# MATHEMATICS WORK BOOK

## CLASS - VII


State Council of Educational Research and Training
Govt. of Tripura

# MATHEMATICS WORK BOOK

Class - VII

**First Edition**
**September, 2021**

**Cover Design**
**Asoke Deb, Teacher**

**Type & Setting : SCERT, Tripura in Collaboration with DEO, South District, Tripura.**

**Printed by : Satyajug Employees Co-operative Industrial Society Ltd.,**
**13/1A Prafulla Sarkar Street, Kolkata-72**

**Publisher :**
**State Council of Educational Research and Training**
**Government of Tripura**

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# বার্তা

শিক্ষার প্রকৃত বিকাশের জন্য, শিক্ষাকে যুগোপযোগী করে তোলার জন্য প্রয়োজন শিক্ষাসংক্রান্ত নিরন্তর গবেষণা। প্রয়োজন শিক্ষা সংশ্লিষ্ট সকলকে সময়ের সঙ্গে সঙ্গে প্রশিক্ষিত করা এবং প্রয়োজনীয় শিখন সামগ্রী, পাঠ্যক্রম ও পাঠ্যপুস্তকের বিকাশ সাধন করা। এস সি ই আর টি ত্রিপুরা রাজ্যের শিক্ষার বিকাশে এসব কাজ সুনামের সঙ্গে করে আসছে। শিক্ষার্থীর মানসিক, বৌদ্ধিক ও সামাজিক বিকাশের জন্য এস সি ই আর টি পাঠ্যক্রমকে আরো বিজ্ঞানসম্মত, নান্দনিক এবং কার্যকর করবার কাজ করে চলেছে। করা হচ্ছে সুনির্দিষ্ট পরিকল্পনার অধীনে।

এই পরিকল্পনার আওতায় পাঠ্যক্রম ও পাঠ্যপুস্তকের পাশাপাশি শিশুদের শিখন সক্ষমতা বৃদ্ধির জন্য তৈরি করা হয়েছে ওয়ার্ক বুক বা অনুশীলন পুস্তক। প্রসঙ্গত উল্লেখ্য, ছাত্র-ছাত্রীদের সমস্যার সমাধানকে সহজতর করার লক্ষ্যে এবং তাদের শিখনকে আরো সহজ ও সাবলীল করার জন্য রাজ্য সরকার একটি উদ্যোগ গ্রহণ করেছে, যার নাম 'প্রয়াস'। এই প্রকল্পের অধীনে এস সি ই আর টি এবং জেলা শিক্ষা আধিকারিকরা বিশিষ্ট শিক্ষকদের সহায়তা গ্রহণের মাধ্যমে প্রথম থেকে দ্বাদশ শ্রেণির ছাত্র-ছাত্রীদের জন্য ওয়ার্ক বুকগুলো সুচারুভাবে তৈরি করেছেন। ষষ্ঠ থেকে অষ্টম শ্রেণি পর্যন্ত বিজ্ঞান, গণিত, ইংরেজি, বাংলা ও সমাজবিদ্যার ওয়ার্ক বুক তৈরি হয়েছে। নবম দশম শ্রেণির জন্য হয়েছে গণিত, বিজ্ঞান, সমাজবিদ্যা, ইংরেজি ও বাংলা। একাদশ দ্বাদশ শ্রেণির ছাত্র-ছাত্রীদের জন্য ইংরেজি, বাংলা, হিসাবশাস্ত্র, পদার্থবিদ্যা, রসায়নবিদ্যা, অর্থনীতি এবং গণিত ইত্যাদি বিষয়ের জন্য তৈরি হয়েছে ওয়ার্ক বুক। এইসব ওয়ার্ক বুকের সাহায্যে ছাত্র-ছাত্রীরা জ্ঞানমূলক বিভিন্ন কার্য সম্পাদন করতে পারবে এবং তাদের চিন্তা প্রক্রিয়ার যে স্বাভাবিক ছন্দ রয়েছে, তাকে ব্যবহার করে বিভিন্ন সমস্যার সমাধান করতে পারবে। বাংলা ও ইংরেজি উভয় ভাষায় লিখিত এইসব অনুশীলন পুস্তক ছাত্র-ছাত্রীদের মধ্যে বিনামূল্যে বিতরণ করা হবে।

এই উদ্যোগে সকল শিক্ষার্থী অতিশয় উপকৃত হবে। আমার বিশ্বাস, আমাদের সকলের সক্রিয় এবং নিরলস অংশগ্রহণের মাধ্যমে ত্রিপুরার শিক্ষাজগতে একটি নতুন দিগন্তের উন্মেষ ঘটবে। ব্যক্তিগত ভাবে আমি চাই যথাযথ জ্ঞানের সঙ্গে সঙ্গে শিক্ষার্থীর সামগ্রিক বিকাশ ঘটুক এবং তার আলো রাজ্যের প্রতিটি কোণে ছড়িয়ে পড়ুক।

**(রতন লাল নাথ)**

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# MATHEMATICS WORK BOOK : Class -VII

## CONTENTS

*Chapter - 1*

# Integers

**Introduction**

We have learnt about whole numbers and integers in Class-vi. Integers form a bigger collection of numbers which contains whole numbers and negative integers. We discuss about these in brief.

## Things to remember

**Integers**

Integers are those numbers which has no fractional part. Integers are of two types -

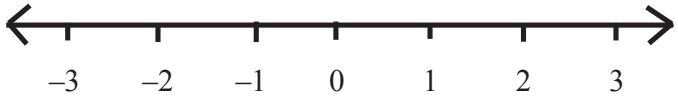
i) **Positive integers :-** 1,2,3 .....etc. are positive integers and

ii) **Negative integers : -**1, -2, -3, .....etc are negative integers.

Zero (0) is neither positive nor negative integers.

**Natural numbers :-** 1, 2, 3, ..... are called natural numbers.

We represent integers on number line as below :-




**Additive inverse**

An integer 'a' is called additive inverse of 'b' if $a + b = 0$.

**Example :** Additive inverse of 2 is -2.

Additive inverse of -2 is 2.

**Absolute value**

Absolute value of a number x implies its numerical value and is denoted by

$|x| = 0$, if $x = 0$

$|x| = -x$, if $x < 0$

$|x| = x$, if $x > 0$

**Example :** $|0| = 0$

$|-5| = -(-5) = 5$

$|+5| = 5$

**Rule of addition**

i) Sum of two positive integers is positive and sum of two negative integers is negative.

**Example :** $(+3) + (+5) = +8 = 8$, $(-7) + (-6) = -13$

ii) When a positive integer and a negative integer are added, smaller number with numerical value is subtracted from the greater number with numerical value and put the sign of number with greater numerical value before the result.

**Example :** $(-5) + (+7) = +2 = 2$, $(+10) + (-15) = -5$

**Properties of addition, subtraction and multiplication of integers**

**i) Closure property under addition**

Sum of two integers is an integer. This property is known as the closure property for addition of integers.

If 'a' and 'b' are two integers, (a+b) is an integer.

**ii) Closure property under subtraction**

Difference of two integers is an integer. If a and b are two integers, a–b is an integer.

**iii) Closure property under multiplication**

Product of two integers is an integer. If a and b are two integers, ab is an integer.

**iv) Comutative property**

Two integers can be added or multiplied in any order. If a and b are two integers,

$a + b = b + a$, $a.b = b.a$

So, addition and multipliclation are commutative for integers.

**v) Associative property**

If a, b, c are three integers.

$(a + b) + c = a + (b + c)$

This property is called associative property for addition.

Again, $(a.b).c = a.(b.c)$

This property is called associative property for multiplication.

**N.B :** i) Subtraction and division are not commutative for integers.

ii) Subtraction and division are not associative for integers.

**Additive identity**

If $a+x = x+a = a$, x is called additive identity, where a and x are integers.

**Example :** $5 + 0 = 0 + 5$ $\therefore$ 0 is additive identity.

**Multiplicative identity**

If *a* and *x* are integers such that $a.x = x.a = a$, x is called multiplicative identity.

**Example :** $7\times1 = 1\times7 = 7$ $\therefore$ 1 is multiplicative identity.

**N.B. :** $(+) \times (+) = +$ $(–) \times (–) = +$

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

**Distributive rule for multiplication**

If a,b,c are any three integers,

$a \times (b+c) = a \times b+a \times c$ [Left distributive law]

$(b+c) \times a = b \times a+c \times a$ [Right distributive law]

**4) Reciprocal or multiplicative inverse**

Two integers a and b are called reciprocal to each other if

$a.b = b.a = 1$

**5)** $a \div o$ is undefined

$o \div o$ is undefined

$a \div a = 1$ $(a \neq o)$

$a \div 1 = a$

## Exercise-1

**1) Fill in the blanks :** **(1 mark)**

i) .....0..... is neither positive nor negative.

ii) The smallest natural number is .....

iii) Additive inverse of 7 is .....

iv) Absolute value of -5 is .....

v) a + b = b + .....

vi) ..... is the additive identity for integers.

vii) 5 ÷ 0 is .....

viii) Use the sign of >, < or = in the box : -7 ☐ 0

**2) Write True (T) or False (F) :** **(1 mark)**

i) Integers are closed under addition.

ii) Integers are commutative under division.

iii) Addition is associative for integers.

iv) Subtraction is associative for integers.

v) a ÷ 1 = a

vi) –5 > –1

vii) (–1) × (–1) × (–1) = –1

**3) Choose the correct answer :** **(1 mark)**

i) Sum of two positive integers is

a) Positive integer b) Negative integer c) 0 d) 1

ii) Product of a positive integer and a negative integer is

a) Positive integer b) Negative integer

c) 0 d) None of these

iii) 80 ÷ (–10) is

a) 8 b) –8 c) 800 d) –80

iv) |–5| + |+2|

a) 7 b) –5 c) 10 d) 25

v) $(-12) \times 8 + (-12) \times 12 =$

a) –240 b) 120 c) 100 d) –130

**4) Very short answer type questions :** **(1 mark)**

i) $(-5) + (-8) = ?$

Ans- $(-5) + (-8) = -5 - 8 = -13$

ii) Find the reciprocal of 5.

Ans-

iii) Find the smallest number among –2, 0, –11

Ans-

iv) Write the multiplicative identity for integer.

Ans-

v) Find the product : –15, –20

Ans-

**5) Short answer type questions :** **(2 marks)**

i) Arrange in ascending order : –3, 0, 5, –8

Ans- –8, –3, 0, 5

ii) Find the smallest and the largest numbers –11, 2, –5, 7, 0.

Ans-

iii) Subtract –15 from the sum of –2 and 12.

Ans-

iv) Simplify : $-13 \times (-18) + (-13) \times (-12)$

Ans-

v) Sum of two integers is –8, if one of them is 5, find the other.

Ans-

**6) Long answer type questions :** **(3/4 marks)**

i) Verify that $-21 \times [8+(-2)] = (-21) \times 8 + (-21) \times (-2)$

ii) Find the product using suitable property $(-735) \times 75 + 25 \times (-735)$

iii) Match the correct option :

| | |
|---|---|
| a) 1 | i) –3 |
| b) 0 | ii) –13 |
| c) $3 \times (-1)$ | iii) Multiplicative identity |
| c) $2 + (-15)$ | iv) Additive identity. |

iv) Shayan has overdrawn his savings account by ₹58. The bank debited him ₹30 for an overdraft fee. Later, he depositid ₹160. What is his current balance?

Ans-

v) Anima is a microbiology student. She was doing research on optimum temperature for the survival of different strains of bacteria. Studies showed that bacteria x need $-33^0$c while bacteria y need optimum temperature of $-65^o$c. What is the temperature difference?

vi) A space craft is at 4000 km above the earth's surface. If it descends at the rate of 5 km per minute, what will be its position after 9 hours?

vii) Simplify :

$83 - [212 \times \{29 - (17 + 9 - (-3)\}]$

viii) Evaluate :

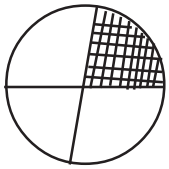
$90 - [-34 \div \{14 - 3 \times (-1)\}]$

*Chapter - 2*

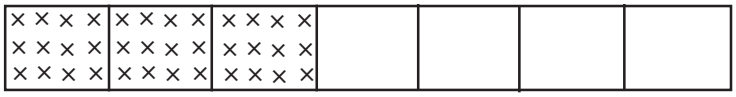
# Fractions and Decimals

You have learnt fractions and decimals in earlier classes.

