EASY

MATH

Key Book Class 4

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Printed By:	Ahmed Naveed Printers
Published By:	INTERNATIONAL MOONLIGHT® PUBLISHERS

Sale & Display Center:	**MoonLight Publishers** 19-Main Urdu Bazar, Lahore
Head Office:	**MoonLight Research Lab.** Aahata Shahadriyan 22 - Urdu Bazar, Lahore
24/7	**03 -111-186-786**
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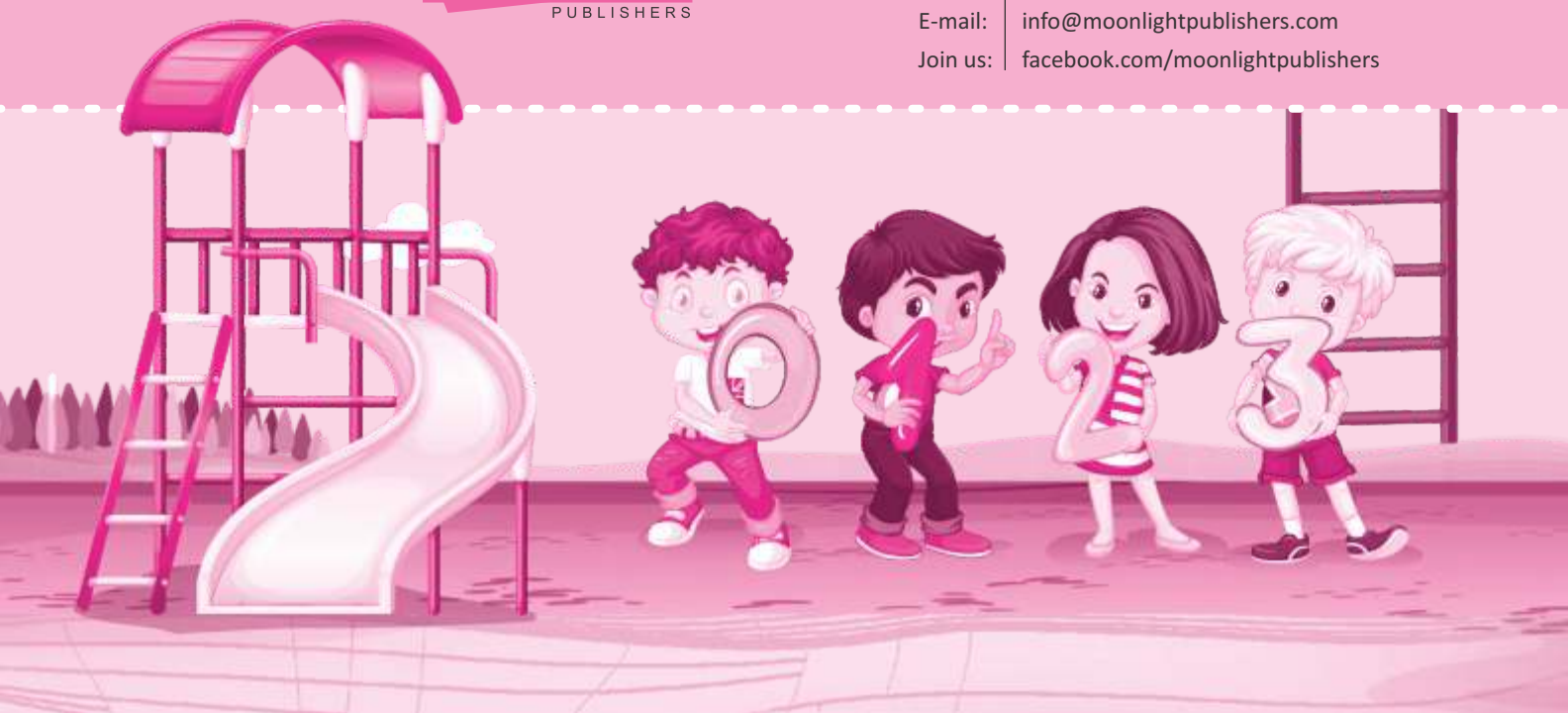


Preface

This series is designed in accordance with the revised syllabus prescribed by the ministry of education for primary schools in Pakistan.

In this series various modern method and techniques have been used to inculcate in the young children the basic mathematical concepts. The approach of treating the subject matter from concert and pictorial to abstract, being still effective in teaching has been maintained in this series.

Each concept has been allocated proper space for incorporation of your colour lively illustrations. Digital pictures and diagrams are added which give appreciable look to this book.

The series is designed in such a way that even a less experienced teacher can easily teach the tough topics of mathematic. Superior paper and high quality printing makes the series acceptable for any prestigious institute.

All possible human efforts are made to make this book error free, but still improvement can be made. All suggestions in this regard are welcomed.

Publishers.

Contents

1 Numbers 04

2 Factors and Multiples 14

3 Fractions 30

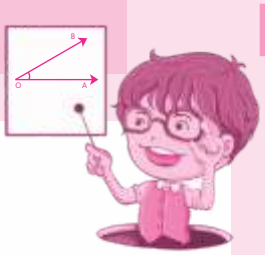
4 Simplification 41

5 Percentage 49

6 Information Handling 61

7 Area and Perimeter 73

8 Angles and Triangles 85



Unit 1

Numbers

Students' Learning Outcomes:

After studying this unit, students will be able to:

- read and write numbers in international and Pakistani style.
- write five and six digit numbers in ascending and descending order.
- understand predecessors and successors.
- to convert a number in expanded form and vice versa.

Activity 1: We have read 5-digit numbers. Let us start with short practice. Write the number names:

a. 20,000 — Twenty thousand

b. 41,317 — Forty one thousand three hundred seventeen

c. 40,070 — Forty thousand and seventy

d. 89,999 — Eighty nine thousand nine hundred and ninety nine

e. 90,909 — Ninety thousand nine hundred and nine

Activity 2: Write down the numbers placing the comma correctly:

a. Seventy thousand. — 70,000

b. Forty five thousand eight hundred. — 45,800

c. Ten thousand and one. — 10,001

d. Fifty thousand and fifty. — 50,050

e. Fifty seven thousand one hundred and ten. — 57,110

5-Digit Number has been placed in periods

Thousands		Hundreds	Tens	Ones
T.TH	TH	H	T	O
4	3	7	6	8

We write this number as 43,768. We say it as: Forty three thousand, seven hundred and sixty eight.

What happens when we add 1 more to the biggest 5-digit number 99,999?

	Thousands		Hundreds	Tens	Ones	
	T.TH	TH	H	T	O	
	1	1	1	1		
	9	9	9	9	9	
					1	+
1	0	0	0	0	0	

Now it has become 6-digit number.

So, we make another house (period) for it.

and put '1' in the house of lakhs.

Lakhs		Thousands		Hundreds	Tens	Ones
T.L	L	T.TH	TH	H	T	O
	1	0	0	0	0	0

99,999 + 1 = 1,00,000

or One Lakh

Note: One Lakh is the smallest 6-digit number

Example 1: Write the number names:

a. 2,00,000 Two lakh

b. 8,00,000 Eight lakh

c. 3,76,000 Three lakh, Seventy six thousand.

d. 4,56,789 Four lakh, fifty six thousand seven hundred and eighty nine

e. 9,96,009 Nine lakh, ninety six thousand and nine

Example 2: Place these 6-digit numbers in period and write in words.

a. 461089 = 4,61,089

= Four lakh, sixty one thousand and eighty nine.

b. 202020 = 2,02,020

= Two lakh, two thousand and twenty.

c. 100001 = 1,00,001
One lakh and one

Example 3: Write these numbers placing your commas correctly:

a. Nine lakh, forty thousand and twenty = 9,40,020
b. Six lakh, two thousand, two hundred and twenty two = 6,02,222
c. Six lakh, six thousand and sixty = 6,06,060
d. Nine lakh, ninety nine thousand nine hundred and ninety nine = 9,99,999
e. One lakh, twenty three thousand, four hundred and fifty six. = 1,23,456

Note: In Pakistan and some other countries 100000 is called one lakh and written as 1,00,000 but elsewhere in the world, it is called one hundred thousand and written as 100,000.

Here is a number 345678. We can write it in two different ways:

1. Pakistani place value chart.

Lakhs		Thousands		Hundreds	Tens	Ones
T.L	L	T.TH	TH	H	T	O
	3	4	5	6	7	8

2. International place value chart.

Thousands			Hundreds	Tens	Ones
H.TH	T.TH	TH	H	T	O
3	4	5	6	7	8

H.TH stands for ''Hundred Thousand".

Remember:
In International style comma ' , ' is placed after every 3rd digit from right to left.

Activity: Place these 6-digit numbers in periods
(First in the Pakistani style and then in international style)

		Pakistani Style	International style
a.	246379	2,46,379	246,379
b.	843788	8,43,788	843,788
c.	202020	2,02,020	202,020
d.	324008	3,24,008	324,008
e.	111111	1,11,111	111,111

Example: Write down the number names according to international style:

a. 234,234 Two hundred thirty four thousand, two hundred and thirty four.

b. 100,001 One hundred thousand and one.

c. 303,404 Three hundred three thousand, four hundred and four.

d. 898,898 Eight hundred ninety eight thousand, eight hundred and ninety eight.

e. 236,780 Two hundred thirty six thousand, seven hundred and eighty.

Expanded Form

We can split a number into sum of place values. For example

3456 = 3000 + 400 + 50 + 6

Now we do practice of expanded form for 6-digit numbers.

Example: Write the given numbers in expanded form:

a. 346,278 = 300,000 + 40,000 + 6,000 + 200 + 70 + 8

b. 450,868 = 400,000 + 50,000 + 0 + 800 + 60 + 8

c. 3,24,666 = 3,00,000 + 20,000 + 4,000 + 600 + 60 + 6

d. 2,76,707 = 2,00,000 + 70,000 + 6,000 + 700 + 0 + 7

Activity: Write down these numbers in expanded from.

a. 3,46,278 = 3,00,000 + 40,000 + 6,000 + 200 + 70 + 8

b. 4,67,999 = 4,00,000 + 60,000 + 7,000 + 900 + 90 + 9

c. 4,00,778 = 4,00,000 + 00,000 + 0,000 + 700 + 70 + 8

d. 5,80,980 = 5,00,000 + 80,000 + 0,000 + 900 + 80 + 0

Arranging the numbers in Ascending and Descending Orders

Ascending Order

In ascending order, we first write the smallest number. Then we write the number which is bigger than which we have already written and so on.

Examples: Write down the given numbers in ascending order:

a. 346,587 , 285,569 , 887,766 , 285,667 , 345,598

In ascending Order:

285,569 , 285,667 , 345,598 , 346,587 , 887,766

b. 637,289 , 637,298 , 633,277 , 633,727 , 633,372

In ascending Order:

633,277 , 633,372 , 633,727 , 637,289 , 637,298

Activity: Write down these numbers in ascending order:

a. 123,344 , 124,567 , 214,667 , 214,779 , 368,298

123,344 , 124,567 , 214,667 , 214,779 , 368,298

b. 437,268 , 437,286, 437,826 , 437,888 , 436,289

436,289 , 437,268 , 437,286 , 437,826 , 437,888

c. 423,213 , 572,133, 172,361 , 736,982 , 6347,298

172,361 , 423,213 , 572,133 , 637,298 , 736,982

Descending Order

In descending order we first write the biggest number, then we write the number which is smaller than which we have already written and so on.

Examples: Write given down the numbers in descending order:

a. 463,728 , 863,799 , 568,733 , 257,608 , 300,809

In descending Order:

863,799 , 568,733 , 463,728 , 300,809 , 257,608

b. 687,354 , 687,333 , 698,376 , 698,877 , 650,555

In descending Order:

698,877 , 698,376 , 687,354 , 687,333 , 650,555

c. 752,688 , 374,827 , 373,865 , 201,918 , 572,631

In descending Order:

752,688 , 572,631 , 374,827 , 373,865 , 201,918

Activity: Write down these numbers in descending order:

a. 356,738 , 462,589 , 637,398 , 463,289 , 354,328

637,398 , 463,289 , 462,589 , 356,738 , 354,328

b. 285,320 , 285,326 , 283,562 , 286,627 , 285,567

286,627 , 285,567 , 285,326 , 285,320 , 283,562

c. 285,320 , 285,326 , 283,562 , 286,627 , 285,567

286,627 , 285,567 , 285,326 , 285,320 , 283,562

Predecessor

Predecessor of a number is a number which comes just before a given number. We can find it by subtracting 1 from the given number. For example, predecessor of 893,621 is 893,620 and predecessor of 380,900 is 380,899

Successor

Successor of a number is a number which comes just after a given number. We can find it by adding 1 in the given number. For example, successor of 354,289 is 354,290 and successor of 530,999 is 531,000

Exercise

1 Write down the number names:

a. 36,827 — Thirty six thousand eight hundred twenty seven

b. 68,509 — Sixty eight thousand five hundred nine

c. 73,980 — Seventy three thousand nine hundred eighty

d. 60,984 — Sixty thousand nine hundred eighty four

e. 340,897 — Three lac forty thousand eight hundred ninety seven

f. 678,543 — Six lac seventy eight thousand five hundred forty three

g. 256,809 — Two lac fifty six thousand eight hundred nine

h. 300,400 — Three lac and four hundred

i. 700,007 — Seven lac and seven

j. 9,00,909 — Nine lac nine hundred and nine

2 Write down the numbers placing the comma correctly:

a. Twenty thousand. — 20,000

b Thirty seven thousand and two hundred. — 37,200

c. Forty nine thousand and ninety four. — 49,094

d. Ninety thousand eight hundred and forty. — 90,840

e. Eleven thousand and eleven. — 11,011

f. Ten thousand one hundred and one. — 10,101

g. Forty one thousand and four. — 41,004

h. Eighty thousand six hundred. — 80,600

3 Write down the number names of given 6-digit numbers:

a. 3,46,200 — Three lac forty six thousand two hundred

b 6,00,000 — Six lac

c. 3,03,030 — Three lac three thousand and thirty

d. 4,44,444 — Four lac forty four thousand four hundred forty four

e. 5,00,600 — Five lac six hundred

f. 8,06,789 — Eight lac six thousand seven hundred eighty nine

g. 9,90,990 — Nine lac ninety thousand nine hundred ninety

h. 9,09,009 — Nine lac nine thousand and nine

i. 7,91,342 — Seven lac ninety one thousand three hundred forty two

4 Write down 6-digit numbers placing commas in:

		(i) Pakistani Style	(ii) International Style
a.	Four lakh and forty.	4,00,040	400,040
b	Three lakh and thirty.	3,00,030	300,030
c.	Nine lakh eight thousand.	9,08,000	908,000
d.	Seven lakh three thousand and fifty.	7,03,050	703,050
e.	Sixty lakh forty eight thousand and forty four.	6,48,044	648,044
f.	One lakh and one.	1,00,001	100,001

5 Write down the given numbers in international style:

a.	567400	567,400	b	123000	123,000
c.	404404	404,404	d.	404040	404,040
e.	300030	300,030	f.	900009	900,009
g.	837209	837,209	h.	509509	509,509

6 Write down in expanded form:

a.	368,290	300,000 + 60,000 + 8,000 + 200 + 90 + 0
b	308,090	300,000 + 00,000 + 8,000 + 000 + 90 + 0
c.	500,700	500,000 + 00,000 + 0,000 + 700 + 00 + 0
d.	360,899	300,000 + 60,000 + 0,000 + 800 + 90 + 9
e.	909,899	900,000 + 00,000 + 9,000 + 800 + 90 + 9
f.	888,887	800,000 + 80,000 + 8,000 + 800 + 80 + 7
g.	693,070	600,000 + 90,000 + 3,000 + 000 + 70 + 0
h.	504,045	500,000 + 00,000 + 4,000 + 000 + 40 + 5

7 Write down predecessor and successor of the given numbers:

	Predecessor	Number	Successor
a.	248,096	248,097	248,098
b.	368,098	368,099	368,100
c.	399,999	400,000	400,001
d.	398,998	398,999	399,000
e.	8,00,899	8,00,900	8,00,901
f.	7,00,998	7,00,999	7,01,000
g.	257,390	257,391	257,392
h.	257,390	257,391	257,392
i.	466,676	466,677	466,678
j.	9,98,888	9,98,889	9,98,890

8 Write down the given numbers in:

i. ascending order ii. descending order

a. 365,253 289,376 466,479 586,374 889,734

289,376 , 365,253 , 466,479 , 586,374 , 889,734

889,734 , 586,374 , 466,479 , 365,253 , 289,376

b. 257,830 257,998 257,488 596,673 689,374

257,488 , 257,830 , 257,998 , 596,673 , 689,374

689,374 , 596,673 , 257,998 , 257,830 , 257,488

c. 869,543 869,537 869,570 868,504 869,059

868,504 , 869,059 , 869,537 , 869,543 , 869,570

869,570 , 869,543 , 869,537 , 869,059 , 868,504

d. 568,776 568777 568,878 568,978 568,876

568,776 , 568,777 , 568,876 , 568,878 , 568,978

568,978 , 568,878 , 568,876 , 568,777 , 568,776

e. 367,009 367,090 367,900 376,900 376,090

367,009 , 367,090 , 367,900 , 376,090 , 376,900

376,900 , 376,090 , 367,900 , 367,090 , 367,009

f. 637,000 637,009 637,900 369,896 568,372

369,896 , 568,372 , 637,000 , 637,009 , 637,900

637,900 , 637,009 , 637,000 , 568,372 , 369,896

g. 987,369 987,639 987,389 987,366 987,247

987,247 , 987,366 , 987,369 , 987,389 , 987,639

987,639 , 987,389 , 987,369 , 987,366 , 987,247

Unit 2

Factors and Multiples

Students' Learning Outcomes:

After studying this unit, students will be able to:

- define factors and multiples.
- find factors and multiples of the given numbers.
- find H.C.F and L.C.M of the given numbers.
- define prime and composite numbers.

Consider the following example. We have 12 balls, and we want to divide them equally in various ways.

1.

Out of 12 balls, one ball is given to 12 boys. $1 \times 12 = 12$

2.

Out of 12 balls, 2 balls are given to 6 boys. $2 \times 6 = 12$

3.

Out of 12 balls, 3 balls are given to 4 boys. $3 \times 4 = 12$

4.

Out of 12 balls, 4 balls are given to 3 boys. $4 \times 3 = 12$

5.

Out of 12 balls, 6 balls are given to 2 boys. $6 \times 2 = 12$

6.

Out of 12 balls, 12 balls are given to 1 boy. $12 \times 1 = 12$

We can write it as:

$12 = 1 \times 12$, $12 = 2 \times 6$

$12 = 3 \times 4$, $12 = 4 \times 3$

$12 = 6 \times 2$, $12 = 12 \times 1$

We see that product (multiplication) of all these numbers is equal to 12. So these all are factors of 12.

In other words, if a number divides the other number completely then it is called the factor of that number.

Example: Write down the factors of:

a. 20

$20 = 1 \times 20$

$20 = 2 \times 10$

$20 = 4 \times 5$

So, factors of 20 are 1,2,4,5,10 and 20

b. 30

$30 = 1 \times 30$

$30 = 2 \times 15$

$30 = 3 \times 10$

$30 = 5 \times 6$

So, factors of 30 are 1,2,3,5,6,10,15 and 30

Activity 1: Write down the factors of given numbers:

a. 8

$8 = 1 \times 8$

$8 = 2 \times 4$

b. 9

$9 = 1 \times 9$

$9 = 3 \times 3$

c. 14

$14 = 1 \times 14$

$14 = 2 \times 7$

d. 24

$24 = 1 \times 24$

$24 = 2 \times 12$

$24 = 3 \times 8$

$24 = 4 \times 6$

e. 32

$32 = 1 \times 32$

$32 = 2 \times 16$

$32 = 4 \times 8$

f. 36

$36 = 1 \times 36$

$36 = 2 \times 18$

$36 = 3 \times 12$

$36 = 4 \times 9$

$36 = 6 \times 6$

Activity 2: How many factors does each number have?

a. 10

Factors of 10 are 1,2,5 and 10

b. 15

Factors of 15 are 1,3,5 and 15

c. 16

Factors of 16 are 1,2,4,8 and 16

d. 18 Factors of 18 are 1,2,3,6,9 and 18	e. 21 Factors of 21 are 1,3,7 and 21	f. 26 Factors of 26 are 1,2,13 and 26
g. 34 Factors of 34 are 1,2,17 and 34	h. 40 Factors of 40 are 1,2,4,5,8, 10,20 and 40	i. 50 Factors of 50 are 1,2,5,10,25 and 50

Common Factors

Consider the following example carefully.

Factors of 12 are 1, 2, 3, 4, 6, 12
Factors of 16 are 1, 2, 4, 8, 16
Factors of 20 are 1, 2, 4, 5, 10, 20

We see that 1, 2 and 4 are present in factors of all three given numbers.

Hence 1,2 and 4 are common factors of 12, 16 and 20

Remember:

When a number is divided by one of its factors, there is no remainder.

$24 \div 1 = 24$
$24 \div 2 = 12$
$24 \div 3 = 8$
$24 \div 4 = 6$
$24 \div 6 = 4$
$24 \div 8 = 3$
$24 \div 12 = 2$
$24 \div 24 = 1$

Example: Find the common factors of 20 and 30

Solution.

Factors of 20 = 1, 2, 4, 5, 10, 20

Factors of 30 = 1, 2, 3, 5, 6, 10, 15, 30

Common factors = 1, 2, 5

Note: 1 is the factor of every number.
Every number is the factor of itself.

Highest Common Factor

We have seen that different numbers can have some same factors.

For example:

Factors of 12 are 1, 2, 3, 4, 6 and 12

Factors of 16 are 1, 2, 4, 8 and 16

Hence common factors are 1, 2 and 4

Among these three common factors, 4 is the greatest factor. It is called highest common factor. It is denoted by H.C.F.

Example 1 : Find the H.C.F of 18 and 24

Solution.

Factors of 18 are 1, 2, 3, 6, 9 and 18

Factors of 24 are 1, 2, 3, 4, 6, 8, 12 and 24

Common factors of 18 and 24 are 1, 2, 3 and 6

Hence H.C.F = 6

Example 2 : Find the H.C.F of 30 and 50

Solution.

Factors of 30 are 1, 2, 3, 5, 6, 10, 15 and 30

Factors of 50 are 1, 2, 5, 10, 25 and 50

Common factors of 30 and 50 are 1, 2, 5 and 10

Hence H.C.F = 10

Prime Numbers

The numbers which have only two factors are called prime numbers. These factors are 1 and the number itself.

Consider the following numbers:

2	3	5
2 = 1 x 2 2 = 2 x 1	3 = 1 x 3 3 = 3 x 1	5 = 1 x 5 5 = 5 x 1
7	**11**	**13**
7 = 1 x 7 7 = 7 x 1	11 = 1 x 11 11 = 11 x 1	13 = 1 x 13 13 = 13 x 2

In all these examples, you can see that all of these numbers have only two factors, i.e, 1 and the number itself.

