frac{2}{5}$ iv. $6\frac{3}{5}$

3. Simplify the following expressions.

i. $(5.3 + 2.1 - 3.4) \times 2.8$

ii. $6.3 - (2.4 - 1.2 \times 1.3)$

iii. $3.7 (2.87 \div 0.7 \times 2)$

iv. $2.2 + (8.4 \div .12 - 20.6)$

v. $(19.4 - 8.2 \times 1.2) + 11.7$

vi. $8.8 - (2.1 + 5.4 \div 0.9)$

4.1.12 Round off decimals upto specified number of decimal places**Definition:**

To round a number means to approximate the number to a given value. When rounding look at the digit to the right of the given place value. If the digit to the right is less than 5, round down. If the digit to the right is 5 or greater than 5, round up.

Example 1

Round 7.12 to the nearest tenth.

Solution

We want to round to the nearest tenth.

7.12

Because the hundredths' digit 2 is less than 5, round down and drop the remaining digits.

The decimal 7.12 rounded to the nearest tenth is 7.1

Example 2

Round 6.237 to the nearest hundredth.

Solution

6.237

Because the thousandths' digit is greater than 5, round up.

The decimal 6.237 rounded to the nearest hundredths is 6.24

Example 3 Round 17.5678 to the nearest thousandths.

Solution 17.5678 Because $8 > 5$, we round up

The decimal 17.5678 rounded to the nearest thousandths is 17.568

4.1.13 Convert fractions to decimals and vice versa

We have learnt how to convert fraction to decimals in article 4.1.1.

We know that:

i. $\frac{1}{4} = 0.25$

ii. $\frac{4}{5} = 0.8$

iii. $1\frac{3}{4} = 1.75$

iv. $3\frac{1}{8} = 3.125$ and $2\frac{1}{80} = 2.0125$

Let us learn how to convert decimals to fractions.

Example 1 Convert 0.25 to fraction.

Solution 0.25 consist of 2 tenths and 5 hundredths.

$$\begin{aligned}\text{Thus, } 0.25 &= \frac{2}{10} + \frac{5}{100} \\ &= \frac{2 \times 10 + 5 \times 1}{100} \\ &= \frac{20 + 5}{100} \\ &= \frac{25}{100} \\ &= \frac{1}{4} \quad (\text{simplest form})\end{aligned}$$

Alternatively:

$$\begin{aligned}0.25 &(\text{it has 25 hundredths}) \\ &= \frac{25}{100} \\ &= \frac{1}{4} \quad (\text{simplest form})\end{aligned}$$

Example 2 Convert 3.125 to fraction.

Solution 3.125 to fraction

$$3.125 = \frac{3125}{1000} = \frac{\overset{25}{\cancel{125}}}{\underset{200}{\cancel{1000}}} = \frac{25}{8} = 3\frac{1}{8}$$

Rule to convert decimals to fractions

- i. Remove the decimal point.
- ii. In the denominator put 1 under decimal point.
- iii. Add as many zeros on the right side of 1 as decimal places in the given decimal.
- iv. Simplify the fraction to its simplest form

More examples:

- i. Convert 2.73 to fraction

Solution

$$\begin{aligned}
 &2.73 \\
 &= \frac{273}{100} \\
 &= 2\frac{73}{100}
 \end{aligned}$$

- ii. Convert 1.65 to fraction

Solution

$$\begin{aligned}
 &1.65 \\
 &= \frac{165}{100} \\
 &= \frac{33}{20} = 1\frac{13}{20}
 \end{aligned}$$

Exercise 4.5

1. Round the following to the nearest one decimal place:
 - i. 8.23
 - ii. 5.38
 - iii. 6.62
2. Round the following to the nearest two decimal places:
 - i. 15.635
 - ii. 8.772
 - iii. 17.827
3. Round the following to the nearest three decimal places:
 - i. 71.8345
 - ii. 90.0362
 - iii. 108.3184
4. Convert the following fractions to decimals:
 - i. $\frac{3}{4}$
 - ii. $5\frac{1}{8}$
 - iii. $17\frac{2}{5}$
5. Convert the following decimals to fractions:
 - i. 17.23
 - ii. 24.52
 - iii. 19.11

4.1.14 Solve real life problems involving decimal

Example 1 Noureen bought 6 note books at the rate of Rs. 22.75 per notebook. How much did she pay?

Solution Cost of one notebook = Rs. 22.75
 Number of notebooks = 6
 Cost of 6 notebooks = 22.75×6
 = Rs. 136.50

Example 2 Javeria bought 13.1 meters of cloth and paid Rs. 238.42 to the shopkeeper. Find the cost per metre of the cloth?

Solution

Number of metres the cloth was bought = 13.1
 Money paid to the shopkeeper = Rs. 238.42
 Rate of the cloth per metre = $238.42 \div 13.1$
 $= 238.42 \times \frac{1}{13.1}$
 $= \frac{2384.2}{131}$
 = Rs. 18.20

Working

$$\begin{array}{r} 18.2 \\ 131 \overline{) 2384.2} \\ \underline{131} \downarrow \\ 1074 \downarrow \\ \underline{1048} \downarrow \\ 262 \\ \underline{262} \\ 0 \end{array}$$

Example 3 Mehwish is 1.91m tall and Nazli is 0.03m smaller than Mehwish. Find Nazli's height.

Solution Mehwish's height = 1.91m
 Nazli's height = $1.91 - 0.03$
 = 1.88m

Exercise 4.6

- Cost of 15.2kg of rice is Rs. 1220.56. Find the cost of 1kg of rice.
- 12.5kg of apples cost Rs. 1065. Find the cost of 8.5kg of apples.

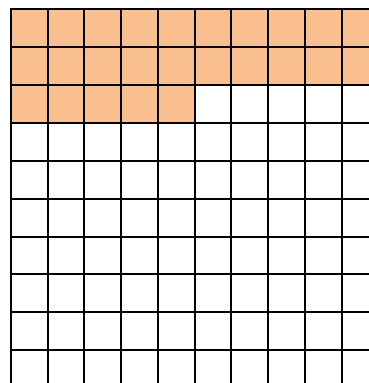
3. Your CD player runs for about 6.5 hours on new batteries. The average length of CDs in your collection is about 1.3 hours. How many CDs can you expect to listen using one new set of batteries?
4. Total length of a pole is 21.3 meters. If 0.2 meter of the length of this pole is inside the ground. Find how much of its length is outside the ground?
5. A person died leaving property worth Rs. 4000.40. His widow got 0.125 of the property. His son got 0.4 of the remainder. What did his widow and son get?

4.2 Percentages

4.2.1 Recognize percentage as a special kind of fraction

Percent:

A ratio whose denominator is 100. The symbol for percent is %. The model on right has 25 out of 100 squares shaded. You can say that 25 percent of the squares are shaded.



Numbers:

You can write 25 percent as $\frac{25}{100}$ or as 25%.

Now percentage has been deduced from per centum which mean rate per hundred or out of 100.

You can see that percentage is a special kind of fraction whose denominator is 100.

i. $\frac{11}{100}$ means 11%

ii. $\frac{23}{100}$ means 23%

iii. $\frac{17}{100}$ means 17%

iv. $\frac{123}{100}$ means 123%

4.2.2 Convert percentage to fraction and to decimal and vice versa

(a) Conversion of percentage to fraction and decimal

Example 1 Convert 13% to fraction and decimal.

Solution 13% [13 out of 100]

$$= \frac{13}{100} = 0.13$$

Example 2 Convert 27% to fraction and decimal.

Solution 27% [27 out of 100]

$$= \frac{27}{100} = 0.27$$

Example 3 Convert 137% to fraction and decimal.

Solution 137%

$$= \frac{137}{100} = 1.37$$

(b) Conversion of fraction and decimal to percentage

Example 1

Convert $\frac{4}{5}$ to percentage.

Solution $\frac{4}{5}$

$$= \frac{4 \times 20}{5 \times 20} = \frac{80}{100}$$

$$= 80\%$$

Example 3

Convert $\frac{3}{10}$ to percentage.

Solution $\frac{3}{10}$

$$= \frac{3 \times 10}{10 \times 10} = \frac{30}{100}$$

$$= 30\%$$

Example 2

Convert $\frac{3}{4}$ to percentage.

Solution $\frac{3}{4}$

$$= \frac{3 \times 25}{4 \times 25} = \frac{75}{100}$$

$$= 75\%$$

Example 4

Convert 0.19 to percentage.

Solution 0.19

$$= \frac{19}{100}$$

$$= 19\%$$

Example 5 Convert 0.294 to percentage.

Solution $0.294 = \frac{294}{1000}$
 $= \frac{294}{100 \times 10}$
 $= \frac{29.4}{100} = 29.4\%$

Activity: Fill in the blanks as given in (i)

Sr. No,	Percentage	Fraction	Decimal
i.	61	$\frac{61}{100}$	0.61
ii.	25		
iii.			0.33
iv.		$\frac{11}{25}$	
v.	37		
vi.			0.65
vii.		$\frac{17}{26}$	
viii.	49		

Exercise 4.7

1. Write the percentage as a fraction.

- | | | | |
|--------|---------|----------|-----------|
| i. 63% | ii. 31% | iii. 93% | iv. 17% |
| v. 80% | vi. 27% | vii. 76% | viii. 41% |

2. Write the fraction as a percent.

i. $\frac{17}{50}$

ii. $\frac{16}{25}$

iii. $\frac{7}{10}$

iv. $\frac{3}{20}$

v. $\frac{9}{10}$

vi. $\frac{1}{4}$

vii. $\frac{3}{5}$

viii. $\frac{3}{4}$

3. Write the decimal as percent.

i. 0.17

ii. 0.23

iii. 0.51

iv. 0.19

4. Calculate the following:

i. 20% of 80

ii. 50% of 40

iii. 40% of 85

4.2.3 Solve real life problems involving percentage

Example 1 15 out of 20 men were wearing caps in the mosque. What percent of men were wearing caps?

Solution

$$\text{Total number of men} = 20$$

$$\text{Number of men wearing caps} = 15$$

$$\begin{aligned}\text{Percent of men wearing caps} &= \frac{15}{20} \times 100 \\ &= 75\%\end{aligned}$$

Example 2 There are 50 green pages of a book and 200 pages are white. What percentage of pages are green?

Solution Total number of pages of the book = $50 + 200 = 250$

$$\text{Number of green pages} = 50$$

$$\begin{aligned}\text{Percentage of green pages} &= \frac{50}{250} \times 100 \\ &= 20\%\end{aligned}$$

Exercise 4.8

1. Price of a pen is Rs. 450. The shopkeeper sold it at a discount of 20%. What did the customer pay to the shopkeeper?

2. A man spends 30% of his income on the education of his children. If he spends Rs. 2100 on education, then find his income.
3. Anwar purchased a table for Rs. 4000. He paid 40% of the price in cash and promised to pay the remaining amount after one month. What did he pay in cash and what amount shall he pay after one month?
4. A student read 70% of pages of a book. If the total number of the pages are 300, how many pages are left to be read?

Review Exercise 4

1. Four possible options have been given. Encircle the correct one.
 - i. Adding 2.12 and 2.6
(a) 4.18 (b) 4.72 (c) 4.0 (d) 4.08
 - ii. Subtracting 3.4 from 5.84
(a) 2.44 (b) 2.80 (c) 9.24 (d) 2.4
 - iii. How many decimal places has 3.456?
(a) 6 (b) 5 (c) 4 (d) 3
 - iv. Multiplying 36.57 by 1000.
(a) 0.03657 (b) 3657 (c) 36570 (d) 365.7
 - v. Dividing 983.6 by 100.
(a) 9.836 (b) 98360 (c) 98.36 (d) 9836
 - vi. What is the product of 0.6 and 3?
(a) 18 (b) 1.8 (c) 9 (d) 0.2
 - vii. Dividing 0.4 by 0.2
(a) 0.02 (b) 0.003 (c) 2 (d) 0.008

- viii. Change $\frac{4}{5}$ to decimal.
(a) 0.008 (b) 1.25 (c) 0.08 (d) 0.8
- ix. Round 13.568 to the nearest hundredth.
(a) 13.57 (b) 13.569 (c) 13.6 (d) 13
2. Simplify the following expressions.
i. $3.21(7.5 - 2.3 \times 1.2)$ ii. $(8.4 - 2.4 \div .6) + 2.7$
iii. $5.03 + (3.2 + 2.9 \times 2.1)$ iv. $8.9 - (12.7 - 3.2 \times 2.2)$
3. Convert the following decimals to fraction.
i. 7.23 ii. 13.97 iii. 6.032
4. Write the percent as a fraction.
i. 54% ii. 72% iii. 97%
5. Write the fraction as a percent.
i. $\frac{13}{50}$ ii. $\frac{7}{10}$ iii. $\frac{29}{100}$
6. Calculate the following:
i. 30% of 30 ii. 20% of 60 iii. 40% of 65
7. Ashraf has Rs. 5000. He gave Rs. 3000 to his brother. What percentage of his amount did he give to his brother?
8. Monthly income of a man is Rs. 7000. He spends Rs. 6000/- monthly. What percentage of his income is he saving?
9. A tailor has 33.6m long piece of cloth. He uses 2.1m cloth for a shirt. How many shirts can he prepare out of this cloth?
10. How many jugs of milk are needed to fill a bucket of capacity 201.15 litre with 1.25 litre jug?

SUMMARY

- A decimal is a number that is written using the base-ten place value system where a decimal point separates the ones and tenths digits.
- In addition of decimals we line up the decimals points, decimals are made of equal decimal places, decimals are added as whole number are added and decimal points are kept in a column.
- In subtraction of decimals we line up the decimal points, decimals are made of equal decimal places, decimal are subtracted as whole numbers and decimal points are kept in a column.
- Decimals with different number of decimal places are called unlike decimals.
- Unlike decimals can be transformed to like decimals by adding placeholder zeros on right side of decimal part.
- Multiplying decimals by 10, 100 and 1000, decimal point of given decimal is moved to the right by 1, 2 and 3 decimal places receptively.
- Dividing a decimal by 10, 100 or 1000 is equivalent to forming a new number by moving the decimal point of the given decimal to the left 1, 2 and 3 places respectively.
- To multiply the decimal by the whole number, we ignore the decimal point. See the decimal places in the given decimal and put the decimal point in the product with the same number of places.
- To multiply a decimal by a decimal is to count the decimal places in the multiplicand and the multiplier and find their sum. Put in the decimal point in the product with this sum of places counting from the right.
- To round means to approximate the number in a given place value. When rounding look at the digit to the right of the given place value. If the digit to the right is less than 5, round down. If the digit to the right is 5 or greater than 5, round up.

5.1 Distance

Distance is a numerical description of how far apart objects are.

5.1.1 Conversion of Units of Lengths

We can convert the unit of distance from one unit to another using the given chart.

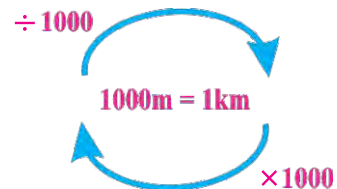
$$\begin{aligned} 1000\text{m} &= 1\text{km} \\ 100\text{cm} &= 1\text{m} \\ 10\text{mm} &= 1\text{cm} \end{aligned}$$

• Kilometres to metres

We can convert Kilometres to metres by multiplying the kilometres with 1000. For example, $3\text{ km} = 3 \times 1000 = 3000\text{ m}$

For changing metres to kilometres we divide the metres by 1000. For example,

$$21000\text{ m} = \frac{21000}{1000} = 21\text{ km}$$

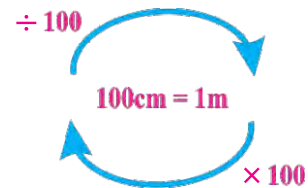


• Metres to centimetres

We can convert metres to centimetres by multiplying the metres with 100. For example, $2.5\text{ m} = 2.5 \times 100 = 250\text{ cm}$.

For changing centimetres to metres we divide the centimetres by 100. For example,

$$3500\text{ cm} = \frac{3500}{100} = 35\text{ m}$$

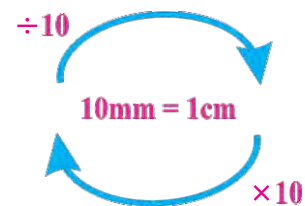


• Centimetres to millimetres,

We can convert centimetres to millimetres by multiplying the centimetres with 10. For example, $6\text{ cm} = 6 \times 10 = 60\text{ mm}$.

For changing millimetres to centimetres we divide the millimetres by 10. For example,

$$500\text{ mm} = \frac{500}{10} = 50\text{ cm}$$



Example 1 Convert 25 km to metres.

Solution 25 kilometres
 $\because 1 \text{ kilometre} = 1000 \text{ metres.}$
 $25 \text{ kilometres} = 25 \times 1000 \text{ m}$
 $= 25,000 \text{ metres}$

Example 2 Convert 15 metres to centimetres.

Solution 15 metres
 $\because 1 \text{ metre} = 100 \text{ centimetre}$
 $15 \text{ metres} = 15 \times 100 \text{ cm}$
 $= 1500 \text{ cm}$

Example 3 Convert 5 centimetres to millimetres.

Solution 5 centimetres
 $\because 1 \text{ centimetre} = 10 \text{ mm}$
 $5 \text{ centimetres} = 5 \times 10 \text{ mm}$
 $= 50 \text{ mm}$

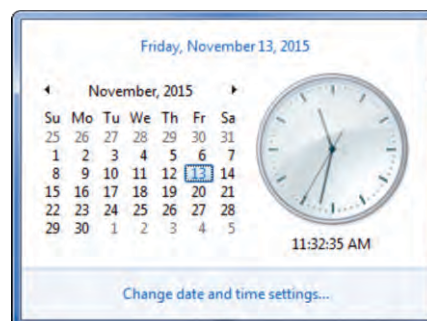
Exercise 5.1

Convert the following:

- | | |
|--------------------------|-----------------------------|
| i. 320 mm to centimetres | ii. 6420 m to kilometres |
| iii. 642 cm to metres | iv. 88 cm to metres |
| v. 224 cm to millimetres | vi. 4.5 cm to millimetres |
| vii. 32 km to metres | viii. 8.73 m to centimetres |
| ix. 150 cm to metres | x. 360 mm to centimetres |

5.2 Time

Time is measured using seconds, minutes, hours, days, weeks, months and years. Clocks measure time in seconds, minutes, hours. Calendars are used to keep the records of days, weeks, months and years.



5.2.1 Conversion of hours to minutes, minutes to seconds and vice versa

In our daily life we need to perform conversions between seconds, minutes and hours. Now we will learn how to perform these conversions. For converting, units of time chart given is helpful.

Time Units Conversion Chart

One Minute	=	60 Seconds
One Hour	=	60 Minutes
One Day	=	24 Hours
One Week	=	7 Days
One Month	=	~ 4 weeks
One Year	=	12 Months

~ : approximately

• Conversion of hours to minutes

As 1 hour = 60 minutes so to convert hours to minutes we multiply number of hours by 60. Following examples show how to convert hours to minutes.

Example Convert the following hours to minutes:

- i. 3 hours ii. 11 hours 55 minutes iii. $2\frac{1}{4}$ hours

Solution i. 3 hours = $3 \times 60 = 180$ minutes.

ii. 11 hours 55 minutes = $11 \times 60 + 55 = 660 + 55 = 715$ minutes.

iii. $2\frac{1}{4}$ hours = $\frac{9}{4} \times 60 = 9 \times 15 = 135$ minutes.

• Conversion of minutes to hours

As 60 minutes = 1 hour or 1 minute = $\frac{1}{60}$ so to convert minutes to hours we divide number of minutes by 60. Following examples show how to convert minutes to hours.

Example Convert the following minutes to hours:

- i. 900 minutes ii. 350 minutes iii. 90 minutes

Solution i. 900 minutes = $\frac{900}{60} = 15$ hours

ii. 350 minutes = $\frac{350}{60} = 5\frac{50}{60} = 5$ hours and 50 minutes

iii. 90 minutes = $\frac{90}{60} = 1\frac{30}{60} = 1$ hour and 30 minutes

- **Conversion of minutes to seconds**

As 1 minute = 60 seconds so to convert minutes to seconds we multiply number of minutes by 60. Following examples show how to convert minutes to seconds.

Example Convert the following minutes to seconds.

- i. 10 minutes ii. 48 minutes

Solution

i. 10 minutes = $10 \times 60 = 600$ seconds

ii. 48 minutes = $48 \times 60 = 2880$ seconds

- **Conversion of seconds to minutes**

As 60 seconds = 1 minute or 1 second = $\frac{1}{60}$ so to convert seconds to minutes we divide number of seconds by 60. Following examples show how to convert seconds to minutes.