You know,



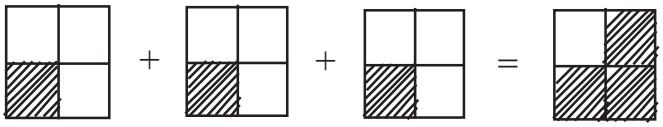
$= \frac{1}{4}$



$= \frac{3}{7}$

**Multiplication of Fraction**

Try to find the value of $\frac{1}{4} \times 3$

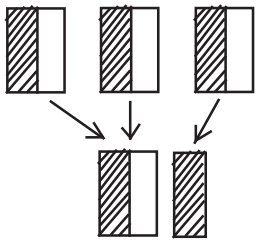


It is clear that, $\frac{1}{4}+\frac{1}{4}+\frac{1}{4}=\frac{3}{4}$

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

**Fraction as an operator 'of'**

Three shaded portions represent = $\frac{1}{2}$ of 3



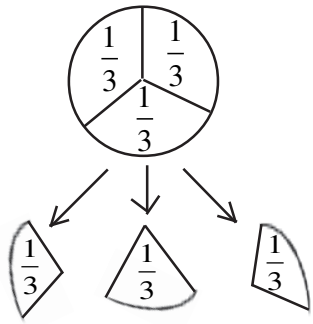
Combining 3 shaded portions, we get = $1\frac{1}{2}$

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

We see, 'of' represnts multiplication

**Division of fractions and reciprocals**

If we divide a whole circle into 3 equal parts, each part




is one-third of the whole. or, $1 \div \frac{1}{3} = 3$

also, $1 \times \frac{3}{1} = 3$

so, $1 \div \frac{1}{3} = 1 \times \frac{3}{1}$

Again, $\frac{1}{3} \times \frac{3}{1} = 1$

The non-zero numbrs whose product with each other is 1, are called reciprocals of each other. Example :-

Recprocal of 3 is $\frac{1}{3}$

Reciprocal of $\frac{4}{5}$ is $\frac{5}{4}$

**Decimal numbers and it's multiplication**

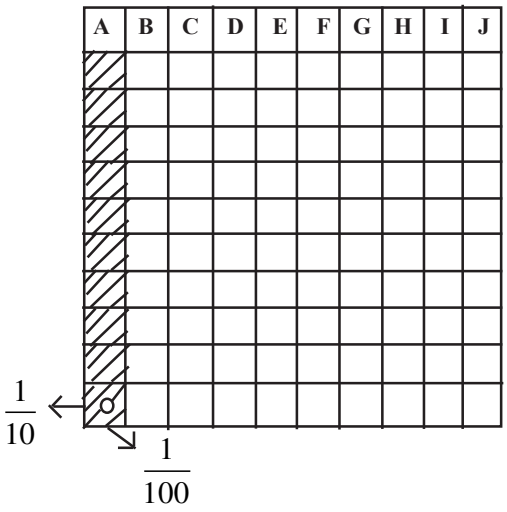
We know, $\frac{1}{10} = 0.1$, $\frac{1}{100} = 0.01$

0.1, 0.01 etc are decimal numbers :

So, $0.1 \times 0.01 = \frac{1}{10} \times \frac{1}{100}$

$= \frac{1}{10}$ of $\frac{1}{100}$

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



In the fig,

part A is $\frac{1}{10}$ th part $= 0.1$ part

and dotted square is $\frac{1}{10}$ th of $\frac{1}{10}$ th

$= (\frac{1}{10} \times \frac{1}{10})$ part

$= \frac{1}{100}$ th part

$= 0.01$

**Division of decimals**

Ram cut a 9.5 cm long strips of paper into 10 pieces. Length of each part will be (9.5 ÷ 10) cm

So, $9.5 \div 10 = \frac{95}{10} \times \frac{1}{10} = \frac{95}{100}$ cm $= 0.95$ cm

While dividing a number by 10, 100 or 1000 the decimal point shift to the left by as many places as there are zeros.

## Exercise-2

**1. Write T for True and F for False :** **(1-mark)**

Example : $\frac{7}{4}$ is a proper fraction.

Ans - F

i) 'Of' represents multiplication.

ii) Reciprocal of $\frac{3}{5}$ is $\frac{5}{3}$

iii) Value of $\frac{3}{100}$ is 0.003.

iv) $\frac{1}{5}$ is equivalent to $\frac{3}{15}$

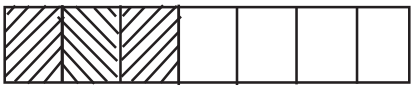
v) 50% of a number means $\frac{1}{2}$ of that number.

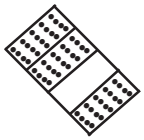
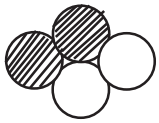
vi) 235 paise = ₹ 23.5

vii) $\frac{3}{5} > 1$

viii) 0.001 means $\frac{3}{1000}$ part.

**2) Write the fraction of the following shaded parts :** **(1-mark)**

| | | |
|---|---|---|
| |  | $\frac{1}{4}$ |
| i) |  | |
| ii) |  | |

| | | |
|---|---|---|
| iii) |  | |
| iv) |  | |
| v) |  | |

**3) Fill in the blanks :** **(1-mark)**

**Example :** a) $\frac{1}{3} + \frac{1}{3} + \frac{1}{3} =$ .....

Ans - 1

i) $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} =$ .....

ii) $\frac{2}{5} + \frac{2}{5} =$ .....

iii) $\frac{3}{5} \times \frac{5}{3} =$ .....

iv) $\frac{1}{4}$ of $4 =$ .....

v) $513 \div 100 =$ .....

**4) Very short answer type questions :** **(1-mark)**

**Example :** a) What is the reciprocal of 6?

Ans - $\frac{1}{6}$

i) What does 'of' mean?

Ans -

ii) Find $\frac{1}{2}$ part of 40.

Ans -

iii) What will be the value if one fraction is multiplied by its reciprocat ?

Ans -

iv) Find, $53 \div 1000 =$

v) $0.05 \times 100 = ?$

vi) $36 \div \frac{1}{2} = ?$

vii) $\frac{8}{15} \times 75 = ?$

viii) What is the reciprocal of $14\frac{3}{5}$ ?

ix) What should be subtracted from 2.07 to get 1.9?

x) By what number should be multiplied a number to shift decimal point 3 digit right side?

**5) Short answer type questions :** **(2 Marks)**

**Example :** a) Find the product : $9\frac{1}{2} \times 1\frac{9}{19}$

**Answer :** $9\frac{1}{2} \times 1\frac{9}{19} = \frac{19}{2} \times \frac{28}{19} = 14$

b) Divide : $11\frac{1}{7} \div 2\frac{3}{5}$

Ans- $11\frac{1}{7} \div 2\frac{3}{5} = \frac{78}{7} \times \frac{5}{13} = \frac{30}{7} = 4\frac{2}{7}$

i) Find the product : $\frac{4}{3} \times \frac{8}{3} \times \frac{9}{32}$

Ans :

ii) Find the product : $6\frac{1}{8} \times \frac{9}{17} \times \frac{68}{270}$

Ans :

iii) Divide : $6\frac{6}{7} \div \frac{16}{42}$

Ans :

iv) Divide : $22.68 \div 5.4$

v) Find the average of 8.4, 7.6 and 3.8.

vi) Find the value of $23.61 \div 1000$

vii) Divide : $21\frac{1}{4}$ by the reciprocal of $7\frac{1}{2}$

viii) Divide the reciprocal of $8\frac{1}{7}$ by the reciprocal of $40\frac{5}{6}$

**6. Long answer type questions :** **(3/4 Marks)**

**Example :** Monthly income of Rabi is ₹ 20,000. He expences $\frac{2}{5}$ part of his income. How much rupees does he deposit in a month?

Ans - Monthly income of Rabi = ₹ 20,000.

Monthly expenses = $\frac{2}{5}$ part of ₹ 20,000

$= \left( \frac{2}{\cancel{5}} \times \overset{4000}{\cancel{2,0000}} \right) =$ ₹ 8,000

Monthly deposits = (20,000 – 8,000) = ₹ 12,000

i) Shyam walks $3\frac{1}{3}$ km per hour. One day, he walked for $4\frac{1}{2}$ hours. How much distance did he walk?

Ans -

ii) The cost of a book is rupees $40\frac{1}{2}$. In ₹ $202\frac{1}{2}$, how many books will be available?

iii) A car travels $75\frac{1}{3}$ km in an hour. To travel $376\frac{2}{3}$ km, how much time required?

iv) The cost of 1 kg potato is ₹ $22\frac{1}{2}$. In ₹ 200, how much potato will be supplied?

v) The length and breadth of a rectangle is 62.5 and 31.5 m respectively. Find the area of the rectangle.

vi) Find : a) 38.53 ÷ 100 b) 0.378 ÷ 1000

vii) Find the average of 7.2, 6.8 and 10.6.

viii) The side of an equilateral triangle is 9.7 cm. Find its perimeter.

ix) The side of a square is 8.3 cm. Find its area.

x) Find : 56.3 + (56.3 × 100) + (56.3 × 1000)

xi) Find : (3.2 ÷ 10) + (3.2 ÷ 100) + (3.2 ÷ 1000)

xii) Which one is greater : ( 101.01 × 0.01) or (10.05 × 0.05)?

xiii) Add : $\frac{37}{47} + \frac{13}{94} + \frac{7}{141}$

xiv) The product of two fractions is $\frac{2}{5}$, one is $\frac{1}{7}$. Find the other fraction.

*Chapter - 3*

# Data Handling

The present-day society is information-oriented. In various field, we need information in the form of numerical figures called data.

These data may be related to the profits of a company during last years, the monthly wages earned by workers in a factory, the marks obtained by the students of a class in a certain exmination, the expenditure on various heads in a five-year plan etc.

**Things to remember**

**Data**

The weights of 25 students of a class, measured in kg are obtained as 35, 28, 26, 30, 32, 35, 26, 31, 36, 28, 29, 30, 27, 26, 30, 27, 26, 30, 25, 28, 29, 28, 27, 28, 30, 32, 31.

- This collection of a particular type of information in the form of numerical figures is called, a set of data.
- This set of data obtained in the original form is called a set of raw data.
- Each numerical figure in the set of data, is called an observation.

**Array**

Arranging the numerical figures of a set of data in ascending or descending order is called an array. The above set of data arrange in ascending order is :

25, 26, 26, 26, 27, 27, 28, 28, 28, 28, 28, 29, 29, 30, 30, 30, 30, 31, 31, 32, 32, 35, 35, 36, 36

**Range**

The difference between the highest and lowest values of the observation in a given set of data is called its range. By presenting the data in the above manner we can get some information about the data. Lowest weight = 25 kg, Highest weight = 36 kg.

Here the range = (36–25) = 11

**Frequency Distribution**

The number of times a particular observation occurs is called its frequency.

We may represent the set of data obtained above in a tabular form showing the frequency of each observation beside it as under :

| Weights of children (in kg) | Tally Marks | Frequency |
|---|---|---|
| 25 | \| | 1 |
| 26 | \|\|\| | 3 |
| 27 | \|\| | 2 |
| 28 | $\cancel{\text{IIII}}$ | 5 |
| 29 | \|\| | 2 |
| 30 | \|\|\|\| | 4 |
| 31 | \|\| | 2 |
| 32 | \|\| | 2 |
| 35 | \|\| | 2 |
| 36 | \|\| | 2 |
| **Total** | | **25** |

**Mean**

The mean of a set of data is find out by dividing the sum of all observations by the total number of observations in the data.

$$\text{Mean } (\overline{x}) = \frac{\text{Sum of all observations}}{\text{Number of observations}}$$

**Example :** Find the arithmetic mean of the numbers 3, 0, –1, 7, 11

**Solution :** $\text{Mean} = \frac{3+0+(-1)+7+11}{5}$

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

**Median**

The median of a set of numbers is the middle number when all the numbers are arranged in descending or ascending order.

Let the total number of observations be $n$

**Case 1 :** When n is odd :

Median = value of $\frac{n+1}{2}$ th observation.

**Case 2 :** When n is even :

Median = $\frac{1}{2}\left\{\frac{n}{2}\text{ th observation} + \left(\frac{n}{2}+1\right)\text{ the observation}\right\}$

**Example 1 :** What is the median weekly salary of workers in a firm whose salaries are–

₹ 84, ₹ 60, ₹ 50, ₹ 45, ₹ 42, ₹ 40, ₹ 38, ₹ 65, ₹ 71

Ans - 1) First arrange the salaries in descending order :

₹ 84, ₹ 71, ₹ 65, ₹ 60, ₹ 50, ₹ 45, ₹ 42, ₹ 40, ₹ 38

2) Next count the number of salaries. It is (n) = 9. (i.e. odd)

Thus mean is $\frac{n+1}{2}$ th term i.e. $\frac{9+1}{2}$ th term = $5^{th}$ term observation.

Here $5^{th}$ term is ₹ 50 therefore, ₹ 50 is the median salary.

**Example 2 :** Find the median salary of the following salaries of workers:

₹ 56, ₹ 89, ₹ 121, ₹ 38, ₹ 98, ₹ 70, ₹ 70, ₹ 72

Ans - Arrange the salaries in descending order :

₹ 121, ₹ 98, ₹ 89, ₹ 72, ₹ 70, ₹ 70, ₹ 56, ₹ 38

Count the number of salaries. It is 8.

$$\text{The median salary} = \frac{\frac{n}{2}\text{ th term} + \left(\frac{n}{2}+1\right)\text{th term}}{2}$$

$$= \frac{\frac{8}{2}\text{ th term} + \left(\frac{8}{2}+1\right)\text{th term}}{2}$$

$$= \frac{4\text{th term} + 5\text{th term}}{2}$$

$$= \frac{72+70}{2} = \frac{142}{2} = 71$$

$\therefore$ The median salary = ₹ 71

**Mode**

The mode of a set of numbers is the numbers which occurs most frequently in the set. If no number occurs more than once, the set of data is said to have no mode. If different numbers occur the same number of times, the set of data has more than one mode.

For example :

6, 7, 3, 9, 2, 1 – no mode

16, 72, 5, 92, 53, 53 – one mode : 53

5, 5, 6, 7, 3, 3, 4, 9 – two modes : 3 and 5

**Example :** 1. Determine the mode of observations -

i) 10, 12, 5, 7, 98, 4, 5, 6, 5

By inspection, the observation 5 occur maximum number of times. Therefore 5 is the mode.

**Bar graph**

Numbers can often be understood more easily if they are pictured. One of the best ways of picturing sets of values is a bar graph.

**How to draw a bar graph**

**Step 1 :** On a graph paper draw a horizontical line OX (x-axis) and a vertical line OY (y-axis).

**Step 2 :** Mark points at equal intervals along with x-axis. Below these points write the names of data items whose values are to be plotted.