Some prime numbers are 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43 etc.

Composite Numbers

The numbers which have more than two factors are called composite numbers. Consider the following examples.

4	6	8
4 = 1 x 4 4 = 2 x 2 4 = 4 x 1	6 = 1 x 6 6 = 2 x 3 6 = 3 x 2 6 = 6 x 1	8 = 1 x 8 8 = 2 x 4 8 = 4 x 2 8 = 8 x 1
9	**10**	**12**
9 = 1 x 9 9 = 3 x 3 9 = 9 x 1	10 = 1 x 10 10 = 2 x 5 10 = 5 x 2 10 = 10 x 1	12 = 1 x 12 12 = 2 x 6 12 = 3 x 4 12 = 4 x 3 12 = 6 x 2 12 = 12 x 1

All of these numbers 4, 6, 8, 9, 10 and 12 have more than two factors so they are called composite numbers.

Activity: Separate the composite and prime numbers:

10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

Composite Numbers							
10	12	14	15	16	18	20	

Prime Numbers							
11	13	17	19				

Co-Prime Numbers

Look at the pair of numbers 2 and 3. What are the factors of this pair?

Factors of 2: 1, 2

Factors of 3: 1, 3

There is only one common factor here, and that common factor is 1. Two numbers which have number 1 as their common factor are called co-prime numbers.

Activity: Out of the given pairs of numbers, which are co-prime numbers?

a. 6 and 9 — No

b. 7 and 9 — No

c. 9 and 16 — No

d. 8 and 13 — No

Multiples

A multiple of a number is the product of that number and any other whole number. For example multiples of 3 are 3,6,9,12,15,18 etc.

Examples: Find first six multiples of:

i. 5

First six multiples of 5 are

5, 10, 15, 20, 25, 30

ii. 9

First six multiples of 9 are

9, 18, 27, 36, 45, 54

Activity: Find first five multiples of:

a. 6 — 6, 12, 18, 24, 30, 36

b. 7 — 7, 14, 21, 28, 35, 42

c. 8 — 8, 16, 24, 32, 40, 48

d. 13 — 13, 26, 39, 52, 65, 78

Prime factorization

The process of representing a number as a product or prime number is called prime factorization. For example, prime factors of 12 are found by division method.

2	12
2	6
3	3
	1

12 = 2 x 2 x 3

2 x 2 x 3 are prime factors of 12

Least Common Multiple

Least common multiple of two numbers is the smallest number, that is a multiple of both. It is represented by L.C.M. Consider the following example.

Example 1: Find L.C.M of 6 and 8:

Solution: We first find the prime factors of 6 and 8.

Prime factors of 06 =

2	6
3	3
	1

So, 6 = 2 x 3

Prime factors of 8 =

2	8
2	4
2	2
	1

So, 8 = 2 x 2 x 2

For finding L.C.M, we write the prime factors of 6 and 8 as:

$6 = (2) \times 3$

$8 = (2) \times 2 \times 2$

Common factors = 2

Non-Common factors = 3, 2, 2

L.C.M= Product of common factors x Product of non-common factors

$= (2) \times (3 \times 2 \times 2)$

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

L.C.M = 24

Example 2: Find the L.C.M of 16 and 24.

Solution: First, find the prime factors of 16 and 24

2	16
2	8
2	4
2	2
	1

2	24
2	12
2	6
3	3
	1

$16 = (2) \times (2) \times (2) \times 2$

$24 = (2) \times (2) \times (2) \times 3$

Common factors = 2, 2, 2

Non-common factors = 2, 3

L.C.M= Product of common factors x Product of non-common factors

$= (2 \times 2 \times 2) \times (2 \times 3)$

$= 8 \times 6$

L.C.M = 48

Exercise

1. Encircle the numbers which are factors of 20.

(1) (2) 3 (4) (5) 6 7 8 9 (10)

2. Encircle the numbers which are factors of 36.

(2) (3) 5 (6) 8 11 (12) 14 16 (18) 20

3. Encircle the composite numbers.

2 3 (4) 5 (6) 7 (8) (9) (10) 11

(12) 13 (14) (15) (16) 17 (18) 19 (20)

4. Encircle the prime numbers.

(2) (3) 6 (7) 8 9 (11) 12 14 15

(17) 20 21 24 26 (29) 30 (31)

5. Write all prime numbers between 30 and 50.

31 37 41 43 47

6. Write all composite numbers between 15 and 30.

15 16 18 20 21 22 24 25 26 27 28

7. Encircle all the multiples of 3 out of the given numbers.

3 4 (6) 8 (12) 14 16 (18) (21) (24)

26 (27) 28 (30) 32 34 (36)

8. Encircle all the multiples of 4 out of the given numbers.

2 3 6 7 (8) 11 (12) 14 (16) 18

21 23 26 30 (32) 34 (36) (40)

9 Write first 6 multiples of the given numbers.

Numbers	Multiples
5	5, 10, 15, 20, 25, 30, 35
6	6, 12, 18, 24, 30, 36, 42
7	7, 14, 21, 28, 35, 42, 49
9	9, 18, 27, 36, 45, 54, 63
13	13, 26, 39, 52, 65, 78, 91

10 Find common factors of:

a. 12 and 20

Factors of 12 are 1, 2, 3, 4, 6, 12
Factors of 20 are 1, 2, 4, 5, 10, 20
Common factors are 1, 2, 4

b. 16 and 20

Factors of 16 are 1, 2, 4, 8, 16
Factors of 20 are 1, 2, 4, 5, 10, 20
Common factors are 1, 2, 4

c. 15 and 25

Factors of 15 are 1, 3, 5, 15
Factors of 25 are 1, 5, 25
Common factors are 1, 5

d. 18 and 28

Factors of 18 are 1, 2, 3, 6, 9, 18
Factors of 28 are 1, 2, 4, 7, 14, 28
Common factors are 1, 2

e. 21 and 28

Factors of 21 are 1, 3, 7, 21
Factors of 28 are 1, 2, 4, 7, 14, 28
Common factors are 1, 7

f. 24 and 36

Factors of 24 are 1, 2, 3, 4, 6, 8, 12, 24
Factors of 36 are 1, 2, 3, 4, 6, 9, 12, 18, 36
Common factors are 1, 2, 3, 4, 6, 12

g. 20 and 30

Factors of 20 are 1, 2, 4, 5, 10, 20
Factors of 30 are 1, 2, 3, 5, 6, 10, 15, 30
Common factors are 1, 2, 5, 10

h. 30 and 48

Factors of 30 are 1, 2, 3, 5, 6, 10, 15, 30

Factors of 48 are 1, 2, 3, 6, 8, 16, 24, 48

Common factors are 1, 2, 3, 6

11 Find H.C.F of:

a. 12 and 16

Factors of 12 are 1, 2, 3, 4, 6, 12

Factors of 16 are 1, 2, 4, 8, 16

Common factors of 12 and 16 are 1, 2 and 4

Hence, H.C.F = 4

b. 16 and 24

Factors of 16 are 1, 2, 4, 8, 16

Factors of 24 are 1, 2, 3, 8, 12, 24

Common factors of 16 and 24 are 1, 2, 8

Hence, H.C.F = 8

c. 20 and 27

Factors of 20 are 1, 2, 4, 5, 10, 20

Factors of 27 are 1, 3, 9, 27

Common factors of 20 and 27 is 1

Hence, H.C.F = 1

d. 30 and 50

Factors of 30 are 1, 2, 3, 5, 6, 10, 15, 30

Factors of 50 are 1, 2, 5, 10, 25, 50

Common factors of 30 and 50 are 1, 2, 5, 10

Hence, H.C.F = 10

e. 24 and 40

Factors of 24 are 1, 2, 3, 4, 6, 8, 12, 24

Factors of 40 are 1, 2, 4, 5, 8, 10, 20, 40

Common factors of 24 and 40 are 1, 2, 4, 8

Hence, H.C.F = 8

f. 30 and 45

Factors of 30 are 1, 2, 3, 5, 6, 10, 15, 30

Factors of 45 are 1, 3, 5, 9, 15, 45

Common factors of 30 and 45 are 1, 3, 5, 15

Hence H.C.F = 15

g. 26 and 42

Factors of 26 are 1, 2, 13, 26

Factors of 42 are 1, 2, 3, 14, 21, 42

Common factors of 26 and 42 are 1, 2

Hence H.C.F = 2

h. 28 and 35

Factors of 28 are 1, 2, 4, 7, 14, 28

Factors of 35 are 1, 5, 7, 35

Common factors of 28 and 35 are 1, 7

Hence H.C.F = 7

12 Find L.C.M of:

a. 6 and 9

2	6
3	3
	1

3	9
3	3
	1

$6 = 2 \times 3$

$9 = 3 \times 3$

Common factors = 3

Non-common factors = 2, 3

L.C.M= Product of common factors x Product of non-common factors

$= (3) \times (2 \times 3)$

$= 3 \times 6$

L.C.M = 18

b. 12 and 18

2	12
2	6
3	3
	1

2	18
3	9
3	3
	1

$12 = (2) \times 2 \times (3)$

$18 = (2) \times 3 \times (3)$

Common factors = 2, 3

Non-common factors = 2, 3

L.C.M= Product of common factors x Product of non-common factors

= (2 x 3) x (2 x 3)

= 6 x 6

L.C.M = 36

c. 10 and 22

2	10
5	5
	1

2	22
11	11
	1

$10 = (2) \times 5$

$22 = (2) \times 11$

Common factors = 2

Non-common factors = 5, 11

L.C.M= Product of common factors x Product of non-common factors

= (2) x (5 x 11)

= 2 x 55

L.C.M = 110

d. 14 and 42

2	14
7	7
	1

2	42
7	21
3	3
	1

$14 = 2 \times 7$

$42 = 2 \times 7 \times 3$

Common factors = 2, 7

Non-common factors = 3

L.C.M= Product of common factors x Product of non-common factors

$= (2 \times 7) \times (3)$

$= 14 \times 3$

L.C.M = 42

e. 15 and 42

3	15
5	5
	1

2	42
3	21
7	7
	1

$15 = 3 \times 5$

$42 = 2 \times 3 \times 7$

Common factors = 3

Non-common factors = 2, 5, 7

L.C.M= Product of common factors x Product of non-common factors

$= (3) \times (2 \times 5 \times 7)$

$= 3 \times 70$

L.C.M = 210

f. 18 and 20

2	18
3	9
3	3
	1

2	20
2	10
5	5
	1

$18 = 2 \times 3 \times 3$

$20 = 2 \times 2 \times 5$

Common factors = 2

Non-common factors = 2, 3, 3, 5

L.C.M= Product of common factors x Product of non-common factors

= (2) x (2 x 3 x 3 x 5)

= 2 x 90

L.C.M = 180

g. 16 and 30

2	16
2	8
2	4
2	2
	1

2	30
3	15
5	5
	1

16 = 2 x 2 x 2 x 2

30 = 2 x 3 x 5

Common factors = 2

Non-common factors = 2, 2, 2, 3, 5

L.C.M= Product of common factors x Product of non-common factors

= (2) x (2 x 2 x 2 x 3 x 5)

= 2 x 120

L.C.M = 240

h. 20 and 35

2	20
2	10
5	5
	1

5	35
7	7
	1

20 = 2 x 2 x 5

35 = 5 x 7

Common factors = 5

Non-common factors = 2, 2, 7

L.C.M= Product of common factors x Product of non-common factors

= (5) x (2 x 2 x 7)

= 5 x 28

L.C.M = 140

i. 18 and 27

2	18
3	9
3	3
	1

3	27
3	9
3	3
	1

$18 = 2 \times 3 \times 3$

$27 = 3 \times 3 \times 3$

Common factors = 3, 3

Non-common factors = 2, 3

L.C.M= Product of common factors x Product of non-common factors

$= (3 \times 3) \times (2 \times 3)$

$= 9 \times 6$

L.C.M = 54

j. 40 and 50

2	40
2	20
2	10
5	5
	1

2	50
5	25
5	5
	1

$40 = 2 \times 2 \times 2 \times 5$

$50 = 2 \times 5 \times 5$

Common factors = 2, 5

Non-common factors = 2, 2, 5

L.C.M= Product of common factors x Product of non-common factors

$= (2 \times 5) \times (2 \times 2 \times 5)$

$= 10 \times 20$

L.C.M = 200

Unit 3

Fractions

Students' Learning Outcomes:

After studying this unit, students will be able to:

- order the given fractions.
- arrange the given fractions in ascending and descending order.
- define different terms used in fractions.
- simplify a given fraction.

Ordering of Fractions

Look at these pairs of fractions. What is similar about them?

$\frac{1}{7}, \frac{2}{7}$ $\quad$ $\frac{3}{8}, \frac{5}{8}$ $\quad$ $\frac{2}{4}, \frac{3}{4}$

In these pairs, denominators are same.

Like Fractions

Fractions with same denominator are called like fractions.

How can we know, which fraction is larger and which one is smaller? For this, keep the following rule in mind.

If the numerator of one like fraction is greater than the other then the first fraction has the greater value.

Examples: Write < or > for smaller or greater fraction.

a. $\frac{4}{7} \square \frac{3}{7}$

Because $4 > 3$

Hence $\frac{4}{7} > \frac{3}{7}$

b. $\frac{2}{3} \square \frac{1}{3}$

Because $2 > 1$

Hence $\frac{2}{3} > \frac{1}{3}$

c. $\frac{3}{11} \square \frac{8}{11}$

Because $3 < 8$

Hence $\frac{3}{11} < \frac{8}{11}$

d. $\frac{9}{10} \square \frac{11}{10}$

Because $9 < 11$

Hence $\frac{9}{11} < \frac{11}{10}$

If we have more than two like fractions, then we can easily arrange them in ascending or descending order only by looking at numerator.

Example 1: Write given like fractions in ascending order

$$\frac{9}{11}, \frac{3}{11}, \frac{6}{11}, \frac{1}{11}, \frac{7}{11}, \frac{8}{11}$$

Solution: Write these like fractions by writing first the fraction whose numerator is less than others, then write the fraction whose numerator is greater then previously written fraction and so on.

So the required order is :

$$\frac{1}{11}, \frac{3}{11}, \frac{6}{11}, \frac{7}{11}, \frac{8}{11}, \frac{9}{11}$$

Example 2: Write the given fractions in descending order:

$$\frac{4}{15}, \frac{9}{15}, \frac{1}{15}, \frac{11}{15}, \frac{7}{15}, \frac{3}{15}$$

Solution: As the greatest value of numerator is 11, so in descending order, the given fractions are written as:

$$\frac{11}{15}, \frac{9}{15}, \frac{7}{15}, \frac{4}{15}, \frac{3}{15}, \frac{1}{15}$$

Equivalent Fraction

If we multiply or divide numerator and denominator of a fraction by the same number, we get an equivalent fraction.

For example: $\frac{2}{3}$ is a fraction, if we multiply its numerator and denominator by 2, we get

$\frac{2 \times 2}{3 \times 2} = \frac{4}{6}$, This $\frac{4}{6}$ is an equivalent fraction of $\frac{2}{3}$. If we again multiply numerator and denominator of $\frac{2}{3}$ by 3, we get $\frac{2 \times 3}{3 \times 3} = \frac{6}{9}$

This fraction ,is also an equivalent fraction of $\frac{2}{3}$.

Note, that fractions $\frac{2}{3}$, $\frac{4}{6}$ and $\frac{6}{9}$, all are equivalent.

Consider another example, $\frac{8}{12}$ is a fraction, if we divide its numerator and denominator by 2, we get

$\frac{8 \div 2}{12 \div 2} = \frac{4}{6}$, $\frac{4}{6}$ is equivalent fraction of $\frac{8}{12}$.

Again if we divide numerator and denominator of $\frac{8}{12}$ by 4, we get:

$\frac{8 \div 4}{12 \div 4} = \frac{2}{3}$, This $\frac{2}{3}$ is also equivalent fraction of $\frac{8}{12}$

Note, that fractions $\frac{8}{12}$, $\frac{4}{6}$ and $\frac{2}{3}$, all are equivalent fractions of each other.

Activity: Find one equivalent fraction of:

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

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

b. $\frac{4}{5}$

$\frac{4 \times 2}{5 \times 2} = \frac{8}{10}$

c. $\frac{5}{7}$

$\frac{5 \times 3}{7 \times 3} = \frac{15}{21}$

d. $\frac{6}{7}$

$\frac{6 \times 3}{7 \times 3} = \frac{18}{21}$

Addition of like fractions

To add like fractions, add only the numerators. The denominator stays the same:

For example:

a. $\frac{3}{4} + \frac{2}{4} = \boxed{\frac{5}{4}}$

b. $\frac{1}{5} + \frac{2}{5} = \boxed{\frac{3}{5}}$

c. $\frac{4}{7} + \frac{2}{7} = \boxed{\frac{6}{7}}$

d. $\frac{2}{9} + \frac{3}{9} = \boxed{\frac{5}{9}}$

Subtraction of like fractions

To subtract like fractions, subtract only the second numerator from first numerator. The denominator stays same.

For example:

a. $\frac{8}{9} - \frac{2}{9} = \boxed{\frac{6}{9}}$

b. $\frac{7}{8} - \frac{2}{8} = \boxed{\frac{5}{8}}$

c. $\frac{3}{4} - \frac{1}{4} = \boxed{\frac{2}{4}}$

d. $\frac{9}{13} - \frac{2}{13} = \boxed{\frac{7}{13}}$

Activity 1: Add these fractions:

a. $\frac{1}{3} + \frac{1}{3} = \boxed{\frac{2}{3}}$

b. $\frac{1}{6} + \frac{3}{6} = \boxed{\frac{4}{6}}$

c. $\frac{2}{7} + \frac{3}{7} = \boxed{\frac{5}{7}}$

d. $\frac{2}{9} + \frac{4}{9} = \boxed{\frac{6}{9}}$

e. $\frac{3}{8} + \frac{2}{8} = \boxed{\frac{5}{8}}$

f. $\frac{6}{11} + \frac{3}{11} = \boxed{\frac{9}{11}}$

g. $\frac{1}{5} + \frac{3}{5} = \boxed{\frac{4}{5}}$

h. $\frac{1}{4} + \frac{2}{4} = \boxed{\frac{3}{4}}$

Activity 2: Subtract these fractions:

a. $\frac{6}{7} - \frac{2}{7} = \boxed{\frac{4}{7}}$

b. $\frac{9}{11} - \frac{2}{11} = \boxed{\frac{7}{11}}$

c. $\frac{5}{8} - \frac{1}{8} = \boxed{\frac{4}{8}}$

d. $\frac{8}{13} - \frac{4}{13} = \boxed{\frac{4}{13}}$

e. $\frac{7}{9} - \frac{2}{9} = \boxed{\frac{5}{9}}$

f. $\frac{6}{17} - \frac{2}{17} = \boxed{\frac{4}{17}}$

g. $\frac{13}{17} - \frac{11}{17} = \boxed{\frac{2}{17}}$

h. $\frac{5}{6} - \frac{4}{6} = \boxed{\frac{1}{6}}$

Unlike Fractions

The fractions with different denominators are called unlike fractions.

For example, $\frac{3}{7}$ and $\frac{4}{5}$ are unlike fractions.

Such as $\frac{2}{3}$ and $\frac{3}{5}$, $\frac{3}{4}$ and $\frac{1}{3}$, $\frac{6}{7}$ and $\frac{2}{5}$ are unlike fraction.

Proper Fractions

Fraction in which numerator is smaller than denominator is called proper fraction.

$\frac{2}{3}$, $\frac{5}{7}$, $\frac{6}{9}$, $\frac{7}{11}$ are examples of proper fractions.

Improper Fractions

Fraction in which numerator is greater than denominator is called improper fraction.

$\frac{3}{2}$, $\frac{6}{5}$, $\frac{7}{3}$, $\frac{11}{9}$ are examples of improper fractions.

Compound/Mixed Fractions

A proper fraction with whole number is called compound or mixed fraction,

$$4\frac{1}{3} \ , \ 2\frac{3}{4} \ , \ 5\frac{2}{3} \ , \ 6\frac{4}{5}$$

are the examples of compound fractions.

($4\frac{1}{3}$ is read as 4 whole 1 by 3)

Remember that:

Improper fraction can be converted into compound fraction and compound fraction can be converted into improper fraction.

Example 1: Convert $\frac{14}{3}$ into compound fraction.

Solution: For converting improper fraction into compound fraction, we divide numerator by denominator.

$$3\overline{)14}\quad 4,\ -12,\ 2$$

Now we convert it into compound fraction.

The quotent becomes whole number part, remainder becomes numerator and divisor becomes denominator.

So, $\frac{14}{3}$ becomes $4\frac{2}{3}$

(It is read as 4 whole 2 by 3) or (4 whole 2 over 3)

Example 2: Convert $5\frac{2}{3}$ into improper fraction.

Solution: $5\frac{2}{3}$

Step 1: Multiply 3 by 5 (denominator with whole number part) It gives us 15.

Step 2: Add 2 in 15 (numerator in product)

Step 3: Write in fractional form $\frac{15+2}{3}$ or $\frac{17}{3}$

Activity 1: Convert the following improper fractions into compound fractions.

a. $\frac{20}{7}$

$$7\overline{)20}\quad 2,\ 14,\ 6$$

So, $\frac{20}{7}$ becomes $2\frac{6}{7}$

b. $\frac{24}{5}$

$$5\overline{)24}\quad 4,\ 20,\ 4$$

So, $\frac{24}{5}$ becomes $4\frac{4}{5}$

Activity 2: Convert the following compound fractions into improper fractions.

a. $5\frac{3}{4}$

$5 \times 4 = 20$

$\frac{20+3}{4} = \frac{23}{4}$

b. $6\frac{2}{7}$

$6 \times 7 = 42$

$\frac{42+2}{7} = \frac{44}{7}$

Simplification

We can reduce a bigger fraction into simplest from by dividing numerator and denominator by the same number.

Example 1: Simplify: $\frac{12}{24}$

Solution:

$\frac{12}{24} = \frac{12 \div 2}{24 \div 2}$ (Divide numerator and denominator by 2)

$= \frac{6}{12}$

$= \frac{6 \div 2}{12 \div 2} = \frac{3}{6}$ (Again divide numerator and denominator by 2)

$= \frac{3 \div 3}{6 \div 3} = \frac{1}{2}$ (Now divide numerator and denominator by 3)

So, $\frac{1}{2}$ is the simplest from of $\frac{12}{24}$.

Example 2: Write down $\frac{24}{36}$ in the simplest form.

Solution:

$\frac{24}{36} = \frac{24 \div 2}{36 \div 2} = \frac{12}{18}$

$= \frac{12 \div 2}{18 \div 2} = \frac{6}{9}$

$= \frac{6 \div 3}{9 \div 3} = \frac{2}{3}$

So, $\frac{2}{3}$ is the simplest from of $\frac{24}{36}$.