Example Convert the following seconds to minutes

- i. 600 seconds ii. 540 seconds
iii. 350 seconds iv. 90 seconds

Solution

i. 600 seconds = $\frac{600}{60} = 10$ minutes

ii. 540 seconds = $\frac{540}{60} = 9$ minutes

iii. 350 seconds = $\frac{350}{60} = 5\frac{50}{60}$
= 5 minutes and 50 seconds

iv. 90 seconds = $\frac{90}{60} = 1\frac{30}{60}$
= 1 minute and 30 seconds

	Working
	5 minutes
60	350
	-300
	50 seconds

5.2.2 Addition and subtraction of units of time with carrying / borrowing

• Addition of Units of Time with carrying

The process is illustrated in the following examples.

Example Add.

- i. 55 minutes, 45 minutes
- ii. 2 hours 30 minutes, 3 hours 58 minutes
- iii. 8 hours 45 minutes 40 seconds, 7 hours 21 minutes 35 seconds
- iv. 9 hours 30 minutes 47 seconds, 3 hours 47 minutes 58 seconds
- v. 18 hours 45 minutes 50 seconds, 15 hours 55 seconds, 10 hours 40 minutes

Solution

- i. 55 minutes, 45 minutes

	Hours	Minutes
①		
	0	55
+	0	45
	1	40

Working	
1 hour	
60	$\begin{array}{r} 100 \\ - 60 \\ \hline 40 \text{ minutes} \end{array}$

- ii. 2 hours 30 minutes, 3 hours 58 minutes

	Hours	Minutes
①		
	2	30
+	3	58
	6	28

Working	
1 hour	
60	$\begin{array}{r} 88 \\ - 60 \\ \hline 28 \text{ minutes} \end{array}$

- iii. 8 hours 45 minutes 40 seconds, 7 hours 21 minutes 35 seconds

	Hours	Minutes	Seconds
①		①	
	8	45	40
+	7	21	35
	16	7	15

Working					
1 hour					
60	$\begin{array}{r} 67 \\ - 60 \\ \hline 7 \text{ minutes} \end{array}$				
	<table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2" style="text-align: right;">1 minute</th> </tr> </thead> <tbody> <tr> <td style="text-align: right;">60</td> <td style="border-left: 1px solid black; padding-left: 10px;"> $\begin{array}{r} 75 \\ - 60 \\ \hline 15 \text{ seconds} \end{array}$ </td> </tr> </tbody> </table>	1 minute		60	$\begin{array}{r} 75 \\ - 60 \\ \hline 15 \text{ seconds} \end{array}$
1 minute					
60	$\begin{array}{r} 75 \\ - 60 \\ \hline 15 \text{ seconds} \end{array}$				

- iv. 9 hours 30 minutes 47 seconds, 3 hours 47 minutes 58 seconds

Hours	Minutes	Seconds
① 9	① 30	47
+ 3	47	58
13	18	45

- v. 18 hours 45 minutes 50 seconds, 15 hours 55 seconds, 10 hours 40 minutes

Days	Hours	Minutes	Seconds
①	①	①	
	18	45	50
	15	0	55
+ 10	40	0	
1	20	26	45

• Subtraction of Units of Time with Borrowing

The process of subtraction is illustrated in the following example.

Example Subtract

- i. 4 hour 10 minutes from 6 hour 25 minutes
 ii. 1 hour 35 minutes from 2 hour 18 seconds
 iii. 2 hour 52 minutes 24 seconds from 4 hour 10 minutes 20 seconds
 iv. 1 hour 5 minutes 35 seconds from 8 hour 5 minutes

Solution

- i. 4 hour 10 minutes from
6 hour 25 minutes

Hours	Minutes
6	25
– 4	10
2	15

- ii. 1 hour 35 minutes from
2 hour 18 seconds

Hours	Minutes
① 2	⑥① 18
– 1	35
0	43

$$60 + 18 = 78$$

$$78 - 35 = 43$$

- iii. 2 hour 52 minutes 24 seconds from 4 hour 10 minutes 20 seconds

	Hours	Minutes	Seconds
	3	⁶⁰ 9	⁶⁰
	4	10	20
–	2	52	24
	1	17	56

$$60 + 20 = 80$$

$$80 - 24 = 56$$

$$60 + 9 = 69$$

$$69 - 52 = 17$$

- iv. 1 hour 5 minutes 35 seconds from 8 hour 5 minutes

	Hours	Minutes	Seconds
	7	⁶⁰ 4	⁶⁰
	8	5	0
–	1	5	35
	6	59	25

$$60 + 0 = 60$$

$$60 - 35 = 25$$

$$60 + 4 = 64$$

$$64 - 5 = 59$$

Exercise 5.2

1. Convert the following:

- 6 hours 40 minutes into minutes.
- 4 minutes 25 seconds into seconds.

2. Convert the following:

- 750 minutes into hours and minutes.
- 900 seconds into minutes and seconds.

3. Solve:

- 3 hours 20 minutes + 1 hour 10 minutes
- 6 hours 45 minutes + 4 hours 15 minutes
- 1 hours 37 minutes + 5 hours 47 minutes
- 9 hours 17 minutes – 3 hours 55 minutes
- 6 hours 27 minutes – 2 hours 46 minutes
- 8 hours 38 minutes – 3 hours 44 minutes
- 5 hours 15 minutes – 1 hour 52 minutes

5.2.3 Conversion of years to months, months to days, weeks to days and vice versa.

Now we learn to perform conversion between days, weeks, months and years.

- **Conversion of years to months**

Following example shows how to convert years to months:

Example Convert:

- i. 15 years to months
- ii. 10 years 11 months to months

Solution 1 year = 12 months

- i. 15 years = $15 \times 12 = 180$ months
- ii. 10 years 11 months = $10 \times 12 + 11 = 120 + 11 = 131$ months

- **Conversion of months to years**

Following example shows how to convert months to years.

Example Convert:

- i. 132 months to years
- ii. 85 months to months and years

Solution 1 month = $\frac{1}{12}$ year

- i. 132 months = $\frac{132}{12} = 11$ years
- ii. 85 months = $\frac{85}{12} = 7\frac{1}{12} = 7$ years 1 month

- **Conversion of months to days**

Following example shows how to convert months to days.

Example Convert:

- i. 4 months to days
- ii. 20 months 15 days to days

Solution 1 month = 30 days

- i. 4 months = $4 \times 30 = 120$ days
- ii. 20 months 15 days = $20 \times 30 + 15 = 600 + 15 = 615$ days

- **Conversion of days to months**

Following example shows how to convert days to months.

Example Convert:

- i. 480 days to months ii. 760 days to months and days

Solution 1 day = $\frac{1}{30}$ months

i. 480 days = $\frac{480}{30} = 16$ months

ii. 760 days = $\frac{760}{30} = 25\frac{10}{30} = 25$ months 10 days

- **Conversion of weeks to days**

Following example shows how to convert weeks to days.

Example Convert:

- i. 18 weeks to days ii. 20 weeks 15 days to days

Solution 1 week = 7 days

i. 18 weeks = $18 \times 7 = 126$ days

ii. 20 weeks 15 days = $20 \times 7 + 15 = 140 + 15 = 155$ days.

- **Conversion of days to weeks**

Following example shows how to convert days to weeks.

Example Convert:

- i. 168 days to weeks ii. 750 days to weeks and days

Solution 1 day = $\frac{1}{7}$ week

i. 168 days = $\frac{168}{7} = 24$ weeks

ii. 750 days = $\frac{750}{7} = 107\frac{1}{7}$
= 107 weeks 1 day

Exercise 5.3

Convert:

1. 83 days to weeks and days
2. 100 days to weeks and days
3. 138 days to weeks and days
4. 1050 days to weeks and days
5. 150 days to months and days
6. 850 days to months and days
7. 1000 days to months and days
8. 35 months to years and months
9. 150 months to years and months
10. 40 months to days
11. 115 months to days
12. 12 years to months
13. $5\frac{5}{12}$ years to months
14. $10\frac{11}{12}$ years to months

5.2.4 Solution of real life problems involving conversion, addition and subtraction of units of time.

Following examples illustrate the use of units of time in real life.

Example 1 Salma is 10 years and 7 months old and her brother is 2 years and 6 months older than her. Find the age of her brother.

Solution Adding 2 years and 6 months to the age of Salma as her brother is older than her:

	Years	Months	
Salma's age =	^① 10	7	$7 + 6 = 13$
Her brother is older by =	+ 2	6	13 months = 1 year 1 month
Age of her brother =	<u>13</u>	<u>1</u>	

Example 2 A train departed from Lahore railway station at 7: 30 am. It travelled for 5 hours and 45 minutes to reach Multan railway station. Find at what time it reached there?

	Hours	Minutes	
Departure time =	^① 7	30	$30 + 45 = 75$
Travelling time =	+ 5	45	75 minutes = 1 hour 15 minutes
Arrival at Multan =	<u>13</u>	<u>15</u>	= 1: 15 pm

Example 3 A man took 44 minutes 5 seconds to reach his office. If he has to stop at four road signals for 1 minute 5 seconds, 45 seconds, 50 seconds and 1 minute 30 seconds. Find how much was his actual travelling time?

Solution

	Minutes	Seconds
	②	
Wait at signal 1 =	1	05
Wait at signal 2 =	0	45
Wait at signal 3 =	0	50
Wait at signal 4 =	+	1 30
Total time at signals =	4	10
	Minutes	Seconds
	43	⑥0
Total Time =	44	05
Time at signals =	– 04	10
Actual travelling time =	39	55

Exercise 5.4

1. Ali is 12 years 9 months old and his sister Alia is 3 years 11 months old. What is the difference in their ages? How much younger Alia is from Ali?
2. Akbar started searching for his missing ball at 2:40 p.m. If he found 3:50 p.m., for how long did he search for the ball?
3. Mr. Murad teaches his class for 45 minutes. If it starts at 3:30 p.m., at what time does it end?
4. Shamim studies from 3:15 p.m. to 4:45 p.m. His sister, Samina studies from 4:30 p.m. to 6:15 p.m. Who studies longer and by how much?
5. Pervaiz has to take his medicine (one pill) after every hour. How many pills will he need for 3 days?
6. Maryam was on vacation for 3 weeks. How many days was she on vacation?

7. Murad ran in a track race on Tuesday. He finished the race in 420 seconds. How many minutes did it take to run the race?
8. Haroon is a runner. He ran 10 Km marathon in 5 hours. How many minutes did he run?
9. Aslam took 100 minutes to complete his homework. How many hours did he take to complete his homework?
10. Tariq studies 5 subjects at home. He spends 50 minutes on Mathematics, 50 minutes on Science, 30 minutes on English, 40 minutes on Urdu, 20 minutes on Computer Studies. Find:
 - (a) How much time had he spent on doing Mathematics and Science?
 - (b) How much time had he spent on doing Urdu and English?
 - (c) How much time had he to study the five subjects altogether?
11. A train takes 4 hours 45 minutes to reach Lahore from Rawalpindi. While a car through motorway, takes 3 hours 50 minutes. Find how much more time does the train take to reach Lahore?

5.3 Temperature

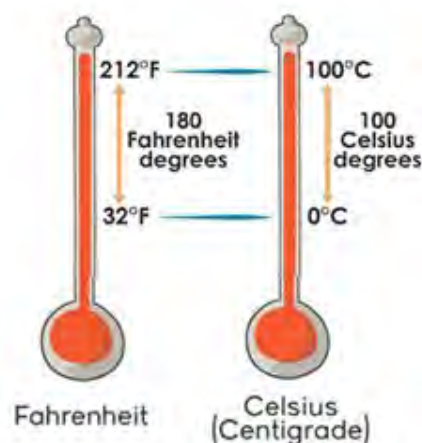
Temperature is one of the basic physical quantities of science. It's a numerical representation of how cold or hot an object is. Temperature is defined as the degree of heat present in an object, measured by a thermometer.

5.3.1 Recognition of units of temperature in Fahrenheit and Celsius

The following two basic temperature scales are commonly used:

- Celsius or Centigrade (C)
- Fahrenheit (F)

- **Celsius Scale:** The basic unit of temperature for everyday applications and use is Celsius scale, in which 0°C corresponds to the freezing point of water and 100°C is its boiling point. It is widely known as centigrade scale because the distance between melting point and boiling point of water is divided into 100 equal intervals called degrees centigrade($^{\circ}\text{C}$).
- **Fahrenheit Scale:** The second basic unit for measuring temperature is Fahrenheit. In Fahrenheit scale 32°F is freezing point and 212°F is the boiling point of water. In Fahrenheit temperature scale, the distance between melting point and boiling point of water is divided in 180 equal intervals called degrees Fahrenheit ($^{\circ}\text{F}$).



Celsius, known as centigrade is a scale of measurement for temperature. It is named after the Swedish astronomer Anders Celsius (1701–1744), who developed a similar temperature scale.

Fahrenheit (symbol $^{\circ}\text{F}$) is a temperature scale proposed in 1724 by the German physicist Daniel Gabriel Fahrenheit (1686–1736), after whom the scale is named.

5.3.2 Solution of real life problems involving conversion, addition and subtraction of units of temperature

In daily life to convert Celsius scale temperature to Fahrenheit scale temperature or vice versa, following steps are taken:

- To convert Celsius to Fahrenheit we multiply the given temperature by $\frac{9}{5}$ and add 32 to the product [or $F = \frac{9}{5} \times C + 32$]

where F is Fahrenheit temperature and C is Celsius temperature.

- To convert Fahrenheit to Celsius we subtract 32 from Fahrenheit temperature and multiply the difference by $\frac{5}{9}$ [or $C = (F - 32) \times \frac{5}{9}$] where C is Celsius temperature and F is Fahrenheit temperature.

Example

Convert:

- | | |
|--------------------------------|--------------------------------|
| i. 32°F to Celsius scale | ii. 212°F to Celsius scale |
| iii. 35° C to Fahrenheit scale | iv. 102° C to Fahrenheit scale |

Solution

- i. 32°F to Celsius scale

Subtract 32 from Fahrenheit temperature = $32 - 32 = 0$

Multiply the difference with $\frac{5}{9} = \frac{5}{9} \times 0 = 0^\circ\text{C}$

Thus, $32^\circ\text{F} = 0^\circ\text{C}$

- ii. 212°F to Celsius scale

Subtract 32 from Fahrenheit temperature = $212 - 32 = 180$

Multiply the difference with $\frac{5}{9} = \frac{5}{9} \times 180 = 100^\circ\text{C}$

Thus, $212^\circ\text{F} = 100^\circ\text{C}$

- iii. 35° C to Fahrenheit scale

Multiply the Celsius scale temperature by $\frac{9}{5} = 35 \times \frac{9}{5} = 63$

Add 32 to the product = $63 + 32 = 95^\circ\text{F}$

Thus, $35^\circ\text{C} = 95^\circ\text{F}$

- iv. 102° C to Fahrenheit scale

Multiply the Celsius scale temperature by $\frac{9}{5} = 102 \times \frac{9}{5} = 183.6$

Add 32 to the product = $183.6 + 32 = 215.6^\circ\text{F}$

Thus, $102^\circ\text{C} = 215.6^\circ\text{F}$

Example

The melting point of a metal is 263°C . If another metal is amalgam (mixed) in it then its melting point is increased by 25°C . Find the new melting point of the mixture.

Solution

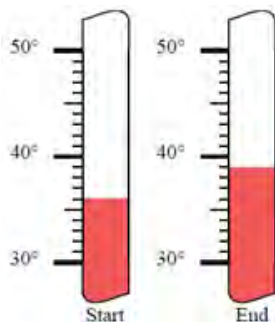
Melting point of pure metal = 263°C

Increase in melting point = 25°C

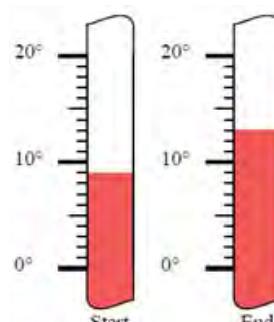
Thus, melting point of mixture is $= 263^{\circ} + 25^{\circ} = 288^{\circ}\text{C}$

Exercise 5.5**1. Determine the sum and difference of these temperatures.**

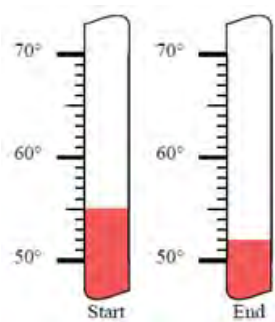
i.



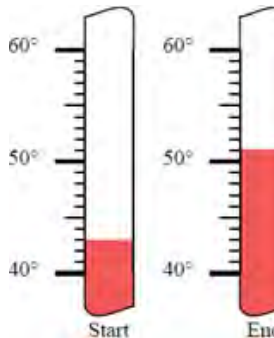
ii.



iii.



iv.

**2. Convert the following temperatures to Fahrenheit scale:**i. 45°C ii. 180°C iii. 210°C iv. 70°C v. 21°C vi. 69°C vii. 85°C viii. 99°C **3. Convert the following temperatures to Celsius scale:**i. 54°F ii. 18°F iii. 121°F iv. 75°F v. 51°F vi. 119°F vii. 105°F viii. 79°F

4. Solve: (Give your answer in Fahrenheit)

- | | |
|---|--|
| i. $110^{\circ}\text{C} + 250^{\circ}\text{F}$ | ii. $80^{\circ}\text{C} + 125^{\circ}\text{F}$ |
| iii. $90^{\circ}\text{F} + 125^{\circ}\text{C}$ | iv. $65^{\circ}\text{F} + 50^{\circ}\text{C}$ |
| v. $70^{\circ}\text{C} - 100^{\circ}\text{F}$ | vi. $90^{\circ}\text{C} - 105^{\circ}\text{F}$ |
| vii. $90^{\circ}\text{F} - 25^{\circ}\text{C}$ | viii. $65^{\circ}\text{F} - 0^{\circ}\text{C}$ |

5. The maximum temperature on a hot day in the month of June is 43°C . What is the maximum temperature on Fahrenheit scale?
6. If the normal body temperature of human body is 98.6°F . What is the normal temperature on a Celsius scale?
7. One day the temperature at 11:00 a.m. was 39°F , and by 2:00 p.m. the temperature was 51°F . What was the change in temperature?
8. In the morning the temperature was 110°F . By the noon time it has gone up by 15° Fahrenheit. What was the noon temperature? (Give your answer in Centigrade)
9. Maqsood records the temperature as 45°C . A thunderstorm comes and the temperature drops by 11° centigrade. What is the temperature after the thunderstorm? (Give your answer in Fahrenheit)

Review Exercise 5

1. Four possible options have been given. Encircle the correct one.

i. 1 cm = _____ mm

- (a) 100 (b) 10 (c) $\frac{1}{10}$ (d) $\frac{1}{100}$

ii. 1 metre = _____ Km

- (a) 1000 (b) 100 (c) $\frac{1}{10}$ (d) $\frac{1}{1000}$

iii. 1 cm = _____ m

- (a) 100 (b) 10 (c) $\frac{1}{10}$ (d) $\frac{1}{100}$

iv. 1 day = _____ hours

- (a) 24 (b) 12 (c) $\frac{1}{12}$ (d) $\frac{1}{24}$

v. 1 hour = _____ days

- (a) 24 (b) 12 (c) $\frac{1}{12}$ (d) $\frac{1}{24}$

vi. To convert Celsius scale to Fahrenheit scale we:

- (a) multiply given temperature by $\frac{9}{5}$ and add 32 to the product.
- (b) multiply given temperature by $\frac{5}{9}$ and add 32 to the product.
- (c) subtract 32 from the given temperature and multiply the difference by $\frac{9}{5}$.
- (d) subtract 32 from the given temperature and multiply the difference by $\frac{5}{9}$.