**Step 3 :** Choose a suitable scale. On that scale determine the heights of the bars for the given numerical values.

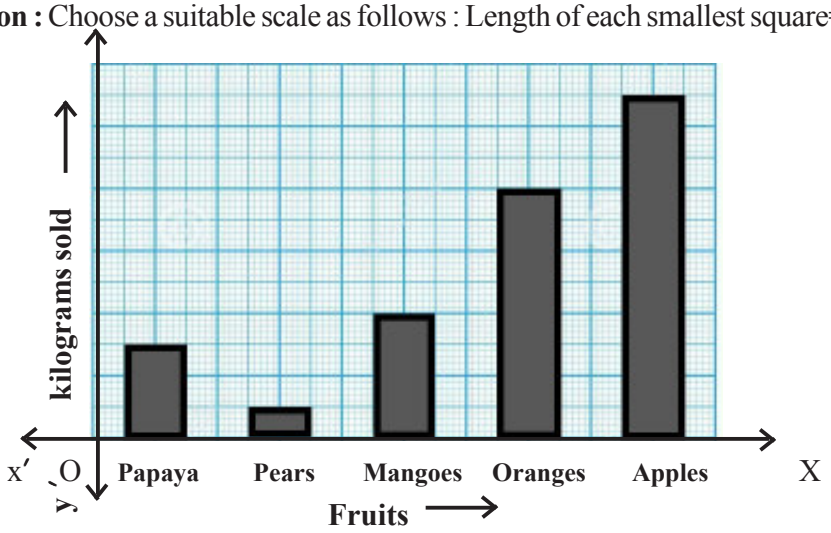
**Step 4 :** Mark off these heights parallel to the y-axis from the points taken in Step 2.

**Step 5 :** On the x-axis, draw bars of equal width for the heights marked in Step 4. The bars should be centered on the points marked on the x-axis. These bars represent the given numerical data.

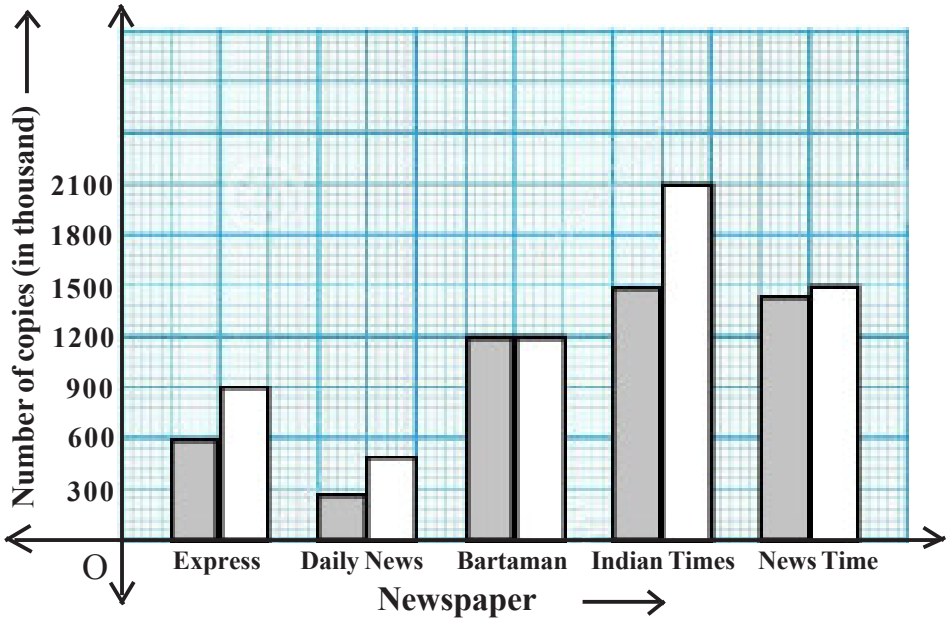
**Example :** The table is given below shows the sale of some fruits in one day by a local market.

| Fruit | Papaya | Pears | Mangoes | Oranges | Apple |
|---|---|---|---|---|---|
| Sale (in kg) | 15 | 5 | 20 | 40 | 55 |

**Solution :** Choose a suitable scale as follows : Length of each smallest square=1kg




**Example :** The graph given below compares the first and second quarter circulation of five newspapers.




**Solution :** From the above graph we can see that the Indian Times had a circulation of about 1500000 in the first quarter. The second quarter circulation was about 2100000. This shows that the Indian Times circulation increased by about 600000.

i) Which newspaper has the lowest circulation?

Ans– Daily Newspaper

ii) Which newspaper has the highest circulation?

Ans– Indian Times

iii) Which newspaper has the smallest increase in circulation?

Ans - News Time

iv) Which newspaper has the same circulation in both the quarters?

Ans - Bartaman

**Chance and Probability**

Death is a certainty. Every living creature which is born, is bound to die. It is certain that the sun will rise in the east. It is impossible that you would grow taller than a giraffe.

Besides, there are events in our daily life which are possible or likely but uncertain. We cannot be sure whether they would happen or not. It is possible that Mr. X will win the election but we cannot be sure. Rahim is a brilliant student while Babita is an average student. It is very likely or we may say there is a good chance that both will get promotion to next class. However, it is very unlikely, that is, there is a poor chance that Babita will get first position in the class.

Probability uses numbers to measure the chance of an outcome happening. All probability have a value between 0 and 1.

$$\textbf{Probability of something happening} = \frac{\text{Number of successful outcome}}{\text{Number of possible outcome}}$$

**Example :** A dice is tossed at random 80 times and the number 3 is obtained 14 times. Find the probability of getting the number 3.

Solution : Total number of trials = 80

Number of times, 3 is obtained = 14

$$\text{So, probability of getting } 3 = \frac{\text{Number of times 3 is obtained}}{\text{Total number of trial}}$$

$$= \frac{14}{80}$$

$$= \frac{7}{40}$$

## Exercise-3

**Choose the correct answer in each of the following questions :** (1 mark)

1. The range of the data 12, 25, 18, 17, 20, 22, 6, 16, 11, 8, 19, 10, 30, 20, 32

   (a) 10 (b) 15 (c) 18 (d) 26

2. The mean of the numbers 6, 8, 9, 14 and 13 is

   (a) 10 (b) 15 (c) 9 (d) 13

3. The median of the number 85, 86, 78, 89 and 64 is

   (a) 85 (b) 84 (c) 78 (d) 86

4. The marks scored by 10 students are 5, 9, 8, 7, 2, 3, 4, 9, 6 and 8, The median marks is

   (a) 6 (b) 7 (c) 6.5 (d) 5.5

5. Mode of the data 15, 17, 15, 19, 14, 18, 15, 14, 16, 15, 14, 20, 19, 14, 15 is

   (a) 14 (b) 15 (c) 16 (d) 17

6. A coin is tosssed 60 times and the tail appears 35 times. In a random throw of a coin, what is the probability of gettingg a head?

   (a) $\frac{7}{12}$ (b) $\frac{12}{7}$ (c) $\frac{5}{12}$ (d) $\frac{1}{25}$

**Write 'T' for true and 'F' for False :** (1 mark)

7. The mode is always one of the numbers in data.
8. The mean is one of the numbers in a data.
9. The median is always one of the numbers in a data.
10. Pobability of an impossible event is zero.
11. Probability of a sure event is 2.
12. Find the mean of first five natural numbers.

**Short answer type questions :** (2 marks)

13. Find the mean of first five prime numbers.
14. Dipak's last six batting scores were 138, 144, 155, 142, 167, 172. What was his mean score?
15. Find the mean of first ten odd natural number.
16. If the median of 46, 64, 88, 40, $x$, 76, 35, 91, 56, 32 and 91 is 58. Find the value of $x$.
17. The heights (in cm) of 9 students of a class are 148, 144, 152, 155, 160, 147, 150, 149, 145. Find the median height.
18. The ages (in years) of 10 teachers in a school are 32, 44, 53, 47, 37, 54, 34, 36, 40, 50. Find the median age.
19. Find the mode of the following data : 14, 25, 14, 28, 18, 14, 23, 22, 14, 18.

20. The points scored by a basketball team in a series of matches are as follows :

17, 2, 7, 27, 25, 5, 14, 18, 10, 24, 48, 10, 8, 7, 10, 28. Find the mode of the data.

21. A bag contains 5 red, 8 black and 7 white balls. One ball is chosen at random. What is the probability that the chosen ball is black?

**Long answer type questions :** (3/4 marks)

22. If the mean of $x$, $x + 2$, $x + 4$, $x + 6$, $x + 8$ is 24, find the value of $x$.

23. The mean of 6 numbers is 24. If one number is excluded, the mean of remaining numbers become 22. Find the excluded number.

24. The mean weight of a class of 20 students is 48 kg. Two more students weighing 60 kg and 58 kg respectively join the class. What is the mean weight of the class now?

25. During the festive season, the scale of the various gadgets is as under :

| Mixer | Microwave | Toster | DVD Player | TV |
|---|---|---|---|---|
| 250 | 200 | 100 | 150 | 50 |

Represent the above information by bar graph.

26. Draw a double bar graph for the given information :

| **Month** | **Jan.** | **Feb.** | **March** | **April** | **May** | **June** |
|---|---|---|---|---|---|---|
| Actual rainfall | 5cm | 15cm | 20cm | 10cm | 5cm | 5cm |
| Predicted rainfall | 10cm | 10cm | 15cm | 5cm | 10cm | 5cm |

27. In the following events, match correctly to indicate whether the outcomes are

(a) possible (b) certain or (c) impossible

i) Your friend will call you tonight.

ii) Thursday will be the day after wednesday next week.

iii) You will have cornflakes, milk and toasts in your breakfast today.

iv) You will be able to see a live dinosaur in the city zoo.

v) You will be awarded a prize for your good performance.

28. Categorize each outcome as likely or unikely :

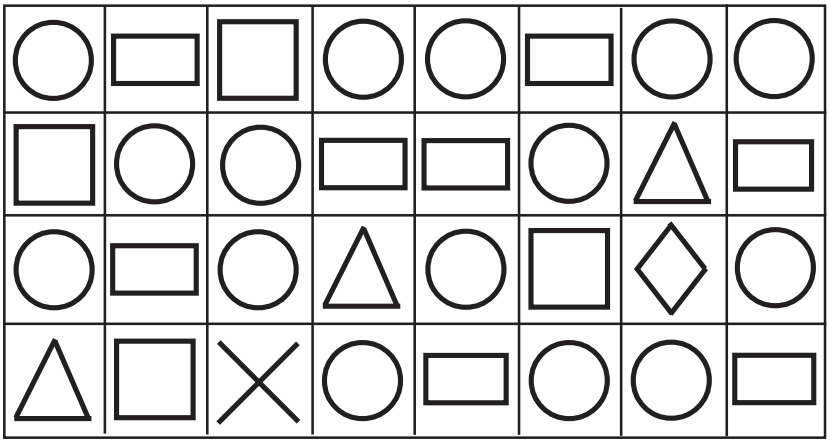
i) Your friend will go to the moon next month.

ii) Someone in your class will be absent next week.

iii) You will become an army officer when you grow up.

29. Refer to the shape chart and fill in the blanks in the following table giving the probability of touching each figure.

**Shape chart -**



**Figures :** i)  ii)  iii) 

iv)  v)  vi) 

**Ans -** Probability of each  being touched is $\frac{4}{32}$ or $\frac{1}{8}$

| (i) | (ii) | (iii) | (iv) | (v) | (vi) |
|---|---|---|---|---|---|
| ? | ? | $\frac{4}{32}$ or $\frac{1}{8}$ | ? | ? | ? |

*Chapter - 4*

# Simple Equations

Any equation consists of left side, an equal sign ('=') and a right side. The following is the general pattern.

| Left side | = | Right side |
|---|---|---|

e.g. In the equaion, x - 2 = 7

a) the left side is x - 2

b) the right side is 7

**Things to remember**

1. An equation is a condition on a variable such that two expressions in the variable should have equal value.
2. The value of the variable for which the equation is satisfied is called the solution of the equation.
3. An equation remains same if the LHS and the RHS are interchanged.
4. Without changing the equality, we may
   - i) Add the same quantity to both sides of the equation.
   - ii) Subtract the same quantity from the both sides of the equation.
   - iii) Multiply both sides of the equation by the same non-zero quantity.
   - iv) Divide both sides of the equation by the same non-zero quantity.
5. Transposing a term means changing its sign and taking it to the other side of the equation.

## Exercise-4

**1. Fill in the blanks :** **(1 Mark)**

a) If $x - 3 = 10$, then $x$ = .....

b) The root of the equation $\frac{m}{11} = -7$ is .....

c) If $\frac{x}{6} - 2 = 5$, then $x$ = .....

d) If $x$ is the root of the equation $3x = 12$, then the value of $2x - 8$ = .....

e) Any value of the variable which makes both sides of a equation equal, is known as a ..... of the equation.

**2. Answer True (T) or False (F) :** **(1 Mark)**

a) P = 2 is a root of the equation $4p - 3 = 13$.

b) If $m-1 = 9$ and $3n = 9$, then $\frac{n}{m} = 0.3$

c) If $4y - 9 = 11 + 2y$, then $y = 10$.

d) $x - 7 = -7$ has a solution in natural numbers.

e) The equation representing the statement "13 less than three times a number gives 3" is $13 - 3x = 3$.

**3. Very short answer type question :** **(1 Mark)**

**a) Write equations for the following statements:**

i) Three-forth of t is 15.

Ans-

ii) Seven times m plus 7 give you 77.

Ans -

iii) One-fourth of a number x minus 4 gives 4.

iv) If you subtract 5 from 6 times a number, you get 7.

v) Eight decreased by 3 times a number equals 2.