Exercise

1 Place < or > in the given fractions:

a. $\frac{4}{7} > \frac{3}{7}$ b. $\frac{5}{9} > \frac{2}{9}$ c. $\frac{2}{9} < \frac{4}{9}$

d. $\frac{4}{5} > \frac{3}{5}$ e. $\frac{1}{8} < \frac{3}{8}$ f. $\frac{3}{13} < \frac{11}{13}$

g. $\frac{6}{7} > \frac{2}{7}$ h. $\frac{7}{17} < \frac{9}{17}$ i. $\frac{7}{11} > \frac{6}{11}$

j. $\frac{14}{19} > \frac{8}{19}$ k. $\frac{13}{21} > \frac{11}{21}$ l. $\frac{16}{17} > \frac{14}{17}$

2 Arrange these fractions in ascending order:

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

$\frac{1}{7}, \frac{2}{7}, \frac{3}{7}, \frac{4}{7}, \frac{5}{7}$

b. $\frac{5}{9}, \frac{1}{9}, \frac{8}{9}, \frac{11}{9}, \frac{10}{9}$

$\frac{1}{9}, \frac{5}{9}, \frac{8}{9}, \frac{10}{9}, \frac{11}{9}$

c. $\frac{4}{11}, \frac{7}{11}, \frac{8}{11}, \frac{3}{11}, \frac{9}{11}$

$\frac{3}{11}, \frac{4}{11}, \frac{7}{11}, \frac{8}{11}, \frac{9}{11}$

d. $\frac{6}{17}, \frac{11}{17}, \frac{19}{17}, \frac{1}{17}, \frac{5}{17}$

$\frac{1}{17}, \frac{5}{17}, \frac{6}{17}, \frac{11}{17}, \frac{19}{17}$

e. $\frac{9}{19}, \frac{13}{19}, \frac{5}{19}, \frac{2}{19}, \frac{18}{19}$

$\frac{2}{19}, \frac{5}{19}, \frac{9}{19}, \frac{13}{19}, \frac{18}{19}$

3 Arrange these fractions in descending order:

a. $\frac{3}{8}$, $\frac{1}{8}$, $\frac{7}{8}$, $\frac{11}{8}$, $\frac{6}{8}$

$\frac{11}{8}$, $\frac{7}{8}$, $\frac{6}{8}$, $\frac{3}{8}$, $\frac{1}{8}$

b. $\frac{4}{11}$, $\frac{9}{11}$, $\frac{3}{11}$, $\frac{1}{11}$, $\frac{10}{11}$

$\frac{10}{11}$, $\frac{9}{11}$, $\frac{4}{11}$, $\frac{3}{11}$, $\frac{1}{11}$

c. $\frac{6}{13}$, $\frac{1}{13}$, $\frac{12}{13}$, $\frac{15}{13}$, $\frac{17}{13}$

$\frac{17}{13}$, $\frac{15}{13}$, $\frac{12}{13}$, $\frac{6}{13}$, $\frac{1}{13}$

d. $\frac{8}{14}$, $\frac{3}{14}$, $\frac{6}{14}$, $\frac{9}{14}$, $\frac{4}{14}$

$\frac{9}{14}$, $\frac{8}{14}$, $\frac{6}{14}$, $\frac{4}{14}$, $\frac{3}{14}$

e. $\frac{5}{17}$, $\frac{9}{17}$, $\frac{3}{17}$, $\frac{1}{17}$, $\frac{10}{17}$

$\frac{10}{17}$, $\frac{9}{17}$, $\frac{5}{17}$, $\frac{3}{17}$, $\frac{1}{17}$

4 Write down two equivalent fractions of the given fractions:

a. $\frac{4}{5}$, $\frac{8}{10}$, $\frac{12}{15}$

b. $\frac{2}{3}$, $\frac{4}{6}$, $\frac{6}{9}$

c. $\frac{6}{7}$, $\frac{12}{14}$, $\frac{18}{21}$

d. $\frac{7}{11}$, $\frac{14}{22}$, $\frac{21}{33}$

e. $\frac{2}{9}$, $\frac{4}{18}$, $\frac{6}{27}$

f. $\frac{1}{7}$, $\frac{2}{14}$, $\frac{3}{21}$

5 Add the given fractions:

a. $\frac{2}{3} + \frac{4}{3} = \frac{6}{3}$

b. $\frac{5}{11} + \frac{3}{11} = \frac{8}{11}$

c. $\frac{1}{6} + \frac{2}{6} = \frac{3}{6}$

d. $\frac{6}{13} + \frac{2}{13} = \frac{8}{13}$

e. $\frac{3}{5} + \frac{1}{5} = \frac{4}{5}$

f. $\frac{14}{17} + \frac{1}{17} = \frac{15}{17}$

g. $\frac{5}{7} + \frac{6}{7} = \frac{11}{7}$

h. $\frac{8}{21} + \frac{3}{21} = \frac{11}{21}$

i. $\frac{4}{9} + \frac{8}{9} = \frac{12}{9}$

j. $\frac{10}{11} + \frac{12}{11} = \frac{22}{11}$

6 Subtract the given fractions:

a. $\frac{8}{10} - \frac{2}{10} = \frac{6}{10}$

b. $\frac{14}{17} - \frac{2}{17} = \frac{12}{17}$

c. $\frac{3}{7} - \frac{1}{7} = \frac{2}{7}$

d. $\frac{9}{13} - \frac{8}{13} = \frac{1}{13}$

e. $\frac{5}{14} - \frac{2}{14} = \frac{3}{14}$

f. $\frac{13}{12} - \frac{8}{12} = \frac{5}{12}$

g. $\frac{9}{13} - \frac{3}{13} = \frac{6}{13}$

h. $\frac{9}{12} - \frac{8}{12} = \frac{1}{12}$

i. $\frac{11}{17} - \frac{4}{17} = \frac{7}{17}$

j. $\frac{9}{14} - \frac{3}{14} = \frac{6}{14}$

7 Convert the given fractions into compound fractions:

a. $\frac{13}{3} = 4\frac{1}{3}$

$3\overline{)13}$ quotient 4, remainder 1

b. $\frac{27}{2} = 13\frac{1}{2}$

$2\overline{)27}$ quotient 13, remainder 1

c. $\frac{18}{4} = 4\frac{2}{4}$

$4\overline{)18}$ quotient 4, remainder 2

d. $\frac{17}{4} = 4\frac{1}{4}$

$4\overline{)17}$ quotient 4, remainder 1

e. $\frac{20}{3} = 6\frac{2}{3}$

$3\overline{)20}$ quotient 6, remainder 2

f. $\frac{29}{6} = 4\frac{5}{6}$

$6\overline{)29}$ quotient 4, remainder 5

g. $\frac{25}{6} = 4\frac{1}{6}$ $\begin{array}{r} 4 \\ 6\overline{)25} \\ 24 \\ \hline 1 \end{array}$

h. $\frac{42}{9} = 4\frac{6}{9}$ $\begin{array}{r} 4 \\ 9\overline{)42} \\ 36 \\ \hline 6 \end{array}$

i. $\frac{34}{8} = 4\frac{2}{8}$ $\begin{array}{r} 4 \\ 8\overline{)34} \\ 32 \\ \hline 2 \end{array}$

j. $\frac{50}{9} = 5\frac{5}{9}$ $\begin{array}{r} 5 \\ 9\overline{)50} \\ 45 \\ \hline 5 \end{array}$

8 Convert the given compound fractions into improper fractions:

a. $3\frac{1}{2}$ $= 3 \times 2 = 6$, $\frac{6+1}{2} = \frac{7}{2}$

b. $2\frac{3}{4}$ $= 2 \times 4 = 8$, $\frac{8+3}{4} = \frac{11}{4}$

c. $6\frac{1}{7}$ $= 6 \times 7 = 42$, $\frac{42+1}{7} = \frac{43}{7}$

d. $5\frac{6}{7}$ $= 7 \times 5 = 35$, $\frac{35+6}{7} = \frac{41}{7}$

e. $4\frac{3}{4}$ $= 4 \times 4 = 16$, $\frac{16+3}{4} = \frac{19}{4}$

f. $8\frac{2}{7}$ $= 8 \times 7 = 56$, $\frac{56+2}{7} = \frac{58}{7}$

g. $7\frac{3}{4}$ $= 7 \times 4 = 28$, $\frac{28+3}{4} = \frac{31}{4}$

h. $5\frac{2}{9}$ $= 9 \times 5 = 45$, $\frac{45+2}{9} = \frac{47}{9}$

i. $6\frac{6}{7}$ $= 6 \times 7 = 42$, $\frac{42+6}{6} = \frac{48}{6}$

j. $7\frac{7}{8}$ $= 7 \times 8 = 56$, $\frac{56+7}{8} = \frac{63}{8}$

k. $8\frac{3}{5}$ $= 8 \times 5 = 40$, $\frac{40+3}{5} = \frac{43}{5}$

l. $3\frac{1}{4}$ $= 3 \times 4 = 12$, $\frac{12+1}{4} = \frac{13}{4}$

m. $9\frac{7}{8}$ $= 9 \times 8 = 72$, $\frac{72+7}{8} = \frac{79}{8}$

n. $5\frac{2}{3}$ $= 5 \times 3 = 15$, $\frac{15+2}{3} = \frac{17}{3}$

o. $7\frac{5}{6}$ $= 7 \times 6 = 42$, $\frac{42+5}{2} = \frac{47}{2}$

p. $6\frac{3}{7}$ $= 6 \times 7 = 42$, $\frac{42+3}{7} = \frac{45}{7}$

Unit 4

Simplification

Students' Learning Outcomes:

After studying this unit, students will be able to:

- solve questions with different mathematical operations.
- multiply and divide numbers with different signs.
- apply DMAS rule to solve questions.
- solve problems with different brackets.

We know that how to add, subtract, multiply and divide, but we used only one mathematical operator at a time. Now we will learn how to solve the questions in which more than one mathematical operators are involved.

Remember! Addition, subtraction, multiplication and division are called mathematical operators.

Example: Solve these:

a. $3 + 8 + 9$

Solution: First add 3 and 8

It gives $3 + 8 = 11$

Now add 9 in 11, it gives 20,

Hence, $3 + 8 + 9 = 20$

b. $5 + 8 - 4$

Solution:

$5 + 8 = 13$

$13 - 4 = 9$

Hence, $5 + 8 - 4 = 9$

c. $7 - 9 + 8$

Solution:

Re arrange these because 9 cannot be subtracted from 7.

It becomes

$= 7 + 8 - 9$

$= 15 - 9 = 6$

d. $3 - 12 + 15$

Solution:

Rearrange these.

$3 + 15 - 12$

$= 18 - 12$

$= 6$

Activity: Solve these:

a. 9 + 3 + 11

9 + 3 + 11
12 + 11 = 23

b. 6 + 7 – 5

6 + 7 – 3
13 – 3 = 10

c. 9 – 12 + 6

9 – 12 + 6
Rearrange these
9 + 6 – 12
15 – 12 = 3

d. 8 – 15 + 20

8 – 15 + 20
Rearrange these
8 + 20 – 15
28 – 15 = 13

Now we shall solve some difficult questions.

4 + 4 = 8 is very easy but what is the answer of 4 – 8 ?

Note: In mathematics subtraction of greater number from smaller number is possible.

If there is no sign with the number, it is understood that, this number is positive or has a plus sign. For example:

3 + 2 = +3 +2
5 + 9 = +5 +9
6 – 3 = +6 –3
and 3 – 6 = +3 –6

Now we shall learn how to solve 3 – 6.

Here 3 has no sign, so it has + sign. This means we have + 3 – 6.

Now write 3 lines with + Sign and
6 lines with – sign.

+ 3 – 6 + III
– III III

Now cut one line of + with one line of –

+ 3 – 6 + III

– III III

We see that all + lines are cut and 3 – lines are remaining. Hence –3 is the answer.

+ 3 – 6 = –3

Remember! If we add or subtract numbers with opposite sign of + and – . The answer will have the sign of bigger number.

Example 1: Write the sign of the answer of these questions.

a. 2 – 7 [Negative]

b. 10 – 15 [–]

c. 8 – 7 [Positive]

d. 20 – 9 [+]

Example 2: Solve – 9 – 4

Solution: Here both numbers have same sign. If we have numbers with same sign, they are always added and same sign is given in answer.

So, – 9 – 4 = – 13

Example 3: Solve – 9 + 4 – 8

Solution: First rearrange them

It gives –9 –8 + 4

add –9 – 8, It gives –17 + 4

Hence –17 + 4 = –13

Activity: Solve these:

a. 6 – 8 + 4

– 2 + 4 = 2

b. 7 – 12 + 15

– 5 + 15 = 10

c. 8 – 12 – 10

– 4 – 10 = –14

d. – 5 – 6 + 8

– 5 – 6 + 8

– 11 + 8 = – 3

There may be situations when multiplication is also involved with addition and subtraction,

Like 3 + 4 x 2, 8 – 2 x 6 etc.

In such situations when multiplication is also involved with addition and subtraction.

- First do multiplication
- Secondly do addition.
- Thirdly do subtraction.

Examples: Solve these:

a. 5 + 6 x 2

Solution:

First multiply

so, 5 + 6 x 2 = 5 + 12

Now add

5 + 12 = 17

Hence, 17 is the answer.

b. 8 – 3 x 2

Solution:

First multiply

so, 8 – 3 x 2 = 8 – 6

Now subtract

8 – 6 = 2

Hence, 2 is the answer.

Activity: Solve these:

a. 12 + 10 x 5

First multiply

12 + 10 x 5 = 12 + 50

Now Add

12 + 50 = 62

b. 10 – 8 x 3

First multiply

10 – 8 x 3 = 10 – 24

Now Subtract

10 – 24 = –14

There may be situations when all four mathematical operators are involved in a problem. In such situations, we use DMAS rule.

DMAS stands for:

D	=	Division	M	=	Multiplication
A	=	Addition	S	=	Subtraction

It means first solve the 'Division', secondly solve the 'Multiplication'. thirdly solve 'Addition' and lastly solve 'Subtraction'.

Example 1: Solve these: $3 + 9 - 2 \times 8 \div 4$

Solution:

$3 + 9 - 2 \times 8 \div 4$ [Divide first $8 \div 4$]

$= 3 + 9 - 2 \times 2$ [Multiply 2×2]

$= 3 + 9 - 4$ [Add $3 + 9$]

$= 12 - 4$ [Subtract $12 - 4$]

$= 8$

Example 2: Simplify: $32 \div 8 + 4 - 2 \times 3$

Solution:

$32 \div 8 + 4 - 2 \times 3$ [Step 1: Divide]

$= 4 + 4 - 2 \times 3$ [Step 2: Multiply]

$= 4 + 4 - 6$ [Step 3: Add]

$= 8 - 6$ [Step 4: Subtract]

$= 2$

Activity: Simplify these:

a. $18 \times 6 \div 2 - 24 + 10$

Sol: $18 \times 6 \div 2 - 24 + 10$

$= 18 \times 3 - 24 + 10$

$= 54 - 24 + 10$

$= 54 + 10 - 24$

$= 64 - 24$

$= 40$

b. $45 \div 5 + 7 \times 11 - 20$

Sol: $45 \div 5 + 7 \times 11 - 20$

$= 9 + 7 \times 11 - 20$

$= 9 + 77 - 20$

$= 86 - 20$

$= 66$

Use of Brackets

Brackets are also used in mathematical problems to change the priority of DMAS rule.

There are three types of Brackets,

i. ( ) These brackets are called Parentheses.

ii. { } These are called Braces

iii. [ ] These are called Square Brackets.

Mostly ( ) are the inner most brackets and are solved first, { } are solved at second place and [ ] are solved in last place. If we have a problem with mathematical operators and brackets, then we ignore the DMAS rule and first solve the brackets.

Example: Simplify: $[\{(-15 + 5) \times 2 + 8\} - 32 \div 8] - (-7)$

Solution:

$[\{(-15 + 5) \times 2 + 8\} - 32 \div 8] - (-7)$

$= [\{-10 \times 2 + 8\} - 32 \div 8] - (-7)$

$= [\{-20 + 8\} - 32 \div 8] - (-7)$

$= [-12 - 32 \div 8] - (-7)$

$= [-12 - 4] - (-7)$

$= -16 - (-7)$

$= -16 + 7$

$= 9$

Note:

$(-) \times (-) = +$

$(-) \times (+) = -$

$(+) \times (+) = +$

$(+) \times (-) = -$

Activity: Simplify the following.

a. $24 - [5 + \{8 - (9 - 6)\}]$

Sol: $24 - [5 + \{8 - (9 - 6)\}]$

$= 24 - [5 + \{8 - 3\}]$

$= 24 - [5 + 5\}]$

$= 24 - 10$

$= 14$

b. $10 \div [3 + \{5 - (12 \div 4)\}]$

Sol: $10 \div [3 + \{5 - (12 \div 4)\}]$

$= 10 \div [3 + \{5 - 3\}]$

$= 10 \div [3 + 2]$

$= 10 \div 5$

$= 2$

c. $4 + [15 - \{7 + (6 \div 2)\}]$

Sol: $4 + [15 - \{7 + (6 \div 2)\}]$

$= 4 + [15 - \{7 + 3\}]$

$= 4 + [15 - 10]$

$= 4 + 5$

$= 9$

d. $100 - [80 \div \{20 \times 2\}] + 3$

Sol: $100 - [80 \div \{20 \times 2\}] + 3$

$= 100 - [80 \div 40] + 3$

$= 100 - 2 + 3$

$= 100 - 5$

$= 95$

Exercise

1 Solve the following questions:

a.	3 + 5 + 7	8 + 7 = 15	b.	2 + 9 + 6	11 + 6 = 17
c.	3 + 9 – 2	12 – 2 = 10	d.	8 + 6 – 4	14 – 4 = 10
e.	5 – 6 + 7	5 – 13 = –8	f.	8 – 9 + 11	8 – 20 = –12
g.	11 – 6 – 9	5 – 9 = –4	h.	14 – 9 – 6	5 – 6 = –1
i.	–5 – 7 + 10	–12 + 10 = –2	j.	–11 – 13 + 8	–24 + 8 = –16

2 Write 'T' for true and 'F' for false answers:

a.	18 – 9 = 9	T	b.	8 – 13 = –6	F
c.	7 – 16 = 9	F	d.	12 – 14 = – 2	T
e.	4 – 6 + 6 = 10	F	f.	16 + 7 – 16 = 7	T
g.	–9 – 4 + 6 = –7	T	h.	3 – 8 – 8 = –13	F
i.	–5 – 6 – 7 = –21	F	j.	6 + 8 – 17 = 3	F

3 Solve these:

a.	3 + 8 x 5	3 + 40 = 43	b.	6 x 6 + 9	36 + 9= 45
c.	2 + 6 – 5	8 – 5 = 3	d.	2 + 2 x 2	2 + 4 = 6
e.	6# #B – 2 + 2	2 – 2 + 2 0 + 2 = 2	f.	2 x 2 + 2	4 + 2 = 6
			h.	16# #4 x 4	4 x 4 = 16
g.	4 – 4# #4	4 – 1 = 3	j.	15 x 3 + 6# #2	15 x 3 + 3 45 + 3 = 48
i.	12 x 6# #2	12 x 3 = 36			
k.	2 + 2 x 2# #2 – 2	2+2 x 1 – 2 4 – 2 = 2	l.	8 + 12# #B – 6	8 + 4 – 6 12 – 6 = 6

4 Simplify the following:

a. 4 + [5 – { 3 – (6 ¸ 3 x 2)}]

Sol: 4 + [5 – { 3 – (6 ¸ 3 x 2)}]
= 4 + [5 – { 3 – (2 x 2)}]
= 4 + [5 – { 3 – 4 }]
= 4 + [5 – { -1}]
= 4 + [5 + 1] = 4 + 6 = 10

b. 24 – 4 + { 6 – (9 – 6)}

Sol: 24 – 4 + { 6 – (9 – 6)}
= 24 – 4 + { 6 – 3 }
= 24 – 4 + 3)}
= 20 + 3
= 23

c. $100 - \{80 \div (20 \times 2)\}$

Sol: $100 - \{80 \div (20 \times 2)\}$

$= 100 - \{80 \div 40\}$

$= 100 - 2$

$= 98$

d. $\{45 + (42 \div 6) - 9\} + 4$

Sol: $\{45 + (42 \div 6) - 9\} + 4$

$= \{45 + 7 - 9\} + 4$

$= \{52 - 9\} + 4$

$= 43 + 4$

$= 47$

e. $73 - \{14 + (92 - 52) \div 8\}$

Sol: $73 - \{14 + (92 - 52) \div 8\}$

$= 73 - \{14 + 40 \div 8\}$

$= 73 - \{14 + 5\}$

$= 73 - 19$

$= 54$

f. $60 - [48 - \{16 + (8 - 4)\}]$

Sol: $60 - [48 - \{16 + (8 - 4)\}]$

$= 60 - [48 - \{16 + 4\}]$

$= 60 - [48 - 20]$

$= 60 - 28$

$= 32$

g. $39 - [6 + \{5 - (6 - 3)\}]$

Sol: $39 - [6 + \{5 - (6 - 3)\}]$

$= 39 - [6 + \{5 - 3\}]$

$= 39 - [6 + 2]$

$= 39 - 8$

$= 31$

h. $100 \times [12 - \{62 + (13 + 26)\}]$

Sol: $100 \times [12 - \{62 + (13 + 26)\}]$

$= 100 \times [12 - \{62 + 39\}]$

$= 100 \times [12 - 101]$

$= 100 \times (-89)$

$= -8900$

i. $40 \div [35 \times 2 - \{6 + 4 + (4 \times 5)\}]$

Sol: $40 \div [35 \times 2 - \{6 + 4 + (4 \times 5)\}]$

$= 40 \div [35 \times 2 - \{6 + 4 + 20\}]$

$= 40 \div [35 \times 2 - 30]$

$= 40 \div [70 - 30]$

$= 40 \div 40$

$= = 1$

j. $6 + [12 - \{15 + 16 \div 4 - (6 + 2)\}]$

Sol: $6 + [12 - \{15 + 16 \div 4 - (6 + 2)\}]$

$= 6 + [12 - \{15 + 4 - 8\}]$

$= 6 + [12 - \{19 - 8\}]$

$= 6 + [12 - 11]$

$= 6 + 1$

$= 7$

Unit 5

Percentage

Students' Learning Outcomes:

After studying this unit, students will be able to:

- understand some basic concepts of percentage.
- understand difference between fractions, decimal fractions and percentage.
- find profit, loss and percentage of the given values.

Any fractions with 100 as a denominator can be expressed as a percentage. For example,

$$\frac{40}{100} = 40\ \% \qquad \frac{60}{100} = 60\ \%$$

Symbol of % is used for percent. Percent means for every hundred or out of every hundred. Your marks in annual exams or terminal exams are also represented in the form of percentage. Consider you got $\frac{640}{800}$ marks in your exams. Which can also be written as $\frac{80}{100}$, we say that you got 80 marks out of every 100 marks. We can also say that you got 80% marks in your exams.