- vii. To convert Fahrenheit scale to Celsius scale we:
- (a) multiply given temperature by $\frac{9}{5}$ and add 32 to the product.
 - (b) multiply given temperature by $\frac{5}{9}$ and add 32 to the product.
 - (c) subtract 32 from the given temperature and multiply the difference by $\frac{9}{5}$.
 - (d) subtract 32 from the given temperature and multiply the difference by $\frac{5}{9}$.
- viii. In Celsius scale the distance between the boiling point of water and freezing point of water is divided into how many equal parts?
- (a) 180 (b) 100 (c) 150 (d) 200
- ix. In Fahrenheit scale the distance between the boiling point of water and freezing point of water is divided into how many equal parts?
- (a) 180 (b) 100 (c) 150 (d) 200
- x. On a Fahrenheit scale the boiling point of water is:
- (a) 100 (b) 180 (c) 200 (d) 212
2. Complete the following:
- i. 1 hour = _____ mins
 - ii. $2\frac{1}{2}$ hours = _____ mins
 - iii. 3 hours and 57 mins = _____ mins
 - iv. $4\frac{3}{4}$ hours = _____ mins
 - v. 5 hours and 33 mins = _____ mins
 - vi. $6\frac{1}{4}$ hours = _____ mins
3. Write the following as hours and minutes.
- i. 330 mins = _____ hours _____ minutes

- ii. 260 mins = _____ hours _____ minutes
- iii. 470 mins = _____ hours _____ minutes
- iv. 205 mins = _____ hours _____ minutes
4. Convert the following:
- i. 28 km 540 m to m
- ii. 29 m 25 cm to cm
- iii. 95 cm 6 mm to mm
- iv. 1024 m to km
- v. 321 cm to m
- vi. 1543 mm to cm
5. Convert the following:
- i. 55 weeks to days
- ii. 105 days to weeks and days
- iii. 370 days to months and days
- iv. 100 months to years and months
6. Add:
- i. 3 hrs 42 min 34 sec to 11 hrs 36 min 31 sec
- ii. 27 hrs 37 sec to 18 hrs and 59 min
- iii. 59 min 59 sec to 1 hr 10 min 10 sec
7. Subtract:
- i. 8 hrs 40 min 20 sec from 11 hrs 32 min 10 seconds
- ii. 5 hrs 30 sec from 8 hrs 10 min
- iii. 3 hrs 20 min 45 sec from 6 hrs
8. Solve: (Give your answer in °C)
- i. $118^{\circ}\text{F} + 105^{\circ}\text{C}$ ii. $85^{\circ}\text{C} + 85^{\circ}\text{F}$
- iii. $95^{\circ}\text{F} - 11^{\circ}\text{C}$ iv. $70^{\circ}\text{C} - 85^{\circ}\text{F}$

9. Tahreem left her house at 10:20 a.m. She spent 2 hours and 15 minutes at her friend's house. She spent 1 hour and 30 minutes in the library. She spent 40 minutes at the park. What time will it be at the end of those activities?
10. Chaudhry needs 45 minutes to get ready. He needs 10 minutes to iron his work clothes. He needs 30 minutes to take breakfast. If it is 6:00 a.m. and he needs to be at work by 8:30 a.m. How much spare time does he have?
11. When Aneesa brought her Ammi's coffee, it was at 152°F . But her Ammi forgot about it for a couple of hours. When she drank it, it had cooled to a room temperature of 68°F . Find the difference in temperature of coffee.
12. Razia's Ammi went to the grocery store. Her mother left the house at 5:05 p.m. and returned at 6:23 p.m. How long was her Ammi gone for shopping?
13. Akbar's family drove to their farm house. They left at 7:30 a.m. they stopped after driving for 4 hours and 18 minutes. It took an other 2 hours and 12 minutes to get to the farm house. What time did they arrive there?
14. Nurse Chandni took Tariq's temperature. It was 103.7°F . How much was it above normal temperature of human body?
(Normal temperature of human body is 98.6°F)
15. The weather forecaster stated that the maximum temperature for the day was 102°F and the minimum temperature was 78°F . What is the difference between the two recorded temperatures?

16. The boiling point of water is 212°F , and the freezing point is 32°F . What is the difference between these 2 temperatures?
17. Today's temperature was 37°C . The maximum temperature for today was 43°C , and the minimum temperature was 12°C . What is the difference between today's temperature and the maximum temperature? Also find the difference between today's temperature and the minimum temperature.

SUMMARY

- We can convert Kilometres to metres by multiplying the kilometres with 1000.
- We can convert metres to centimetres by multiplying the metres with 100.
- We can convert millimetres to metres by dividing the millimetres by 1000.
- For changing metres to kilometres we divide the metres by 1000.
- For changing centimetres to metres we divide the centimetres by 100.
- For changing millimetres to centimetres we divide the millimetres by 10.
- Calendars are used to keep the records of days, weeks, months and years.
- 1 hour = 60 minutes.
- 1 minute = $\frac{1}{60}$ hour.
- 1 minute = 60 seconds.
- 1 year = 12 months
- 1 month = $\frac{1}{12}$ year

- 1 month = 30 days
- $1 \text{ day} = \frac{1}{30} \text{ months}$
- 1 week = 7 days
- $1 \text{ day} = \frac{1}{7} \text{ week}$
- Temperature is defined as the degree of heat present in an object, measured by a thermometer.
- Celsius Scale: The basic unit of temperature for everyday applications and use is Celsius scale, in which 0°C corresponds to the freezing point of water and 100°C is its boiling point. It is widely known as Centigrade scale because the difference between freezing and boiling points of water is divided into 100 equal intervals called degrees Centigrade ($^{\circ}\text{C}$).
- Fahrenheit Scale: Another unit of temperature is Fahrenheit, are used to record surface temperature measurements by meteorologists in the United States. In Fahrenheit scale 32°F is freezing point and 212°F is the boiling point of water. In Fahrenheit temperatures scale the difference between freezing and boiling points of water, is divided into 180 equal intervals called degree Fahrenheit ($^{\circ}\text{F}$).
- To convert Celsius to Fahrenheit we multiply the given temperature by $\frac{9}{5}$ and add 32 to the product.
- To convert Fahrenheit to Celsius we subtract 32 from Fahrenheit temperature and multiply the difference by $\frac{5}{9}$ the difference.

6.1 Unitary Method

6.1.1 Describe the concept of unitary method.

Unitary means "of one". In unitary method the cost of several objects is given and then by finding the cost of one object we can calculate the cost of many objects.

6.1.2 Calculate the value of many objects of the same kind when the value of one of these objects is given.

If the value of one object is known we can find the value of many objects of the same kind by multiplication. Following example illustrates this process.

Example Cost of 1 book is Rs. 20. What is the cost of 10 such books?

Solution: Cost of 1 book = Rs. 20

$$\begin{aligned}\text{Cost of 10 books} &= 20 \times 10 \\ &= \text{Rs. } 200\end{aligned}$$

Multiply the value of one object by the number of more objects.

Cost of 10 books is Rs. 200.

6.1.3 Calculate the value of one object when the value of many objects of the same type is given

Let us explain this method with the help of a few examples.

Example 1 If 4 oranges cost Rs.12, how much do 9 oranges cost?

Solution Cost of 4 oranges = Rs. 12

$$\text{Cost of 1 orange} = \frac{12}{4} = \text{Rs. } 3$$

$$\text{Cost of 9 oranges} = 9 \times 3 = \text{Rs. } 27$$

Cost of 9 oranges is Rs. 27

Example 2 Cost of 5 pens is Rs 125. What is the cost of 10 pens?

Solution Cost of 5 pens = Rs. 125

$$\text{Cost of 1 pen} = \frac{125}{5} = \text{Rs. } 25$$

$$\text{Cost of 10 pens} = 10 \times 25 = \text{Rs. } 250$$

Cost of 10 pens is Rs. 250

Example 3 5 workers can complete a work in 22 days. In how many days same work will be completed if 11 workers are employed?

Solution 5 workers can complete a work in = 22 days

$$1 \text{ worker can complete the work in} = 5 \times 22 = 110 \text{ days}$$

$$11 \text{ workers can complete the work in} = \frac{110}{11} = 10 \text{ days}$$

11 workers can complete the work in 10 days.

Exercise 6.1

1. If a carpet is sold for Rs.1,550 per square metre, how much will it cost to cover a room that measures 20 square metres?
2. If 4 litres of paint can cover 1,120 square metres, how many square metres will 7 litres of paint cover?
3. If the scale on a map reads $2 \text{ cm} = 50 \text{ km}$, how many km are there between two cities whose distance on a map is 7.5 cm ?
4. If a person burns 120 calories in 15 minutes of cycling, how many calories will the person burn in 75 minutes?
5. If a pizza delivery person drives 276 km in 3 days, how many km will the person drive in 5 days?

6. If an author writes 3 chapters in 10 days, how long will it take the author to write a 15 chapter book?
7. If it takes 12 metres cloth to make 3 dresses, how many metres of cloth will be needed to make 10 dresses?
8. If 4 kg of grass seed covers 1,250 square metres, how many kg of grass seed will be needed to cover 3,000 square metres?
9. Parvez earns Rs. 3,600 in 4 days. How many days will it take him to earn Rs. 4,500?

6.2 Direct and Inverse Proportion

6.2.1 Define ratio of two quantities.

A ratio is a relation between two quantities of the same kind. It can be expressed as a fraction. The symbol for ratio is a colon (:). Ratio shows how much of one quantity there is as compared to another quantity. Ratios are used to make comparisons between quantities. In general, the ratio of a to b is written as $a : b = \frac{a}{b}$.

Examples

- i. The ratio of 4 to 10 is 4:10 or $\frac{4}{10}$ which reduces to 2:5 .
- ii. If there is 1 boy and 3 girls, we can write the ratio as:
$$1:3 = \frac{1}{3}$$

6.2.2 Define and identify direct and inverse proportion.

Direct Proportion: It is a relationship between two quantities such that if one increases, other also increases. If one decreases, the other also decreases.

Inverse Proportion: It is a relationship between two quantities such that if one increases, other decreases. If one decreases, the other increases.

Some situations of Direct Proportion:

- More articles, more money is required to purchase. Fewer articles, less money is required to purchase.
- More men at work, more work is done. Fewer men at work, lesser work is done.
- More money borrowed, more interest is to be paid. Less money borrowed, less interest is to be paid.
- More speed, more distance is covered in fixed time. Less speed, less distance is covered in fixed time.
- More working hours, more work will be done. Less working hours, less work will be done.

Some situations of Inverse Proportion.

- More men at work, less time is taken to finish the same work.
- More speed, less time is taken to cover the same distance.
- More men in the camp and less number of days for food stock to last.
- More is the cost less you could buy with the same amount of money.

6.2.3 Solve real life problems involving direct and inverse proportion (by unitary method).

Unitary method can be used to solve real life problems involving direct and inverse proportions. Following examples illustrate the process of solving problems.

(a) Direct Proportion by Unitary Method

Example 1 If 12 flowers cost Rs.156, what do 28 flowers cost?

Solution This is the situation of direct proportion as: More flowers result in more cost.

Cost of 12 flowers = Rs. 156

$$\text{Cost of 1 flower} = \frac{156}{12} = \text{Rs. } 13$$

Cost of 28 flowers = $13 \times 28 = \text{Rs. } 364$

Example 2 A car travels 240 km in 40 litres of petrol. How much distance will it cover in 9 litres of petrol?

Solution This is the situation of direct proportion as: Less quantity of petrol, less distance is to be covered.

In 40 litres of petrol, distance covered = 240 km

$$\text{In 1 litres of petrol, distance covered} = \frac{240}{40} = 6 \text{ km}$$

In 9 litres of petrol, distance covered = $6 \times 9 = 54 \text{ km}$

Example 3 A labourer gets Rs.9800 for 14 days work. How many days should he work to get Rs.21,000?

Solution This is a situation of direct proportion as: more money will be received for working more days.

Number of days to earn Rs. 9,800 = 14 days

$$\text{Number of days to earn Rs. } 1 = \frac{14}{9,800} \text{ days}$$

$$\begin{aligned} \text{Number of days to earn Rs. } 21,000 &= \frac{14}{9,800} \times 21,000 \\ &= 30 \text{ days.} \end{aligned}$$

Therefore, Rs.21,000 can be earned by a labourer in 30 days.

(b) Inverse Proportion by Unitary Method

Real life problems involving inverse proportion can be solved using unitary method. This is illustrated by the following examples.

Example 1 16 men can build a wall in 56 hours. How many men will be required to do the same work in 32 hours?

Solution This is a situation of inverse proportion as: More the number of men, then faster they will build the wall i.e., less number of days needed.

Number of men who build the wall in 56 hours = 16 men

Number of men who build the wall in 1 hour = 16×56 men

Number of men who can build the wall in 32 hours = $\frac{16 \times 56}{32}$
= 28 men

Therefore, in 32 hours, wall is built by 28 men.

Example 2 12 typists can type a book in 18 days. In how many days 4 typists will type the same book?

Solution

This is a situation of indirect proportion as: Less number of typists will take more days.

Number of days in which 12 typists can type a book = 18 days

Number of days in which 1 typist can type a book = 18×12

Number of days in which 4 typists can type a book = $\frac{18 \times 12}{4}$
= 54 days

Therefore, 4 typists will type a book in 54 days.

Example 3 If 72 workers can do a piece of work in 40 days. How many more days are required to complete the same work if 8 workers left the job?

Solution This is a situation of indirect proportion as: Less workers will require more days to complete the work.

Number of workers left the job = 8

Number of remaining workers to complete work = $72 - 8 = 64$

Number of days to complete work by 72 workers = 40 days

Number of days to complete work by 1 worker = 72×40

Number of days to complete work by 64 workers = $\frac{72 \times 40}{64} = 45$ days

More number of days = $45 - 40 = 5$ days

Therefore, 64 workers will require 5 more days to complete the same work.

Exercise 6.2

1. 12 farmers harvest the crops in 20 hours. How many farmers will be required to do the same work in 15 hours?
2. The weight of 56 books is 8 kg. What is the weight of 152 such books?
3. Asad types 450 words in half an hour. How many words would he type in 7 minutes?
4. A worker is paid Rs.7500 for 6 days' work. If he works for 23 days, how much will he get?
5. A water tank can be filled in 7 hours by 5 equal sized pumps working together. How much time will 7 pumps take to fill it up?
6. 15 masons can build the wall in 20 days. How many masons will build the wall in 12 days?
7. 76 persons can complete the job in 42 days. In how many days will 56 persons do the same job?
8. In a camp, there is food for 400 persons for 23 days. If 60 more persons join the camp, find the number of days the provision will last.
9. The freight for 75 quintals of goods is Rs. 375. Find the freight for 42 quintals.
10. A car travels 228 km in 3 hours.
 - (a) How long will it take to travel 912 km?
 - (b) How far will it travel in 7 hours?

11. The weight of 56 books is 7 kg.
- (a) What is the weight of 90 such books?
 - (b) How many such books weigh 7.5 Kg?

Review Exercise 6

1. Four possible options have been given. Encircle the correct one.
- i. If the cost of several objects is given and by finding the cost of one object the cost of many objects is calculated then this method is called:
 - (a) unitary method
 - (b) direct proportion method
 - (c) inverse proportion method
 - (d) ratio
 - ii. The cost of 15 pens is Rs. 105. What is the cost of one pen?
 - (a) Rs. 120
 - (b) Rs. 95
 - (c) Rs. 7
 - (d) Rs. 1
 - iii. A car travels 90 km in 10 litres of petrol. How many litres of petrol is needed to travel 180 km?
 - (a) 15 litres
 - (b) 20 litres
 - (c) 25 litres
 - (d) 30 litres
 - iv. If the value of many objects of the same kind is known we can find the value of one of these objects by:
 - (a) addition
 - (b) subtraction
 - (c) multiplication
 - (d) division
 - v. If the value of many objects of the same kind is known we can find the value of one of these objects by:
 - (a) multiplication
 - (b) division
 - (c) ratio
 - (d) unitary method

- vi. A relation between two quantities of the same kind by division is called:
(a) ratio (b) proportion
(c) unitary method (d) all of the above
- vii. A relationship between two quantities such that if one increases, other also increases. If one decreases, the other also decreases is called:
(a) unitary method (b) ratio
(c) direct proportion (d) inverse proportion
- viii. A relationship between two quantities such that if one increases, other decreases is called:
(a) unitary method (b) ratio
(c) direct proportion (d) inverse proportion
- ix. More working hours, more work will be done. Less working hours, less work will be done. What kind of relation it is?
(a) unitary method (b) ratio
(c) direct proportion (d) inverse proportion
- x. More men at work, less time taken to finish the work. What is the kind of this relation?
(a) unitary method (b) ratio
(c) direct proportion (d) inverse proportion
2. Ashraf bought a dozen pens for Rs. 144. Find the cost of 15 such pens.
3. The cost of 2 kg of onions is Rs.24. What will the cost of 12 kg of onions?

4. 12 tailors can stitch 15 shirts in a day. How many shirts will be stitched by 28 tailors in a day?
5. A train is moving at a uniform speed of 68 km per hour. How far will it go in 15 minutes?
6. A man is paid Rs.7700 for 7 days. If he works for 21 days, how much will he get?
7. In 8 hours, workers fill 960 bottles of cold drinks. How many bottles will be filled in 6 hours?
8. Ahmad reads 21 pages of a book every day and finishes the book in 30 days. If he reads 18 pages in a day, in how many days will he finish the book?
9. 6 pipes are required to fill the tank in 64 minutes. How many pipes are required to fill the tank in 96 minutes?
10. If 17 men can complete the work in 42 hours. How many men will be required to do the same work in 34 hours?
11. A school has 8 periods in a day such that each period is of 35 minutes. If the number of periods is reduced to 7, then how long would each period be?
12. 500 soldiers in a fort had enough food for 30 days but 125 soldiers were transferred to another fort. For how many days did the food last then?
13. 5 pumps working together can empty the tank in 36 minutes. How long will it take to empty the tank if 9 such pumps are working together?

Summary

- In unitary method the cost of several objects is given and then by finding the cost of one object we can calculate the cost of many objects.
- If we know the cost of one object, then to know the cost of many objects we will do multiplication.
- If we know the cost of many objects, then to know the cost of one object we will do division.
- If the value of one object is known, we can find the value of many of these objects by multiplication.
- If the value of many objects of the same kind is known, we can find the value of one of these objects by unitary method.
- A ratio is a relation between two quantities of the same kind. It can be expressed as a fraction. The symbol for ratio is a colon (:).
- Ratio shows how much of one quantity is compared to another quantity. Ratios are used to make comparisons between quantities.
- In general, the ratio of a to b is written as $a:b = \frac{a}{b}$.
- Direct Proportion is a relationship between two quantities such that if one increases, other also increases. If one decreases, the other also decreases.
- Inverse Proportion is a relationship between two quantities such that if one increases, other decreases. If one decreases, the other increases.

7.1 Angles

7.1.1 Recall an angle and recognize acute, right, obtuse, straight and reflex angle

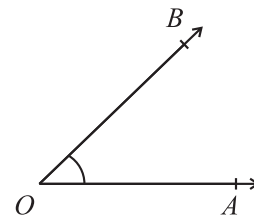
We have learnt about an angle and its different types in previous classes. However we recall these concepts.

Angle

We have learnt in grade 4 that an angle is formed by two distinct rays with the same endpoint.

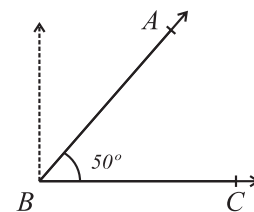
The common endpoint is called the vertex. The figure to the right is of an angle O, AOB or BOA .

The symbol for an angle is \angle .



Acute Angle

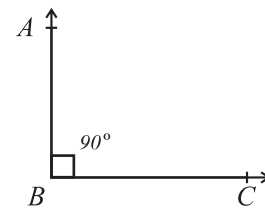
The angle ABC given on the right side is an acute angle because its measure is less than 90° i.e.; $m\angle ABC < 90^\circ$.



Right Angle

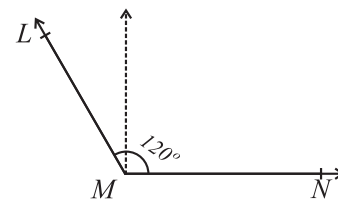
$\angle ABC$ is a right angle because the measure of $\angle ABC$ is equal to 90° . i.e.

$$m\angle ABC = 90^\circ$$



Obtuse Angle

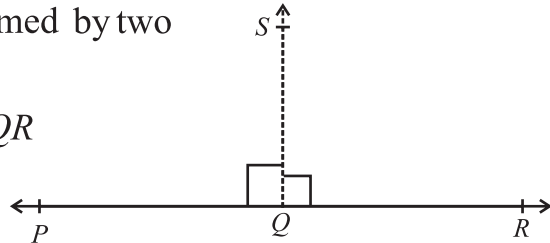
$\angle LMN$ is an obtuse angle because its measure 120° is greater than 90° and less than 180° i.e. $m\angle LMN > 90^\circ$



Straight Angle

$\angle PQR$ is a straight angle which is formed by two adjacent right angles PQS and SQR .

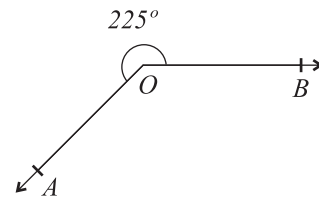
$$\begin{aligned} m\angle PQR &= m\angle PQS + m\angle SQR \\ &= 90 + 90 \\ &= 180^\circ \end{aligned}$$



It is clear from the figure that \overrightarrow{QP} and \overrightarrow{QR} are two rays in opposite directions with common point Q as vertex.