**b) Write the following equations in statement form :**

i) $\frac{3p}{5} = 6$

Ans -

ii) $4y - 2 = 18$

Ans -

iii) $3x + 4 = 25$

**c) Solve :**

i) $y - 4 = -7$

ii) $2p + 8 = 0$

**4. Multiple choice questions (MCQS) :-** **(1 Mark)**

a) If $z + \frac{1}{4} = 1\frac{1}{4}$, find 3z.

i) 12 ii) $\frac{3}{4}$ iii) 9 iv) 3

b) What value of x would make the expressions $4x + 5$ and $-x + 15$ equal?

i) 1 ii) -2 iii) 2 iv) 1

c) One-fourth of a number plus 3 gives 4. The number is.

i) 16 ii) 12 iii) 4 iv) 1

d) If $\frac{3}{4}$ th of a number is 60, then half the number is

i) 30 ii) 40 iv) 80 iv) 60

e) The sum of the angles of a triangle is $180^0$. If the three angles are $(2y + 15)^0$, $85^0$ and $(y + 20)^0$, the value of y is

i) $60^O$ ii) $30^O$ iii) $20^O$ iv) $10^O$

f) If $\frac{x}{-2} = 1$, then find the sum of the values of $(3x + 4)$ and $(x + 5)$.

i) 0 ii) 12 iii) 17 iv) 1

g) If $6.2y = 0.0124$ then y equals

i) 0.2 ii) 20 iii) 0.002 iv) 0.02

h) Two complementary angles differ by $10^0$. The larger angle is

i) $60^0$ ii) $64^0$ iii) $54^0$ iv) $50^0$

i) The sum of two consecutive odd numbers is 36. The smaller one is

i) 15 ii) 17 iii) 19 iv) 13

j) The ages of A and B are is the ratio 5:3. After 6 years, their ages will be in the ratio 7:5. the present age of A is

i) 15 years ii) 5 years iii) 10 years iv) 20 years

**5. Short answer type questions :** **(2 marks)**

a) Solve :

i) $3(2x - 1) + 7x = -29$

Ans : $3(2x - 1) + 7x = -29$

or, $6x - 3 + 7x = -29$

or, $13x = -29 + 3$

or, $13x = -26$

or, $x = \frac{-26}{13}$

$\therefore \ x = -2$

ii) $3x + \frac{1}{5} = 2 - x$

Ans :

iii) $8 ( \frac{x}{2} - 3) = 16$

iv) $2(x - 2) + 3 (4x - 1) = 0$

v) $7 - 5x = 5 - 7x$

b) Set up equations and solve :

i) The sum of two consecutive number is 53. Find the numbers.

Ans : i) Let the two consecutive numbers are x, x+1,

As per problem, $x + (x + 1) = 53$

or, $x + x + 1 = 53$

or, $2x = 53 - 1$

or, $2x = 52$

$\therefore \ x = 26$

$\therefore$ the required numbers are 26 and 27

ii) Three times a number is equal to 18. Find the number

Ans :

iii) How old is Ramesh, if 10 years ago he was 25 years old?

iv) After gaining 15 kg, Nisha weighs 60 kg. What was her previous weight?

v) Two supplementary angles differ by $44^0$. Find the angles.

**6. Long answer type questions : (3/4 marks)**

a) Solve : $\frac{x}{2} - 2 = \frac{x}{4} + \frac{x}{5} - 1$

$\frac{x}{2} - \frac{x}{4} - \frac{x}{5} = -1 + 2$

or, $\frac{10x - 5x - 4x}{20} = 1$

or, $\frac{x}{20} = 1$

$\therefore \quad x = 20$

b) Solve : $2x - 3 = \frac{3}{10}(5x - 12)$

Ans -

c) Solve : $\frac{2x-3}{20} + \frac{x+3}{4} = \frac{4x+1}{7}$

d) Sachin scored twice as many runs as Rahul . Together their runs fell two short of a double century. How many runs did each one score?

e) The length of a rectangular field is twice its breadth. If the perimeter of the field is 150 metres, find its length and breadth.

*Chapter - 5*

# Lines and Angles

We learnt about angles and lines in previous classes. Now we shall learn about some properties of angles and lines.

**Line**

In geometry, a line can be defined as a straight one dimensional figure that has no thickness and extends endlessly in both directions.


Here $\overleftrightarrow{PQ}$ is a line. It has no end point. We can not measure the length of a line.

**Line Segment**

A line segment is a part of a line which has two end points.


Here $\overline{AB}$ is a line segment. The end points are A and B. We can measure the length of a line segment.

**Ray**

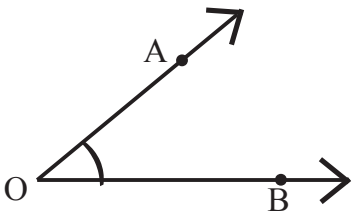
A ray is a part of a line that has one end point (i.e. starting point) and its extends in one direction endlessly.


Here $\overrightarrow{OX}$ is a ray. The starting point is O. We can not measure the length of a ray.

**Angles**

In geometry, a figure which is formed by two rays or line that have a common end point is called an angle. The two rays are called the sides (arm) of an angle and the common end point is called the vertex.

Here $\angle AOB$ is an angle formed by $\overrightarrow{OA}$ and $\overrightarrow{OB}$ rays. O is the vertex and $\overrightarrow{OA}$ , $\overrightarrow{OB}$ are sides of the angle.




**Diffferent Angles and their Properties**

**Acute angle**

An angle which measures less than $90^O$ and more than $0^O$ is called an acute angle.

**Right angle**

The angle which measures exactly $90^O$ is called a right angle.

**Obtuse angle**

An angle which measures less than $180^O$ and more than $90^O$ is called an obtuse angle.

**Straight angle**

An angle which measures exactly $180^O$ is called a straight angle.

**Reflex angle**

The angle which measures greater than $180^O$ and less than $360^O$ is known as the reflex angle.

**Complete angle**

An angle whose measure is equal to $360^O$ is called a complete angle.

**Complementary angles**

Two angles are called complementary if the sum of this measures is $90^0$.

$\therefore$ $\angle A$ and $\angle B$ are complementary if

$\angle A + \angle B = 90^O$

The complementary angle of $x^O$ is $(90 - x)^O$

**Supplementary angles**

Two angles are called supplementary if the sum of their measures is $180^O$.

$\therefore$ $\angle A$ and $\angle B$ are supplementary if

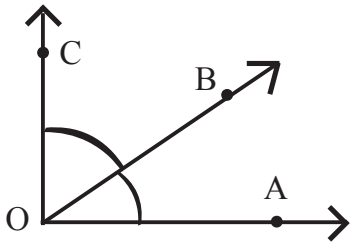
$\angle A + \angle B = 180^O$

The supplementary angle of $x^O$ is $(180 - x)^O$

**Adjacent angles**

Two angles with a common vertex, one common arm and the non-common arms on either side of the common arm are called adjacent angles.

Here ∠AOB and ∠BOC are adjacent angles.

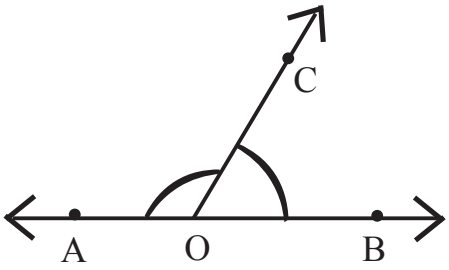



**Linear pair of angles**

Two adjacent angles are said to form a linear pair of angles if their non-common arms are two opposite rays.

Here ∠AOC and ∠BOC form a linear pair of angles.

$\therefore \angle AOC + \angle BOC = 180^O$




**Result**

i) If a ray stands on a line then the sum of the adjacent angles so formed is $180^O$.

ii) The sum of all angles formed on the same side of a line at a given point on the line is $180^O$.

iii) The sum of all angles around a point is $360^O$.

**Vertically opposite angles**

When two lines intersect, the opposite angles are equal, these angles are called vertically opposite angles as they are opposite to each other at a vertex.

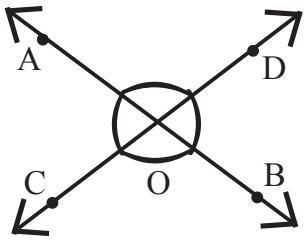
Two pairs of vertically opposite angles are

i) ∠AOD and ∠COB

ii) ∠AOC and ∠BOD

Here ∠AOD =∠COB and ∠AOC = ∠BOD.

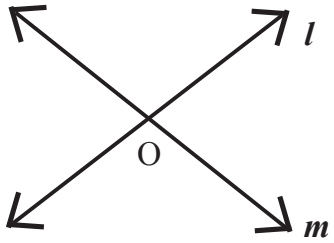
So vertically opposite angles are equal.



**Intersecting lines**

When two or more lines meet each other in a plane, they are called intersecting lines. The meeting point is called the point of intersection.

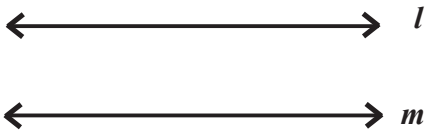
Here ***l*** and ***m*** are intersecting lines and O is the point of intersection.




**Parallel lines**

If two lines in a plane do not intersect each other, then they are paralled to each other

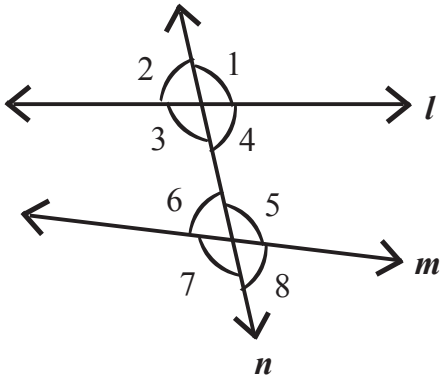
Here ***l*** | | ***m***




**Transversal**

A line which intersects two or more lines at distinct points is called a transversal.

Here ***l*** and ***m*** two non-parallel lines and ***n*** is a transversal.



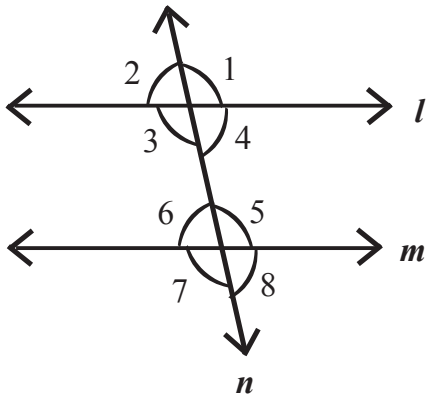

**Angles made by a transversal**

| Types of angles | Angles shown |
|---|---|
| Interior angles | ∠3, ∠4, ∠5, ∠6 |
| Exterior angles | ∠1, ∠2, ∠7, ∠8 |
| Pairs of corresponding angles | ∠1 and ∠5, ∠2 and ∠6<br>∠3 and ∠7, ∠4 and ∠8 |
| Pairs of alternate interior angles | ∠3 and ∠5, ∠4 and ∠6 |
| Pairs of alternate exterior angles | ∠1 and ∠7, ∠2 and ∠8 |
| **Pairs of interior angles on the same side of the transversal** | ∠3 and ∠6, ∠4 and ∠5 |

**Transversal of Parallel Lines**

Here $l \,||\, m$ and n is a transversal.

When a transversal cuts two parallel lines, we have the following results :




i) Each pair of corresponding angles are equal

$\angle 1 = \angle 5, \quad \angle 2 = \angle 6, \quad \angle 3 = \angle 7, \quad \angle 4 = \angle 8$

ii) Each pair of alternate interior angles are equal

$\angle 3 = \angle 5$ and $\angle 4 = \angle 6$

iii) Each pair of alternate exterior angles are equal

$\angle 1 = \angle 7$ and $\angle 2 = \angle 8$

iv) Each pair of interior angles on the same side of transversal are supplementary.

$\angle 3 + \angle 6 = 180^{O}, \quad \angle 4 + \angle 5 = 180^{O}$

**Result**

i) When a transversal cuts two lines, such that pairs of corresponding angles are equal, then the lines have to be parallel.

ii) When transversal cuts two lines, such that pairs of alternate interior angles are equal, the lines have to be parallel.

iii) When a transversal cuts two lines, such that pairs of interior angles on the same side of the transversal are supplementary, the lines have to be parallel.

## Exercise-5

**1. Fill in the blanks :** **(1 mark)**

a) The sum of all angles around a point is .....

b) Two angles are called a pair of .....if their arms form two paris of opposite rays.

c) An angle which is equal to its supplement is .....

d) If a ray stands on a line then the sum of the adjacent angles so formed is .....

e) If two line intersect then the vertically opposite angles are .....

f) If $x^{O}$ and $y^{O}$ are supplementary angles then $x^{o} + y^{o}$ = .....

g) The complementary angle of $75^{O}$ is .....

**2. Which of the following statements are true (T) and which are false (F) ? (1 mark)**

a) Sum of two supplementary angles is $90^{O}$.

b) Two supplementary angles are always obtuse angles.

c) Vertically opposite angles are equal.

d) A linear pair may have two acute angles.

e) Sum of interior angles on the same side of a transversal with two parallel lines is $180^{O}$.

f) A line which intersects two or more lines at distinct points is called a transversal.

g) The distance between two parallel lines remains the same everywhere.

h) The sum of all angles around a point is $180^{O}$.

i) If a ray stands on a line then the sum of the adjacent angles so formed is $90^{O}$.

j) $90^{O}$ is equal to its complement.

**3. Very short answer type questions : (1 mark)**

a) Find the angle which is twice of its complement.

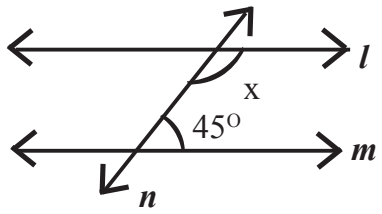
Ans -

b) Define adjacent angles.

Ans -

c) From the figure
find the value of x.

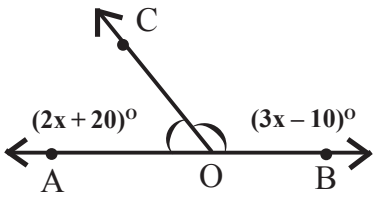
Ans -




d) What is the measure of an angle whose measure is $32^{O}$ less than its supplement?

Ans -

e) If $\angle AOC = (2x + 20)^{O}$
and $\angle BOC = (3x - 10)^{O}$
Find the value of x.