A percent can be greater than 100%. For example Ahmed had Rs. 1000 in his saving box. After one year, he saves Rs. 1500 more, the percentage of increase in his saving box is:

$$\frac{1500}{1000} \times 100\% = 150\%$$

Example 1: Change these fractions into equivalent fraction with denominator 100.

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

$\frac{1}{4} = \frac{1 \times 25}{4 \times 25}$ Making denominator 100

$\frac{25}{100} =$

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

$\frac{3}{4} = \frac{3 \times 25}{4 \times 25}$ Making denominator 100

$\frac{75}{100} =$

c. $\frac{4}{5}$

$\frac{4}{5} = \frac{4 \times 20}{5 \times 20}$ Making denominator 100

$\frac{80}{100} =$

d. $\frac{11}{25}$

$\frac{11}{25} = \frac{11 \times 4}{25 \times 4}$ Making denominator 100

$\frac{44}{100} =$

Example 2: Express these as a fractions of 100:

a. $\frac{3}{5}$ of 100

$= \frac{3 \times 100}{5}$

$= \frac{300}{5}$

$= 60$

b. $\frac{11}{20}$ of 100

$= \frac{11 \times 100}{20}$

$= \frac{1100}{20}$

$= 55$

c. $\frac{21}{25}$ of 100

$= \frac{21 \times 100}{25}$

$= \frac{2100}{25}$

$= 84$

d. $\frac{7}{10}$ of 100

$= \frac{7 \times 100}{10}$

$= \frac{700}{10}$

$= 70$

Example 3: Convert the given fractions into decimal:

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

$= 0.6$

$$5\overline{)3.0}\ 0.6$$
$$-0.0$$
$$3.0$$
$$-3.0$$
$$x$$

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

$= 0.25$

$$4\overline{)1.00}\ 0.25$$
$$-0$$
$$10$$
$$-\ 8$$
$$20$$
$$-\ 20$$
$$x$$

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

$= 0.7$

$$10\overline{)7.0}\ 0.7$$
$$-0.0$$
$$7.0$$
$$-7.0$$
$$x$$

d. $\frac{11}{20}$

$= 0.55$

$$20\overline{)11.00}\ 0.55$$
$$-00$$
$$110$$
$$-100$$
$$100$$
$$-\ 100$$
$$x$$

Activity Complete the following table:

Percentage	Fraction	Decimal
35%	$\frac{35}{100} = \frac{7}{20}$	$\frac{35}{100} = 0.35$
25%	$\frac{25}{100} = \frac{5}{20}$	$\frac{25}{100} = 0.25$
60%	$\frac{60}{100} = \frac{3}{5}$	$\frac{60}{100} = 0.6$
75%	$\frac{75}{100} = \frac{3}{4}$	$\frac{75}{100} = 0.75$
$37\frac{1}{2}\%$	$\frac{75}{2} = \frac{3750}{100}$	$\frac{3750}{100} = 37.5$
75%	$\frac{75}{100} = \frac{3}{4}$	$\frac{75}{100} = 0.75$
145%	$\frac{145}{100} = \frac{29}{20}$	$\frac{145}{100} = 1.45$
125%	$\frac{125}{100} = \frac{5}{4}$	$\frac{125}{100} = 1.25$

Change into Percentage

We can change a fractions into percentage by converting the denominator of the given fraction into 100 (by multiplication or division).

Example: Convert the following fractions into percentage.

a. $\frac{2}{5} = \frac{2 \times 20}{5 \times 20}$

$= \frac{40}{100}$

$= 40\%$

b. $\frac{2}{4} = \frac{2 \times 25}{4 \times 25}$

$= \frac{50}{100}$

$= 50\%$

c. $\frac{110}{200} = \frac{110 \div 2}{200 \div 2}$

$= \frac{55}{100}$

$= 55\%$

d. $\frac{140}{250} = \frac{140 \times 4}{250 \times 4}$

$= \frac{560}{1000} =$

$= \frac{56}{100} = 56\%$

Activity: Convert these fractions into percentage:

a. $\frac{220}{250} = \frac{220 \div 2.5}{250 \div 2.5}$

$= \frac{88}{100}$

$= 88\%$

b. $\frac{300}{400} = \frac{300 \div 4}{400 \div 4}$

$= \frac{75}{100}$

$= 75\%$

Finding Percentage of a Number

Example 1: Find 25% of 80

Solution: 25% of 80 $= \frac{25}{100} \times 80$

$= \frac{\overset{5}{\cancel{25}}}{\cancel{100}} \times \overset{4}{\cancel{80}}$

$= 1 \times 20$

$= 20$

Example2: Find 30% of 120

Solution: $30\% \text{ of } 120 = \frac{30}{100} \times 120$

$$= \frac{3\cancel{0}}{1\cancel{00}} \times 12\cancel{0} = 36$$

Profit

If a shopkeeper purchases something at a particular price and sells it at higher price, then he will earn profit. The price at which a shopkeeper purchases is called cost price and the price at which he sells is called sale price.

If sale price is greater than cost price then he will gain profit.

Note: Sale price is represented by S.P and cost price is represented by C.P. For calculating profit, we use this formula.

Profit = S.P – C.P

Example 1: If cost price is Rs. 5350 and sale price is Rs. 7255 then find profit.

Solution: We know that:

Profit = S.P – C.P

So, profit = Rs. 7255 – Rs. 5350

Profit = Rs. 1905

```
  ⑥①
  7 2 5 5
– 5 3 5 0
---------
  1 9 0 5
```

Activity: Find the profit:

if C.P = Rs. 3675 , S.P = Rs. 4305

Solution: We know that:

Profit = S.P – C.P

So. Profit = Rs.4305 – Rs.3675

Profit = Rs.630

```
  4 3 0 5
– 3 6 7 5
---------
    6 3 0
---------
```

Note: With the help of formula, Profit = S.P – C.P

We can also find S.P and C.P

Example 1:

If C.P = Rs. 690 and Profit = Rs. 310, find S.P.

Solution:

C.P = Rs. 690

Profit = Rs. 310

We know that Profit = S.P – C.P

or S.P = Profit + C.P

Hence, S.P = Rs. 310 + Rs. 690

S.P = Rs.1000

$$\begin{array}{r} {\scriptstyle (1)}\ 3\ 1\ 0 \\ -\ 6\ 9\ 0 \\ \hline 1\ 0\ 0\ 0 \end{array}$$

Example 2:

If profit = Rs. 295 and S.P = Rs. 975 then find C.P

Solution:

Profit = Rs. 295

S.P = Rs. 975

We know that Profit = S.P – C.P

or C.P = S.P – Profit

So, C.P = Rs. 975 – Rs. 295

C.P = Rs.680

$$\begin{array}{r} 9\ 7\ 5 \\ -\ 2\ 9\ 5 \\ \hline 6\ 8\ 0 \end{array}$$

Loss: If a shopkeeper purchases something at a particular price and sells it at lower price, then he will suffer a loss.

If cost price = C.P

Sale price = S.P

Then loss = C.P – S.P

Example 1: If cost price = Rs. 3655

sale price = Rs. 3485 then find loss.

Solution: As we know that:

Loss = C.P – S.P

Loss = Rs.3655 – Rs. 3485

Loss = Rs. 170

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

Example 2: If a shopkeeper buys a bat at Rs.715 and he suffers a loss of Rs.95 after selling the bat. What is his sale price?

Solution: Here cost price (C.P) = Rs. 715

Loss = Rs. 95

S.P = ?

As we know that Loss = C.P – S.P

or S.P = C.P – Loss

So S.P = Rs.715 – Rs. 95

S.P = Rs.620

$$\begin{array}{r} 7\ 1\ 5 \\ -\ 9\ 5 \\ \hline 6\ 2\ 0 \end{array}$$

Profit and Loss Percentage

We can also find the profit and loss percentage using the following formulae:

$$\text{Loss percentage} = \frac{\text{Loss}}{\text{C.P}} \times 100$$

$$\text{Profit percentage} = \frac{\text{Profit}}{\text{C.P}} \times 100$$

Example 1: A shopkeeper buys a bike at Rs.50,000 and sells it at Rs.45.000. Find his loss%.

Solution. For finding loss %, we first calculate the loss.

Loss = C.P – S.P

Loss = Rs. 55,000 – Rs. 45000

Loss = Rs. 5000

$$\text{Loss percentage} = \frac{\text{Loss}}{\text{C.P}} \times 100$$

$$= \frac{\cancel{5000}}{\cancel{50,000}} \times \frac{2}{\cancel{100}}$$

Loss percentage = 10%

Example 2: A shopkeeper sells a remote control car at Rs. 2500 with profit of Rs. 500. Find his profit percentage.

Solution:

S.P = Rs. 2500

Profit = Rs. 500

For finding profit %, we need C.P

We know that Profit = S.P – C.P

or C.P = S.P – Profit

C.P = Rs. 2500 – Rs. 500

C.P = Rs. 2000

$$\text{Profit percentage} = \frac{\text{Profit}}{\text{C.P}} \times 100$$

$$= \frac{\cancel{500}^{25}}{\cancel{2000}} \times \cancel{100}$$

Hence Profit percentage = 25%

Exercise

1 Write down each percentage as a fraction.

a. $15\% = \frac{15}{100}$ b. $25\% = \frac{25}{100}$ c. $35\% = \frac{35}{100}$ d. $17\% = \frac{17}{100}$

e. $20\% = \frac{20}{100}$ f. $45\% = \frac{45}{100}$ g. $35\% = \frac{35}{100}$ h. $50\% = \frac{50}{100}$

i. $55\% = \frac{55}{100}$ j. $60\% = \frac{60}{100}$ k. $75\% = \frac{75}{100}$ l. $90\% = \frac{90}{100}$

2 Write these fractions as percentage.

a. $\frac{4}{20} = \frac{4}{\cancel{20}} \times \frac{5}{\cancel{100}} = 20\%$ b. $\frac{3}{25} = \frac{3}{\cancel{25}} \times \frac{4}{\cancel{100}} = 12\%$

c. $\frac{8}{25} = \frac{8}{\cancel{25}} \times \frac{4}{\cancel{100}} = 32\%$ d. $\frac{9}{20} = \frac{9}{\cancel{20}} \times \frac{5}{\cancel{100}} = 45\%$

e. $\frac{11}{20} = \frac{11}{\cancel{20}} \times \frac{5}{\cancel{100}} = 55\%$ f. $\frac{4}{5} = \frac{4}{\cancel{5}} \times \frac{20}{\cancel{100}} = 80\%$

g. $\frac{2}{5} = \frac{2}{\cancel{5}} \times \frac{\overset{20}{\cancel{100}}}{} = 40\%$

h. $\frac{3}{50} = \frac{3}{\cancel{50}} \times \frac{\overset{2}{\cancel{100}}}{} = 6\%$

i. $\frac{33}{50} = \frac{33}{\cancel{50}} \times \frac{\overset{2}{\cancel{100}}}{} = 66\%$

j. $\frac{10}{40} = \frac{\overset{1}{\cancel{10}}}{\underset{4}{\cancel{40}}} \times \frac{\overset{25}{\cancel{100}}}{} = 25\%$

k. $\frac{20}{40} = \frac{\overset{1}{\cancel{20}}}{\underset{2}{\cancel{40}}} \times \frac{\overset{50}{\cancel{100}}}{} = 50\%$

l. $\frac{25}{40} = \frac{\overset{5}{\cancel{25}}}{\underset{20}{\cancel{40}}} \times \frac{\overset{50}{\cancel{100}}}{\underset{10}{}} \overset{25}{\underset{2}{}} = 62.5\%$

3 Write down these percentage as decimal fractions:

a. 25%

$= 25 \times \frac{1}{100} = \frac{25}{100} = \frac{1}{4} = 0.25$

b. 33%

$= 33 \times \frac{1}{100} = \frac{33}{100} = 0.33$

c. 9%

$= 9 \times \frac{1}{100} = \frac{9}{100} = 0.09$

d. 19%

$= 19 \times \frac{1}{100} = \frac{19}{100} = 0.19$

e. 36%

$= 36 \times \frac{1}{100} = \frac{36}{100} = \frac{9}{25} = 0.36$

f. 67%

$= 67 \times \frac{1}{100} = \frac{67}{100} = 0.67$

g. 120%

$= 120 \times \frac{1}{100} = \frac{120}{100} = \frac{6}{5} = 1.2$

h. 39.5%

$= \frac{395}{10} \times \frac{1}{100} = \frac{395}{1000} = 0.395$

i. 10.5%

$= \frac{105}{10} \times \frac{1}{100} = \frac{105}{1000} = 0.105$

j. 12.5%

$= \frac{125}{10} \times \frac{1}{100} = \frac{125}{1000} = 0.125$

k. $33\frac{1}{2}\%$

$= 33 \times 2 = \frac{66 + 1}{2} = \frac{67}{2}$

$= \frac{67 \times 50}{2 \times 50} = \frac{3350}{100} = 33.5$

l. $45\frac{1}{2}\%$

$= 45 \times 2 = \frac{90 + 1}{2} = \frac{91}{2}$

$= \frac{91 \times 50}{2 \times 50} = \frac{4550}{100} = 45.5$

4 Find the percentage of the given numbers:

a. 15 % of 20

$= \frac{\overset{3}{\cancel{15}}}{\underset{5}{\cancel{100}}} \times \cancel{20} = 3$

b. 33 % of 99

$= \frac{33}{100} \times 99 = 32.67$

c. 15 % of 75

$= \frac{15}{\underset{4}{\cancel{100}}} \times \overset{3}{\cancel{75}} = 11.25$

d. 20 % of 100

$= \frac{20}{100} \times \overset{1}{\cancel{100}} = 100$

e. 25 % of 125

$= \frac{25}{\cancel{100}_{4}} \times \overset{5}{\cancel{125}} = 31.25$

f. 40 % of 160

$= \frac{\overset{8}{\cancel{40}}}{\cancel{100}} \times \frac{\overset{80}{\cancel{160}}^{40}}{\underset{50}{\cancel{}}\ \underset{25}{\cancel{}}\ \underset{5}{\cancel{}}} = 64$

g. 20 % of 130

$= \frac{\overset{2}{\cancel{20}}}{\cancel{100}} \times \frac{\overset{13}{\cancel{130}}}{\underset{10}{\cancel{}}} = 26$

h. 40 % of 200

$= \frac{40}{\cancel{100}} \times \overset{2}{\cancel{200}} = 80$

i. 45 % of 450

$= \frac{45}{\cancel{100}_{2}} \times \overset{9}{\cancel{450}} = 202.5$

j. 35 % of 210

$= \frac{35}{100} \times 210 = 73.5$

k. 90 % of 450

$= \frac{90}{\cancel{100}_{2}} \times \overset{5}{\cancel{450}} = 405$

l. 65 % of 195

$= \frac{\overset{13}{\cancel{65}}}{\cancel{100}} \times \frac{\overset{39}{\cancel{195}}}{\underset{20}{\cancel{}}\ \underset{4}{\cancel{}}} = 126.75$

5 Find profit or loss in following questions:

a. C.P = Rs. 150
S.P = Rs. 225
Profit = S.P – C.P
Profit = Rs.225 – Rs.150
Profit = Rs.75

b. S.P = Rs. 3,450
C.P = Rs. 4,450
Loss = C.P – S.P
Loss = Rs.4450 – Rs.3450
Loss = Rs.1000

c. C.P = Rs. 275
S.P = Rs. 305
Profit = S.P – C.P
Profit = Rs.305 – Rs.275
Profit = Rs.30

d. S.P = Rs. 6,250
C.P = Rs. 6,000
Profit = S.P – C.P
Profit = Rs.6250 – Rs.6000
Profit = Rs.250

e. C.P = Rs. 310
S.P = Rs. 410
Profit = S.P – C.P
Profit = Rs.410 – Rs.310
Profit = Rs.100

f. S.P = Rs. 8,000
C.P = Rs. 10,000
Loss = C.P – S.P
Loss = Rs.10000 – Rs.8000
Loss = Rs.2000

g. C.P = Rs. 290
S.P = Rs. 400
Profit = S.P – C.P
Profit = Rs.400 – Rs.290
Profit = Rs.110

h. S.P = Rs. 9,500
C.P = Rs. 12,000
Loss = C.P – S.P
Loss = Rs.12000 – Rs.9500
Loss = Rs.2500

i. C.P = Rs. 460
S.P = Rs. 590
Profit = S.P – C.P
Profit = Rs.590 – Rs.460
Profit = Rs.130

j. S.P = Rs. 45,000
C.P = Rs. 42,000
Profit = S.P – C.P
Profit = Rs.45000 – Rs.42000
Profit = Rs.3000

k. C.P = Rs. 10,000
S.P = Rs. 15,000
Profit = S.P – C.P
Profit = Rs.15000 – Rs.10000
Profit = Rs.5000

l. S.P = Rs. 9,000
C.P = Rs. 12,000
Loss = C.P – S.P
Loss = Rs.12000 – Rs.9000
Loss = Rs.3000

6 Find profit % or loss % from the following questions:

a. C.P = Rs. 6,000
Profit = Rs. 1,200
Profit = S.P – C.P
S.P = Profit + C.P
S.P = Rs.1200 + Rs.6000
S.P = Rs.7200

b. C.P = Rs. 1,6500
S.P = Rs. 1,4750
Loss = C.P – S.P
Loss = Rs.16500 – Rs.14750
Loss = Rs.1750

c. C.P = Rs. 2,500
S.P = Rs. 2,000
Loss = C.P – S.P
Loss = Rs.2500 – Rs.2000
Loss = Rs.500

d. S.P = Rs. 6,000
C.P = Rs. 7,250
Loss = C.P – S.P
Loss = Rs.7250 – Rs.6000
Loss = Rs.1250

e. C.P = Rs. 565
Profit = Rs. 50
Profit = S.P – C.P
S.P = Profit + C.P
S.P = Rs.50 + Rs.565
S.P = Rs.615

f. C.P = Rs. 8,900
S.P = Rs. 12,450
Profit = S.P – C.P
Profit = Rs.12450 – Rs.8900
Profit = Rs.3550

g. S.P = Rs. 7,225
C.P = Rs. 10,000
Loss = C.P – S.P
Loss = Rs.10000 – Rs.7225
Loss = Rs.2775

h. Loss = Rs. 600
C.P = Rs. 18,000
Loss = C.P – S.P
S.P = C.P – Loss
S.P = Rs.18000 – Rs.600 = 17400

i. S.P = Rs. 10,250
C.P = Rs. 14,250
Loss = C.P – S.P
Loss = Rs.14250 – Rs.10250
Loss = Rs.4000

j. Loss = Rs. 1,200
C.P = Rs. 18,000
Loss = C.P – S.P
S.P = C.P – Loss
S.P = Rs.18000 – Rs.1200 = 16800

k. C.P = Rs. 16,000
Loss = Rs. 4,000
Loss = C.P – S.P
S.P = C.P – Loss
S.P = 16000 – 4000 = 12000

l. Loss = Rs. 900
C.P = Rs. 2100
Loss = C.P – S.P
S.P = C.P – Loss
S.P = Rs.2100 – Rs.900 = 1200

m. C.P = Rs. 15,000
Loss = Rs. 3,000
Loss = C.P – S.P
S.P = C.P – Loss
S.P = 15000 – 3000 = 12000

n. C.P = Rs. 700
S.P = Rs. 900
Profit = S.P – C.P
Profit = Rs.900 – Rs.700
= Rs.200

o. C.P = Rs. 670
Profit = Rs. 75
Profit = S.P – C.P
S.P = Profit + C.P
S.P= Rs.75+Rs.670= Rs.745

p. C.P = Rs. 485
S.P = Rs. 678
Profit = S.P – C.P
Profit = Rs.678 – Rs.485
= Rs.193

q. S.P = Rs. 10,980
C.P = Rs. 8,671
Profit = S.P – C.P
Profit = Rs.10980 – Rs.8671
Profit = Rs.2309

r. C.P = Rs. 2,250
Loss = Rs. 800
Loss = C.P – S.P
S.P = C.P – Loss
S.P = Rs.2250 – Rs.800 =1450

Unit 6

Information Handling

Students' Learning Outcomes:

After studying this unit, students will be able to:

- understand the concept of data and information.
- represent the given data into useful information.
- draw different types of graphs.
- read a diagram and anser the given questions.

Information handling is a branch of statistics which deals with the collection, analysis, explanation and presentation of data.

Data

A data is a set of information and facts which is represented in the form of figures. For example, age of class 4 students can be written as 9, 8, 9, 9, 10, 8, 9, 9, 10, 9, 8. This collection is called data.

Presentation of Data

After the collection of data, the most important step is its presentation. Data can be represented in the form of tables and different type of graphs.

We know that a data is collected in raw form and it provides us information about individuals. Data in such form is called ungrouped data. After arranging the data for descried information, it is called grouped data. For example a teacher collected the marks of 20 students in mathematics test.

30, 35, 10, 25, 46, 75, 95, 80, 70, 65, 55, 95, 74, 66, 30, 21, 26, 45, 50, 61

This is ungroup data. Now if we arrange it to represent information in groups, then it is called grouped data.

Number of students obtained marks from 10 to 40 = 7

Number of students obtained marks from 41 to 70 = 8

Number of students obtained marks from 41 to 100 = 5

It can be seen that it is easier to visualize the given information, if given data is presented in grouped form. Now we arrange this data using a table:

Groups	Marks	Tally Marks	No. of Students
11 – 40	30, 35, 10, 25, 30, 21, 26	𝍸 II	7
41 – 70	46, 70, 65, 55, 66, 45, 50, 61	𝍸 III	8
71 – 100	75, 95, 80, 95, 74	𝍸	5

The method used in this table is called tally method. We draw a single line 'I' for displaying marks (value), 'II' lines means 2 values, 'III' means 3 values and so on. If we want to represent 5 values, we shall use 4 straight lines and a cross line, like '𝍸'. '𝍸' means five values.

Example: Number of cars on a busy road are recorded by their colours. Draw a tally chart to represent this information.

White, white, red, black, grey, grey, silver, white, white, black, red, black, black, grey, white, white, grey, while, black, white.

Colours	Tally Marks	No. of Cars
White	𝍸 III	8
Black	𝍸	5
Red	II	2
Grey	IIII	4
Silver	I	I

Activity:

Draw a tally table for the favourite fruits of students of class 4.

mango, mango, apple, melon, water-melon, grapes, mango, mango, grapes, melon, apple , apple, banana, banana, banana, mango, mango, apple, water-melon, melon, apple banana, apple melon mango, mango.

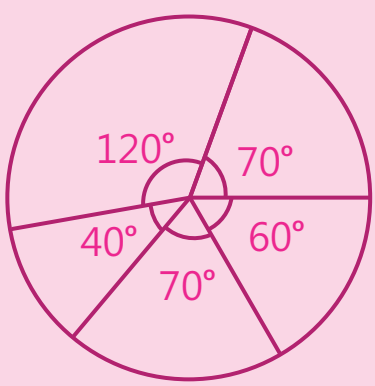
Solution:

Fruits	Tally Marks	No. of Fruits
Mango	𝍸 III	8
Apple	𝍸 I	6
Melon	IIII	4
Banana	IIII	4
Watermelon	I	2

Pie Graph

A graph in which data is represented by sector of a circle is called a pie graph.