Reflex Angle

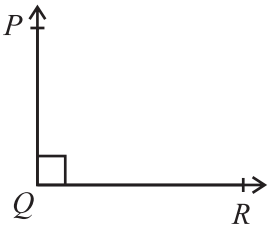
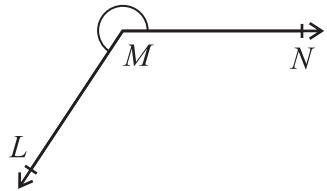
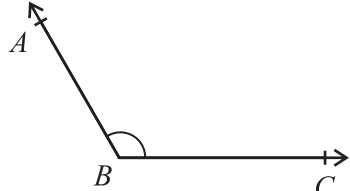
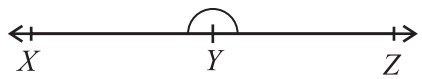
$\angle AOB$ is a reflex angle because its measure is 225° which is greater than 180° and less than 360° .



Exercise 7.1

1. Identify and write under each angle its type.

<p>(i)</p> <p>_____</p>	<p>(ii)</p> <p>_____</p>
<p>(iii)</p> <p>_____</p>	<p>(iv)</p> <p>_____</p>
<p>(v)</p> <p>_____</p>	<p>(vi)</p> <p>_____</p>

<p>(vii)</p>  <p>_____</p>	<p>(viii)</p>  <p>_____</p>
<p>(ix)</p>  <p>_____</p>	<p>(x)</p>  <p>_____</p>

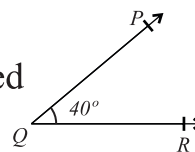
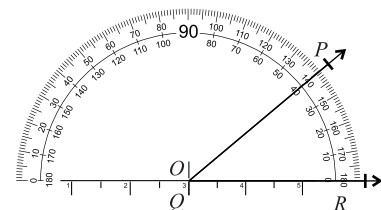
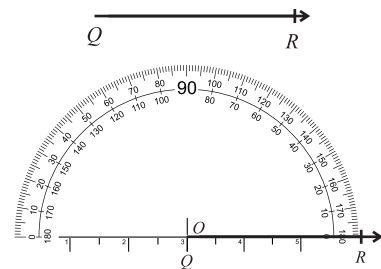
7.1.2 Draw Acute and Obtuse angles of different measures using Protractor

Draw an Acute Angle

Draw an angle of measure 40° .

Steps of Construction:

- (i) Draw a ray QR
- (ii) Place the straight edge of the protractor such that its central point O falls on Q and the ray joining the central point to the mark 0 coincides with ray QR .
- (iii) Read the protractor from the inner side where its 0 mark lies on the ray QR .
- (iv) Mark a point P near the circular edge marked 40° as given in the figure.
- (v) Remove the protractor and draw the ray QP as shown in the figure.
- (vi) Thus $m\angle PQR = 40^\circ$ is the required acute angle.

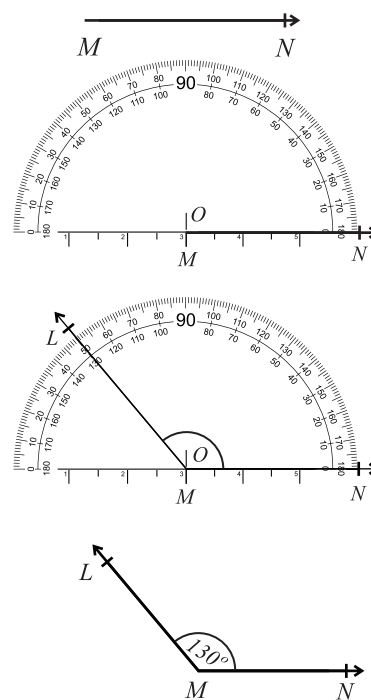


Draw an Obtuse Angle

Draw an angle of measure 130° .

Steps of Construction

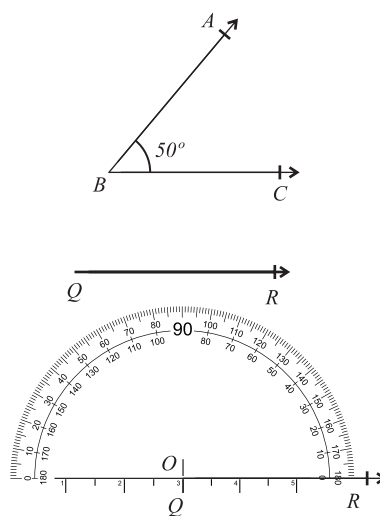
- (i) Draw a ray MN .
- (ii) Place the straight edge of the protractor such that its central point O falls on M and the ray joining the central point to the mark 0 coincides with ray MN .
- (iii) Read the protractor from the inner scale where its zero (0) mark lies on the ray MN .
- (iv) Mark a point L near the edge marked 130° as shown in the figure.
- (v) Remove the protractor and draw the ray as shown in the adjoining figure.
- (vi) Thus, $m\angle LMN = 130^\circ$ is the required obtuse angle.



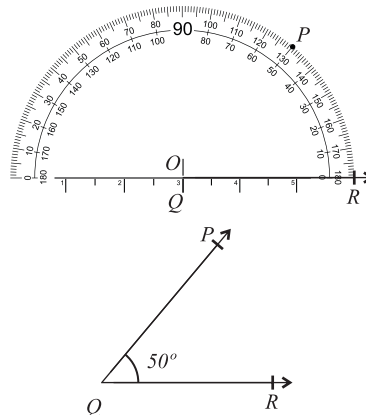
7.1.3 Draw an angle equal in measure to a given angle

Steps of Construction

- (i) Measure the given angle ABC with the help of a protractor that is $m\angle ABC = 50^\circ$. We have to draw an angle equal in measure of given angle i.e. 50° . We proceed further as under.
- (ii) Draw a ray QR with Q as the initial point (vertex).
- (iii) Place the centre of the protractor on Q and adjust it such that its straight edge or base line coincide with ray QR .



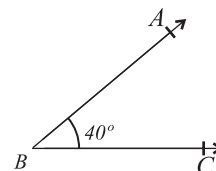
- (iv) Start from zero (0) and read the inner scale till we reach the mark 50.
- (v) Mark a point P against the mark 50.
- (vi) Remove the protractor and draw the ray QP .
- (vii) Thus, $m\angle PQR = 50^\circ$ which is the required angle equal in measure to the given angle.



7.1.4 Draw an angle twice in measure to a given angle.

Steps of Construction

- (i) Measure the given angle ABC with the help of a protractor $m\angle ABC = 40^\circ$.

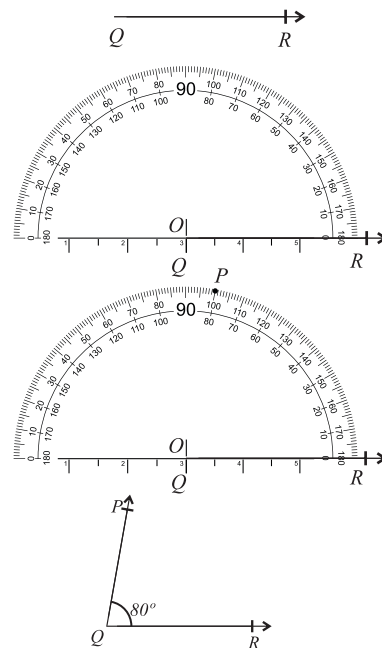


We have to draw an angle twice in measure of the given angle i.e the measure will be $2 \times 40^\circ = 80^\circ$.

To draw an angle of measure 80° with the help of a protractor, we proceed further as below.

- (ii) Draw a ray QR with Q as the initial point.
- (iii) Place the centre of the protractor on Q such that its baseline coincide with ray QR .
- (iv) Start from 0 and read the inner scale till we reach the mark 80.
- (v) Mark a point P against the mark 80.
- (vi) Remove the protractor and draw the ray QP .

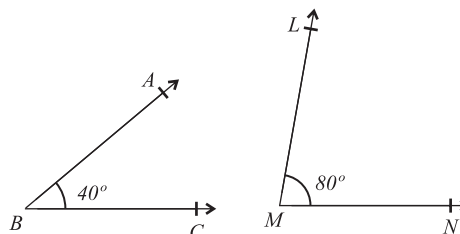
Thus, $m\angle PQR = 80^\circ$ is the required angle twice in measure to the given angle ABC .



7.1.5 Draw an angle equal in measure to the sum of two angles

Steps of Construction

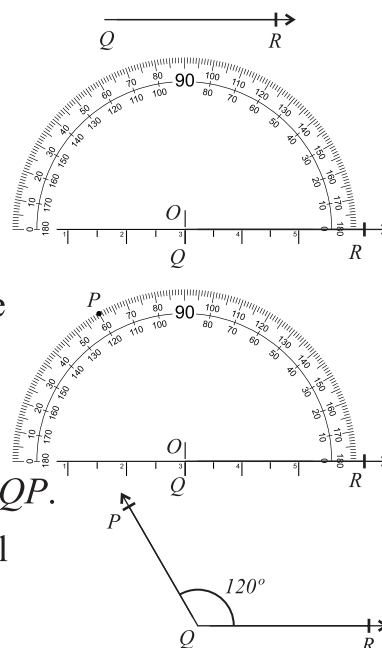
- (i) Measure the given angles ABC and LMN with the help of protractor and note that $m\angle ABC = 40^\circ$ and $m\angle LMN = 80^\circ$.



The sum of measures of the given angles is $40^\circ + 80^\circ = 120^\circ$.

We have to draw an angle equal in measure to the sum of measures of two given angles i.e, 120° . We proceed further as below.

- (ii) Draw a ray QR with Q as the initial point.
- (iii) Place the centre of the protractor on Q such that its baseline coincides with ray QR .
- (iv) Start from zero and read the inner scale till we reach at the mark 120° .
- (v) Mark a point P near the mark 120° .
- (vi) Remove the protractor and draw the ray QP .



Thus, $m\angle PQR = 120^\circ$ is the required angle equal in measure to the sum of two given angles.

7.1.6 Construction of Angles

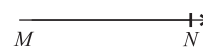
We have to construct a right angle, a straight angle and a reflex angle. We shall construct these angles one by one.

Right Angle

Construct an angle whose measure is 90° .

Steps of construction:

- (i) Draw a ray MN .



- (ii) Place a protractor on MN such that its central point O falls on M and the ray joining the central point to the mark zero coincides with the ray MN .
- (iii) Read the protractor from the inner side where zero mark lies on the ray MN till we reach the mark 90° .
- (iv) Mark a point L near the mark 90° as shown in the figure.
- (v) Remove the protractor and draw the ray ML as given in the figure.

Thus, $m\angle LMN = 90^\circ$ is the required right angle.

Straight Angle

Construct an angle of measure 180° .

Steps of Construction:

- (i) Draw a ray QR .
- (ii) Place a protractor on \overrightarrow{QR} such that its central point falls on Q and the ray joining the central point to the mark zero coincides with the ray QR .
- (iii) Read the protractor from the inner side where zero mark lies on the ray QR till we reach the mark 180° .
- (iv) Mark a point P near the mark 180° as shown in the figure.
- (v) Remove the protractor and draw the ray QP as given in the figure,

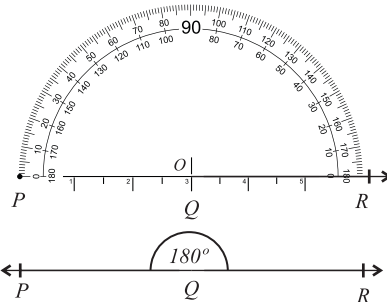
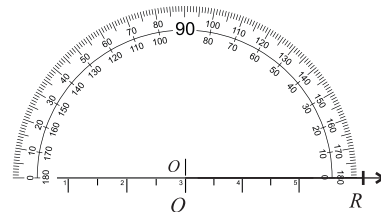
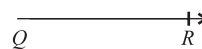
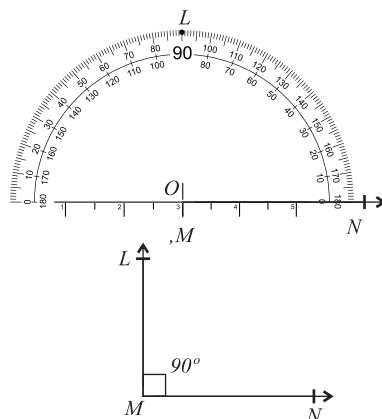
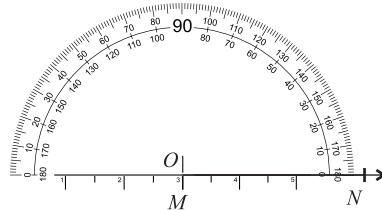
Thus, $m\angle PQR = 180^\circ$ is the required straight angle.

Reflex Angle

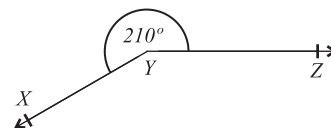
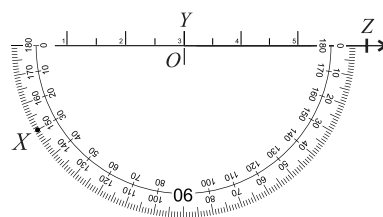
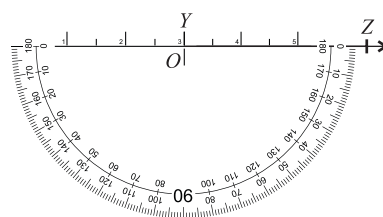
Construct an angle of measure 210° . Now, $210^\circ = 180^\circ + 30^\circ$

Steps of Construction:

- (i) Draw a ray YZ .



- (ii) Place a protractor on \overrightarrow{YZ} such that its central point O to fall on Y and the ray joining the central point to mark zero(0) coincides with the ray YZ .
- (iii) Read the protractor from the outer side where its zero mark lies on the ray YZ till the mark 30° .
- (iv) Mark a point X near the mark 30° as given in the figure. The angle will become $180^\circ + 30^\circ = 210^\circ$.
- (v) Remove the protractor and draw the ray YX as shown in the figure.



Thus, $m\angle XYZ = 210^\circ$ is the required reflex angle.

Reflex angles of different measures can be drawn in the same manner.

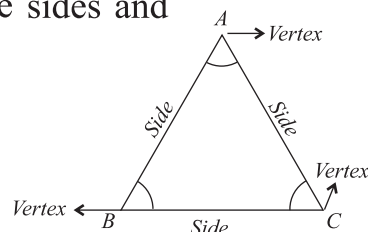
7.2 Triangles

7.2.1 Definition of a Triangle

A triangle is a simple closed figure having three sides and three angles.

In the given triangle ABC :

- (i) A , B and C are the vertices.
- (ii) \overline{AB} , \overline{BC} and \overline{CA} are the three sides.
- (iii) Three angles are $\angle ABC$, $\angle BCA$ and $\angle BAC$. The symbol used for a triangle is \triangle . So $\triangle ABC$ means triangle ABC . The triangle can be written in any one of six ways as $\triangle ABC$, $\triangle CBA$, $\triangle BAC$, $\triangle CAB$, $\triangle BCA$ and $\triangle ACB$.



It may be noted that the order of the vertices does not matter while writing the name of a triangle.

Remember that:

The number of angles is equal to the number of sides of a triangle.

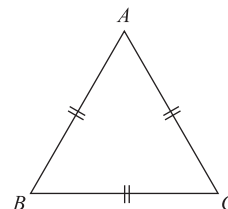
7.2.2 Definition of triangle with respect to their sides

(i) Equilateral Triangle

An equilateral triangle is a triangle in which all the three sides are equal in length.

The triangle given on the right side is an equilateral triangle because its all three sides are equal

i.e. $m\overline{AB} = m\overline{BC} = m\overline{CA}$

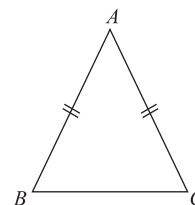


(ii) Isosceles Triangle

An isosceles triangle is a triangle in which any two sides are equal in length.

The figure on the right side is an isosceles triangle ABC because its two sides are equal

in length i.e. $m\overline{AB} = m\overline{AC}$

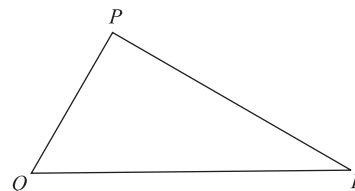


(iii) Scalene Triangle

A scalene triangle is a triangle in which all the sides are of different lengths.

The figure on the right side is a scalene triangle because none of its side is equal in length to any other side i.e.

$m\overline{PQ}$, $m\overline{QR}$ and $m\overline{PR}$ are not equal.

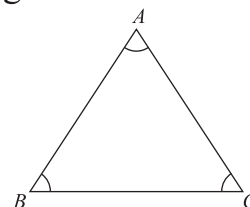


7.2.3 Definition of triangles with respect to their Angles

(i) Acute Angled Triangle

An acute angled triangle is a triangle with all three angles are acute angles (less than 90°).

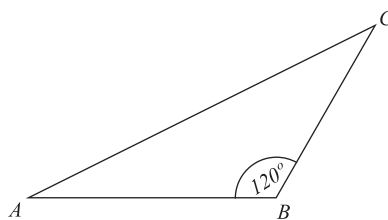
In the figure on the right side is an acute angled triangle because its all three angles are acute.



(ii) Obtuse Angled Triangle

An obtuse angled triangle is a triangle with one obtuse angle (greater than 90°).

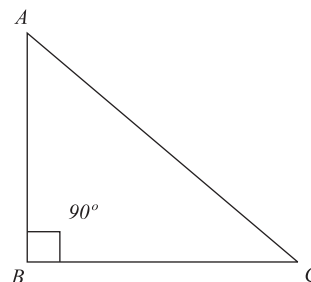
$\triangle ABC$ is an obtuse angled triangle because its one angle is obtuse angle i.e. $m\angle B = 120^\circ$ (greater than 90°). We know that no triangle can have more than one obtuse angle because a triangle must have the sum of all three angles as 180° .



(iii) Right Angled Triangle

A right angled triangle is a triangle in which one angle is 90° .

In the given figure $\triangle ABC$ is a right angled triangle because its one angle B is a right angle i.e. $m\angle B = 90^\circ$.



7.2.4 Construction of triangles when three sides are given

(i) Equilateral Triangle

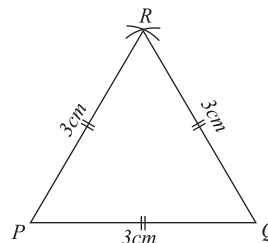
Example:

Draw an equilateral triangle PQR whose measure of each side is 3 cm .

Solution:

Steps of Construction:

- (i) Draw a line segment $PQ = 3\text{ cm}$.
- (ii) Taking P as centre draw an arc of radius 3 cm over \overline{PQ} .
- (iii) Taking Q as centre, draw an arc of



radius 3cm over \overline{PQ} which cuts the first arc at point R .

- (iv) Join R with P and Q one by one.

Thus, $\triangle PQR$ is the required equilateral triangle.

(ii) Isosceles Triangle

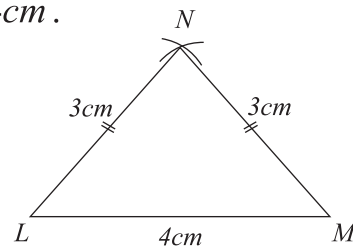
Example

Draw an Isosceles triangle LMN with measure of its two sides as 3cm each and measure of third side is 4cm .

Solution

Steps of Construction:

- (i) Draw a line segment LM such that $m\overline{LM} = 4\text{cm}$.
- (ii) Taking L as centre, draw an arc of radius 3cm over \overline{LM} .
- (iii) Taking M as centre, draw another arc of radius 3cm over \overline{LM} , which cuts the first arc at point N .
- (iv) Join N with L and M one by one.



Thus, $\triangle LMN$ is the required isosceles triangle.

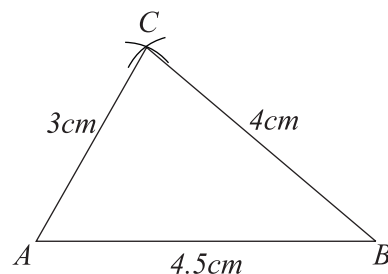
(iii) Scalene Triangle

Example Draw a scalene triangle ABC with measure of its sides as $m\overline{AB} = 4.5\text{cm}$, $m\overline{BC} = 4\text{cm}$ and $m\overline{AC} = 3\text{cm}$.

Solution

Steps of Construction:

- (i) Draw a line segment $AB = 4.5\text{cm}$.
- (ii) Taking A as centre, draw an arc of radius 3cm over \overline{AB} .



- (iii) Taking B as centre, draw another arc of radius 4cm over \overline{AB} , which cuts the previous arc at point C.
- (iv) Join C with A and B one by one.

Thus, $\triangle ABC$ is the required scalene triangle.