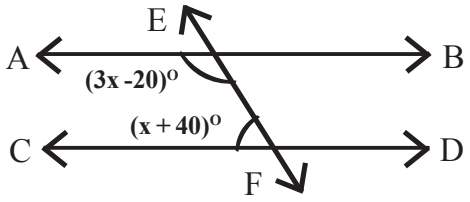
**4. Multiple choice questions (Choose the correct answer) :** **(1 mark)**

i) Two complementary angles are in the ratio 2 : 3. Find the smaller angle.

a) $60^O$ b) $36^O$ c) $63^O$ d) $54^O$

Ans -

ii) In the given figure AB || CD. Find the value of $x$.




a) $40^O$ b) $50^O$ c) $45^O$ d) $60^O$

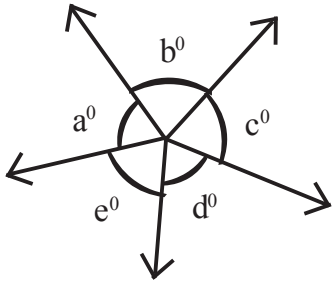
Ans -

iii) The adjacent angles of a rhombus are $(2x - 35)^O$ and $(x + 5)^O$. Find x.

a) $40^O$ b) $210^O$ c) $70^O$ d) $50^O$

Ans -

iv)




In the given figure, the angles a, b, c, d and e are consecutive angles. Find the value of a.

a) $70^O$ b) $74^O$ c) $75^O$ d) none of these.

v) The sum of an angle and half of its complementary angle is $75^O$. Find the angle.

a) $80^O$ b) $40^O$ c) $60^O$ d) $50^O$

**5. Short answer type questions :** **(2 marks)**

a) Find the angle which is equal to twice of its supplement.

Ans -

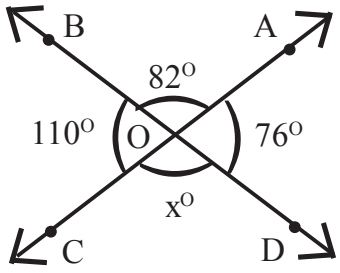
b) In the given figure

$\angle AOB = 82^O$, $\angle BOC = 110^O$,

$\angle COD = x^O$ and $\angle DOA = 76^O$.

Find the value of x.

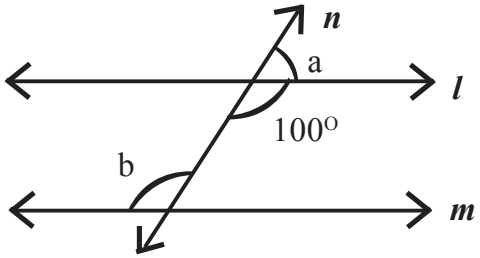
Ans -




c) Two parallel lines $l$ and $m$ are cut by a transversal $n$. If the interior angles on the same side of n be $(2x-7)^O$ and $(3x-8)^O$, find the measure of each of these angles.

d) Find the complementary and supplementary angle of $61^O$.

e)




In the figure, $l \,||\, m$.

Find the value of (b–a).

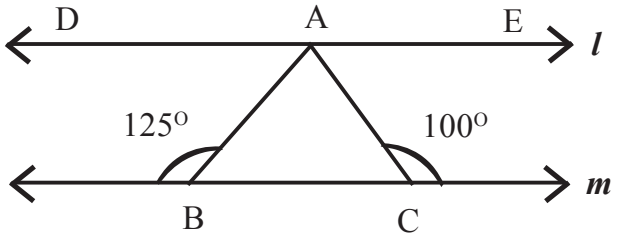
**6. Long answer type questions :** **(3/4 marks)**

a) If the supplementary angle of an angle is 4 times its complementary angle, then find the angle.

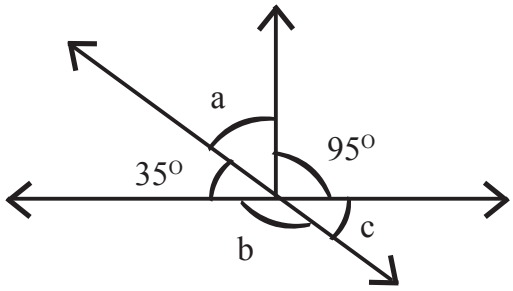
Ans -

b) In the given figure $l \,||\, m$, then find $\angle BAD + \angle CAE$

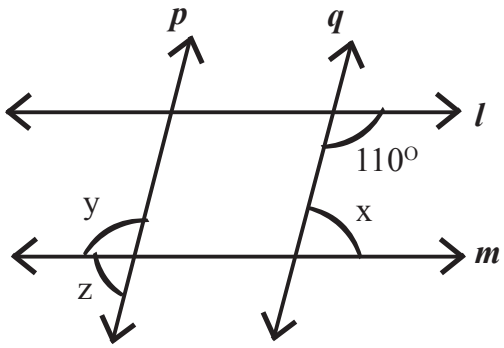
Ans -



c) From the given figure find the value of a, b, and c.




d)




In the given figure $l \| m$ and $p \| q$, find the value of x, y and z.

e) Match Column - A with Column - B

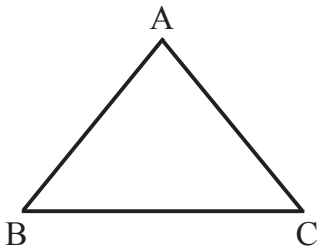
| **Column - A** | | **Column - B** | |
|---|---|---|---|
| a) | Linear pair of angles | i) | Have a common vertex |
| b) | The supplement of $60^{\circ}$ is | ii) | Adjacent and Supplementary |
| c) | The complement of $45^{\circ}$ is | iii) | $120^{\circ}$ |
| d) | Two adjacent angles | iv) | $45^{\circ}$ |

## *Chapter - 6*

# Triangle and its Properties

A triangle is a simple closed plane figure made of three line segments. It has three vertices, three sides and three angles. A

The triangle $\Delta$ABC has




**Sides :** $\overline{AB}$, $\overline{BC}$, $\overline{CA}$

**Angles :** $\angle BAC$, $\angle ABC$, $\angle BCA$

**Vertices :** A, B, C

The side opposite to the vertex A is BC.

Classification of triangles based on the (i) sides, (ii) angles.

(i) **Based on Sides :** Scalene triangle, Isosceles triangle and Equilatera triangle.

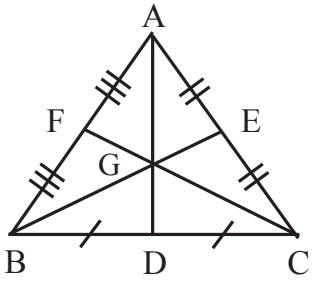
(ii) **Based on Angles :** Acute-angled-triangle, Obtuse-angled-triangle and Right-angled-triangle.

**Medians of a triangle**

The line segment joining a vertex of a triangle to the mid point of its opposite side is called a median of the triangle.

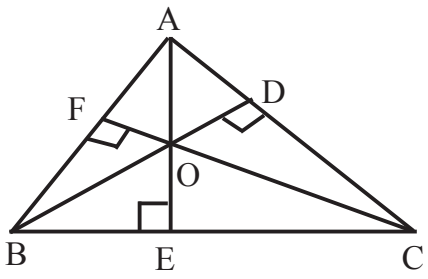
A triangle has 3 medians.

$\Delta$ ABC has three medians AD, BE and CF interesect the point G. The point G is called **centroid** of the $\Delta$ ABC.



**Altitudes of a triangle**

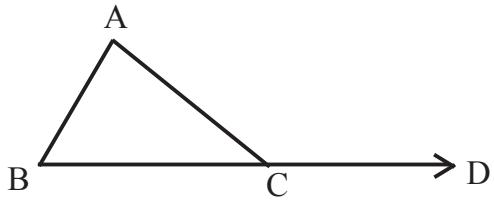
The perperdicular line segment from a vertex of a triange to its opposite side is called an altitude of the triangle. A triangle has 3 altitudes.




$\Delta$ABC has three altitudes AE, BD, CF intersect the point O. The point O is called **orthocentre**.

**Exterior angle of a triangle and its property**

An exterior angle of a triangle is formed, when a side of a triangle is produced. At each vertex, you have two ways of forming an exterion angle.




$\Delta$ABC, $\angle$ACD is an exterior angle.

The measure of any exterior angle of a triangle is equal to the sum of the measures of its interior opposite angles. The relation between exterior angle and its two interior opposite angles is referred to as the Exterior angle property of a triangle.

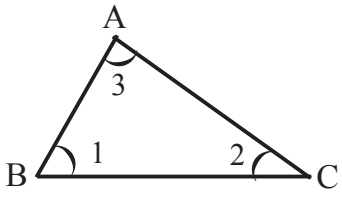
$\therefore \angle CAB + \angle ABC = \angle ACD$

**Angle sum property of a triangle**

The total measure of the three angles of a triangle is $180^0$. By angle sum property of a triangle,

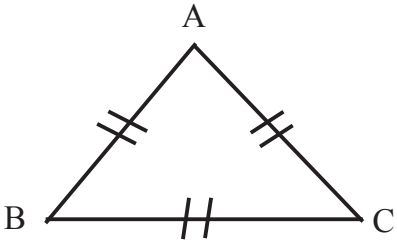
$\angle 1 + \angle 2 + \angle 3 = 180^O$

**i.e.** $\angle ABC + \angle BCA + \angle CAB = 180^O$

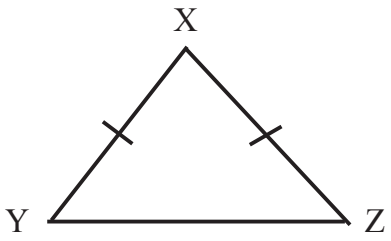



**Two special triangles : Equilateral and Isosceles**

A triangle is said to be equilateral, if each one of its sides has the same length. In an equilateral triangle, each angle measure $60^O$.



A triangle in which two sides are of equal lengths is called an isosceles triangle. The non-equal side of an isosceles triangle is called its base, the base angles of an isosceles triangle have equal measure.



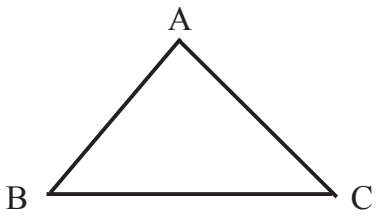

**Property of the lengths of sides of a triangle**

The sum of the lengths of any two sides of a triangle is greater than the length of the third side.

$\Delta$ ABC, AB + BC > AC,

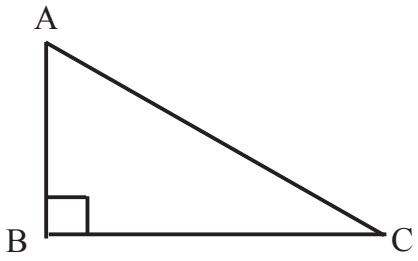
BC + CA > AB, CA + AB > BC

The difference between the lengths of any two sides is smaller than the length of the third side.




**Right-angled triangles and Pythagoras property**

In a right angled triangle, the side opposite to the right angle is called the hypotenuse and the other two sides are called its legs.




**Pythagoras Rule**

In a right - angled triangle, the square of the hypotenuse = the sum of the squares of the arms of the right angle.

If a triangle is not right - angled, this rule does not hold good. If the pythagoras rule holds, the triangle must be right - angled-triangle.

## Exercise-6

**Very Short Answer Type Questions :** **(1 mark)**

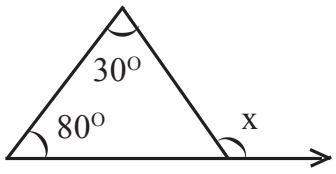
1. How many medians can a triangle have?

Ans - A triangle has 3 medians.

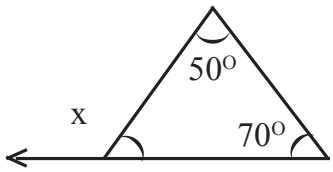
2. How many altitudes can a triangle have?

3. Find the value of the unknown exterior angle x in the following diagrams.

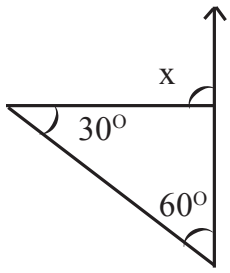
a)




b)

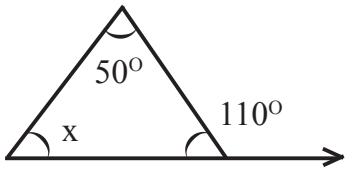



c)

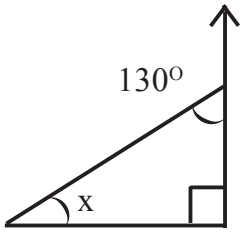



4. Find the value of the unknown interior angle x in the following figures.

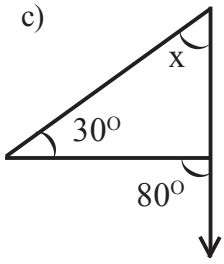
a)




b)




c)




5. Two angles of a triangle are $30^{O}$ and $90^{O}$. Find the third angle.

6. Which is the longest side of a right triangle?

7. In a $\Delta$ ABC, $\angle A = 35^{O}$ and $\angle B = 65^{O}$, find the measure of $\angle C$.

8. One of the acute angles of a right triangle is $36^{O}$, find the other.

**Fill in the blanks :** **(1 mark)**

1. A triangle has ..... altitudes. Ans - 3

2. A triangle has ..... medians.

3. The total measure of the three angles of a triangle is .....

4. In an equilateral triangle, each angle has measure .....

5. The sum of the lengths of any two sides of a triangle is ..... the length of the third side.

6. If the pythagoras rule holds, the triangle must be .....

7. A triangle in which all three sides are of equal lengths is called an .....
8. A triangle in which two sides are of equal lengths is called an .....
9. An exterior angle of a triangle is equal to the sum of its .....
10. In a right-angled triangle, the square of the hypotenuse = .....

**Which of the following statements are true (T) and which are false (F) :**

1. The total measure of the three angles of a triangle is $180^O$. Ans - T
2. A triangle has 2 medians.
3. If the pythagoras rule holds, the triangle must be acute angled.
4. The difference between the lengths of any two sides is smaller than the length of the third side.
5. A median connects a vertex of a triangle to the mid-point of the opposite side.
6. The sides opposite to the right angle is called the hypotenuse.
7. In an equilateral triangle, each angle has measure $80^0$.
8. The six elements of a triangle are its three angles and the three sides.
9. The total measure of the three angles of a triangle is $180^0$.
10. The sum any two angles of a triangle always greater than the third angle.
11. In a right triangle, the hypotenuse is the longest side.