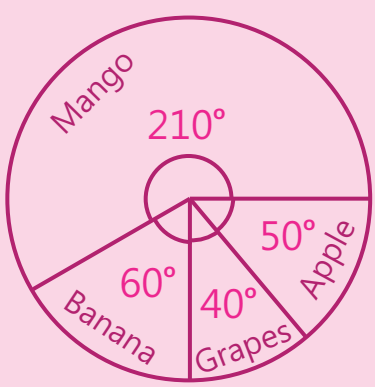
We normally use a graph for comparison of data. In this graph we draw a circle of suitable radius and as we know a circle consists of 360°, divide it into sectors according to given values. It may look like as:



Let us starts with example:

Example:

Read the following pie graph which is showing the favourite fruit of 900 boys.



i. How many boys' favourite fruit is mango?

ii. How many boys' favourite fruit is banana?

iii. How many boys' favourite fruit is apple?

iv. How many boys' favourite fruit is grape?

v. Which fruit is the most favourite of the boys?

Solution:

We can find a quantity by the given angles. For this purpose, we use the following formula.

$$\text{Required quantity} = \frac{\text{given angle}}{360} \times \text{total quantity}$$

i. Mango $= \frac{\cancel{210}^{35}}{\cancel{360}_{6}_{1}} \times \cancel{900}^{15} = 35 \times 15 = 525$ boys

ii. Banana $= \frac{\cancel{60}^{1}}{\cancel{360}_{6}_{1}} \times \cancel{900}^{150} = 150$ boys

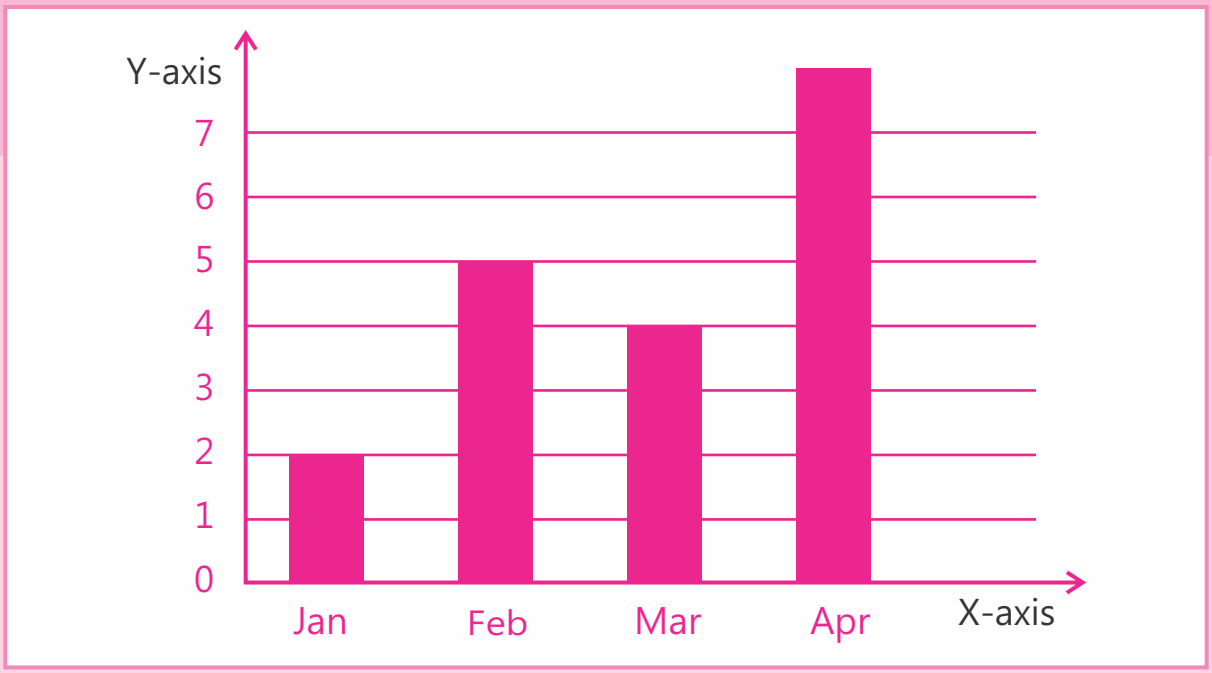
iii. Apple $= \frac{\cancel{50}^{25}}{\cancel{360}_{2}_{1}} \times \cancel{900}^{5} = 25 \times 5 = 125$ boys

iv. Grapes $= \frac{\cancel{40}^{1}}{\cancel{360}_{9}_{1}} \times \cancel{900}^{100} = 100$ boys

Bar Graph

A group in which data is represented by a number of rectangular bars is called a bar graph.

A bar graph has specific width and equal distance from the other bars. We use two rays to draw a bar graph which are called axis and marking on axis is called its scale as shown in the figure below:



Reading the Bar Graph

The above bar graph represents the marks obtained by Ahmad in four tests.

i. In first test he scored 25 marks and it is his lowest score.

ii. In test 2 he scored 50 marks.

iii. In test 3 he scored 100 marks.

iv. In last test he scored marks between 25 and 50. Use your scale to measure value on a graph paper or simply add the two values and divide them by 2. i.e,

$$\frac{25 + 50}{2} = \frac{75}{2} = 37.5$$

Drawing of a Bar Graph

Drawing of a bar graph is not very difficult. Here are the steps how to construct a bar graph.

i. Carefully read given values and note the maximum and minimum values.

ii. According to these values draw a suitable scale.

iii. Now draw/plot value according to your scale.

Example:

Farooq spent rupees on different days of week which are given table below in the form of a table.

Days	Mon	Tue	Wed	Thu	Fri
Rs.	600	450	500	400	250

By using above table, draw a bar graph.

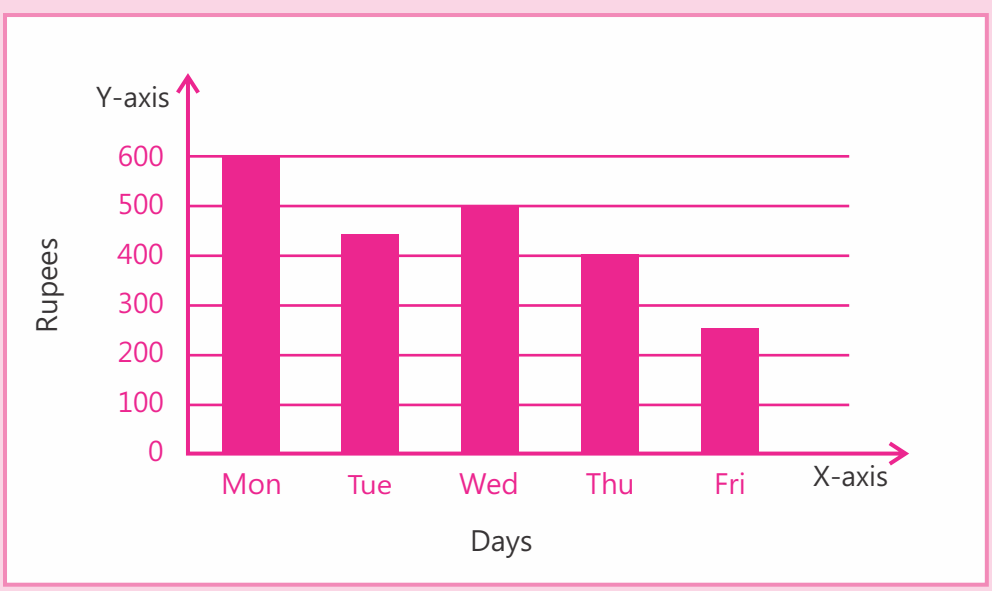
Solution: Here minimum and maximum values are 250 and 600, so we have to choose a scale which represents both these values and values between them.

i. First draw two lines at right angle for X-axis and Y- axis.

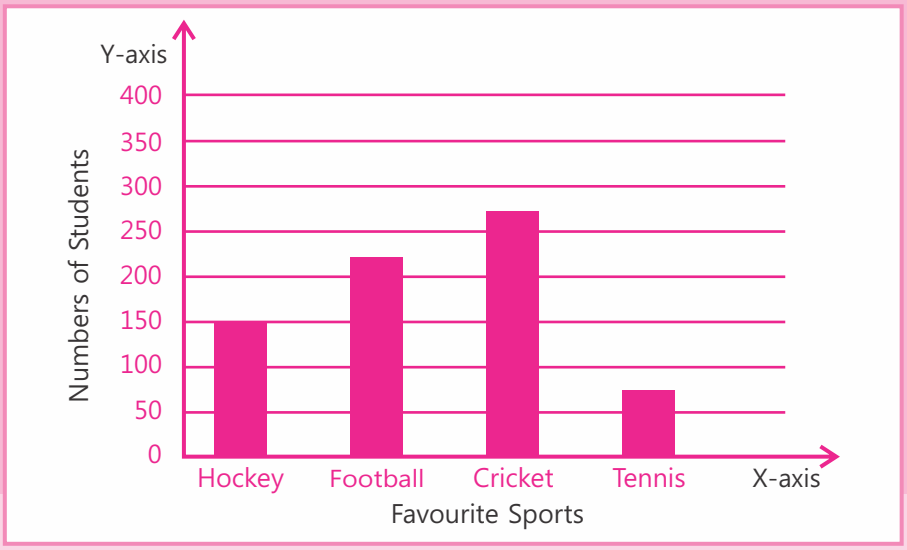
ii. On X-axis draw points of equal intervals for representing days in bars.

iii. On Y-axix every gap between lines is equal to Rs.100

iv. Now, draw bars according to the given values.



Activity: Read the given bar graph and answer the following questions:



Questions:

i. Which sport is least favourite? Tennis

ii. How many students like cricket? 275

iii. How many students like hockey and football? 150, 225

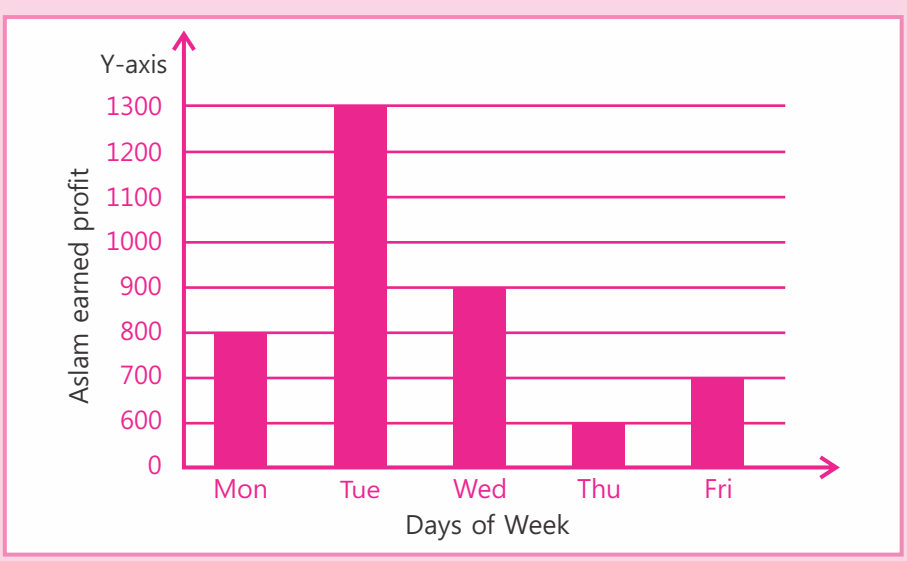
iv. Calculate total number of students. 1800

v. Calculate the difference between the students who like cricket and tennis. 200

Activity: Aslam earned profit on different days of week, which is given below in the form of a table.

Days	Mon	Tue	Wed	Thu	Fri
Rs.	800	1300	900	600	700

By using data draw a bar graph.



Exercise

1 Represent the given data into table form using Tally method.

These are the marks of 20students in a maths test.

38, 40, 56, 70, 75, 94, 99, 20, 79, 67, 55, 81, 30, 16, 100, 10, 50, 60, 73, 67

Take first group 10 – 40, second group 41 – 70 and third group 71 – 110.

Groups	Tally Marks	No. of Students
10 - 40	𝍸 I	6
41 - 70	𝍸 II	7
71 - 110	𝍸 II	7

2 Use Tally marks to represent amount of rain in mm in a rainy season month.

30, 60, 110, 90, 120, 60, 30, 15, 44, 45, 80, 37, 46, 67, 77, 79
40, 40, 80, 45, 88, 130, 110, 125, 90, 95, 70, 65, 60, 49

Make four groups of 1 – 35, 36 – 70, 71 – 105 and 106 – 140.

Groups	Tally Marks	No. of Students
1 - 35	III	3
36 - 70	𝍸 𝍸 IIII	14
71 - 105	𝍸 III	8
106 - 140	𝍸	5

3 Height of a class of 40 students are given in inches.

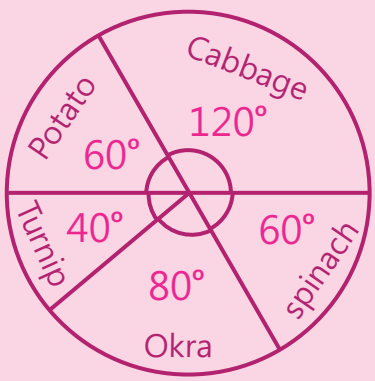
Represent these values using Tally Method.

75, 71, 67, 64, 53, 48, 50, 54, 66, 63, 60, 49, 51, 53, 66, 70, 65, 65, 61, 54, 54, 56, 50, 53, 61, 61, 56, 71, 75, 75, 74, 53, 46, 57, 58, 62, 61, 54, 53, 49.

Make five groups as 40-47, 48-55, 56-63, 64-71 and 72-79

Groups	Tally Marks	No. of Students
40 - 47	I	1
48 - 55	𝍸 𝍸 𝍸	15
56 - 63	𝍸 𝍸 I	11
64 - 71	𝍸 IIII	9
72 - 79	IIII	4

4 Read the following pie chart which is showing the favourite vegetables of 600 boys.



We can find a quantity by the given angles. For this purpose, we use the following formula.

Required quantity = $\frac{\text{given angle}}{360}$ x T.Q

i. How many boys ' favourite vegetable is cabbage?

$$R.Q = \frac{120}{360} \times \frac{600}{5} = 200$$

ii. How many boys ' favourite vegetable is okra?

$$R.Q = \frac{80}{360} \times \frac{600}{5} = 133.33$$

iii. How many boys ' favourite vegetable is spinach?

$$R.Q = \frac{60}{360} \times \frac{600}{100} = 100$$

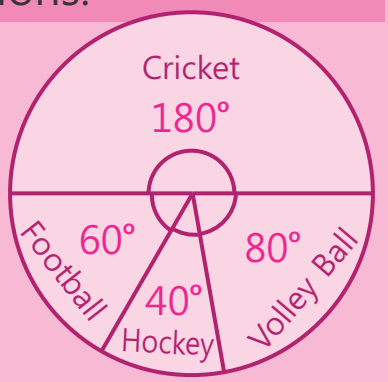
iv. How many boys ' favourite vegetable is potato?

$$R.Q = \frac{60}{360} \times \frac{600}{100} = 100$$

v. How many boys ' favourite vegetable is turnip?

$$R.Q = \frac{40}{360} \times \frac{600}{5} = 66.67$$

5 This pie chart shows the liking of 720 students in school for different games. Answer the following questions.



i. In how many sectors pie graph is divided?

Pie Graph is divided = 4 sectors

ii. Which game is most popular and which is least?

The cricket is most popular and hockey in least popular.

iii. How many students like to play football?

$$R.Q = \frac{60}{\cancel{360}_{6}} \times \frac{\cancel{720}^{12}}{2} = 120$$

iv. How many students like to play hockey?

$$R.Q = \frac{40}{\cancel{360}_{6}} \times \frac{\cancel{720}^{12}}{2} = 80$$

v. How many students like to play cricket?

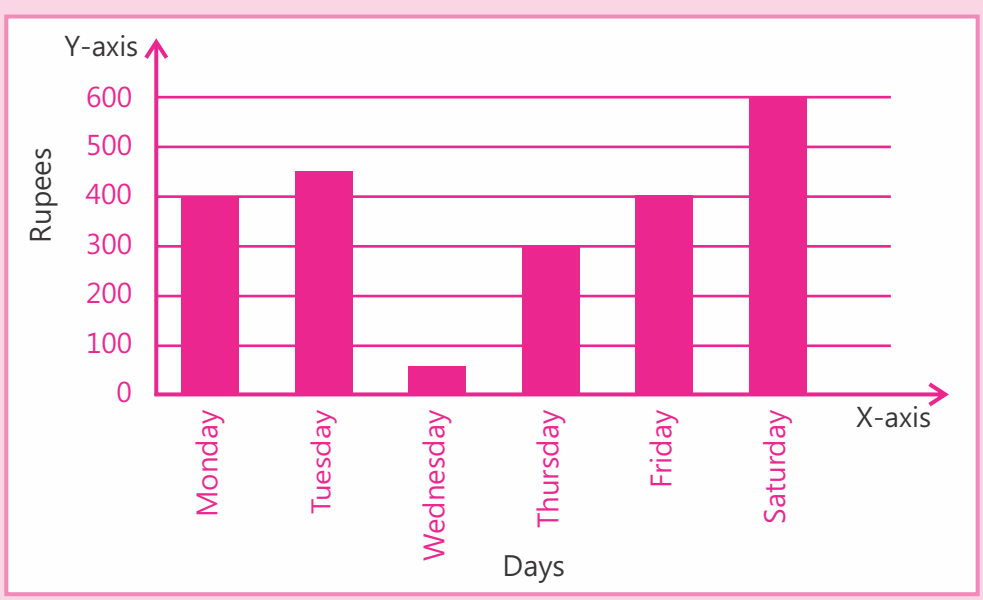
$$R.Q = \frac{180}{\cancel{360}_{6}} \times \frac{\cancel{720}^{12}}{2} = 360$$

vi. How many students like to play football and volley ball?

$$R.Q = \frac{80}{\cancel{360}_{6}} \times \frac{\cancel{720}^{12}}{2}$$

Volley Ball= 160 Football= 120

6 This bar graph shows the amount earned by Zahid in six days of week. Read the graph and answer the following questions.



i. What amount Zahid earn in 6 days? 2,200

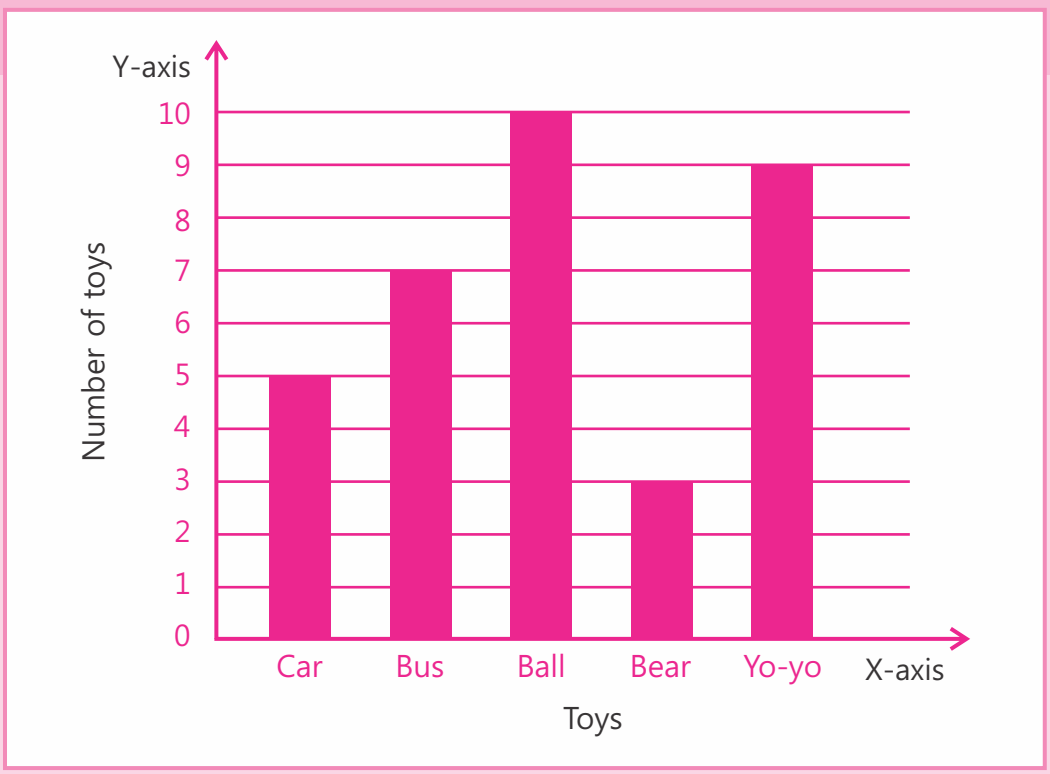
ii. In which day, did he earn maximum amount? Sat

iii. In which day, did he earn minimum amount? wed

iv. How much he earned in first 3 days of week? 900

v. How much he earned last 3 days of week? 1300

7 This bar graph shows the number of toys sold on Monday at a toy shop. Read the graph and answer the following questions.



i. How many cars were sold? 5

ii. How many more buses were sold than bears? 4

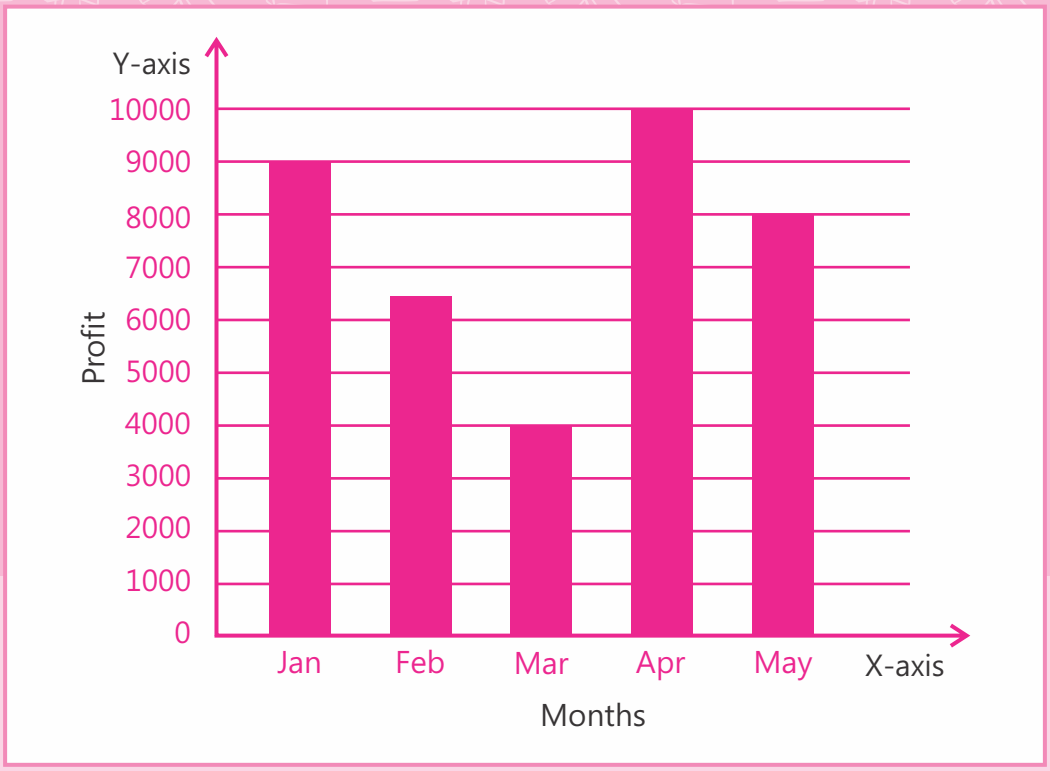
iii. Which toy was sold the most? Ball

iv. How many yo-yo were sold in all? 9

v. Which toy did the shop-keeper sell the least? Bear

8 Draw a bar graph using the following data:

Month	Jan	Feb	Mar	April	May
Profit(Rs.)	9,000	6,500	4,000	10,000	8,000



9 Temperature (in centigrade) of some cities are given. Represent this information in bar graph:

Cities	London	Otawa	Burlin	Jacobabad	Delhi
Temperature	4 °C	10 °C	12 °C	48 °C	34 °C

Unit 7

Area and Perimeter

Students' Learning Outcomes:

After studying this unit, students will be able to:

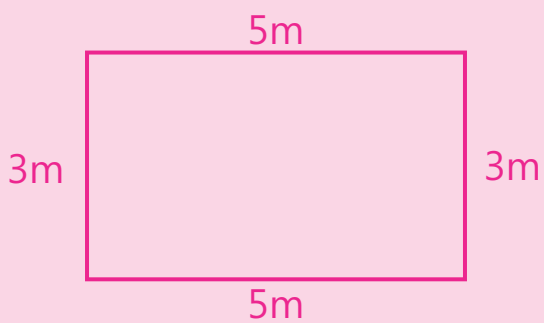
- understand concept of area and perimeter.
- find area of different geometrical figures.
- find perimeter of different geometrical figures.
- solve problems with the help of formula.