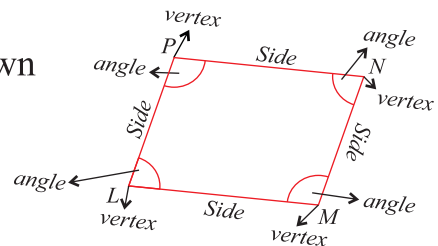
Exercise 7.2

1. Construct the following triangles.

- (i) $m\overline{AB} = 6\text{cm}$, $m\overline{BC} = 4\text{cm}$, $m\overline{AC} = 5\text{cm}$
- (ii) $m\overline{PQ} = 4.5\text{cm}$, $m\overline{QR} = 5\text{cm}$, $m\overline{PR} = 4.5\text{cm}$
- (iii) $m\overline{LM} = 5\text{cm}$, $m\overline{MN} = 4.5\text{cm}$, $m\overline{LN} = 4\text{cm}$
- (iv) $m\overline{AB} = 5\text{cm}$, $m\overline{BC} = 6\text{cm}$, $m\overline{AC} = 4.5\text{cm}$
- (v) $m\overline{PQ} = 6\text{cm}$, $m\overline{QR} = 4\text{cm}$, $m\overline{PR} = 5\text{cm}$
- (vi) $m\overline{LM} = 6\text{cm}$, $m\overline{MN} = 4\text{cm}$, $m\overline{LN} = 5\text{cm}$

7.3 Quadrilateral

A closed plane figure with four sides is known as a quadrilateral. It has also four angles and four vertices.


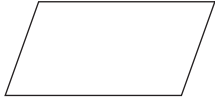


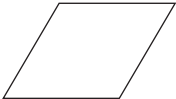



7.3.1 Recognize the Kinds of Quadrilateral

Following are the different kinds of quadrilateral.

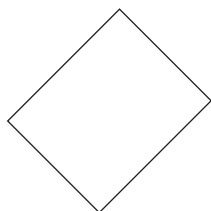
- | | | |
|--------------------|----------------|----------------|
| (i) Square | (ii) Rectangle | (iii) Kite |
| (iv) Parallelogram | (v) Rhombus | (vi) Trapezium |

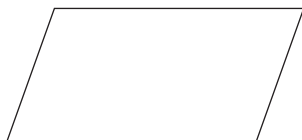
Activity 1: Match the name of each kind of quadrilateral with its figure.

Figure	Name	Figure	Name
	Kite		Rectangle
	Rhombus		Parallelegram
	Square		Trapezium

Activity 2: Write the particular name under each kind of quadrilateral.













7.3.2 Construction of Square and Rectangle

Square

We know that a square has four equal sides and each angle is of 90°

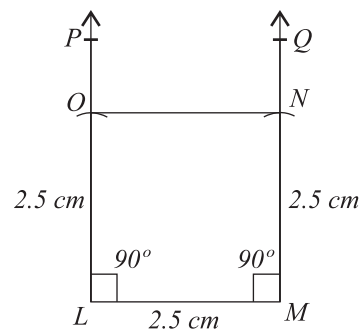
Example

Construct a square with length of each side 2.5 cm .

Solution

Steps of Construction:

- (i) Draw a line segment $LM = 2.5\text{ cm}$.
- (ii) Construct an angle of 90° with the help of a protractor at the point L and at the point M .
- (iii) Taking L as centre, draw an arc of radius 2.5 cm which cuts the vertical \overrightarrow{LP} at point O .
- (iv) Taking M as centre, draw an arc of radius 2.5 cm which cuts the vertical \overrightarrow{MQ} at point N .
- (v) Join the point O with point N .



Thus, $LMNO$ is the required square.

Rectangle

In a rectangle each two opposite sides are equal in length and measure of each angle is of 90° .

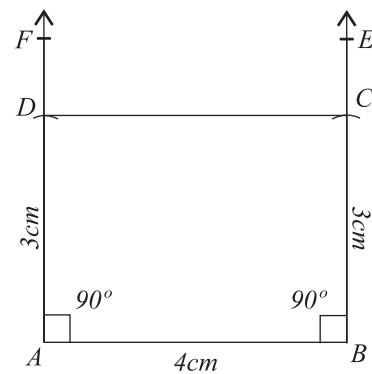
Example

Construct a rectangle having length 4cm and width 3cm .

Solution

Steps of Construction

- (i) Draw a line segment $AB = 4\text{cm}$
- (ii) Construct an angle of 90° at point A with the help of a protractor.
- (iii) Similarly draw an angle of 90° at point B .
- (iv) Taking point A as centre, draw an arc of 3cm which cuts \overrightarrow{AF} at point D .
- (v) Taking point B as centre, draw an arc of 3cm which cuts \overrightarrow{BE} at point C .
- (vi) Join point C with point D .



Thus, $ABCD$ is the required rectangle.

Exercise 7.3

1. Construct the following squares with the help of ruler, protractor and compasses whose length of a side is given below.
 - (i) 2cm (ii) 2.5cm (iii) 3cm
2. Construct rectangles with the help of compasses, ruler and protractor with the following measurement.
 - (i) Length 6cm , Breadth 4cm (ii) Length 4cm , Breadth 2cm
 - (iii) Length 5cm , Breadth 3cm (iv) Length 7cm , Breadth 5cm

Review Exercise 7

1. Four possible options have been given. Encircle the correct one.
- i. A triangle whose all the three sides are equal in length is called:
(a) a scalene triangle (b) an isosceles triangle
(c) an acute angled triangle (d) an equilateral triangle
 - ii. An angle equal to 180° is known as:
(a) a straight angle (b) a reflex angle
(c) a right angle (d) an obtuse angle
 - iii. A triangle whose all the three angles are acute is called:
(a) a scalene triangle (b) a right angled triangle
(c) an obtuse angled triangle (d) an acute angled triangle
 - iv. An angle greater than 180° and less than 360° is called:
(a) a right angle (b) an obtuse angle
(c) a straight angle (d) a reflex angle
 - v. An angle equal to 90° is known as:
(a) a right angle (b) an obtuse angle
(c) an acute angle (d) a reflex angle
 - vi. An angle less than 90° is called:
(a) a right angle (b) an obtuse angle
(c) an acute angle (d) a reflex angle
 - vii. A triangle whose one angle is a right angle is called:
(a) an acute angled triangle (b) an obtuse angled triangle
(c) a right angled triangle (d) a scalene triangle

viii. A triangle whose all the three sides are different in measure is called:

- (a) an equilateral triangle (b) an isosceles triangle
(c) an acute angled triangle (d) a scalene triangle

ix. An angle greater than 90° and less than 180° is known as:

- (a) an acute angle (b) an obtuse angle
(c) a right angle (d) a reflex angle

x. A triangle whose two sides are equal in length is called:

- (a) an equilateral triangle (b) an acute angled triangle
(c) an isosceles triangle (d) a scalene triangle

2. Draw the following:

- (i) An acute angle (ii) An obtuse angle
(iii) A reflex angle (iv) A straight angle
(v) A right angle

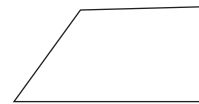
3. Define the following:

- (i) An equilateral triangle (ii) A scalene triangle
(iii) An isosceles triangle (iv) An acute angle triangle
(v) An obtuse angled triangle (vi) A right angled triangle

4. Construct a square whose measure of one of its sides is 2.5cm.

5. Construct a rectangle whose length is 4cm and width is 3cm.

6. Recognize and write the name under each figure given below.



Summary

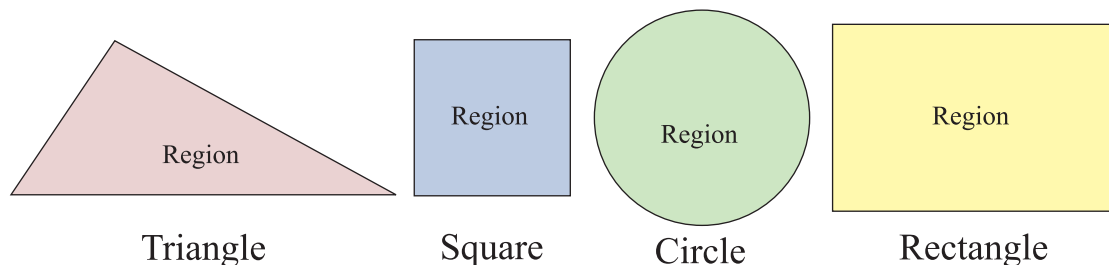
- An angle is formed by two distinct rays with the same endpoint.
- The angle whose measure is less than 90° is an acute angle.
- The angle whose measure is equal to 90° is a right angle.
- The angle whose measure is greater than 90° and less than 180° is an obtuse angle.
- An angle formed by two adjacent right angles is a straight angle.
- An angle which is greater than 180° and less than 360° is reflex angle.
- A triangle whose all three sides are equal is an equilateral triangle
- A triangle whose measures of any two sides are equal is an isosceles triangle.
- A triangle whose all sides are of different lengths is a scalene triangle.
- An acute angled triangle is a triangle whose all three angles are acute.
- An obtuse angled triangle is a triangle having one obtuse angle.
- A triangle having one angle 90° is a right angled triangle.
- A closed plane figure with four sides or edges is a quadrilateral.
- Different kinds of quadrilateral are:
 - (i) square
 - (ii) rectangle
 - (iii) kite
 - (iv) parallelogram
 - (v) rhombus
 - (vi) trapezium

8.1 Perimeter and Area

8.1.1 Recognition of Region of a Closed Figure

Region of a closed figure comprises of the surface enclosed by the boundary and the boundary of the figure itself.

The regions of the different closed figures are given below:



8.1.2 Differentiation Between Perimeter and Area of a Region

Perimeter

Perimeter is the distance around a closed figure. In other words the length of the boundary of the closed figure is known as the perimeter of the figure. Since the perimeter is a distance, it is measured in cm, m and km.

Area is the quantity that expresses the extent of a two dimensional figure. Area is measured in square units i.e. cm^2 , m^2 and km^2 .

8.1.3 Writing the Formula for Perimeter and Area of a Square and a Rectangle

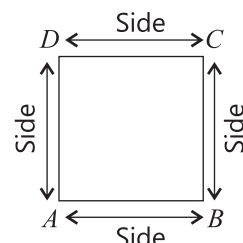
• Perimeter

(i) Perimeter of a square

We know that a square has four sides of equal length. To find the perimeter of the square, we add the lengths of four sides of a square i.e;

$$\text{Perimeter of a square} = \text{side} + \text{side} + \text{side} + \text{side} = 4 \times \text{side}$$

\therefore **Formula for perimeter of a square = $4 \times \text{side unit}$**

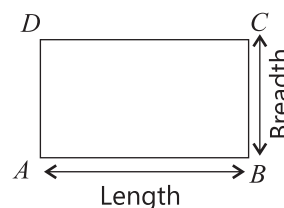


Example Find the perimeter of a square whose length of a side is 5cm.

Solution Length of a side = 5cm
 Perimeter of the square = $4 \times \text{side}$
 $= 4 \times 5$
 $= 20\text{cm}$

(ii) Perimeter of a Rectangle

We know that a rectangle has 2 equal lengths and 2 equal breadths. To find the perimeter of a rectangle, we add the measures of four sides i.e.,



$$\begin{aligned}\text{Perimeter of the rectangle} &= \text{Length} + \text{Breadth} + \text{Length} + \text{Breadth} \\ &= \text{Length} + \text{Length} + \text{Breadth} + \text{Breadth} \\ &= 2 (\text{Length}) + 2(\text{Breadth}) \\ &= 2 (\text{Length} + \text{Breadth})\end{aligned}$$

\therefore **Formula for perimeter of a rectangle = $2 (\text{Length} + \text{Breadth})$ unit**

Example

Find the perimeter of a rectangle whose length is 5cm and breadth is 4cm.

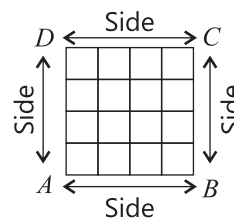
Solution Length of the rectangle = 5cm
 Breadth of the rectangle = 4cm
 Perimeter of the rectangle = $2(\text{Length} + \text{Breadth})$
 $= 2(5 + 4)$
 $= 2(9)$
 $= 18\text{cm}$

• Area

(i) Area of a Square

The area is the product of length and breadth. In a square length of each side is equal i.e.

$$\begin{aligned}\text{length} &= \text{breadth} = \text{side} \\ \text{Area of a square} &= \text{side} \times \text{side}\end{aligned}$$



\therefore **Formula for the area of a square = $\text{side} \times \text{side} (\text{unit})^2$**

Example Find the area of a square whose length of a side is 3cm.

Solution Length of side = 3cm

$$\begin{aligned}\text{Area} &= \text{side} \times \text{side} \\ &= 3 \times 3 = 9\text{cm}^2\end{aligned}$$

(ii) Area of a Rectangle

The area of a rectangle can be calculated with the help of product of length and breadth.

$$\therefore \text{Formula for the area of a rectangle} = \text{Length} \times \text{Breadth (unit)}^2$$

Example

Find the area of a rectangle whose length is 12cm and breadth is 8cm.

Solution

Length of the rectangle = 12cm

Breadth of the rectangle = 8cm

$$\begin{aligned}\text{Area of the rectangle} &= \text{Length} \times \text{Breadth} \\ &= 12 \times 8 = 96\text{cm}^2\end{aligned}$$

8.1.4 Application of formulas to find Perimeter and Area of a Square and a Rectangular Region

Example 1

Find the perimeter and area of a square whose side is 12cm.

Solution

Length of the side = 12cm

$$\begin{aligned}\text{Perimeter of the square} &= 4 \times \text{side} \\ &= 4 \times 12 \\ &= 48\text{cm}\end{aligned}$$

$$\begin{aligned}\text{Area of the square} &= \text{side} \times \text{side} \\ &= 12 \times 12 \\ &= 144\text{cm}^2\end{aligned}$$

Example 2 Find the perimeter and area of a rectangle whose length is 12cm and breadth is 8cm.

Solution Length of the rectangle = 12cm
 Breadth of the rectangle = 8cm
 Perimeter of the rectangle = $2(\text{Length} + \text{Breadth})$
 $= 2(12 + 8) = 2(20)$
 $= 40\text{cm}$
 Area of the rectangle = $\text{Length} \times \text{Breadth}$
 $= 12 \times 8 = 96\text{cm}^2$

Exercise 8.1

- Find the perimeter and area of the square shaped figures whose length of one side is given below:
 (i) 3cm (ii) 7cm (iii) 9cm (iv) 10cm (v) 11cm
 (vi) 17cm (vii) 2.5cm (viii) 3.6cm (ix) 18cm
- Find the perimeter and area of each rectangular shaped figure whose length and breadth are given below:
 (i) Length = 12cm , Breadth = 8cm (ii) Length = 9cm , Breadth = 3cm
 (iii) Length = 6cm , Breadth = 4cm (iv) Length = 12cm , Breadth = 7cm
 (v) Length = 7.5cm, Breadth = 3.5cm (vi) Length = 15.5cm, Breadth = 4.5cm

8.1.5 Solution of Appropriate Problems of Perimeter and Area

Example 1 The length of a square shaped room is 5 metre. Find the cost of flooring at the rate of Rs.900 per square metre.

Solution Length of the room = 5m
 Area of the room = $\text{side} \times \text{side}$
 $= 5 \times 5 = 25\text{m}^2$
 Cost of flooring $1\text{m}^2 = \text{Rs.}900$
 Cost of flooring $25\text{m}^2 = 25 \times 900$
 $= \text{Rs.} 22,500$

Example 2 The Length of the side of a square shaped field is 17m.
Find the cost of fencing it at the rate of Rs.10 per meter.

Solution Length of the field = 17m

$$\begin{aligned}\text{Perimeter of the field} &= 4 \times \text{side} \\ &= 4 \times 17 = 68\text{m}\end{aligned}$$

$$\text{The cost of fencing 1m} = \text{Rs.}10$$

$$\begin{aligned}\text{The cost of fencing 68m} &= 68 \times 10 \\ &= \text{Rs.}680\end{aligned}$$

Example 3 The length of a rectangular field is 120m and its breadth is 80m. Find the cost of:

- (a) fencing it at the rate of Rs.100 per metre and
- (b) Ploughing it at the rate of Rs. 10 per square metre.

Solution (a) Length of the field = 120m

$$\text{Breadth of the field} = 80\text{m}$$

$$\begin{aligned}\text{Perimeter of the field} &= 2(\text{Length} + \text{Breadth}) \\ &= 2(120 + 80) \\ &= 2(200) = 400\text{m}\end{aligned}$$

$$\text{The cost of fencing 1m} = \text{Rs.}100$$

$$\begin{aligned}\text{The cost of fencing 400m} &= 400 \times 100 \\ &= \text{Rs.} 40,000\end{aligned}$$

$$\begin{aligned}\text{(b) Area of the field} &= \text{length} \times \text{breadth} \\ &= 120 \times 80 \\ &= 9600\text{m}^2\end{aligned}$$

$$\text{The cost of ploughing } 1\text{m}^2 = \text{Rs.} 10$$

$$\begin{aligned}\text{The cost of ploughing } 9600\text{m}^2 &= 9600 \times 10 \\ &= \text{Rs.} 96,000\end{aligned}$$

Example 4 The perimeter of a square shaped field is 20m. Find the area of the field.

Solution Perimeter of the field = 20m
 $4 \times \text{side} = 20\text{m}$
 $\text{side} = \frac{20}{4} = 5\text{m}$
Area of the field = side \times side
 $= 5 \times 5 = 25\text{m}^2$

Example 5 The perimeter of a rectangular orchard is 250m. If the length is 75m, find the breadth of the orchard.

Solution Perimeter of the orchard = 250m
i.e. $2(\text{Length} + \text{Breadth}) = 250\text{m}$
 $\therefore \text{Length} + \text{Breadth} = 125\text{m}$
Length of the orchard = 75m
 $\therefore 75 + \text{Breadth} = 125$
 $\Rightarrow \text{Breadth} = 125 - 75$
 $= 50\text{m}$

Exercise 8.2

1. The perimeter of a square shaped room is 8m. Find the area of the room.
2. The perimeter of a rectangular garden is 400m. If its length is 125m, then find the area of the garden.
3. Find the cost of laying a carpet in a square shaped room of side 8 metre at the rate of Rs.150 per square metre.
4. The perimeter of a square room is 40m. Find the cost of flooring it at the rate of Rs.10 per square metre.
5. The length of a playground is 36m and breadth is 24m. Find the cost of leveling it at the rate of Rs. 125 per square metre. Also find the cost of fencing it at the rate of Rs.100 per metre.

6. A garden is 48m long and 32m wide. Find the cost of leveling it at the rate of Rs.60 per square metre. Also find the cost of fencing around it at the rate of Rs. 50 per metre.
7. Find the cost of flooring a rectangular hall at the rate of Rs.60 per square metre. The length and breadth of the hall is 15 metres and 10 metres respectively.

Review Exercise 8

1. Four possible options have been given. Encircle the correct one.
- (i) The region of a figure consists of:
(a) surface and boundary (b) surface and area
(c) area and perimeter (d) surface and dimensions
- (ii) The length of the side of a square is 3 cm. What is the perimeter of the square?
(a) 3 cm (b) 12 cm (c) 9 cm (d) 9 cm^2
- (iii) What is the area of a square with length of side as 4 cm?
(a) 16 cm (b) 8 cm (c) 16 cm^2 (d) 4 cm^2
- (iv) The dimensions of a rectangular region are 8 cm and 4 cm. What is the area of this rectangular region?
(a) 32 cm (b) 12 cm (c) 12 cm^2 (d) 32 cm^2
- (v) The perimeter of a square is 20 cm. What is the length of its side?
(a) 5 cm (b) 25 cm^2 (c) 20 cm^2 (d) 4 cm
- (vi) What is the area of a rectangle whose length is 10 cm and breadth is 5 cm?
(a) 50 cm (b) 50 cm^2 (c) 30 cm (d) 30 cm^2
- (vii) What will be the length of side of a square with 32 cm as its perimeter?
(a) 32 cm (b) 8 cm (c) 8 cm^2 (d) 4 cm

(viii) The distance around a figure is called:

- | | |
|---------------|------------|
| (a) surface | (b) area |
| (c) perimeter | (d) region |

Summary

- The region of a closed figure comprises of the surface enclosed by the boundary and the boundary of the figure itself.
- Perimeter is the distance around a closed figure or the boundary of the closed figure is the perimeter of the figure.
- The unit of measure of the perimeter is usually cm, m or km.
- Area is the quantity that expresses the extend of a two dimensional figure.
- The unit of measure of area is usually cm^2 , m^2 or km^2 .
- The formula of perimeter of a square is $4 \times \text{side (unit)}$.
- The formula of perimeter of a rectangle is $2(\text{length} + \text{breadth}) \text{ unit}$.
- Area of a square is:

$$\text{Area} = \text{side} \times \text{side (unit)}^2$$

- Area of a rectangle is:

$$\text{Area} = \text{length} \times \text{breadth (unit)}^2$$

9.1 Average

In everyday life average is commonly used word / term. A large information can be expressed in a simple way by the term average. There are three averages in common use i.e. (i) arithmetic mean (ii) median and (iii) mode. The average is the popular term used for arithmetic mean. It is used to compare two or more groups in terms of performance.