**Multiple Choice Questions :**

1. The total measure of the three angles of a triangle is–

   a) $120^O$ b) $180^O$ c) $90^O$ d) $150^O$

Ans - b) The total measure of the three angles of a triangle is $180^O$.

2. In an equilateral triangle, each angle has measure–

   a) $60^O$ b) $90^O$ c) $120^O$ d) $180^O$

3. An exterior angle of a triangle is equal to the sum of its–

   a) exterior opposite angles b) interior opposite angles

   c) two right angles d) two acute angles

4. The perpendicular line segment from a vertex of a triangle to its opposite side is called an -

   a) median b) hypotenuse c) bisectors d) altitude

5. If the pythagoras rule holds, the triangle must be–

a) right-angled b) acute-angled c) obtuse-angled d) straight-angled.

6. Which of the following can be the sides of a right triangle?

a) 2 cm, 3 cm, 4 cm b) 3 cm, 4 cm, 5 cm

c) 4 cm, 5 cm, 6 cm d) 5 cm, 6 cm, 7 cm

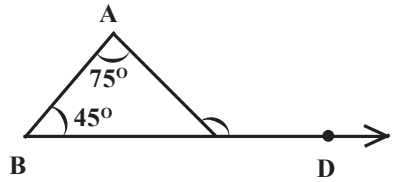
7. One of the angles of a triangle is $60^0$ and the other two angles are equal. The measure of each of the equal angles.

a) $50^O$ b) $60^O$ c) $70^O$ d) $80^O$

8. In the given figure alongside, the measur of $\angle ACD$ is

a) $50^O$ b) $55^O$

c) $120^O$ d) $45^O$




9. The hypoteruse of a right triangle is 17 cm long. If one of the remaining two sides is 8 cm in length, the length of the other side is–

a) 15 cm b) 16 cm c) 17 cm d) 18 cm

10. If all angles of a triangle is equal, then the triangle is–

a) equilateral triangle b) isosceles triangle

c) scalere triangle d) right-angled triangle

**Short Answer Type Questions :** **(2 marks)**

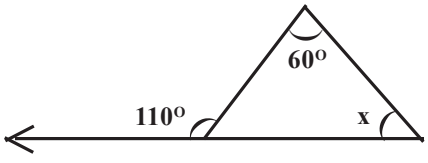
1. Determine whether the triangle whose lengts of sides are 3 cm, 4 cm, 5 cm is a right - angled-triangle.

Ans - $3^2 = 3 \times 3 = 9$, $4^2 = 4 \times 4 = 16$, $5^2 = 5 \times 5 = 25$

Since $3^2 + 4^2 = 9 + 16 = 25 = 5^2$ $3^2 + 4^2 = 5^2$

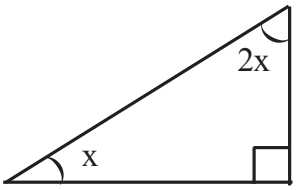
Therefore, the triangle is right - angled - triangle.

2. Find angle x in figure

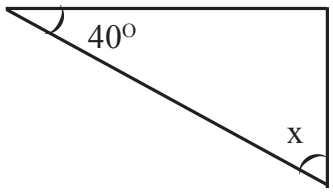


3. Find the value of the unknown x in the following diagrams.

a)




b)



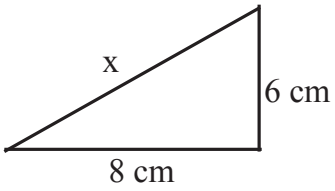

4. Is it possible to have a triangle with the following sides.

a) 2 cm, 3 cm, 5 cm b) 3 cm, 6 cm, 7 cm

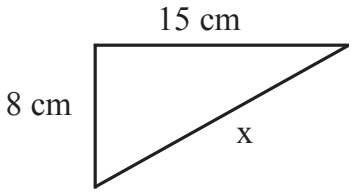
5. ABC is a triangle, right-angled at C. If AB = 25 cm and AC = 7 cm. Find BC.

6. Find the unknown length x in the following figures.

a)




b)

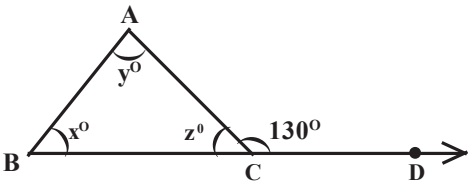



7. An exterior angle of a triangle is of measure $80^0$ and one of its interior opposite angles is of measure $30^O$. Find the measure of the other interior opposite angle.

8. In the figure given alongside,

x : y = 2 : 3 and $\angle ACD = 130^O$.

Find the values of x, y and z.




9. Find the angles of a triangle which are in the ratio 3 : 4 : 5.

**Long answer type questions :** **(3/4 marks)**

1. The three angles of a triangle are in the ratio 1 : 2 : 1. Find all the angles of a triangle.

Ans - Let the angles are $x^0$, $2x^0$ and $x^0$.

The total measure of the three angles of a triangle is $180^O$

$x^O + 2x^O + x^O = 180^O$

or, $4x = 180$,

or, $x = \frac{180}{4}$ ,

$\therefore \quad x = 45$

The angles are $45^O$, $2 \times 45^O = 90^O$, $45^O$

2. Three angles of a triangle are in the ratio 2 : 3 : 4. Find all the angles of a triangle.

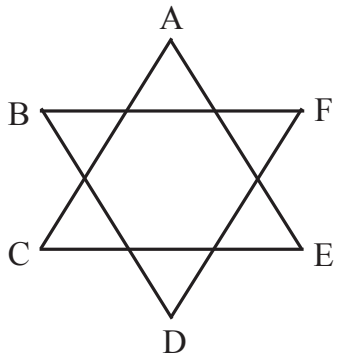
Ans -

3. One of the angle of a triangle is $80^O$ and other two angles are in the ration 3 : 7. Find the two angles of the triangle.

Ans -

4. A man goes 24 m due east and then 10 m due north. How far is he away from his initial position.
5. A tree is broken at a height of 6 m from the ground and its top touches the ground at a distance of 8 m from the base of the tree. Find the original height of the tree.
6. The adjoining figure has been obtained by using two traingles,

prove that
$\angle A + \angle B + \angle C + \angle D + \angle E + \angle F = 360^O$



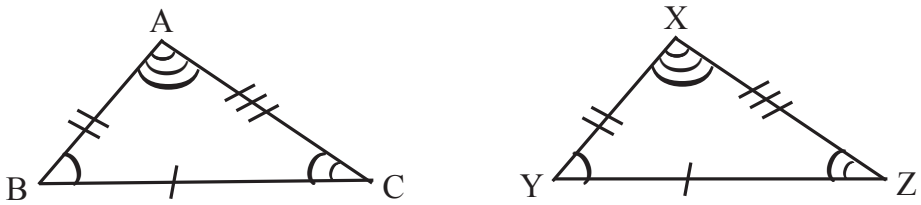

7. One side of a triangle is produced and the exterior angle so formed is $120^O$. If the interior opposite angle be in the ratio 3 : 5, find the measure of each angle of the triangle.

*Chapter - 7*

# Congruence of Triangles

**Introduction**

The two figures are congruent if they have exactly the same size and shape. The congruent triangles have the congruent sides and angles. The congruence between two triangles is shown by the symbol ≅.




$\Delta ABC \cong \Delta XYZ$

| Corresponding sides | Corresponding angles |
|---|---|
| AB = XY | $\angle A = \angle X$ |
| BC = YZ | $\angle B = \angle Y$ |
| AC = XZ | $\angle C = \angle Z$ |

**Things to remember**

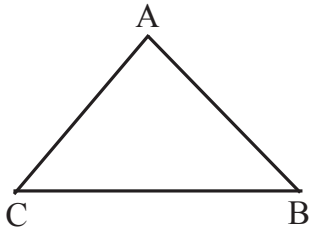
**Six elements of a triangle**

There are six elements in a triangle.

Three sides : $\overline{AB}$, $\overline{BC}$, $\overline{CA}$

Three angles : $\angle BAC$, $\angle ABC$, $\angle BCA$

Three vertices : A, B, C



**Congruence**

The relation of two objects being congruent is called congurence.

**Real life examples of congruent figures**

i) A pack of biscuits which has all biscuits of the same size and shape.

ii) Earrings of the same set. iii) Two bricks of same size and shape.

**Congruence of the segments**

If two line segments are equal in length, they are congruent.

**or,** If two line segments are congruent, they are equal in length.

**Congruence angles**

If two angles have the same measure, they are congruent.

**or,** If two angles are congruent, they have the same measure.

**Congruence of circles**

If two circles have the same radii, they are congruent.

**or,** If two circles are congruent, they have the same radii.

**Congruence of squares**

If two squares have the same side in length, they are congruent.

**Congruence of rectangles**

If the length and breadth of a rectangle is equal to the length and breadth of another rectangle, they are congruent.

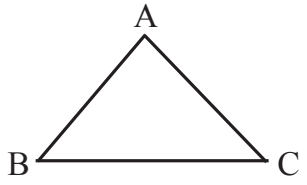
**Congruence of triangles**

If $\Delta ABC \cong \Delta PQR$

**Corresponding Vertices**

A and P, B and Q, C and R

denoted by $A \leftrightarrow P$, $B \leftrightarrow Q$, $C \leftrightarrow R$




**Corresponding Sides**

AB and PQ denoted by $AB \leftrightarrow PQ$

BC and QR denoted by $BC \leftrightarrow QR$

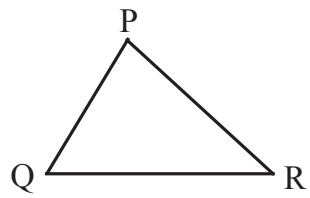
AC and PR denoted by $AC \leftrightarrow PR$

**Corresponding Angles**

$\angle A$ and $\angle P$ denoted by $\angle A \leftrightarrow \angle P$

$\angle B$ and $\angle Q$ denoted by $\angle B \leftrightarrow \angle Q$

$\angle C$ and $\angle R$ denoted by $\angle C \leftrightarrow \angle R$



**Criteria for Congruence of triangles**

**i) SSS Congruence Criterion :** If three sides of one triangle are equal to the corresponding three sides of another triangle, the triangles are said to be congruent.

**ii) SAS Congruence Criterion :** If two sides and the angle included between them of a triangle are equal to two corresponding sides and the angle included between them of another triangle, the triangles are congruent.

**iii) ASA Congruence Criterion :** If two angles and the included side of a triangle are equal to two correspodning angles and the included side of another triangle, the triangles are congruent.

**iv) AAS Congruence Criterion :** When two angles and a non-included side of a triangle are equal to the corresponding angles and included sides of another triangle, the triangles are congruent.

**v) RHS Congruence Criterion :** If the hypotenuse and one side of a right-angled triangle are respectively equal to the hypotenuse and one side of another right-angled triangle, the triangles are congruent.

## Exercise - 7

**1. Fill in the blanks :** **(1 mark)**

i) Two line segments of equal length are .....

Ans - congruent.

ii) Two angles of same measure are .....

iii) Among two congruent angles, one has a measure of $80^{o}$; the measure of the other angle is .....

iv) Two congruent squares have their sides in ..... length.

v) The included angle between the sides AB and AC is .....

vi) The included side between the angles $\angle$QPR and $\angle$PQR is .....

vii) Congruence objects are ..... copies of one another.

viii) If $F_1$ and $F_2$ are two congruent figures, we can write it as .....

**2. Write True (T) or False (F) :** **(1 mark)**

i) Perimeter of two triangles that are congruent is equal. Ans - T

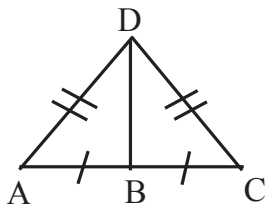
ii) Two triangles can be congruent using the AAA criteria.

iii) If two triangles are congruent, their corresponding angles and corresponding sides are equal.

iv) AAS is not a triangle conguence relationship.

v) All triangles are congruent.

vi) In the figure , $\Delta ABD \cong \Delta CBD$, By SSS criteria.



vii) If two triangles are congruent, they have equal areas.

**3. Choose the correct answer :** **(1 mark)**

i) Which of the following criterion two triangles cannot be congruent?

a) SSS b) AAA c) SAS d) ASA

Ans - (b)

ii) If $\Delta ABC \cong \Delta PQR$, $\angle A$ corresponds to

a) $\angle P$ b) $\angle Q$ c) $\angle R$ d) none of these

iii) We want to show that $\Delta ABC \cong \Delta PQR$ and we have to use SSS criterion. We have AB = PQ and BC = QR. What more we need to show?

a) CA = RP b) AB = QR c) BC = PQ d) none of these

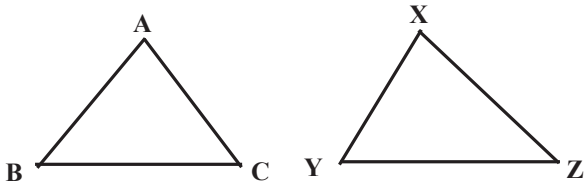
iv) Which cogruence criterion do you use in the following?

Given AB = XY

$\angle BAC = \angle YXZ$ and

AC = XZ

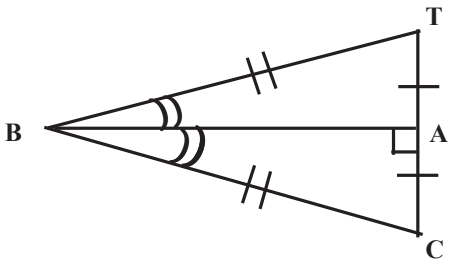
$\therefore \Delta ABC \cong XYZ$




a) SSS b) SAS c) AAS d) RHS

v) Complete the congruence statement

$\Delta$ BCA $\cong$ ?




a) $\Delta$ BTA b) $\Delta$ BAT

c) $\Delta$ ABT d) $\Delta$ ATB

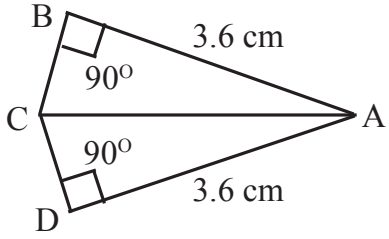
**4. Very short answer type questions :** **(1 mark)**

i) $\Delta ABC \cong \Delta PQR$. If AB = 5 cm, what is the length of PQ?