Perimeter

The sum of all sides of a closed figure is called its perimeter. Perimeter is very important in our daily life and in mathematics.

If we want to construct a boundary wall around a plot, we use the perimeter to estimate the cost.

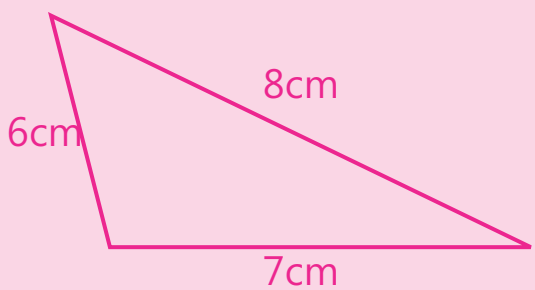
Consider you are jogging around a rectangular park, when you complete one round around it, is called, total distance or perimeter.



The perimeter of the given figure is

5m + 3m + 5m + 3m = 16m

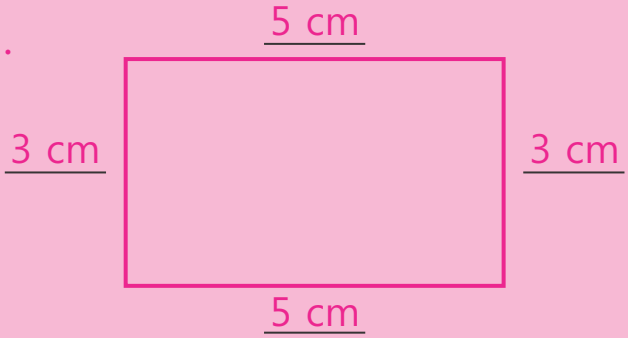
The perimeter of a trianglular region can be found in the same way.



Perimeter of given figure = 6cm + 7cm + 8cm = 21cm

Activity: Measure all the line segments and write the length, then find the perimeter.

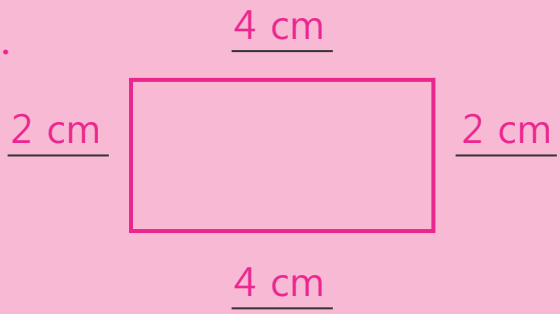
a.



Perimeter

5 + 3 + 5 + 3 = 16cm

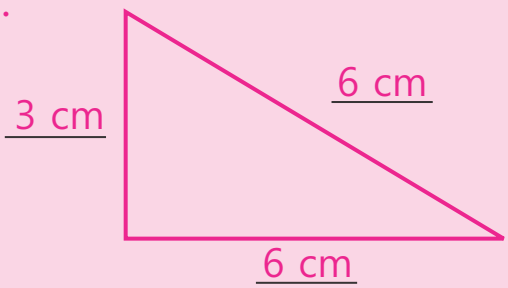
b.



Perimeter

4 + 2 + 4 + 2 = 12cm

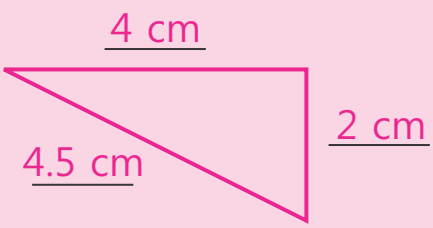
c.



Perimeter

3 + 6 + 6 = 15cm

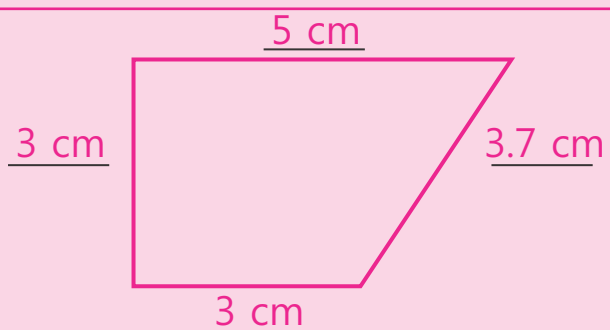
d.



Perimeter

4 + 2 + 4.5 = 10.5cm

e.



Perimeter

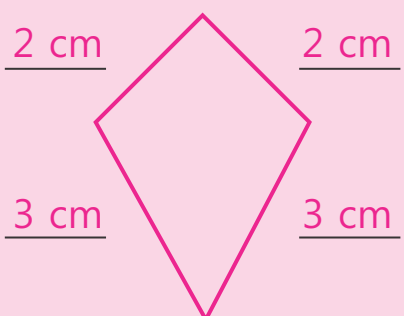
5 + 3.7 + 3 + 3 = 14.7cm

f.

Perimeter

6 + 2 + 6 + 2 = 16cm

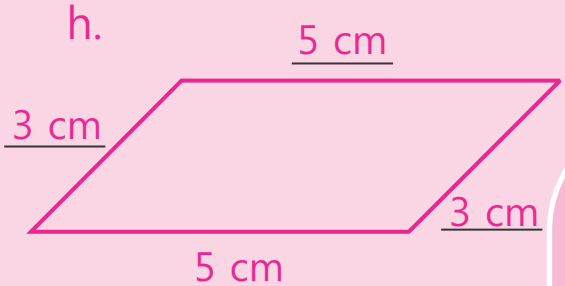
g.



Perimeter

2 + 3 + 2 + 3 = 10cm

h.

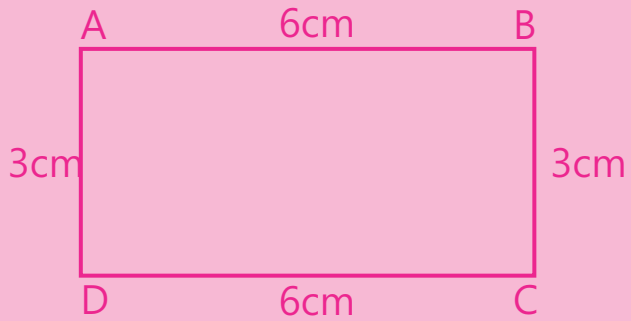


Perimeter

5 + 3 + 5 + 3 = 16cm

Figures are drawn with names. All the sides of closed figures have a specific names. We use this name for representing length of that sides.

Look at the given figure:



It is a rectangle. It has four sides named as AB, BC, CD and DA. The side AB has length 6cm. So we can write it as

AB = 6cm

Similarly BC = 3cm, CD = 6cm and DA = 3cm

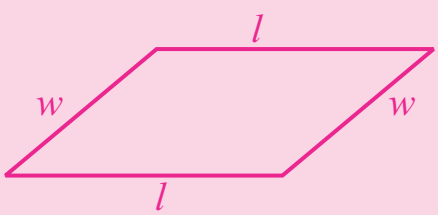
We can find the perimeter of this figure as:

Perimeter = AB + BC + CD + DA

= 6cm + 3cm + 6cm + 3cm

= 18 cm

Perimeter of a rectangle or parallelogram can be found in term of formula.



Here 'l' stands for length and 'w' stands for width.

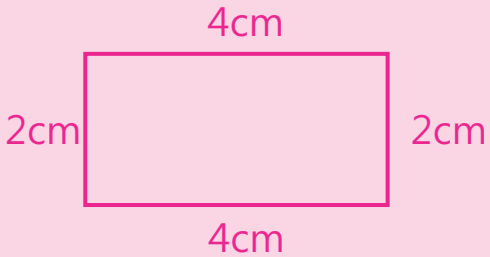
Perimeter $= l + w + l + w$

$= 2l + 2w$

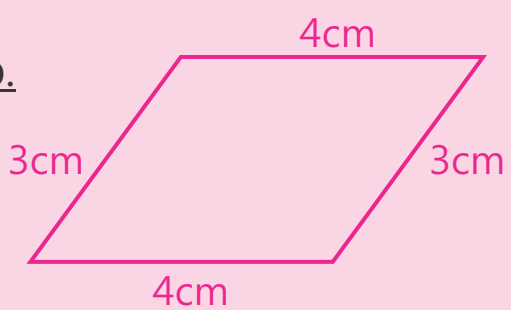
$= 2(l + w)$

Examples 1: Find the perimeter of the given figures using formula.

a.



b.



Solution: a.

Perimeter = $2(l + w)$

Here l = 4cm

and w = 2cm

Hence, perimeter = 2(4 + 2)

= 2(6)

= 12 cm

b.

Perimeter = $2(l + w)$

Here l = 4 cm

and w = 3cm

Hence perimeter = 2(4 + 3)

= 2(7)

= 14 cm

Example 2: A triangle has sides measuring 9cm, 10cm and 8cm. What is its perimeter?

Solution: Perimeter = Sum of all sides

1st side = 9 cm

2nd side = 10 cm

3rd side = 8 cm

Hence, perimeter = 9cm + 10cm + 8cm

= 27 cm

Example 3: The length and width of a white board in our classroom is 180 cm and 150 cm. Find its perimeter.

Solution: Perimeter = $2(l + w)$

length (l) = 180 cm

width (w) = 150 cm

perimeter = 2 (180 + 150)

= 2 (330 cm) = 660 cm

Example 4: Find the perimeter of square with one side = 4 cm

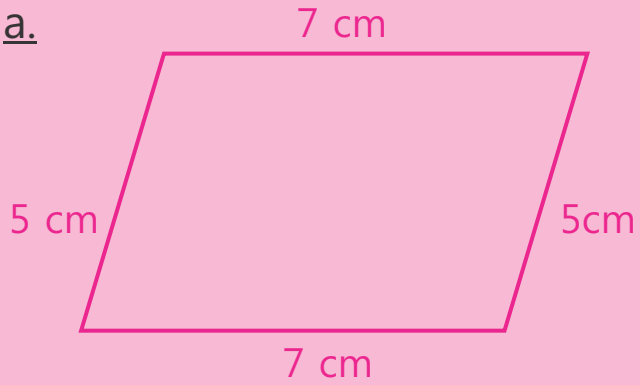
Solution: We know that square is a figure in which all four sides are equal. So if one side is 4cm then other three sides will also be of 4 cm length.

Hence the perimeter of square = 4cm + 4cm + 4cm + 4 cm

= 16 cm

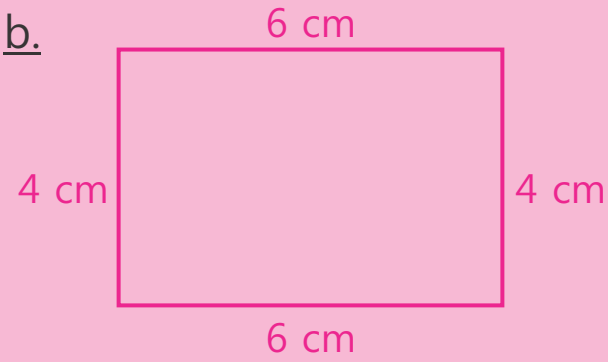
Activity: Find the perimeter of the given figure using formula:

a.



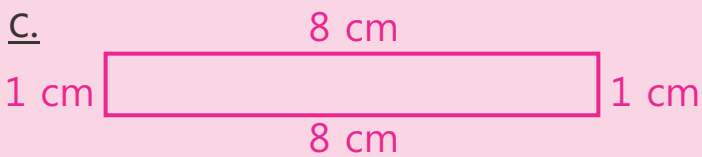
Perimeter = 2 (l + w)
length (l) = 7 cm
width (w) = 5 cm
Perimeter = 2 (7 cm + 5 cm)
= 2 (12 cm) = 24 cm

b.



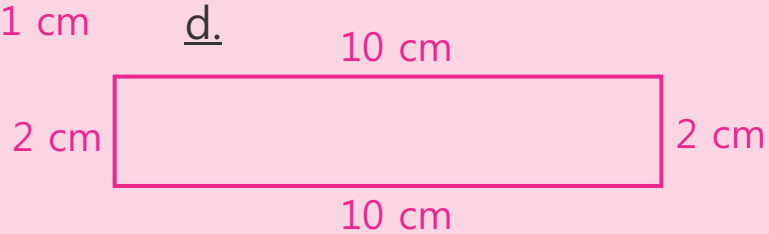
Perimeter = 2 (l + w)
length (l) = 6 cm
width (w) = 4 cm
Perimeter = 2 (6 cm + 4 cm)
= 2 (10 cm) = 20 cm

c.



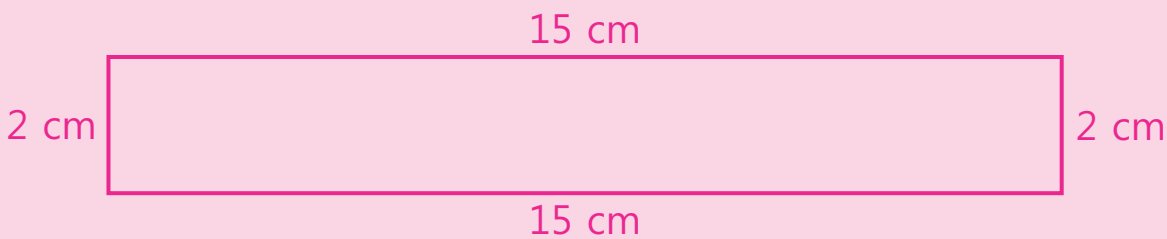
Perimeter = 2 (l + w)
length (l) = 8 cm
width (w) = 1 cm
Perimeter = 2 (8 cm + 1 cm)
= 2 (9 cm) = 18 cm

d.



Perimeter = 2 (l + w)
length (l) = 10 cm
width (w) = 2 cm
Perimeter = 2 (10 cm + 2 cm)
= 2 (12 cm) = 24 cm

e.



Perimeter = 2 (l + w)
length (l) = 15 cm
width (w) = 2 cm
Perimeter = 2 (15 cm + 2 cm)
= 2 (17 cm) = 34 cm

Area

The amount of surface, a shape covers is called its area. Area of different figure can be found by different formulae.

Area of square

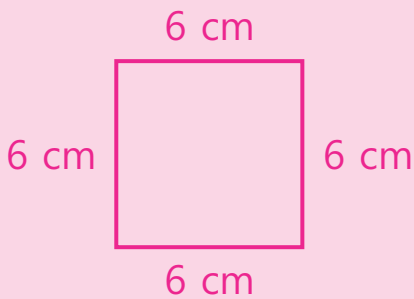
Area of a square can be found by multiplying its length with length

$$\text{Area of square} = l \times l$$
$$= l^2$$

Example: Find area of a square when length of one side is 6cm.

Solution:

$$\text{Area} = l \times l$$
$$= 6\text{cm} \times 6\text{cm}$$
$$= 36\ \text{cm}^2$$



Remember

When two same units are multiplied with each other, they are written in the form of power or square.

i.e, cm x cm = cm^2

m x m = m^2

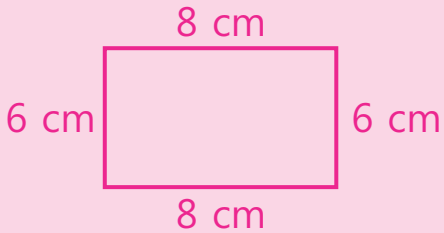
2 is called square or power or exponent.

Area of Rectangle

Area of a rectangle is found by multiplying its length with width.

So Area of rectangle = $l \times w$

Example: Find area of the given figure:



Solution: Area of rectangle = l x w

length (l) = 8cm

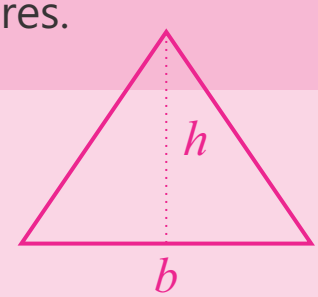
width (w) = 6cm

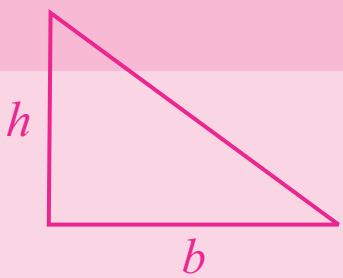
Area of rectangle = 8cm x 6cm = 48cm²

Area of Triangle

A triangle has three sides. To find area of a triangle, we multiply its height with base and then divide it by 2.

Look at the figures.



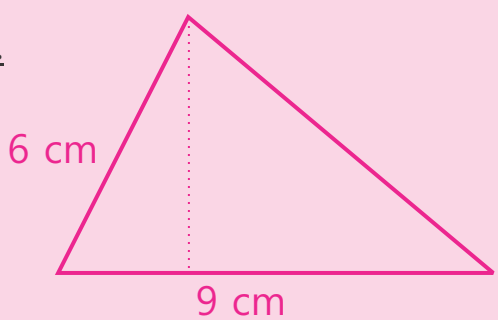


Area of triangle = $\frac{1}{2}$ x (base x height)

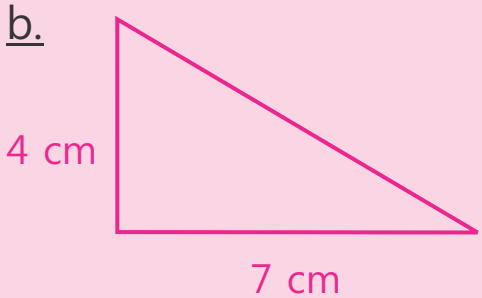
or = $\frac{1}{2}$ x (b x h)

Examples: Find the area of the given figures.

a.



b.



Solution: a.

Area of triangle = $\frac{1}{2}$ x (b x h)

b = 9 cm

h = 6 cm

So, Area of triangle = $\frac{1}{2}$ x (9cm x 6cm)

= $\frac{1}{2}$ x 54 cm²

= 27 cm²

Solution: b.

Area of triangle = $\frac{1}{2}$ x (b x h)

b = 7 cm

h = 4 cm

So, Area of triangle = $\frac{1}{2}$ x (7cm x 4cm)

= $\frac{1}{2}$ x 28 cm²

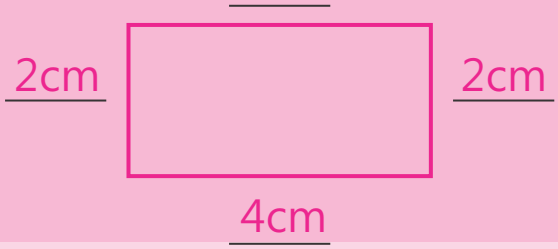
= 14 cm²

Exercise

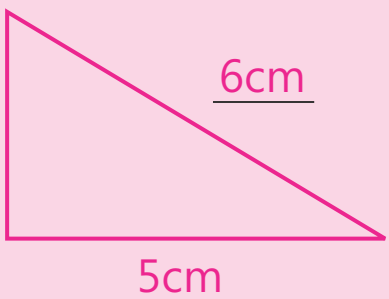
1 Measure the sides of the given figures and write them at proper places.

a.

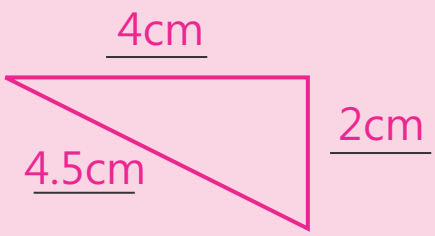
b.



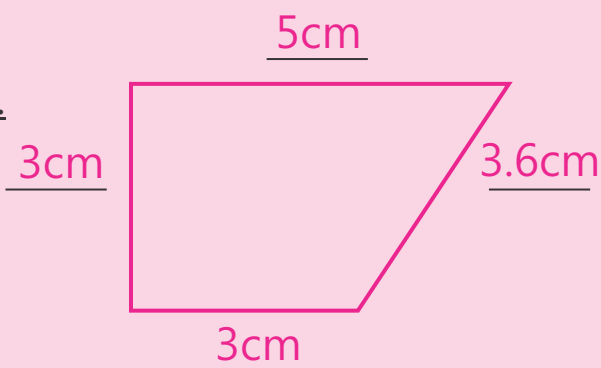
c.



d.

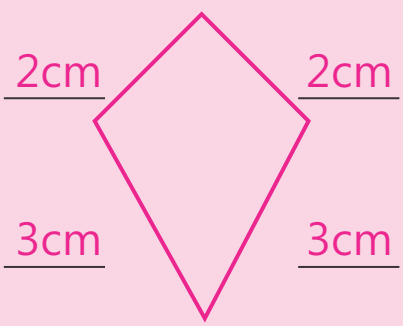


e.