9.1.1 Define an Average (Arithmetic Mean)

Average is a quantity which represents the given several quantities or numbers.

Average is the sum of the quantities divided by the number of quantities i.e.,

$$\text{Average} = \frac{\text{Sum of the quantities}}{\text{Number of quantities}}$$

9.1.2 Finding an average of given numbers

This is explained with the help of following examples.

Example 1

Find the average of the numbers 10, 35, 50, 75 and 60

Solution

Given numbers are 10, 35, 50, 75, 60

$$\begin{aligned}\text{Sum of the given numbers} &= 10 + 35 + 50 + 75 + 60 \\ &= 230\end{aligned}$$

$$\text{Total given numbers} = 5$$

$$\begin{aligned}\therefore \text{Average} &= \frac{\text{Sum of the quantities}}{\text{Number of quantities}} \\ &= \frac{230}{5} \\ &= 46\end{aligned}$$

\therefore The average of the given numbers is 46.

Example 2

Find the average of the following numbers 239, 310, 225, 285, 250, 369, 360 and 474

Solution

Given numbers = 239, 310, 225, 285, 250, 369, 360, 474

Total given numbers = 8

$$\begin{aligned}\therefore \text{Average} &= \frac{\text{Sum of the quantities}}{\text{Number of quantities}} \\ \text{Average} &= \frac{239 + 310 + 225 + 285 + 250 + 369 + 360 + 474}{8} \\ &= \frac{2512}{8} \\ &= 314\end{aligned}$$

\therefore The average of the given numbers is 314.

We observed in the above examples that the average is not the given number. It is a point (number) which may or may not be a given number.

In the formula:

$$\text{Average} = \frac{\text{Sum of the quantities}}{\text{Number of quantities}}$$

There are three unknown quantities: average, sum of quantities and number of quantities. We can find anyone of these unknown quantities if

we are given the value of the other two quantities. For example:

- (a) To find the sum of quantities, the above formula will take the form as:

$$\text{Sum of quantities} = \text{Average} \times \text{Number of quantities}$$

It is illustrated with the example.

Example 1

Average of 5 quantities is 50. Find the sum of the quantities.

Solution

$$\begin{aligned}\text{Average} &= 50 \\ \text{Number of quantities} &= 5 \\ \therefore \text{Sum of quantities} &= \text{Average} \times \text{Number of quantities} \\ &= 50 \times 5 \\ &= 250\end{aligned}$$

- (b) To find the number of quantities, the formula will be of the form:

$$\text{Total Number of quantities} = \frac{\text{Sum of the quantities}}{\text{Average}}$$

Example 2

If the sum of quantities is 250 and the average of the quantities is 50, then find the number of quantities.

Solution

$$\begin{aligned}\text{Sum of quantities} &= 250 \\ \text{Average} &= 50 \\ \text{Number of quantities} &= \frac{\text{Sum of the quantities}}{\text{Average}} \\ &= \frac{250}{50} \\ &= 5\end{aligned}$$

9.1.3 Solution of the real life problems involving average

Example 1

Saud obtained the following marks in different subjects. Find his average marks in the subjects.

Subjects	English	Mathematics	Urdu	Science
Marks	70	80	64	50

Solution

Marks obtained in English = 70

Marks obtained in Mathematics = 80

Marks obtained in Urdu = 64

Marks obtained in science = 50

Sum of the obtained marks = $70 + 80 + 64 + 50 = 264$

Number of subjects = 4

$$\begin{aligned}\therefore \text{Average marks} &= \frac{\text{Sum of marks}}{\text{Number of subjects}} \\ &= \frac{264}{4} \\ &= 66 \text{ marks}\end{aligned}$$

\therefore The average marks of the subjects are 66.

Example 2

The daily income (in Rs.) of a worker is given below. Find the average daily income of the worker.

Days	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Income (Rs)	400	450	350	500	475	375

Solution

$$\begin{aligned}\text{Sum of daily income} &= 400 + 450 + 350 + 500 + 475 + 375 \\ &= \text{Rs. } 2550 \\ \text{Number of days} &= 6 \\ \therefore \text{Average daily income} &= \frac{2550}{6} \\ &= \text{Rs. } 425\end{aligned}$$

Example 3

A player's average score in 4 one-day matches is 48 runs. Find his total score in 4 one day matches.

Solution

$$\begin{aligned}\text{Total one day matches} &= 4 \\ \text{Average score} &= 48 \text{ runs} \\ \therefore \text{Total score} &= \text{Average score} \times \text{Number of matches} \\ &= 48 \times 4 \\ &= 192 \text{ runs}\end{aligned}$$

Example 4

Azeem obtained total 264 marks in his test in different subjects. His average marks are 66 in each subject. Find the number of subjects in which he took test.

Solution

$$\begin{aligned}\text{Azeem scores total marks} &= 264 \\ \text{Average marks} &= 66 \\ \text{Number of subjects} &= \frac{\text{Total marks}}{\text{Average}} \\ &= \frac{264}{66} \\ &= 4 \\ \therefore \text{He took test in 4 subjects.}\end{aligned}$$

Exercise 9.1

1. Find the average of the following numbers:
 - i. 125, 145, 80, 124, 102, 144
 - ii. 150, 200, 250, 300, 350, 400, 450
 - iii. 200, 300, 250, 260, 210, 0, 280, 108
 - iv. 220, 320, 0, 250, 240, 0, 260, 6
 - v. 250, 312, 224, 288, 230, 270, 260, 310, 340
2. If the average of 5 numbers is 76, then find the sum of all the numbers.
3. Sum of few numbers is 350 and the average of these numbers is 50. Find the total numbers.
4. Samina's monthly savings of last six months is given below:

Months	July	August	September	October	November	December
Savings (Rs.)	2000	2500	1650	1500	1750	1502

Find her average monthly savings for each month.

5. Ali paid the electricity bills of last five months as given below.
Find his average monthly electricity bill of each month.

Months	March	April	May	June	July
Bill (Rs.)	575	1253	1675	1893	2004

6. Six students of class 5 obtained marks in a Mathematics test which are given below:

Students	Ali	Asad	Saad	Saud	Hamza	Shafiq
Marks	96	47	89	93	75	68

Find the average marks of each student obtained.

7. The temperature of seven days of a city is given below. Find the average temperature of each day.

Days	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Temperature	31°	36°	41°	38°	42°	40°	38°

8. A player scored runs in T-20 matches as given below:

Matches	1 st	2 nd	3 rd	4 th	5 th	6 th
Runs	56	49	32	74	99	62

Find his average runs scored for each match.

9. Aslam obtained marks in 5 different Mathematics tests as follows:

Test	1 st	2 nd	3 rd	4 th	5 th
Marks	93	87	96	58	46

Find his average marks for each test.

10. Prices of the books of different subjects are given below:

Subjects	English	Urdu	Science	Mathematics	S. Studies
Price (Rs.)	95	92	76	89	68

Find the average price of each book.

11. A player scored runs on average of 62 runs per match. He played 6 matches. Find total runs he scored in these matches.
12. Amina's total monthly savings of few months is Rs. 12,600. Her monthly average savings is Rs. 1,800. Find the number of months of her savings.

9.2 Block, column and bar graph

A bar graph and a column graph are really the same thing. Both provide a graphical representation of data using rectangles/bars of equal width to compare quantities. The bar graphs are drawn vertically or horizontally with equal spacing between them.

9.2.1 Drawing block graph or column graph

We use graph paper to draw block or column graph. We learn to draw the graph with the help of following examples:

Example 1

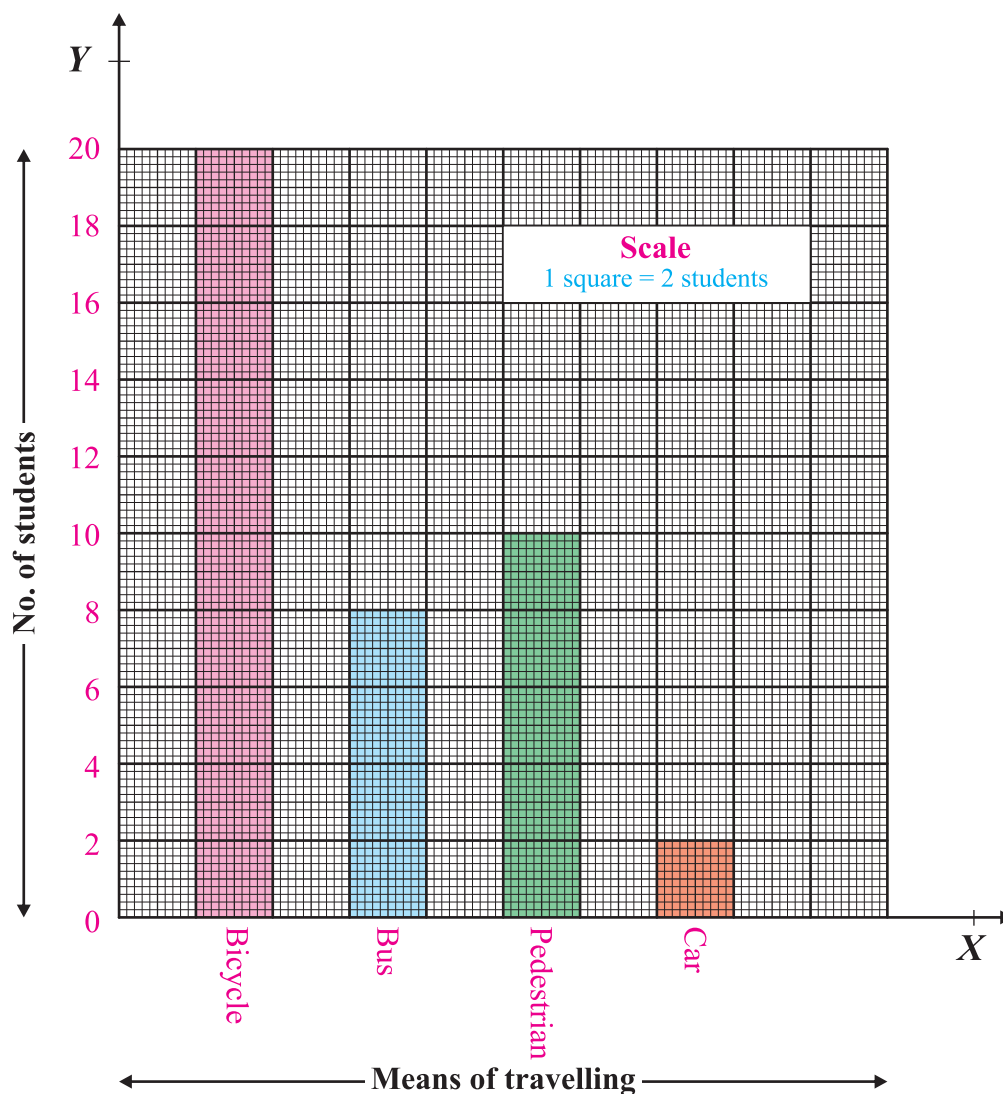
Forty students of class 5 use different means to travel from school to their homes. The tabulated information is given below:

Means	Bicycle	Bus	Pedestrian	Car
Number of students	20	8	10	2

Represent this information through column graph.

Solution

- i. Draw \overrightarrow{OX} and \overrightarrow{OY} perpendiculars to each other and intersecting at a point O .
- ii. Write the means of travelling along X -axis and the number of students along Y -axis.



- iii. One square represents two students along Y -axis.
- iv. 20 students use bicycle. Since one square represents 2 students, 10 squares are taken as length and which is selected to make the graph look attractive. The width is the same for each means throughout the graph.
- v. 8 students use bus, so we take 4 squares along Y -axis as length and same width as for first block.
- vi. Similarly for pedestrian, we take 5 squares as length and for car users we take one square as length whereas the width will be equal in each case.

Thus this is the required graph.

Example 2

Five students received Eidi as given in table below. Represent the given information by a column graph.

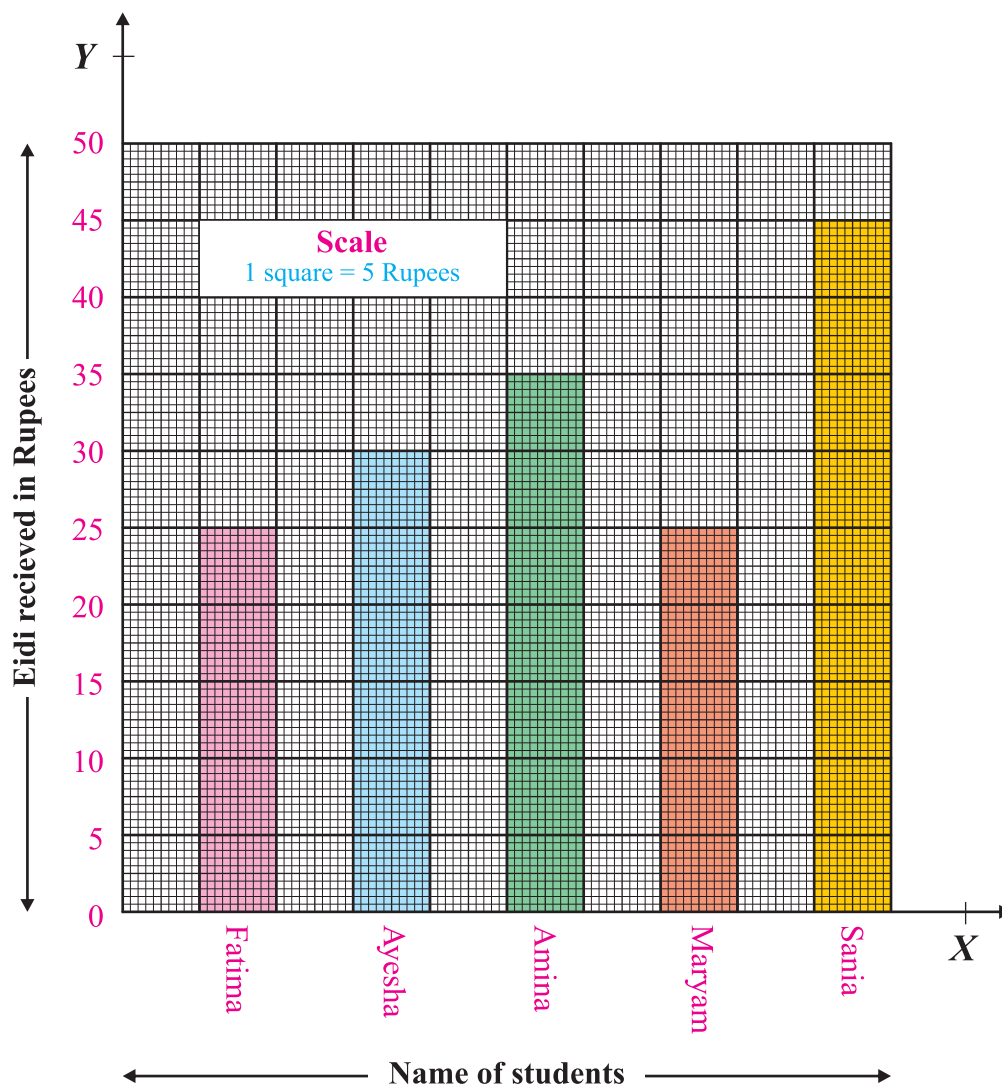
Names	Fatima	Ayesha	Amina	Maryam	Sania
Eidi (Rs.)	25	30	35	25	45

Solution

- i. Draw X -axis and Y -axis.
- ii. Write the names of students along X -axis and Eidi received along Y -axis.
- iii. One square represents 5 rupees along Y -axis.

- iv. 5 squares will represent 25 rupees along Y -axis of Fatima's Eidi.
- v. 6, 7, 5 and 9 squares will represent Eidi of Ayesha, Amina, Maryam and Sania respectively.
- vi. The width will be the same for each column.

Thus this is the required column graph.



Exercise 9.2

1. On Eid day four friends collected Eidi in rupees as given in the following table:

Names	Saud	Ammar	Ali	Usman
Eidi (Rs.)	1000	600	800	400

Hint: One square represents 100 rupees.

Represent the given information by a column graph.

2. Saud obtained marks out of 100 in the annual examination of class 5 in the different subjects as given in the following table. Represent the information by a column graph.

Subjects	Mathematics	Urdu	Islamiat	English
Marks	90	70	80	60

Hint: Take one square as 10 marks.

3. In a table given below, the likings of class 5 students in games are:

Games	Football	Hockey	Cricket	Volleyball
Number of students	25	30	45	20

Draw a column graph representing the above information.

Hint: One square represents 5 students.

4. Amina's result out of 100 marks is given below:

Subjects	English	Urdu	Islamiat	Mathematics	Science
Marks	90	70	90	80	70

Draw a column graph with the help of above information.

Hint: One square represents 10 marks.

5. The sales of a store is given below in a table:

Days	Monday	Tuesday	Wednesday	Thursday	Friday
Sales (Rs.)	3,000	4,500	2,500	3,500	4,000

Draw a column graph representing the above information.

Hint: One square represents Rs. 500.

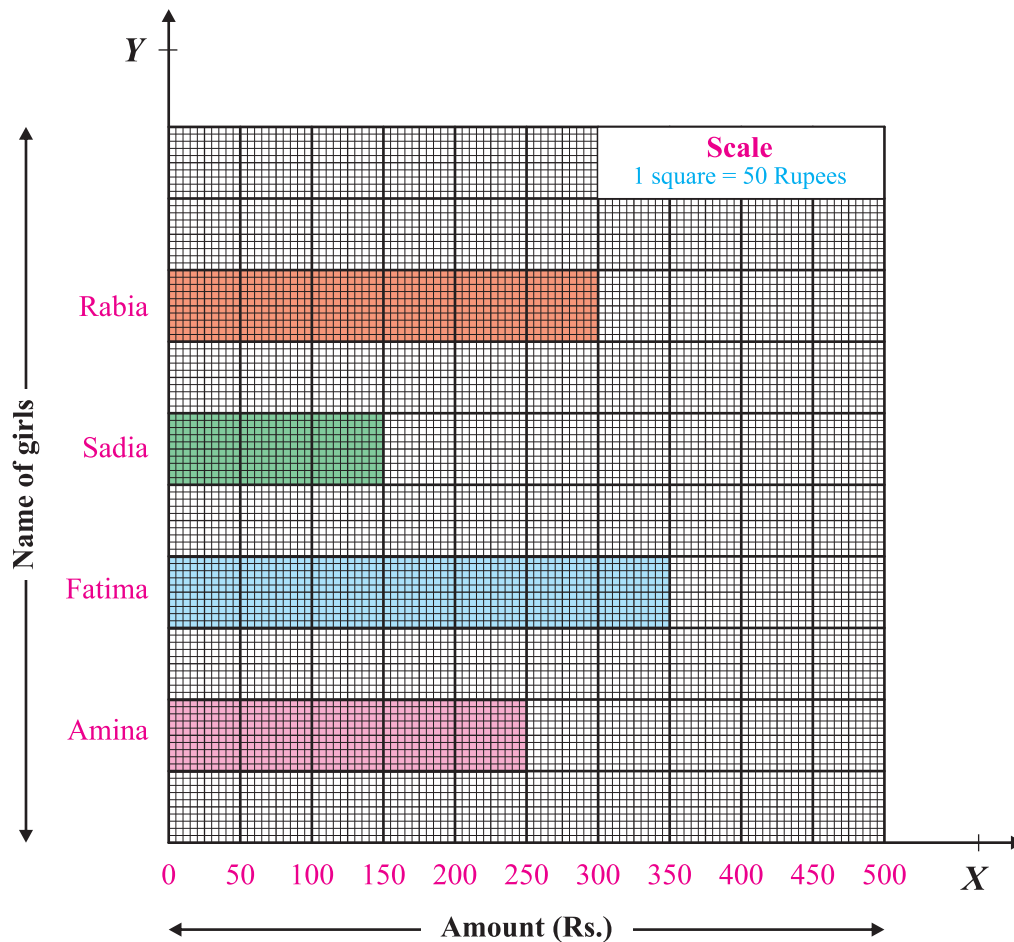
9.2.2 Read a simple bar graph given in horizontal and vertical form

We know that in a bar graph the quantities are represented by rectangles or bars. These bars have uniform width. These bar graphs can be drawn horizontally or vertically as required.

We have learnt to draw a column graph in the last article. Now, we will study the given graph in horizontal or vertical form.