Ans - AB = PQ = 5 cm.

ii) In the given figure, by which congruence rule the following triangles congruent?

Ans -



iii) In $\Delta$DEF and $\Delta$PQR, $\angle E = 80^o$, $\angle F = 30^o$, EF = 5 cm, $\angle P = 80^o$, PR = 5 cm, R = $30^o$. By which congruence rule the triangles are congruent?

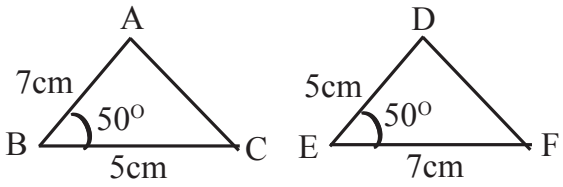
Ans -

iv) What is congruence?

Ans -

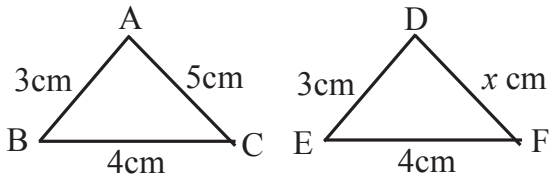
v) Are the following triangle congruent?

Ans -




vi) Given triangle are congruent, what is the measurement of x?

Ans -



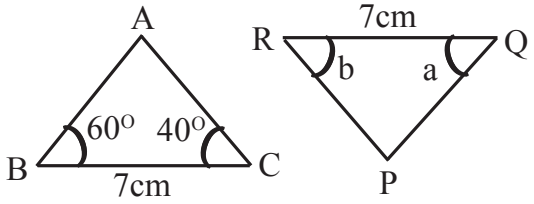

**5. Short answer type questions :** **(2 marks)**

i) $\Delta$ABC $\cong$ $\Delta$PQR. Find the measures of $\angle a$ and $\angle b$.

Ans - $\therefore$ $\Delta$ABC $\cong$ $\Delta$PQR

$\angle a = 60^o$

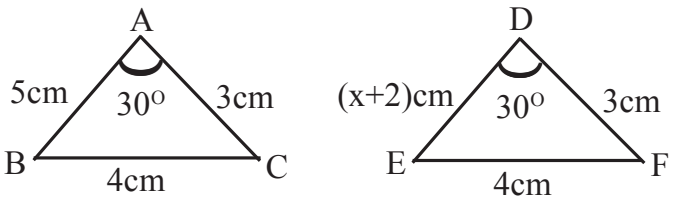
$\angle b = 40^o$ [By CPCT]



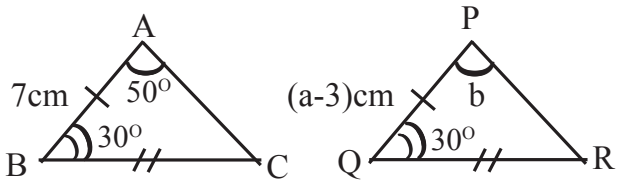

ii) $\Delta$ABC $\cong$ $\Delta$FDE and AB = 4 cm, EF = 7 cm and BC = 12 cm. What is the respective lengths of AC and DE?

Ans -

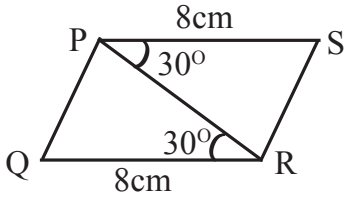
iii) If $\Delta$ABC $\cong$ $\Delta$DEF, find the value of x.



iv) If $\Delta ABC \cong \Delta PQR$, find the value of a and b.



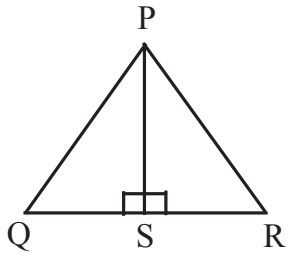

v) In the given figure which triangle is conguent to PQR? Also, mention the criteria.




**6. Long answer type questions :** **(3/4 marks)**

i) In the given figure PS ⊥ QR and PS is the bisector of ∠QPR. Prove that $\Delta PQS \cong \Delta PRS$. [Hints : Use ASA]

Ans -




ii) PQR is an isosceles triangle with PQ = PR and M is the mid-point of QR.

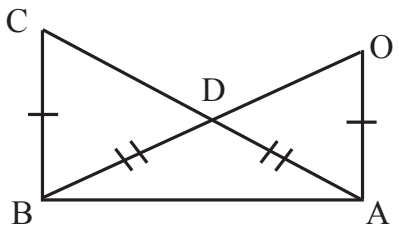
a) State three parts of equal parts in $\Delta PQM$ and $\Delta PRM$.

b) Is $\Delta PQM \cong \Delta PRM$. If so why?

Ans-

iii) Show that $\Delta AOB \cong \Delta BCA$. Given CB = OA, AC = OB.

Ans-

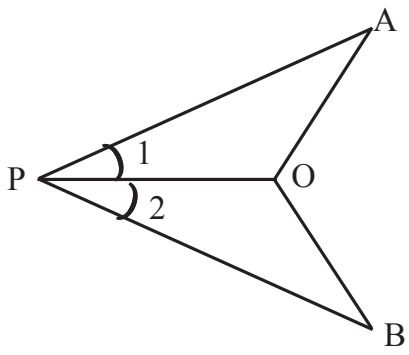


iv) In the given figure PA = PB and $\angle 1 = \angle 2$

a. Is $\Delta PAO \cong \Delta PBO$? Give reason.

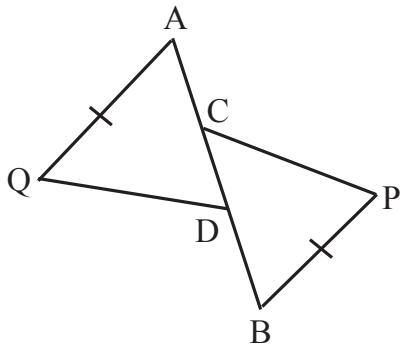
b. Is AO = BO?

Ans-



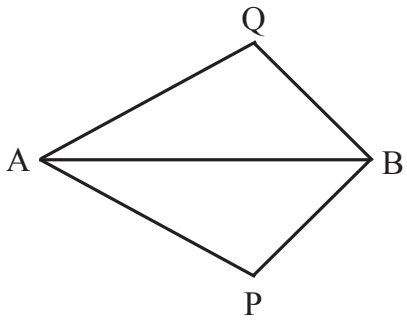

v) In the figure, AQ=PB, AC=BD and $\angle A = \angle B$. Is $\Delta QAD \cong \Delta PBC$? If yes by which congruence criterion applicable?

Ans -



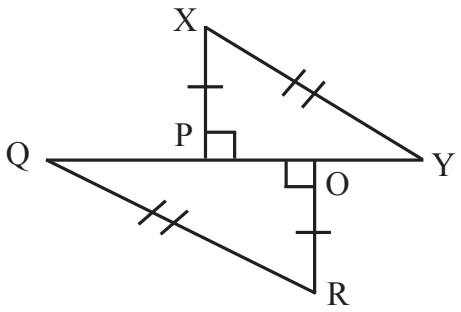

vi) In the given figure, AB is the bisector of $\angle A$ and $\angle B$. Show that AQ = AP and BQ = BP.

Ans -




vii) In the given figure, state the three pairs or equal parts in $\Delta XPY$ and $\Delta ROQ$. Is $\Delta XPY \cong \Delta ROQ$? Why?

Ans -



*Chapter - 8*

# Comparing Quantities

Suppose, we are comparing heights of two girls– Sima and Rita. If height of Sima = 160 cm and height of Rita = 120 cm.

then, $\frac{\text{height of Sima}}{\text{height of Rita}} = \frac{160 \text{ cm}}{120 \text{ cm}}$

$= \frac{4}{3}$

[ $\therefore$ Height of Sima = $\frac{4}{3}$ × Height of Rita]

Height of Sima : Height of Rita = 4 : 3

Read as 4 is to 3

$\frac{4}{3}$ or 4 : 3 is the ratio of their heights. If x and y are two quantities of same unit, then the fraction $\frac{x}{y}$ is the ratio of x and y. (y = o)

**Meaning of Percentage**

Percent is derived from Latin word "Per centum" meaning "Per hundred".

So, 0.75 = (0.75 × 100) = 75 %

and, $\frac{1}{4} = \left(\frac{1}{4} \times 100\right)\% = 25\ \%$

Similarly, $50\% = \frac{50}{100} = \frac{1}{2} = 0.5$

** Percentage increased $= \left( \frac{\text{amount of change}}{\text{original amount}} \times 100 \right) \%$

**Buying and Selling**

Cost price of a thing is written as CP. Selling price is written as SP. If SP > CP, then you made a profit. If CP> SP, then you made a loss. So, we can write–

i) Profit = SP – CP

ii) Loss = CP – SP

iii) Profit percent $= \left( \frac{\text{Profit}}{\text{CP}} \times 100 \right) \%$

iv) Loss percent $= \left( \frac{\text{Loss}}{\text{CP}} \times 100 \right) \%$

**Simple Interest**

The amount that we invest or borrow is called Principal (P). There is a rate of interest (R) and after a time period (T) interest (I) is calculated.

So, we can write, Simple Interest $= \frac{P \times R \times T}{100}$

Total Amount = Principal + Interest

## Exercise - 8

**1. Write 'T' for True and 'F' for False**

**Example :** The ratio 1 : 2 is equivalent to the ratio 2 : 1.

Ans - F

i) If CP = SP, there is no profit or loss.

ii) 2% means 2 out of thousand.

iii) Use of scale is necessary to represent a map.

iv) 4 : 1 < 2 : 1.

v) To compare two quantities, the units must be the same.

vi) Amount = Principal + Interest.

vii) Loss = SP - CP.

viii) 50% means $\frac{1}{2}$

**2. Fill in the blanks :** **(1 mark)**

| | **Statement** | **Ratio** |
|---|---|---|
| **Example** | 10 kg to 5 kg | 2 : 1 |
| i) | 18 m to 9 m | |
| ii) | ₹ 18 to ₹ 3 | |
| iii) | 30 days to 5 days | |
| iv) | 80 paise to ₹ 8 | |
| v) | 1 kg to 250 g | |

**3. Write the percentage of the fractions :** **(1-mark)**

| Question **No** | **Part / Fraction** | **Percentage** |
|---|---|---|
| | $\frac{1}{4}$ | 25% |
| i) | $\frac{3}{5}$ | |
| ii) | $\frac{7}{10}$ | |
| iii) | $\frac{17}{20}$ | |
| iv) | $\frac{3}{8}$ | |
| v) | $\frac{7}{13}$ | |

**4. Short answer type questions :** **( 2- marks)**

**Example :** 15 pens cost ₹135 what would be the cost 10 such pens?

**Ans -** Cost of 15 pens is ₹135

Cost of 1 pen $= ₹\frac{135}{15}$

Cost of 10 pens $= ₹\frac{135}{15} \times 10$

$= ₹ 90$

i) In a school, out of 800 students, 72 are absent. What percent students are absent?

Ans -

ii) If 90% of class-IX girls have bi-cycle and 20 girls have no bi-cycles. How many girls students are there in class-IX?

Ans -

iii) Find the whole quantity, if 40% of it is 180.

iv) Ram buys a TV for ₹ 5000 and sells at profit of 10%. What is the selling price?

v) If principal is ₹1200, rate of interest 8% pa. Calculate the interest for 3 years.

**5. Long answer type questions : ( 3/4 - marks)**

**Example :** In a school the ratio of the boys to the girls is 5 : 4, Number of total students is 630. How many boys and girls are there?

**Ans -** Number of total students = 630

Ratio of the boys to the girls = 5 : 4

Number of boys in the school $= 630 \times \frac{5}{5+4}$

$= 630 \times \frac{5}{9} = 350$ Nos.

Number of girls in the school $= 630 \times \frac{5}{5+4}$

$= 630 \times \frac{4}{9} = 280$ Nos.

i) A shop has 900 items, out of which 45 are defective. What percent are good in condition.

Ans -

ii) The cost of a football is ₹ 240. If the shopkeeper sells it at loss of 6%. What is its selling price?

iii) In a shop a radio was sold for ₹ 630 with a profit 5%, what was it's cost price?

iv) Rahim borrowed ₹ 2400 at simple interest rate of 12% p.a. What amount to be paid at the end of 5 years?

v) ₹ 9600 is given at 6% p.a. of interest. Find the interest which will be received after $3\frac{1}{2}$ years.

vi) Cost price of a thing was ₹ 1000. It was sold at ₹ 1200. Find the profit percent.

vii) Rita borrowed ₹ 5000 and after 2 years she paid ₹ 7000 at simple interest rate. Find the interest and rate of interest.

viii) At what rate of simple interest ₹ 1000 will be doubled in amount in 10 years?

ix) In a village total population is 20000. The ratio of the males to the females is 4 **:** 1. How many females are there?

**6. Match the column A with column B :** **(3-marks)**

| **COLUMN - A** | **COLUMN - B** |
|---|---|
| i) 25 % | a) 100 |
| ii) 0.5 | b) $\frac{1}{4}$ |
| iii) 150% | c) 50% |
| iv) 50% of 200 | d) 150 |
| v) 75% of 200 | e) 1.5 |
| | f) 75 |

*Chapter - 9*

# Rational Numbers

Before we start the introduction of rational numbers let us recall that for two given integers a and b, thier sum a+b, product $a \times b$, and difference a-b are always integers.