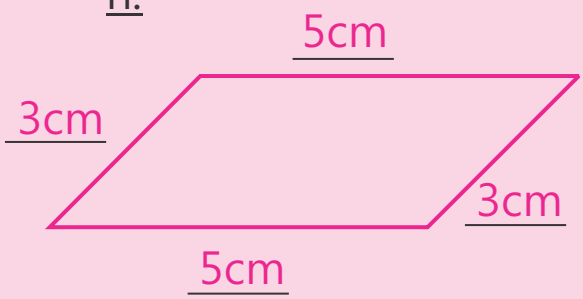


f.

g.

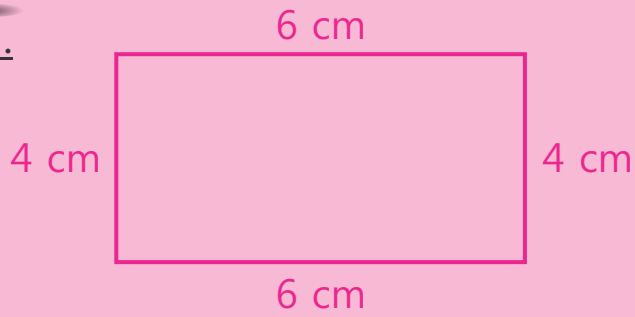


h.



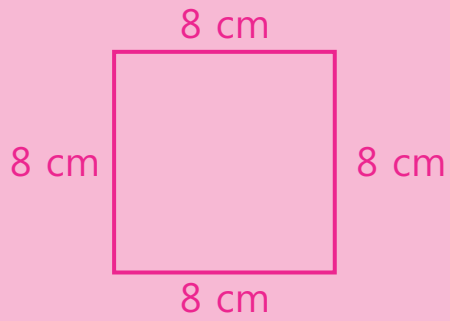
2 Find perimeter of the given figures.

a.



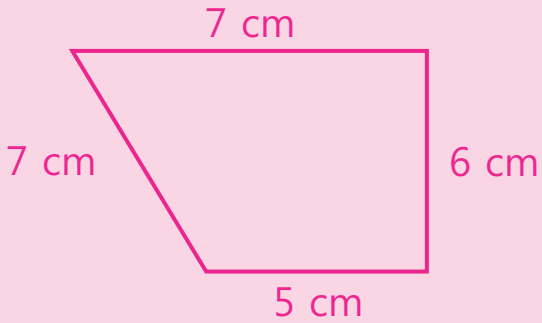
Perimeter 20cm

b.



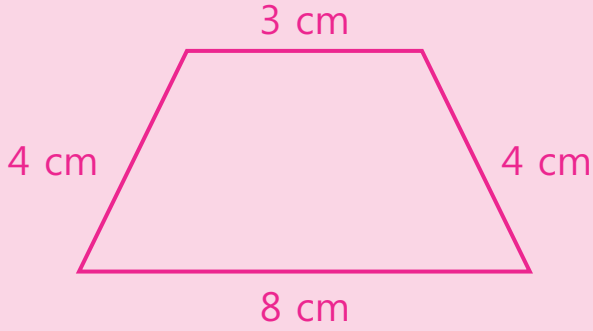
Perimeter 32cm

c.



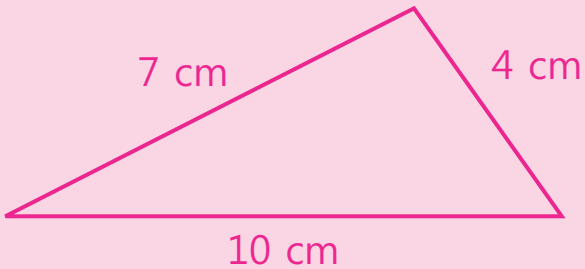
Perimeter 25cm

d.



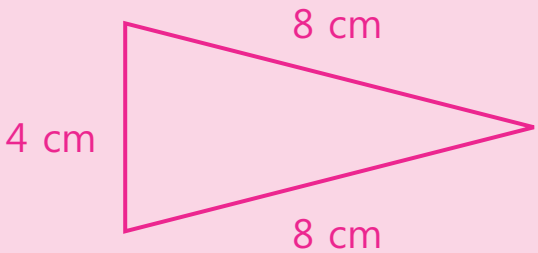
Perimeter 19cm

e.



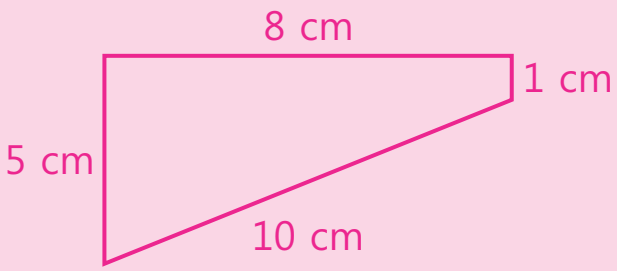
Perimeter 21cm

f.



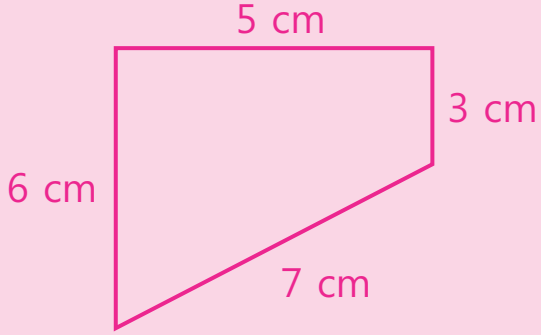
Perimeter 20cm

g.



Perimeter 24cm

h.



Perimeter 21cm

3 Find perimeter of rectangles using the formula:

a. l = 5 cm
w = 4 cm
Perimeter = 2 (l + w)
= 2 (5 cm + 4 cm)
= 2 (9 cm) = 18 cm

b. l = 8 cm
w = 4 cm
Perimeter = 2 (l + w)
= 2 (8 cm + 4 cm)
= 2 (12 cm) = 24 cm

c. l = 10 cm
w = 3 cm
Perimeter = 2 (l + w)
= 2 (10 cm + 3 cm)
= 2 (13 cm) = 26 cm

d. l = 9 cm
w = 13 cm
Perimeter = 2 (l + w)
= 2 (9 cm + 13 cm)
= 2 (22 cm) = 44 cm

e. l = 9 cm
w = 11 cm
Perimeter = 2 (l + w)
= 2 (9 cm + 11 cm)
= 2 (20 cm) = 40 cm

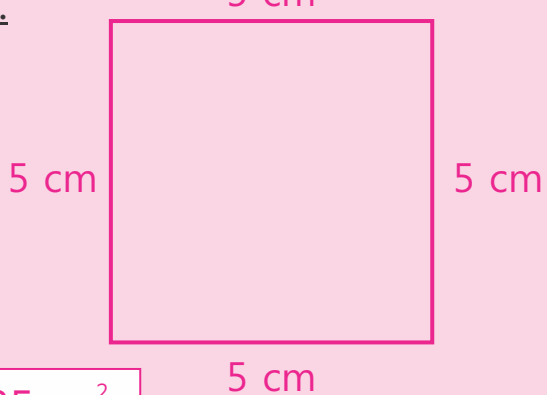
f. l = 6 cm
w = 6.5 cm
Perimeter = 2 (l + w)
= 2 (6 cm + 6.5 cm)
= 2 (12.5 cm) = 25 cm

g. l = 7.5 cm
w = 4 cm
Perimeter = 2 (l + w)
= 2 (7.5 cm + 4 cm)
= 2 (11.5 cm) = 23 cm

h. l = 8.5 cm
w = 3 cm
Perimeter = 2 (l + w)
= 2 (8.5 cm + 3 cm)
= 2 (11.5 cm) = 23 cm

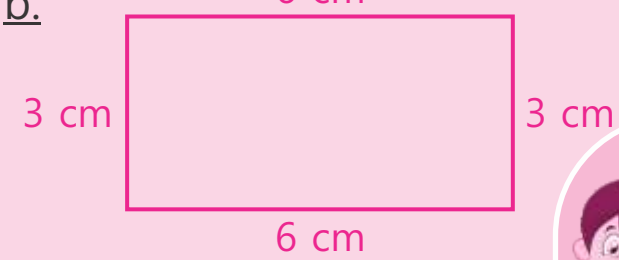
4 Find area of the given figures:

a.



25cm^2

b.

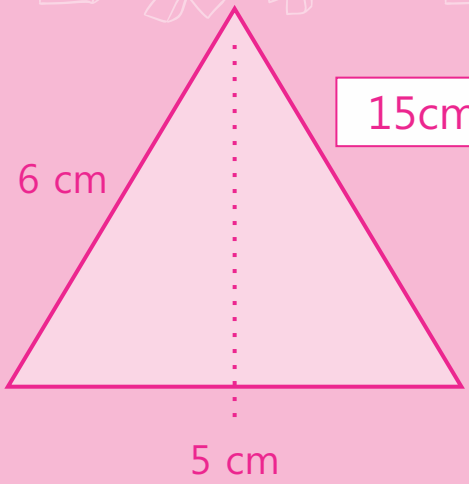


18cm^2

c.

$32cm^2$

d.



$15cm^2$

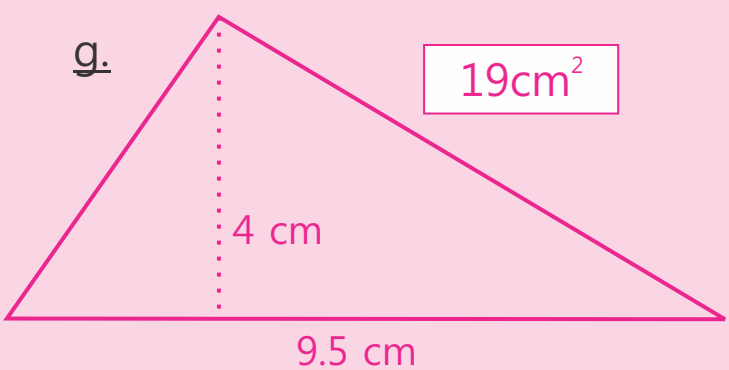
e.

$9cm^2$

f.

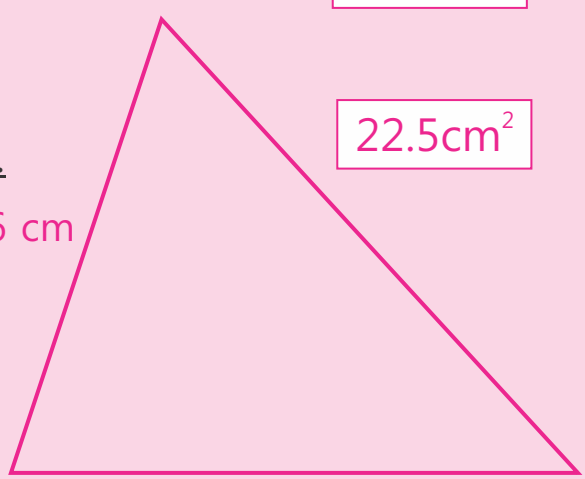
$40.5cm^2$

g.



$19cm^2$

h.



$22.5cm^2$

5 A rectangular room is 21m long and 15m wide. Find the area of the room.

l = 21 m

w = 15 m

Area = (l x w)

= (21 m x 15 m)

= 315 m^2

6 A plot is 18 m long and 8 m wide. What is the area of this plot?

$$l = 18 \text{ m}$$
$$w = 8 \text{ m}$$
$$\text{Area} = (l \times w)$$
$$= (18 \text{ m} \times 8 \text{ m})$$
$$= 144 \text{ m}^2$$

7 A triangle has height of 6.5cm and its base is 7cm. Find its area.

$$h = 6.5 \text{ cm}$$
$$b = 7 \text{ cm}$$
$$\text{Area} = \frac{1}{2}(h \times b)$$
$$= \frac{1}{2}(6.5 \text{ cm} \times 7 \text{ cm})$$
$$= \frac{1}{2}(45.5 \text{ cm}^2)$$
$$= \frac{45.5}{2} \text{ cm}^2$$
$$\text{Area} = 22.75 \text{ cm}^2$$

8 A rectangle has length 8cm and width 5cm,A square has one of its sides 6 cm long. Which shape has the greater area? What is the difference between their area?

Area of rectangle

$$\text{Area} = (l \times w)$$
$$= (8 \text{ cm} \times 5\text{cm})$$
$$\text{Area} = 40 \text{ cm}^2$$

Area of square

$$\text{Area} = (l \times w)$$
$$= (6 \text{ cm} \times 6\text{cm})$$
$$\text{Area} = 36 \text{ cm}^2$$

Rectangle is greater in shape then square difference

Difference= Area of rectangle - Area of square

$= 40 \text{ cm}^2 - 36 \text{ cm}^2 \quad = 4\text{cm}^2$

Unit 8

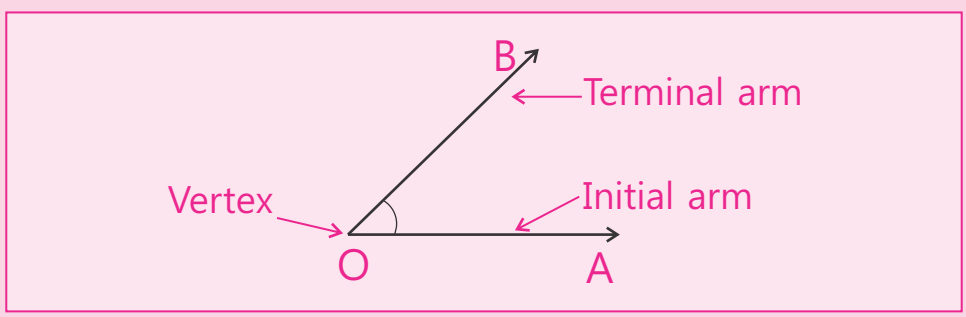
Angles and Triangles

Students' Learning Outcomes:

After studying this unit, students will be able to:

- define basic concept of angles and triangles.
- find and draw different angles.
- define different types of triangle.
- define angles.

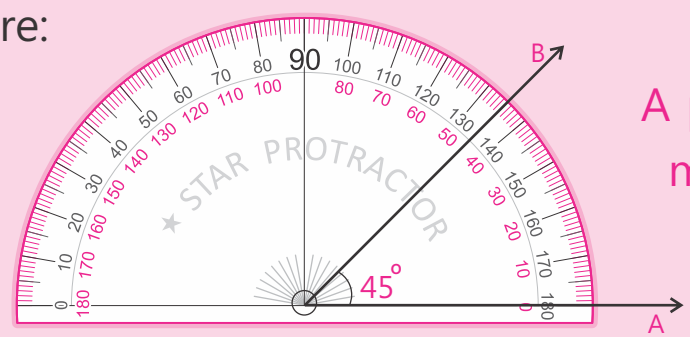
We know that when two rays meet at a common point, they form an angle. The common point is called vertex and two rays are called arms of angle. One arm is called initial arm and the other arm is called terminal arm



In given figure, O is common point of rays $\overrightarrow{OA}$ and $\overrightarrow{OB}$, so it is vertex. OB is called initial arm and OA is called Terminal arm. In mathematics a ray is represented by $\longrightarrow$ arrow sign. Hence $\overrightarrow{OA}$ and $\overrightarrow{OB}$ represent two rays. We read this angle in two ways.

$\angle$ AOB or $\angle$ BOA ($\angle$ sign is called angle)

Angles are always measured from initial arm to terminal arm. The degree of an angle is represented by 'o' sign. Consider the given figure:



A protractor is used to measure the degree of an angle.

In this figure, angle is measured from ray $\overrightarrow{OA}$ (the initial arm) and we count the angles until we reach at the ray $\overrightarrow{OB}$ (the terminal ray).

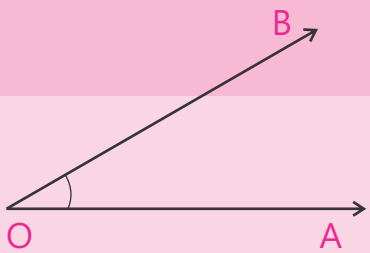
The given angle is 45°.

It is written as m∠AOB = 45°

or m∠BOA = 45°

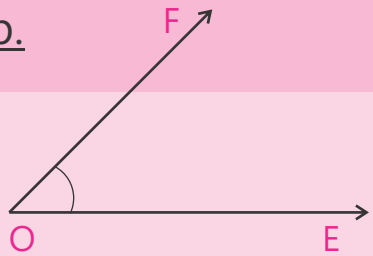
Activity: Measure the given angles using protractor and write them below the figures.

a.



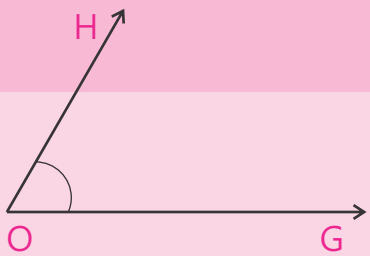
m∠AOB = 30°

b.



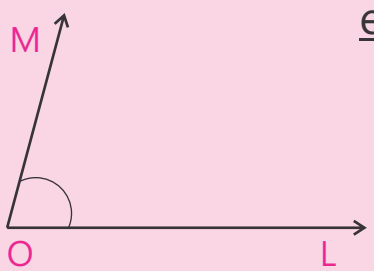
m∠EOF = 45°

c.



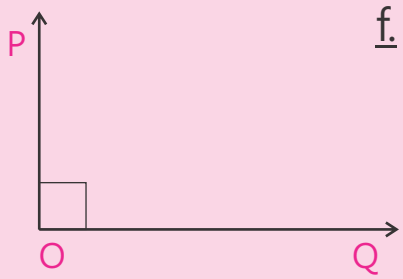
m∠GOH = 60°

d.



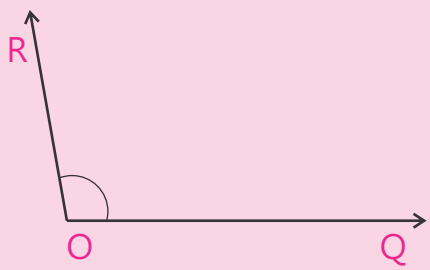
m∠LOM = 75°

e.



m∠QOP = 90°

f.



m∠QOR = 100°

Types of Angles

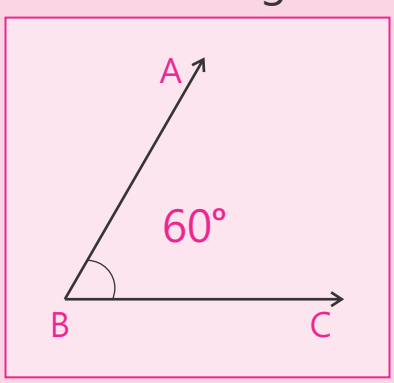
There are many types of angles.

Acute Angle:

The angle between O and 90° is called an acute angle. In other words an angle less than 90° is called an acute angle. For example,

∠ ABC = 60° So it is an acute angle.

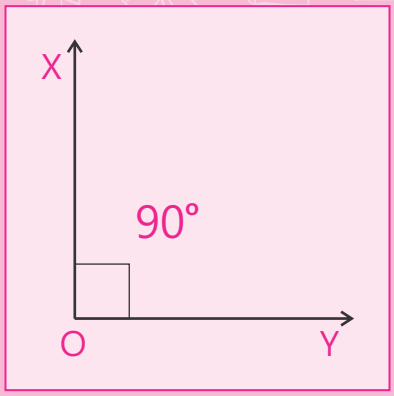
Further examples of acute angles are 15°, 35°, 45°, 80°, 85° etc.

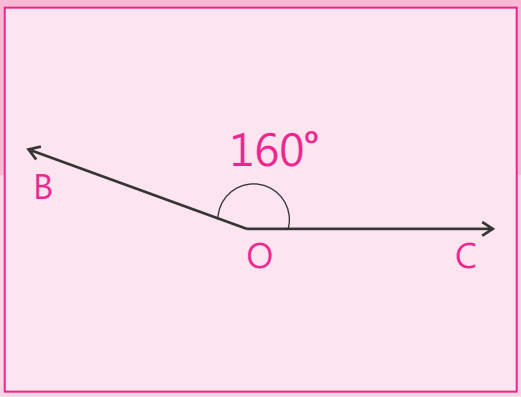


Right Angle:

The angle of 90° is called a right angle.

∠XOY = 90°, so it is a right angle.





Obtuse Angle:

The angle between 90° and 180° is called an obtuse angle. In other words an angle which is less than 180° but greater than 90° is called obtuse angle. For example,

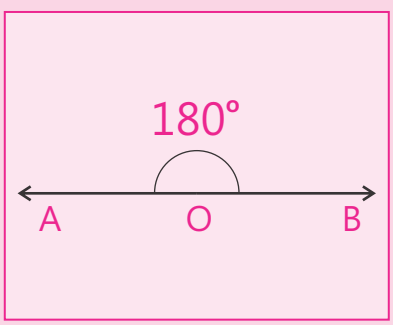
∠BOC = 160°, so it is an obtuse angle.

Further examples of obtuse angles are 95°, 110°, 140°, 165°, etc.

Straight Angle:

The angle of 180° is called straight angle.

∠AOB = 180°, so it is a straight angle.

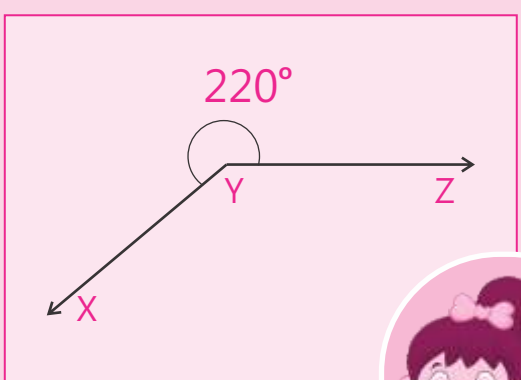


Reflex Angle:

The angle between 180° and 360° is called reflex angle. In other words reflex angle is greater than 180° but less than 360°. For example,

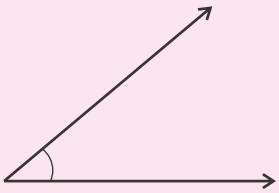
∠XYZ = 220°, so it is a reflex angle.

Further examples of reflex angles are 185°, 200°, 260°, 310°, 325°, etc.



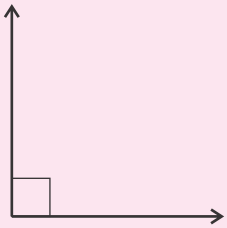
Activity: Measure the given angles and write their types below them.

a.



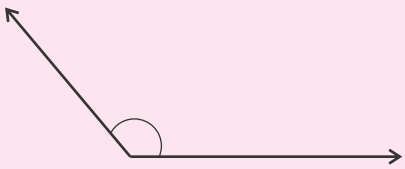
Acute Angle

b.



Right Angle

c.