(a) Horizontal bar graph**Example 1**

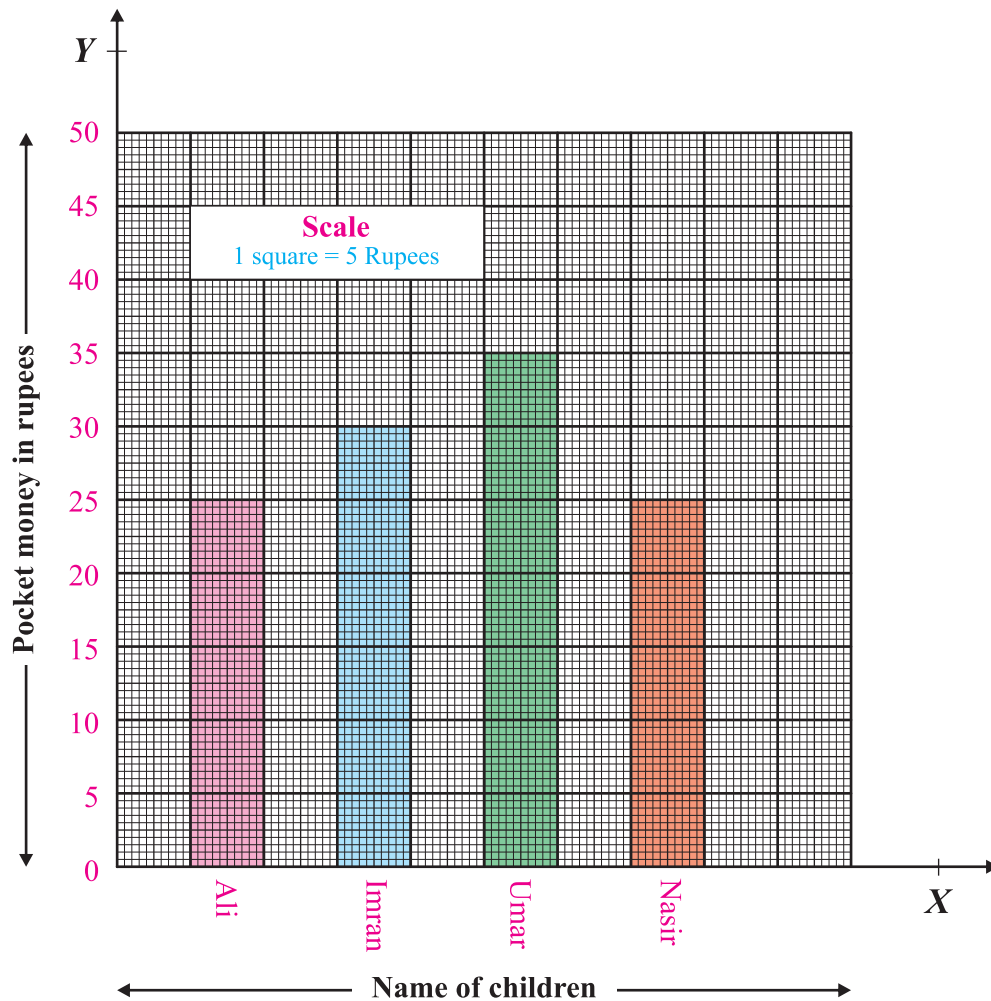
Look at the graph given below and read the graph:

**Solution**

- i. Rabia has Rs. 300.
- ii. Sadia has Rs. 150.
- iii. Fatima has Rs. 350.
- iv. Amina has Rs. 250.
- v. Fatima has the maximum amount i.e., Rs. 350.
- vi. Sadia has the minimum amount i.e., Rs. 150.

(b) Vertical bar graph**Example 2**

The following vertical bar graph represents the pocket money of some children. Read the vertical bar graph.

**Solution**

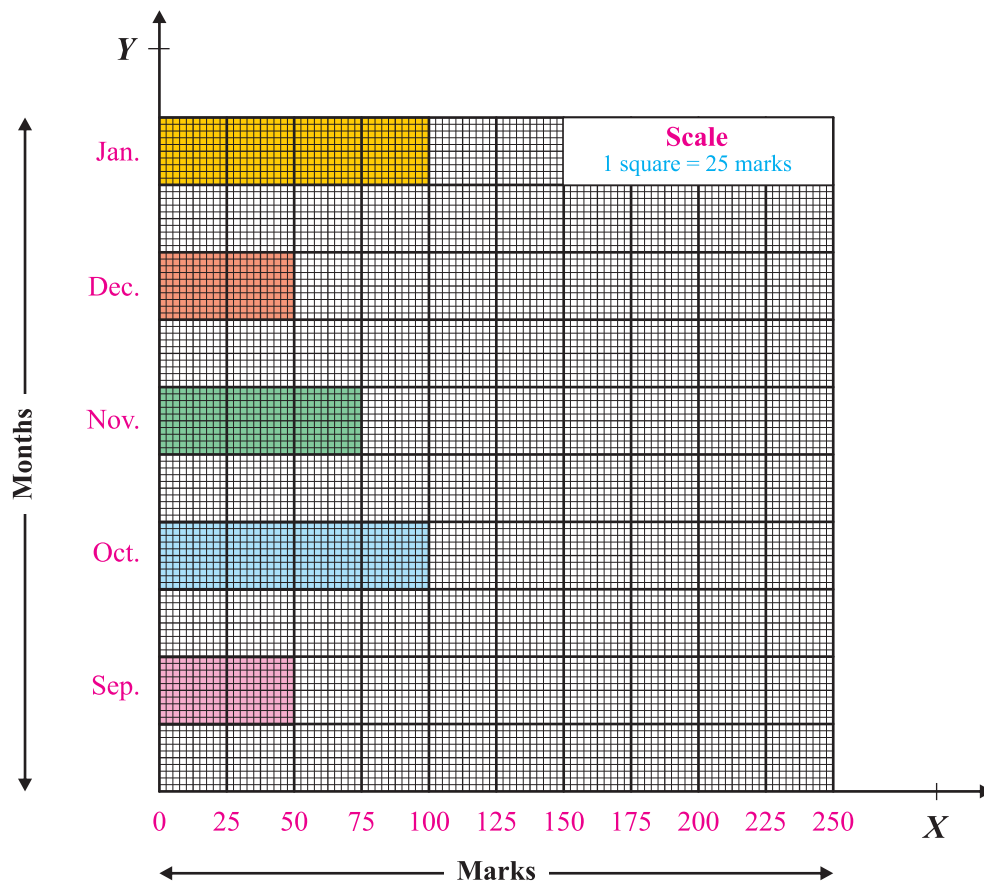
- Umar has maximum pocket money i.e., Rs. 35.
- Ali and Nasir both have the minimum pocket money i.e. Rs. 25.
- Imran has pocket money Rs. 30.

9.2.3 Interpret a simple bar graph given in horizontal and vertical form

(a) Horizontal simple bar graph

Example 3

Look at the horizontal bar graph given below which represents the marks obtained in monthly tests by a student. Interpret the graph.



Solution

From the above horizontal bar graph, we interpret that:

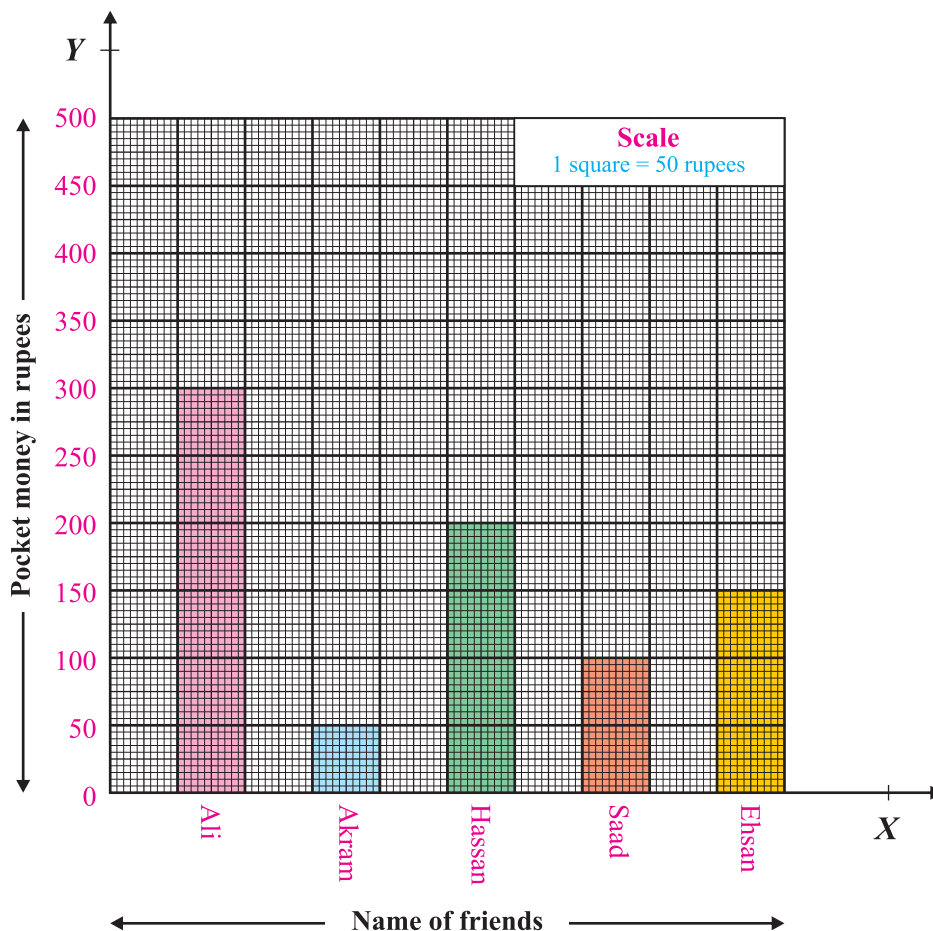
- Marks in January test are 100.
- Marks in December test are 50.
- Marks in November are 75.

- iv. Marks in October test are 100.
- v. Marks in September are 50.
- vi. Maximum marks are in January and October tests.
- vii. Minimum marks are in September and December tests.
- viii. Minimum marks are 50.
- ix. Difference between maximum and minimum marks is 50.

(b) Vertical simple bar graph

Example 4

Look at the following vertical bar graph which represents pocket money of the friends. Interpret the vertical bar graph.



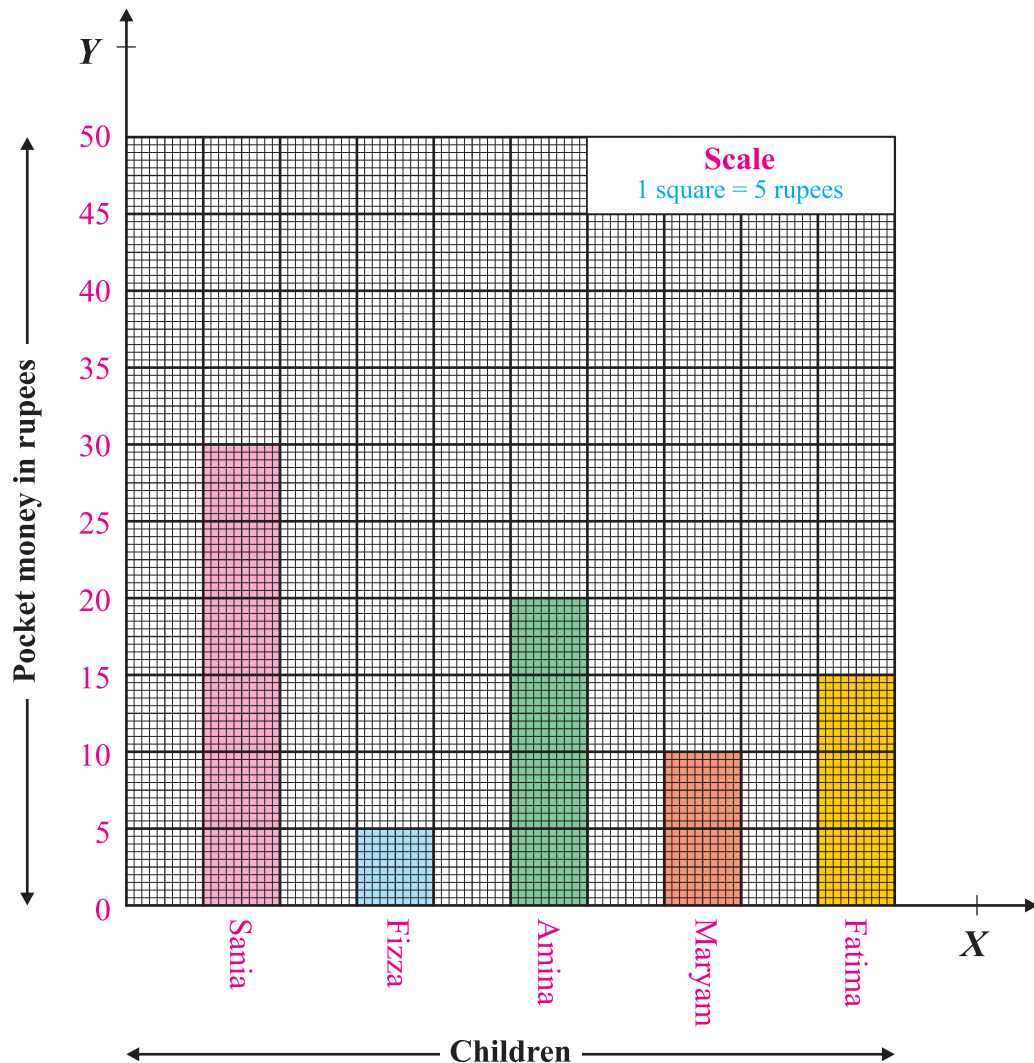
Solution

From the given vertical simple bar graph we interpret that:

- i. Ali has Rs. 300.
- ii. Akram has Rs. 50.
- iii. Hassan has Rs. 200.
- iv. Saad has Rs. 100.
- v. Ehsan has Rs. 150.
- vi. Ali has the maximum amount i.e., Rs. 300.
- vii. Akram has the minimum amount i.e., Rs. 50.
- viii. Ali has Rs. 250 more than Akram.
- ix. Ali has Rs. 100 more than Hassan.
- x. Ali has Rs. 200 more than Saad.
- xi. Ali has Rs. 150 more than Ehsan.
- xii. Hassan has Rs. 50 more than Ehsan.
- xiii. Hassan has Rs. 100 more than Saad.
- xiv. Saad has Rs. 50 more than Akram.

Exercise 9.3

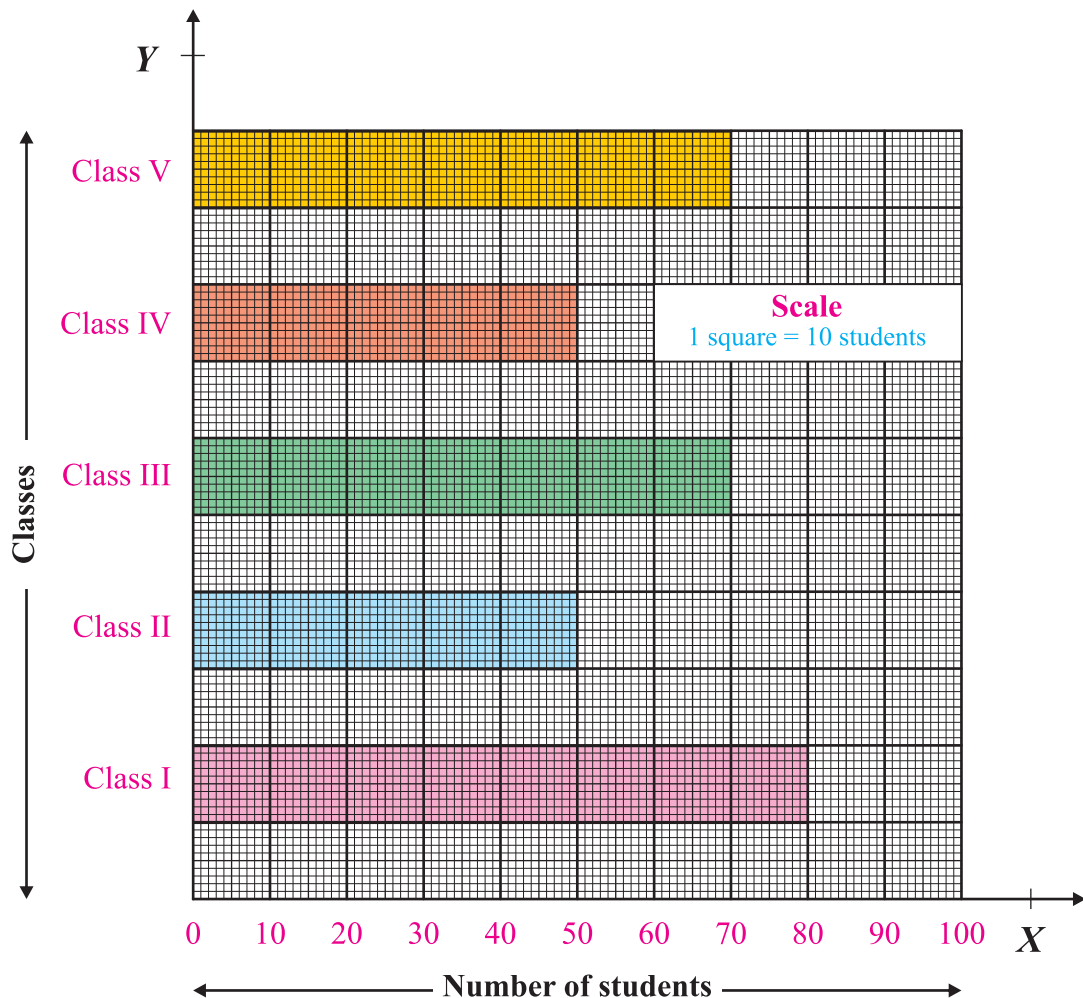
1. Read the following vertical simple bar graph. The graph represents the daily pocket money of five children.



Answer the following questions:

- What information we get from the graph?
- Who is getting the maximum pocket money?
- Who is getting the minimum pocket money?
- What is the difference between the pocket money of Sania and Fizza?

- v. What is the difference between the pocket money of Fizza and Fatima?
 - vi. What is the difference between the pocket money of Sania and Fatima?
 - vii. What is the difference between the pocket money of Fizza and Maryam?
 - viii. What is the difference between the pocket money of Fizza and Amina?
 - ix. How much rupees is Sania's pocket money?
 - x. How much rupees is Fizza's pocket money?
2. The number of boys in different classes in a school are represented in the following simple horizontal bar graph. Look at the graph carefully and answer the questions given under the graph.



- i. How many students are in class I?
- ii. How many students are in class II?
- iii. How many students are in class III?
- iv. How many students are in class IV?
- v. How many students are in class V?
- vi. In which class the number of students are maximum?
- vii. In which class the number of students are minimum?
- viii. How many students are more in class I than class V.
- ix. In which class the number of students is more either in class I or class IV?
- x. What is the difference between the number of students of class II and class V?

Review Exercise 9

1. Four possible options have been given. Encircle the correct one.
 - i. A quantity representing the given quantities is:
 - (a) a data
 - (b) a quantity
 - (c) a graph
 - (d) an average
 - ii. The formula $\frac{\text{Sum of quantities}}{\text{Number of quantities}}$ is of:
 - (a) a graph
 - (b) a data
 - (c) an information
 - (d) an average
 - iii. The average of marks 50, 10, 30, 20, 40 is:
 - (a) 50
 - (b) 150
 - (c) 30
 - (d) 40

iv. Number of quantities \times average is equal to:

- (a) sum of quantities (b) difference of quantities
(c) product of quantities (d) division of quantities

2. Define average.

3. Find the average of 100, 500, 300, 200 and 400.

4. Income of a worker is given below:

Days	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Income (Rs.)	200	350	400	300	250	300

Find his average of daily income.

Summary

- Average is a quantity which represents the given quantities or numbers.
- $$\text{Average} = \frac{\text{Sum of quantities}}{\text{Number of quantities}}$$
- $$\text{Sum of quantities} = \text{Average} \times \text{Number of quantities}$$
- $$\text{Number of quantities} = \frac{\text{Sum of quantities}}{\text{Average}}$$
- The information represented in the form of bars is called a bar graph.
- The width of the bar is uniform throughout the graph.