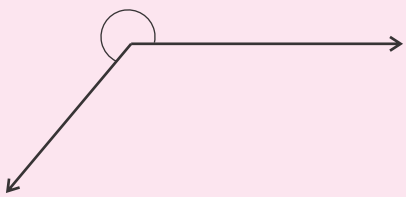


Obtuse Angle

d.

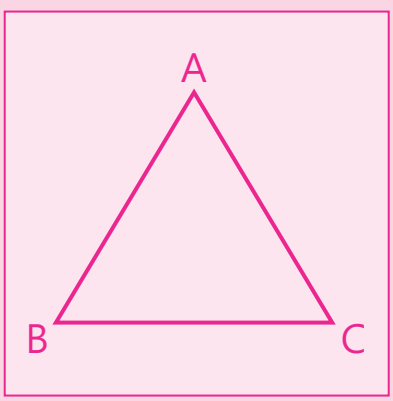
Straight Angle

e.



Reflex Angle

Triangles



A three sided closed figure with straight sides is called a triangle.

A triangle has three vertices and three sides. (Vertex is a point where two sides meet, plural of vertex is vertices).

In the given figure AB, BC and CA are three sides while A, B and C are its three vertices. A triangle also has three angles. In given figure △ABC, △BCA and △CAB are different names of triangle. "△" is the sign of triangle. They can also be written in reverse order as △CBA, △ACB and △BAC.

A triangle is represented in six ways. So the above triangle can be represented by ∠ABC, ∠BAC, ∠CAB, ∠ACB, ∠BCA or ∠CBA

Types of Triangle (with respect to angles)

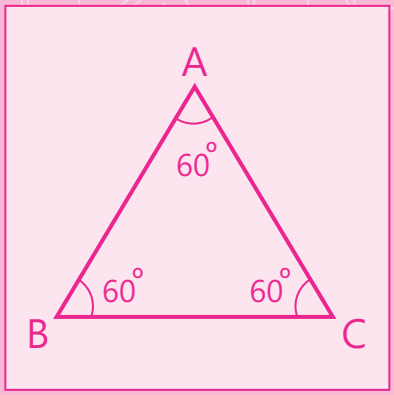
Triangles are divided in three types according to their angles.

(i) Acute angled triangle (ii) Right angled triangle

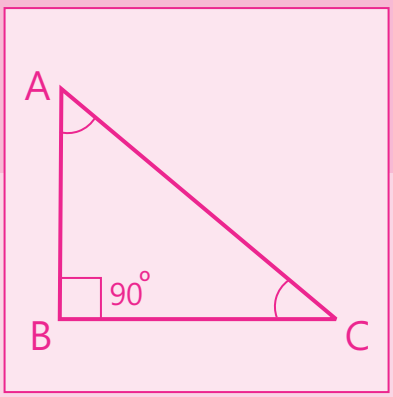
(iii) Obtuse angled triangle

(i) Acute angled triangle:

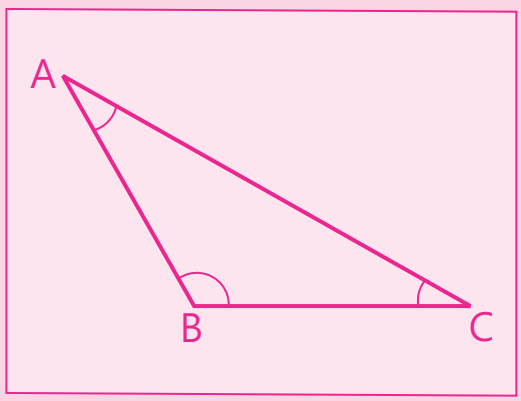
A triangle whose all three angles are acute (Less than 90°) is called an acute angled triangle.



The given figure is an acute angled triangle because all of its angles are less than 90°.



(ii) Right angled triangle: A triangle in which one angle is of 90°, is called right angled triangle. The given figure is a right angled triangles because ∠ABC = 90°.



(iii) Obtuse angled triangle:

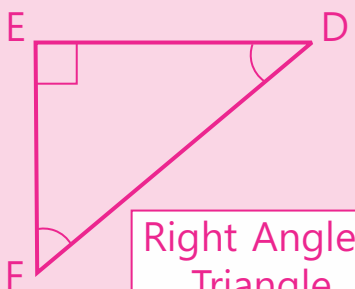
A triangle in which one angle is greater than 90° but less than 180° is called obtuse angled triangle.

The given figure is an obtuse angled triangle because ∠ABC is greater than 90°.

Note: Sum of three angles of a triangle is always 180°. If sum of angles is less than or greater 180°, then it will not be a triangle.

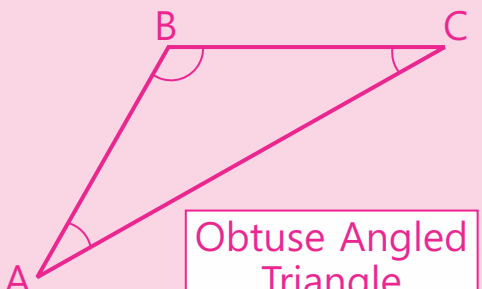
Activity: Measure the angles and then write down the name of triangles:

a.



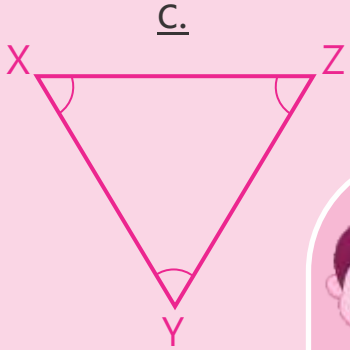
Right Angled Triangle

b.



Obtuse Angled Triangle

c.

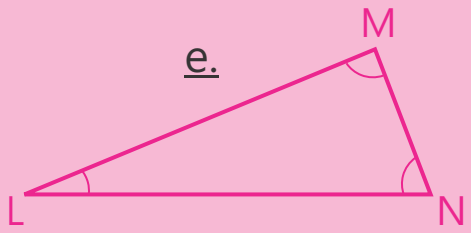


Acute Angled Triangle

d.

Acute Angled Triangle

e.



Obtuse Angled Triangle

Types of triangles (with respect to sides)

Triangle are divided into three types with respect to their lengths of sides.

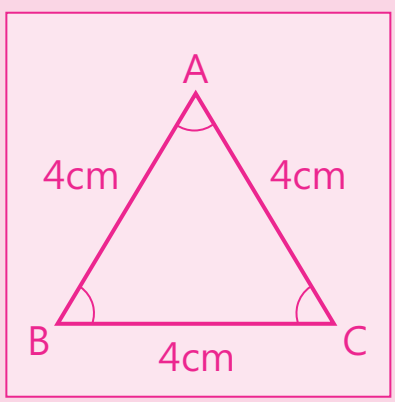
(i) Equilateral Triangle (ii) Isosceles Triangle

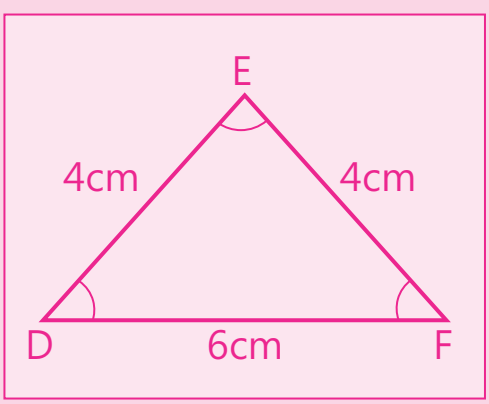
(iii) Scalene Triangle

(i) Equilateral Triangle:

A triangle whose all sides are equal, is called an Equilateral Triangle.

△ABC is an Equilateral Triangle because all of its three sides are equal.





(ii) Isosceles Triangle:

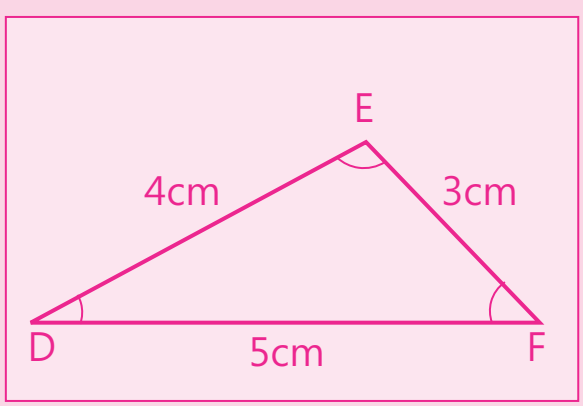
A triangle whose any two sides are equal, is called an Isosceles Triangle.

△DEF is an Isosceles Triangle because two of its sides are equal.

(iii) Scalene Triangle:

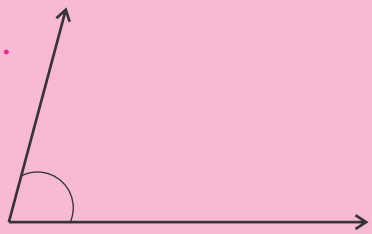
A triangle whose no side is equal to any other side, is called a Scalene Triangle.

△ PQR is a scalene triangle because all of its three sides are different.

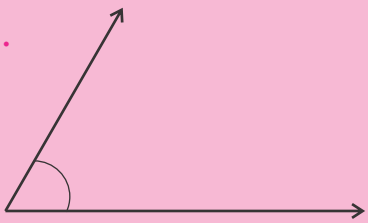


Exercise

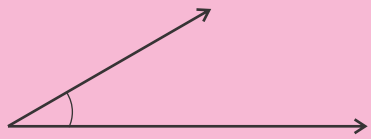
1 Measure the following angles and write their measurement below the figure:

a. 

75°

b. 

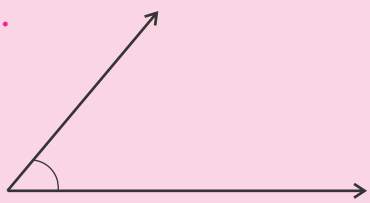
60°

c. 

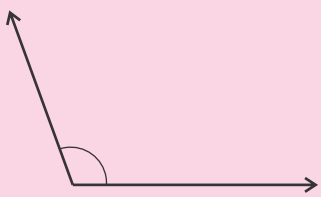
30°

d.

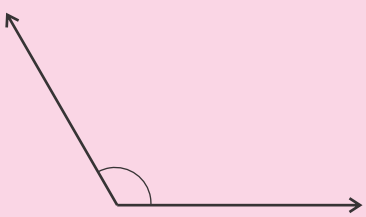
15°

e. 

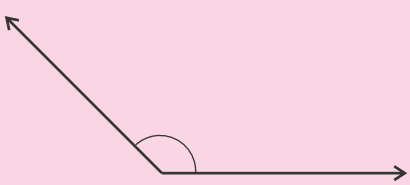
50°

f. 

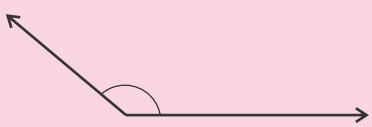
110°

g. 

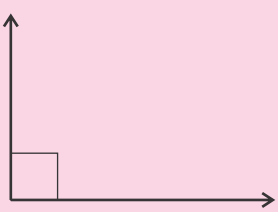
120°

h. 

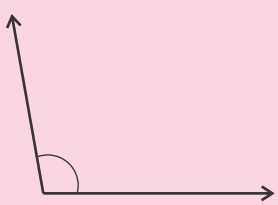
135°

i. 

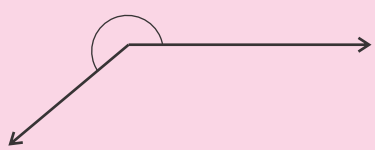
140°

j. 

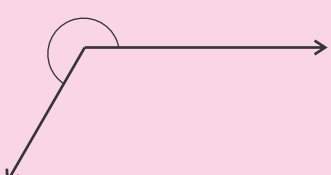
90°

k. 

100°

l. 

220°

m. 

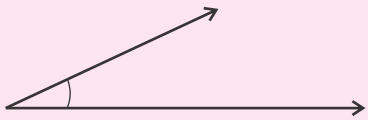
240°

n.

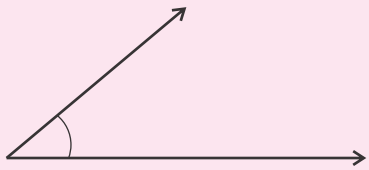
180°

2 Draw the angles of the given measurement:

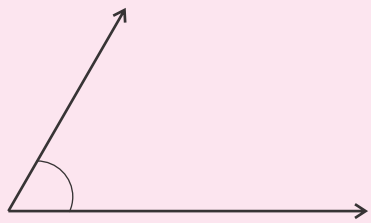
a. 25°



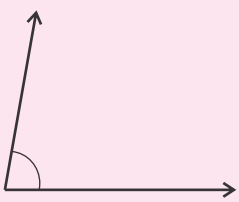
b. 40°



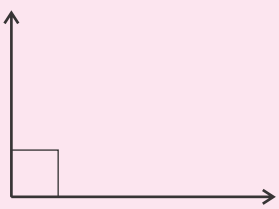
c. 60°



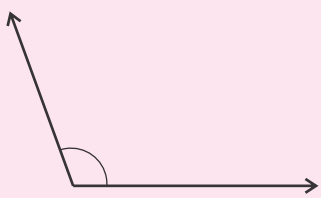
d. 80°



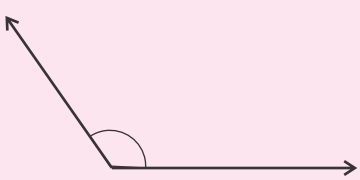
e. 90°



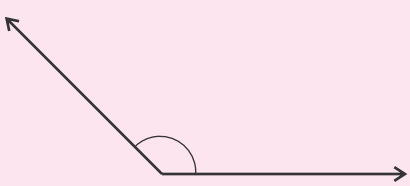
f. 110°



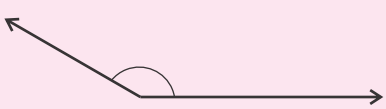
g. 125°



h. 135°



i. 150°



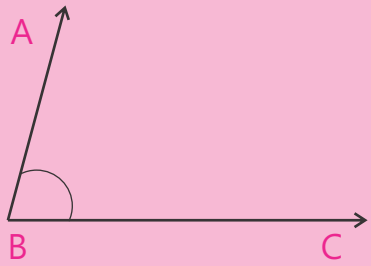
j. 165°

k. 180°

3 Write down the names of the given angles in both ways:

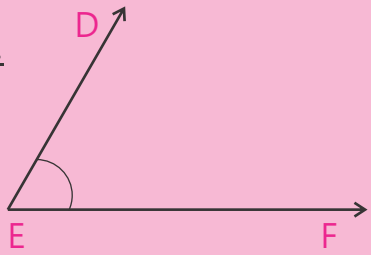
(one is done for you)

a.



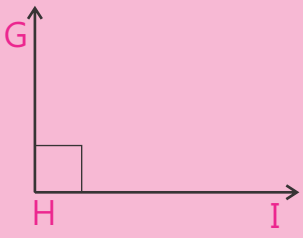
∠ABC | ∠CBA

b.



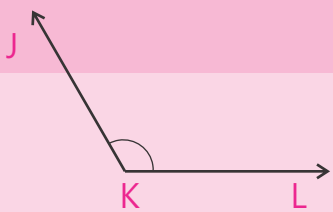
∠DEF | ∠FED

c.



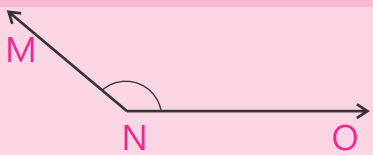
∠GHI | ∠IHG

d.



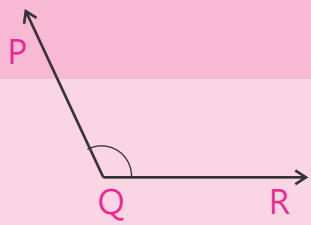
∠LKJ | ∠JKL

e.



∠ONM | ∠MNO

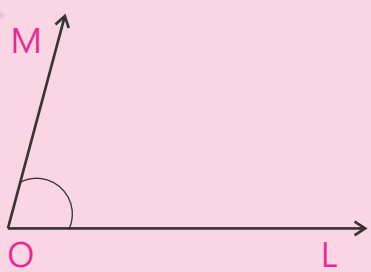
f.



∠PQR | ∠RQP

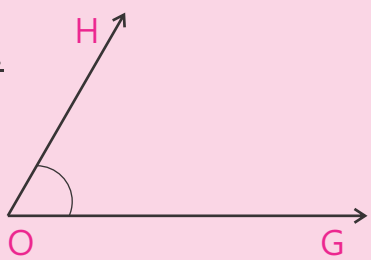
4 Write down the names of angles after measuring them.

a.



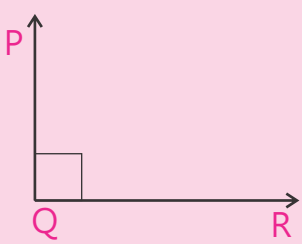
Acute angle

b.



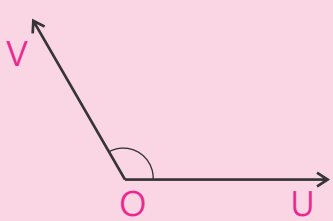
Acute angle

c.



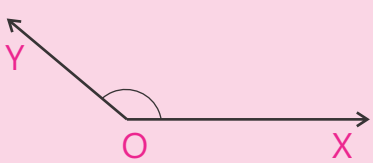
Right angle

d.



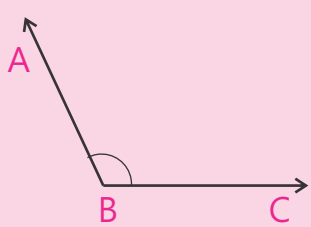
Obtuse angle

e.



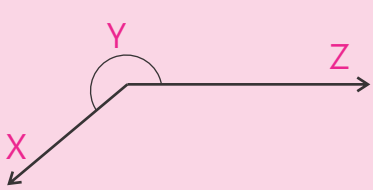
Obtuse angle

f.



Obtuse angle

g.



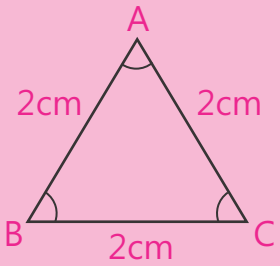
Reflex angle

h.

Straight angle

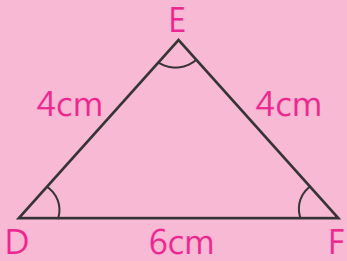
5 Write down the names of triangles with respect to sides.

a.



Equilateral triangle

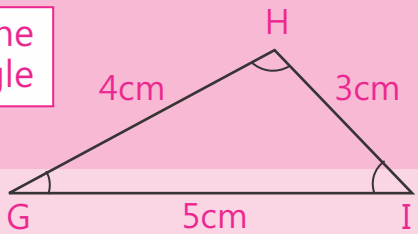
b.



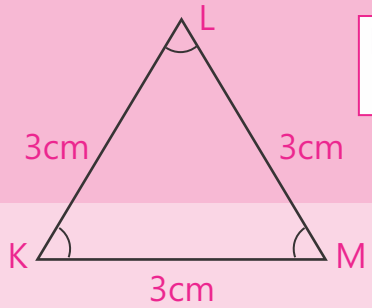
Isosceles trianle

c.

Scalene triangle



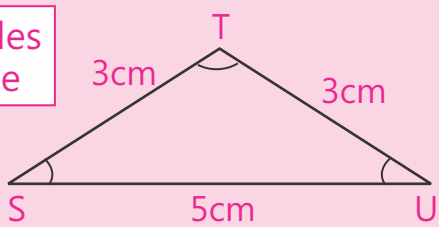
d.



Equilateral triangle

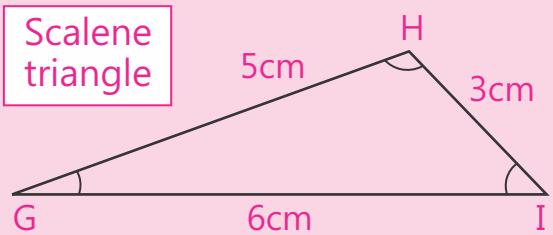
e.

Isosceles trianle



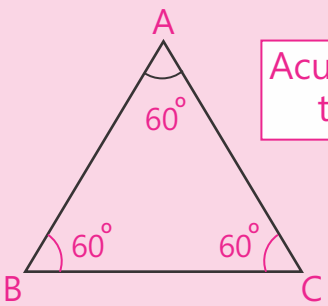
f.

Scalene triangle



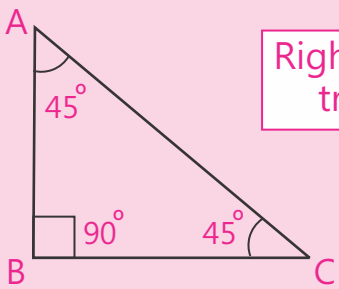
6 Write down the names of triangles with respect to angles:

a.



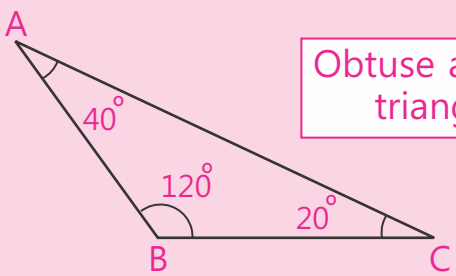
Acute angled triangle

b.



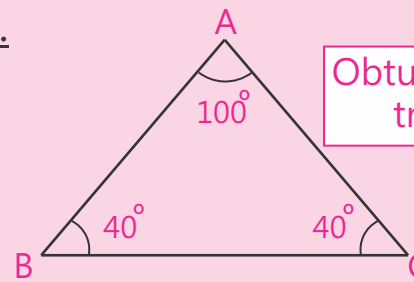
Right angled triangle

c.



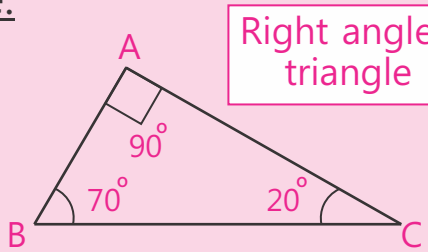
Obtuse angled triangle

d.



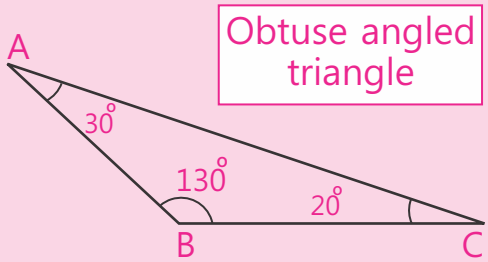
Obtuse angled triangle

e.



Right angled triangle

f.



Obtuse angled triangle