Exercise 1.1

1.
 - i. Twenty three million, one hundred twenty three thousand, four hundred five.
 - ii. Three hundred forty million, three hundred sixty five thousand, nine hundred one.
 - iii. Two hundred thirty one million, seven hundred thousand, three hundred twenty one.
 - iv. Nine hundred eighty seven million, two hundred twelve thousand, nine hundred seven.
 - v. Nine hundred seventy five million, eight hundred sixty four
 - vi. One billion.
2.
 - i. 75,420,714
 - ii. 516,284,700
 - iii. 912,000,501
 - iv. 250,374,611
 - v. 500,000,000
 - vi. 999,999,999
 - vii. 1,000,000,000

Exercise 1.2

- | | | |
|-----------------|----------------|-----------------|
| 1. 7,538,022 | 2. 5,003,593 | 3. 21,128,823 |
| 4. 95,471,881 | 5. 145022537 | 6. 342,623,503 |
| 7. 2,561,976 | 8. 485,680,858 | 9. 980977461 |
| 10. 11,067,193 | 11. 636084518 | 12. 605,756,542 |
| 13. 578,929,626 | 14. 790156142 | 15. 725,460,169 |

Exercise 1.3

- | | | |
|-----------------|-----------------|----------------|
| 1. 6,099,892 | 2. 3,952,863 | 3. 21,134,428 |
| 4. 37,443,248 | 5. 628,350,941 | 6. 252,891,393 |
| 7. 7,781,991 | 8. 304893236 | 9. 542208123 |
| 10. 9,402,369 | 11. 908,897,701 | 12. 35,398,944 |
| 13. 772,671,110 | 14. 508481372 | 15. 48477950 |

ANSWERS

Exercise 1.4

- | | | |
|-----------------|---------------|----------------|
| 1. 3456270 | 2. 24584200 | 3. 258961000 |
| 4. 15604110 | 5. 35,537,970 | 6. 32,044,200 |
| 7. 56,317,338 | 8. 94,538,561 | 9. 282,000,056 |
| 10. 155,533,392 | | |

Exercise 1.5

- | | |
|-----------------------|-------------------------|
| 1. Q = 26590 R = 3 | 2. Q = 17859 R = 8 |
| 3. Q = 9021 R = 15 | 4. Q = 7705 R = 33 |
| 5. Q = 8411 R = 23 | 6. Q = 2318 R = 112 |
| 7. Q = 1055 R = 93 | 8. Q = 1675 R = 296 |
| 9. Q = 1627 R = 71 | 10. Q = 1329 R = 258 |

Exercise 1.6

- | | | | | |
|--------|--------|--------|---------|--------|
| 1. 34 | 2. 61 | 3. 55 | 4. 59 | 5. 35 |
| 6. 109 | 7. 111 | 8. 36 | 9. 72 | 10. 48 |
| 11. 33 | 12. 64 | 13. 36 | 14. 150 | 15. 56 |

Exercise 1.7

- | | | |
|---------------|------------|------------|
| 1. Rs. 33,000 | 2. Rs. 170 | 3. 70 |
| 4. Rs. 1,120 | 5. Rs. 20 | 6. Rs. 225 |

Exercise 1.8

- | | | | | | |
|-------|-------|-------|--------|--------|--------|
| 1. 30 | 2. 54 | 3. 40 | 4. 11 | 5. 114 | 6. 74 |
| 7. 33 | 8. 27 | 9. 0 | 10. 16 | 11. 21 | 12. 22 |

Review Exercise 1

1. i. c ii. b iii. d iv. a
2. i. Twelve million three hundred twenty one thousand one fifty.
ii. Two hundred one million four hundred twenty one thousand two hundred

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3. i. 813,000,402 ii. 260,565,620 4. i. 12,055,475 ii. 662,541,065
5. i. 9,408,148 ii. 90,823,015 6. i. 6,098,565 ii. 40,711,420
7. i. $Q = 20964$ $R = 5$ ii. $Q = 60417$ $R = 8$
8. i. 57 ii. 72 9. i. 10 ii. 30

Exercise 2.1

1. 5 2. 4 3. 4 4. 5 5. 15 6. 20
7. 12 8. 24 9. 8 10. 12 11. 21 12. 14

Exercise 2.2

1. 3 2. 24 3. 5 4. 4 5. 14 6. 9
7. 12 8. 14 9. 32 10. 12 11. 16 12. 28

Exercise 2.3

1. 100 2. 1080 3. 160 4. 560 5. 288
6. 840 7. 600 8. 480 9. 1188 10. 18000

Exercise 2.4

1. 60 2. 150 3. 300 4. 600 5. 1200
6. 300 7. 480 8. 432 9. 560 10. 540

Exercise 2.5

1. 5 2. 45 3. 600 4. 675 5. Rs. 20 6. 24 bananas

Review Exercise 2

1. i. b ii. a iii. c
2. i. 8 ii. 15 iii. 25
3. i. 4 ii. 19 iii. 9
4. i. 180 ii. 108 iii. 90
5. i. 510 ii. 168 iii. 1140
6. 8 7. 180 8. 250 9. 10 litre

Exercise 3.1

1. $\frac{7}{18}$ 2. $\frac{22}{45}$ 3. $\frac{73}{99}$ 4. $\frac{31}{72}$ 5. $\frac{13}{15}$
-

ANSWERS

- | | | | | | | | | | |
|-----|-----------------|-----|-----------------|-----|----------------|-----|-----------------|-----|----------------|
| 6. | $\frac{11}{26}$ | 7. | $\frac{33}{32}$ | 8. | $\frac{1}{6}$ | 9. | $\frac{17}{60}$ | 10. | $\frac{1}{6}$ |
| 11. | $\frac{11}{18}$ | 12. | $\frac{7}{26}$ | 13. | $\frac{5}{12}$ | 14. | $\frac{5}{34}$ | 15. | $\frac{5}{26}$ |
| 16. | $\frac{17}{56}$ | 17. | $\frac{1}{20}$ | 18. | $\frac{7}{60}$ | | | | |

Exercise 3.2

- | | | | | | | | | | | | |
|----|-----------------|----|----------------|----|-----------------|-----|------------------|-----|------------------|-----|----------------|
| 1. | $\frac{11}{12}$ | 2. | $\frac{1}{12}$ | 3. | $\frac{31}{30}$ | 4. | $\frac{1}{4}$ | 5. | $\frac{9}{14}$ | 6. | $\frac{5}{24}$ |
| 7. | $\frac{71}{45}$ | 8. | $\frac{1}{5}$ | 9. | $\frac{83}{60}$ | 10. | $\frac{83}{210}$ | 11. | $1\frac{29}{30}$ | 12. | $\frac{1}{42}$ |

Exercise 3.5

- | | | | | | | | | | |
|----|----------------|----|------------------|----|-----------------|----|-----------------|----|---------------|
| 1. | $\frac{1}{4}$ | 2. | $\frac{3}{70}$ | 3. | $\frac{5}{56}$ | 4. | 7 | 5. | $\frac{1}{2}$ |
| 6. | $\frac{8}{45}$ | 7. | $\frac{605}{36}$ | 8. | $\frac{209}{9}$ | 9. | $\frac{21}{25}$ | | |

Exercise 3.8

- | | | | | | | | | | |
|----|---------------|----|-----------------|----|-----------------|----|------------------|----|---------------|
| 1. | $\frac{1}{2}$ | 2. | 2 | 3. | $\frac{14}{15}$ | 4. | $\frac{40}{147}$ | 5. | $\frac{1}{2}$ |
| 6. | $\frac{7}{6}$ | 7. | $\frac{55}{84}$ | 8. | $\frac{9}{8}$ | 9. | $\frac{6}{5}$ | | |

Exercise 3.9

- | | | | | | | | | | |
|----|-----------------|----|----------------|----|------------------|----|-------------------|----|---------------|
| 1. | $7\frac{7}{18}$ | 2. | $1\frac{2}{5}$ | 3. | $1\frac{44}{81}$ | 4. | $25\frac{11}{15}$ | 5. | $\frac{4}{5}$ |
| 6. | $\frac{19}{60}$ | 7. | $5\frac{5}{9}$ | 8. | $\frac{4}{9}$ | | | | |

Review Exercise 3

- | | | | | |
|----|--------|---------|----------|---------|
| 1. | i. (b) | ii. (c) | iii. (c) | iv. (b) |
|----|--------|---------|----------|---------|

ANSWERS

- | | | | | |
|---------------------|---------------------|----------------------|--------------------|--------------------|
| i. $1\frac{1}{2}$ | ii. $2\frac{2}{3}$ | iii. $2\frac{8}{9}$ | iv. $\frac{2}{9}$ | v. $\frac{2}{3}$ |
| vi. 2 | vii. $2\frac{1}{4}$ | viii. $1\frac{2}{7}$ | ix. $2\frac{1}{3}$ | x. $\frac{7}{9}$ |
| xi. $\frac{11}{16}$ | xii. $1\frac{2}{7}$ | xiii. $\frac{4}{27}$ | xiv. 14 | xv. $3\frac{1}{2}$ |
| xvi. $\frac{7}{60}$ | | | | |

Exercise 4.1

- | | | | |
|----|--------------|-------------|---------------|
| 1. | i. 68.99 | ii. 774.33 | iii. 137.7592 |
| | iv. 99.1063 | v. 113.5308 | vi. 152.3731 |
| 2. | i. 148.9205 | ii. 730.542 | iii. 50.2911 |
| | iv. 125.1332 | | |

Exercise 4.2

- | | | | |
|----|------------|--------------|---------------|
| 1. | i. 667.8 | ii. 1036.81 | iii. 886.734 |
| | iv. 1112.2 | v. 293.4 | vi. 382 |
| 2. | i. 7272.1 | ii. 13723.51 | iii. 2182 |
| 3. | i. 70034.5 | ii. 31830.1 | iii. 57223 |
| 4. | i. 8.352 | ii. 17.2002 | iii. 0.0651 |
| 5. | i. 1.6131 | ii. 14.7253 | iii. 0.00231 |
| 6. | i. 3.43443 | ii. 0.29375 | iii. 0.037582 |

Exercise 4.3

- | | | | |
|----|---------------|---------------|--------------|
| 1. | i. 92.4 | ii. 448.8 | iii. 1449.92 |
| | iv. 79.488 | | |
| 2. | i. 4.23 | ii. 5.02 | iii. 8.14 |
| | iv. 3.04 | | |
| 3. | i. 31.50 | ii. 1540.4136 | iii. 10.5144 |
| | iv. 2159.0064 | | |

ANSWERS

Exercise 4.4

- | | | | | | | | | |
|----|----|-------|-----|------|------|-------|-----|------|
| 1. | i. | 51 | ii. | 24 | iii. | 13 | iv. | 22 |
| 2. | i. | 0.04 | ii. | 0.15 | iii. | 3.4 | iv. | 6.6 |
| 3. | i. | 11.2 | ii. | 5.46 | iii. | 30.34 | iv. | 51.6 |
| | v. | 21.26 | ii. | 0.7 | | | | |

Exercise 4.5

- | | | | | | | |
|----|----|--------------------|-----|-------------------|------|--------------------|
| 1. | i. | 8.2 | ii. | 5.4 | iii. | 6.6 |
| 2. | i. | 15.64 | ii. | 8.77 | iii. | 17.83 |
| 3. | i. | 71.835 | ii. | 90.036 | iii. | 108.318 |
| 4. | i. | 0.75 | ii. | 5.125 | iii. | 17.4 |
| 5. | i. | $17\frac{23}{100}$ | ii. | $24\frac{13}{25}$ | iii. | $19\frac{11}{100}$ |

Exercise 4.6

1. Rs. 80.30 2. Rs. 724.20 3. 5 4. 21.1 m
5. Widow's share = Rs. 500.05 ; Son's share = Rs. 1400.14

Exercise 4.7

- | | | | | | | | | |
|----|----|------------------|-----|------------------|------|------------------|-------|------------------|
| 1. | i. | $\frac{63}{100}$ | ii. | $\frac{31}{100}$ | iii. | $\frac{93}{100}$ | iv. | $\frac{17}{100}$ |
| | v. | $\frac{80}{100}$ | vi. | $\frac{27}{100}$ | vii. | $\frac{76}{100}$ | viii. | $\frac{41}{100}$ |
| 2. | i. | 34% | ii. | 64% | iii. | 70% | iv. | 15% |
| | v. | 90% | vi. | 25% | vii. | 60% | viii. | 75% |
| 3. | i. | 17% | ii. | 23% | iii. | 51% | iv. | 19% |

Exercise 4.8

1. Rs. 360 2. Rs. 7000
3. Cash = Rs. 1600, After one month = Rs. 2400
4. 90 pages

ANSWERS

Review Exercise 4

1. i. b ii. a iii. d iv. c v. a
vi. b vii. c viii. d ix. a
2. i. 15.2154 ii. 7.1 iii. 14.32 iv. 3.24
3. i. $7\frac{23}{100}$ ii. $13\frac{97}{100}$ iii. $6\frac{32}{1000}$
4. i. $\frac{54}{100}$ ii. $\frac{72}{100}$ iii. $\frac{97}{100}$
5. i. 26% ii. 70% iii. 29%
6. i. 9 ii. 12 iii. 26
7. 60% 8. $14\frac{2}{7}\%$ 9. 16 10. 160.92

Exercise 5.1

- i. 32 cm ii. 6.42 km iii. 6.42 m iv. 0.88 m
v. 2240 mm vi. 45 mm vii. 32000 m viii. 873 cm
ix. 1.50 m x. 36 cm

Exercise 5.2

1. i. 400 minutes ii. 265 seconds
2. i. 12 hours 30 minutes ii. 15 minutes
3. i. 4 hours 30 minutes ii. 11 hours
iii. 7 hours 24 minutes iv. 5 hours 22 minutes
v. 3 hours 41 minutes vi. 4 hours 54 minutes
vii. 3 hours 23 minutes

Exercise 5.3

1. 11 weeks and 6 days 2. 14 weeks and 2 days
3. 19 weeks and 5 days 4. 150 weeks
5. 5 months 6. 28 months and 10 days

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- | | | | |
|-----|-----------------------|-----|-----------------------|
| 7. | 33 months and 10 days | 8. | 2 years and 11 months |
| 9. | 12 years and 6 months | 10. | 1200 days |
| 11. | 3450 days | 12. | 144 months |
| 13. | 65 months | 14. | 131 months |

Exercise 5.4

- | | | | |
|-----|------------------------|-----|--------------------|
| 1. | 8 years 10 months | 2. | 1 hour 10 minutes |
| 3. | 4.15 pm | 4. | Samina, 15 minutes |
| 5. | 72 pills | 6. | 21 days |
| 7. | 7 minutes | 8. | 300 minutes |
| 9. | 1 hour 40 minutes | | |
| 10. | (a) 1 hour 40 minutes | (b) | 1 hour 10 minutes |
| | (c) 3 hours 10 minutes | | |
| 11. | 55 minutes | | |

Exercise 5.5

- | | | | | | | | | |
|----|----|---------|-----|---------|------|----------|-------|---------|
| 1. | i. | 75°, 3° | ii. | 22°, 4° | iii. | 107°, 3° | iv. | 94°, 8° |
| 2. | i. | 113°F | ii. | 356°F | iii. | 410°F | iv. | 158°F |
| | v. | 69.8°F | vi. | 156.2°F | vii. | 185°F | viii. | 210.2°F |
| 3. | i. | 12.2°C | ii. | -7.78°C | iii. | 49.44°C | iv. | 23.89°C |
| | v. | 10.56°C | vi. | 48.33°C | vii. | 40.55°C | viii. | 26.11 |
| 4. | i. | 480°F | ii. | 301°F | iii. | 347°F | iv. | 187°F |
| | v. | 58°F | vi. | 89°F | vii. | 13°F | viii. | 33°F |
| 5. | | 109.4°F | 6. | 37°C | 7. | 12°F | 8. | 51.44°C |
| 9. | | 93.2°F | | | | | | |

Review Exercise 5

- | | | | | | | | | | | |
|----|-----|---|------|---|-------|---|-----|---|----|---|
| 1. | i. | b | ii. | d | iii. | d | iv. | a | v. | d |
| | vi. | a | vii. | d | viii. | b | ix. | a | x. | d |

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2. i. 60 minutes ii. 150 minutes iii. 237 minutes
iv. 285 minutes v. 333 minutes vi. 375 minutes
3. i. 5 hours 30 minutes ii. 4 hours 20 minutes
iii. 7 hours 50 minutes iv. 3 hours 25 minutes
4. i. 28540 m ii. 2925 cm iii. 956 mm
iv. 1 km 24 m v. 3 m 21 cm vi. 154 cm 3 mm
5. i. 385 days ii. 15 weeks
iii. 12 months 10 days iv. 8 years 4 months
6. i. 15 hours 19 minutes 5 seconds
ii. 45 hours 59 minutes 37 seconds
iii. 2 hours 10 minutes 9 seconds
7. i. 2 hours 51 minutes 50 seconds
ii. 3 hours 9 minutes 30 seconds
iii. 2 hours 39 minutes 15 seconds
8. i. 152.77°C ii. 114.44°C
iii. 24°C iv. 40.56°C
9. 2:45 pm 10. 1 hour 5 minutes
11. 84°F 12. 1 hour 18 minutes
13. 2 pm 14. 5.1°F
15. 24°F 16. 180°F 17. 6°C, 25°C

Exercise 6.1

1. Rs. 31000 2. 1960 m² 3. 187.5 km 4. 600 calories
5. 460 km 6. 50 days 7. 40m 8. 9.6 kg
9. 5 days
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Exercise 6.2

- | | | | |
|------------|----------------------|------------------------|--------------|
| 1. 16 | 2. 21.71 kg | 3. 105 words | 4. Rs. 28750 |
| 5. 5 hours | 6. 25 masons | 7. 57 days | 8. 20 days |
| 9. Rs. 210 | 10. 12 hours, 532 km | 11. 11.25 kg, 60 books | |

Review Exercise 6

- | | | |
|---------------------------|-----------------------------|-------------------|
| 1. i. a. unitary method | ii. c. Rs. 7 | iii. b. 20 liters |
| iv. d. division | v. d. unitary method | vi. a. ratio |
| vii. c. direct proportion | viii. d. inverse proportion | |
| ix. c. direct proportion | x. d. inverse proportion | |
-
- | | | | |
|--------------|----------------|--------------|----------------|
| 2. Rs. 180 | 3. Rs. 144 | 4. 35 shirts | 5. 17 km |
| 6. Rs. 23100 | 7. 720 bottles | 8. 35 days | 9. 4 pipes |
| 10. 21 men | 11. 40 min | 12. 40 days | 13. 20 minutes |

Exercise 7.1

- | | | |
|-------------|--------------|------------|
| 1. i. Right | ii. Obtuse | iii. Acute |
| iv. Reflex | v. Straight | vi. Acute |
| vii. Right | viii. Reflex | ix. Obtuse |
| x. Straight | | |

Review Exercise 7

- | | | | | |
|-----------|----------|-----------|---------|--------|
| 1. i. (d) | ii. (a) | iii. (d) | iv. (d) | v. (a) |
| vi. (c) | vii. (c) | viii. (d) | ix. (b) | x. (c) |

Exercise 8.1

- | | | |
|--------------------------------|------------------------------------|------------------------------|
| 1. i. 12cm, 9cm ² | ii. 28cm, 49cm ² | iii. 36cm, 81cm ² |
| iv. 40cm, 100cm ² | v. 44cm, 121cm ² | vi. 68cm, 289cm ² |
| vii. 10cm, 6.25cm ² | viii. 14.4cm, 12.96cm ² | ix. 72cm, 324cm ² |

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2. i. 40cm, 96cm² ii. 24cm, 27cm² iii. 20cm, 24cm²
iv. 38cm, 84cm² v. 22cm, 26.25 cm² vi. 40cm, 69.75cm²

Exercise 8.2

1. 4 m² 2. 9,375m² 3. Rs. 9,600
4. Rs. 1,200 5. Rs. 1,08,000, Rs. 12,000
6. Rs. 92,160, Rs. 8,000 7. Rs. 9,000

Review Exercise 8

1. i. (c) ii. (b) iii. (c) iv. (d) v. (a)
vi. (b) vii. (b) viii. (c)

Exercise 9.1

1. i. 120 ii. 300 iii. 201 iv. 162 v. 276
2. 380 3. 7 4. Rs. 1817 5. Rs. 1480
6. 78 marks 7. 38° 8. 62 runs 9. 76 marks
10. Rs. 84 11. 372 runs 12. 7 months

Exercise 9.3

1. i. The information about daily pocket money of five students.
ii. Sania is getting the maximum money.
iii. Fizza is getting the minimum money.
iv. Rs. 25 v. Rs. 10 vi. Rs. 15 vii. Rs. 5
viii. Rs. 15 ix. Rs. 30 x. Rs. 15
2. i. 80 ii. 50 iii. 70 iv. 50
v. 70 vi. class I vii. Class II and Class IV
viii. 10 students ix. class I x. 20 students

Review Exercise 9

1. i. (d) ii. (d) iii. (c) iv. (a) 3. 300 4. Rs. 300