However, it may not always be possible for a given integer to exactly divide another given integer, that means the result of division of an integer by non-zero integers may or may not be an integer. For example, when 9 is divided by 4, the result is not an integer since we know $\frac{9}{4}$ is a fraction. Thus, there is need to extend the system of integers so that it may also be possible to divide any integer by any other given integer, different from zero.

**Things to remember**

**Integers**

All natural numbers, 0 (zero) and negatives of counting numbers are called integers. Thus, .....-5, -4, -3, -2, -1, 0, 2, 3, 5 ..... etc. are all integers.

**Fraction**

The number of the form where *a* and *b* are natural numbers, are called fraction. Thus $\frac{a}{b}, \frac{1}{3}, \frac{4}{7}$ etc. are all fraction.

**Rational Numbers**

A number is said to be a rational number if it can be expressed in the form of $\frac{p}{q}$, where *p* and *q* are integres and $q \neq 0$.

**Examples :**

i) Each of the number $\frac{5}{6}, \frac{-6}{11}, \frac{6}{-17}$ is a rational number.

ii) Zero is a rational number, since we can write $= \frac{0}{1}$, which is the quotient of two integers with a nonzero denominator.

iii) Every natural number is a rational number. We can write,

$1 = \frac{1}{1}$, $2 = \frac{2}{1}$, $3 = \frac{3}{1}$ and so on.

iv) Every integer is a rational number.

v) Every fraction is a rational number.

**Positive rational numbers**

A rational number is said to be positive if its numerator and denominator are either both positive or both negative.

**Example :** Each of the numbers $\frac{5}{4}, \frac{-3}{-8}, \frac{36}{63}$ is a positive rational number.

**Negative rational numbers**

A rational number is said to be negative if its numerator and denominator are such that one of them is a positive integer and the other is negative integer.

**Example :** Each of the numbers $\frac{-3}{8}, \frac{3}{-8}, \frac{18}{-7}$ is a negative rational number.

**Equivalent rational numbers**

Two rational numbers are said to be equivalent if one can be obtained from the other by multiplying (or dividing) its numerator and denominator by the same nonzero number.

**Example : 1**

Find four rational numbers equivalent to each of rational numbers :

i) $\frac{3}{4}$ ii) $\frac{5}{-7}$ iii) $\frac{-8}{3}$

**Solution :** We have ,

i) $\frac{3}{4} = \frac{3\times2}{4\times2} = \frac{3\times3}{4\times4} = \frac{3\times4}{4\times4} = \frac{3\times5}{4\times5}$

$\therefore \quad \frac{3}{4} = \frac{6}{8} = \frac{9}{12} = \frac{12}{16} = \frac{15}{20}$

Thus, four rational numbers squivalent to $\frac{3}{4}$ are $\frac{6}{8}, \frac{9}{12}, \frac{12}{16}, \frac{15}{20}$

**Example : 2**

Express $\frac{-3}{8}$ as rational number with i) Denominator = 32

ii) Denominator = –40

**Solution :** i) Denominator of $\frac{-3}{8}$ is 8.

To get 32, we should multiply $32 \div 8 = 4$

So, We multiply its numerator and denominator by 4.

$$\frac{-3}{8} = \frac{(-3)\times 4}{8\times 4} = \frac{-12}{32}$$

Hence, $\frac{-3}{8} = \frac{-12}{32}$

ii) Denominator of $\frac{-3}{8}$ is 8

By what number should we multiply 8 to get (–40)?

Clearly, such number is $(-40) \div 8 = -5$

So, We multiply its numerator and denominator by (–5)

$$\therefore \quad \frac{-3}{8} = \frac{(-3)\times(-5)}{8\times(-5)} = \frac{+15}{-40} \quad \text{Hence, } \frac{-3}{8} = \frac{+15}{-40}$$

**Standard form of a rational number**

A rational number $\frac{p}{q}$ is said to be in standard form if q is positive and p and q have no common divisor other than 1.

**Example :** Express each of the following numbers in standard form :

i) $\frac{21}{35}$ ii) $\frac{-32}{40}$

**Solution :** i) The given number is $\frac{21}{35}$

HCF of 21 and 35 is 7

So, we divide its numerator and denominator by 7.

i) $\frac{21}{35} = \frac{21 \div 7}{35 \div 7} = \frac{3}{5}$

Hance, $\frac{21}{35} = \frac{3}{5}$ (in standard form).

ii) the given number is $\frac{-32}{40}$

HCF of 32 and 40 is 8.

So, we divide the numerator and denominator by 8.

$$\frac{-32}{40} = \frac{(-32) \div 8}{40 \div 8} = \frac{-4}{5}$$

$\frac{-32}{40} = \frac{-4}{5}$ (in standard form)

**Comparison of Rational Number**

It is clear that :

i) Every positive ration number is greater than 0.

ii) Every negative rational number is less than 0.

How to compare two rational numbers?

**Step - 1** : Express each of the two given rational numbers with positive denominator.

**Step - 2** : Take the LCM of these positive denominators.

**Step - 3** : Express each rational number (Obtained in Step-1) With this LCM as the common denominator.

**Step - 4** : The number having the greater numerator is greater.

**Exapmple - 1** : Which is greater of the two rational number $\frac{2}{-3}$ and $\frac{-4}{5}$ ?

**Solution :** First we write each of the given numbers with a positive denominator.

The number is $\frac{2}{-3} = \frac{2 \times (-1)}{(-3) \times (-1)} = \frac{-2}{3}$ $\frac{-4}{5}$ and other number is

Now, the LCM of the denominator 3 and 5 is 15.

$\therefore \quad \frac{-2}{3} = \frac{(-2)\times 5}{3\times 5} = \frac{-10}{15} \qquad \frac{-4}{5} = \frac{(-4)\times 3}{5\times 3} = \frac{-12}{15}$

Now, $(-10) > (-12)$

$\therefore \quad \frac{-10}{15} > \frac{-12}{15} \Rightarrow \frac{-2}{3} > \frac{-4}{5}$ Hence, $\frac{2}{-3} > \frac{-4}{5}$

**Example - 2 :** Arrange the rational numbers $\frac{-3}{5}, \frac{7}{-10}, \frac{-5}{6}$ is ascending order.

**Solution :**

First we express each of the given numbers with positive denominator.

$$\frac{7}{-10} = \frac{7\times(-1)}{(-10)\times(-1)} = \frac{-7}{10}$$

So, the given numbers are $\frac{-3}{5}, \frac{-7}{10}, \frac{-5}{6}$

LCM of 5, 10, 6 = 30

Now,

$$\frac{-3}{5} = \frac{(-3)\times 6}{5\times 6} = \frac{-18}{30}$$

$$\frac{-7}{10} = \frac{(-7)\times 3}{10\times 3} = \frac{-21}{30}$$

$$\frac{-5}{6} = \frac{(-5)\times 5}{6\times 5} = \frac{-25}{30}$$

Here, $\frac{-25}{30} < \frac{-21}{30} < \frac{-18}{30}$

That is $\frac{-5}{6} < \frac{7}{-10} < \frac{-3}{5}$

**Addition of Rational Numbers**

Suppose we gave to add two given rational numbers. First convert each of them in a rational number with a positive denominator.

**Case I :** When denominators of given numbers are equal.

Let $\frac{p}{q}$ and $\frac{r}{q}$ be any two rational numbers

Then we define $\left(\frac{p}{q}+\frac{r}{q}\right) = \frac{p+r}{q}$

**Case II :** When denominators of given numbers are unequal.

**Step 1** : Take the LCM of denominator of the given rational numbers.

**Step - 2** : Express each of the given rational numbers with the above LCM as the common denominator.

**Step - 3** : Now, add the numbers as shown in case -1

**Example :** Add $\frac{7}{-27}+\frac{11}{18}$

**Solution :** First we express $\frac{-7}{27}$ as a rational number with positve denominator.

We have $\frac{7}{-27}=\frac{7\times(-1)}{(-27)\times(-1)}=\frac{-7}{27}$

So, The required sum is $\frac{-7}{27}+\frac{11}{18}$

LCM of 27 and 18 = 54

$$\frac{7}{-27}=\frac{(-7)\times 2}{27\times 2}=\frac{-14}{54} \text{ and } \frac{11}{18}=\frac{11\times 3}{18\times 3}=\frac{33}{54}$$

$$\therefore \frac{7}{-27}+\frac{11}{18}=\frac{-7}{27}+\frac{11}{18}=\frac{-14}{54}+\frac{33}{54}=\frac{(-14)+33}{54}=\frac{19}{54}$$

Hence, the required sum is $\frac{19}{54}$

**Subtraction of Rational Numbers**

For any two rational numbers $\frac{a}{b}$ and $\frac{c}{d}$ we define :

$$\left(\frac{a}{b}-\frac{c}{d}\right)=\frac{a}{b}+\left(\frac{-c}{d}\right)$$

We say that the additive inverese of $\frac{c}{d}$ is $\left(\frac{-c}{d}\right)$

$$\therefore \left(\frac{a}{b}-\frac{c}{d}\right) = \frac{a}{b} + (\text{Additive inverse of } \frac{c}{d})$$

**Example - 1 :** Subtract $\frac{3}{4}$ from $\frac{2}{3}$

**Solution :** We have $\left(\frac{2}{3}-\frac{3}{4}\right)$

$$= \frac{2}{3} + (\text{additive inverse of } \frac{3}{4})$$

$$= \frac{2}{3} + \left(\frac{-3}{4}\right) = \frac{8+(-9)}{12} = \frac{-1}{12}$$

**Multipliclation**

The product of two rational numbers is defined below.

$$\text{Product of two rational numbers} = \frac{\text{Production of their numerators}}{\text{Product of their denominators}}$$

Thus, for any rational numbers $\frac{a}{b}$ and $\frac{c}{d}$,

We have $\left(\frac{a}{b}\times\frac{c}{d}\right)=\frac{a\times c}{b\times d}$

**Example :** Find the product :

i) $\frac{2}{3}\times\frac{5}{7}$ ii) $\frac{-8}{13}\times\frac{39}{-4}$

**Solution :** We have i) $\frac{2}{3}\times\frac{5}{7}=\frac{2\times5}{3\times7}=\frac{10}{21}$

ii) We have $\frac{-8}{13}\times\frac{39}{-4}$

First we write $\frac{39}{-4}$ as a rational number with positive denominator.

$$\therefore \quad \frac{39}{-4} = \frac{39\times(-1)}{(-4)\times(-1)} = \frac{-39}{4}$$

Now, $\quad \frac{-8}{13}\times\frac{39}{-4}$

$$= \frac{-8}{13}\times\frac{-39}{4}$$

$$= \frac{(-8)\times(-39)}{13\times 4}$$

$$= \frac{\overset{2}{\cancel{8}}\times\overset{3}{\cancel{39}}}{\cancel{13}\times\cancel{4}} \quad [\because \text{Product of two negative integer is positive}]$$

$$= 6$$

**Division**

If $\frac{a}{b}$ and $\frac{c}{d}$ are two rational numbers such that $\frac{c}{d} \neq 0$ then we define.

$$\left(\frac{a}{b}\div\frac{c}{d}\right) = \frac{a}{b} \times (\text{ reciprocal of } \frac{c}{d})$$

$$= \frac{a}{b} \times \frac{d}{c}$$

**Example :** i) $\frac{7}{15}\div\frac{2}{3}$ ii) $\frac{-9}{20}\div\frac{-3}{10}$

**Solution :** i) We have : $\frac{7}{15}\div\frac{2}{3}$

$$= \frac{7}{5\cancel{15}}\times\frac{\cancel{3}}{2}$$

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

ii) $\frac{-9}{20} \div \frac{-3}{10}$

$= \frac{-9}{20} \times \frac{10}{-3}$

$= \frac{-9}{20} \times \frac{-10}{3}$

$= \frac{(-9)\times(-10)}{20\times 3}$

$= \frac{\overset{3}{\cancel{9}} \times \cancel{10}}{\underset{2}{\cancel{20}} \times \cancel{3}} = \frac{3}{2}$

## Exercise - 9

**Choose the correct option of the following questions :** **(1 mark)**

1. Which of the following rational number is positive ?

   a) $\frac{-8}{7}$ b) $\frac{19}{-13}$ c) $\frac{-3}{-4}$ d) $\frac{-21}{13}$

2. Which of the following rational number is negative?

   a) $-\left(\frac{-3}{7}\right)$ b) $\frac{-5}{-8}$ c) $\frac{9}{8}$ d) $\frac{3}{-7}$

3. The standard form of $\frac{-48}{60}$ is –

   a) $\frac{48}{60}$ b) $\frac{-60}{48}$ c) $\frac{-4}{5}$ d) $\frac{-4}{-5}$

4. Which of the following is equivalent to $\frac{4}{5}$ –

   a) $\frac{5}{4}$ b) $\frac{16}{25}$ c) $\frac{16}{20}$ d) $\frac{15}{25}$

5. Which of the following number is equal to its reciprocal ?

   a) 1 b) 2 c) $\frac{1}{2}$ d) 0

**Fill in the blanks to make the statement true :** **(1 mark)**

6. $\frac{-3}{5}$ is _____ than 0 .

7. The standard form of $\frac{18}{-24}$ is ——

8. $-\frac{1}{2}$ is _____ than $\frac{1}{5}$.

9. $\frac{-27}{45}$ and $\frac{-3}{5}$ represent _____ national numbers

10. Additive inverse of $\frac{2}{3}$ is _____

**State whether the following statement are true (T) or false (F) :** **(1 mark)**

11. Zero is the smallest rational number.
12. Every integer is a rational number.
13. Each fractionk is a rational number.
14. $\frac{4}{6}$ is equivalent to $\frac{2}{3}$ .
15. Every rational number is a whole number

**Very short answer type questions :** **(1 mark)**

16. If $\frac{-5}{7} = \frac{x}{28}$ , find the value of $x$.
17. Express $\frac{3}{4}$ as a rational number with denominator –80.
18. Express $\frac{-15}{16}$ as a rational number with numertator 75.
19. Find two rational number which are equivlent to $\frac{7}{15}$.
20. Write the reciprocal of $\frac{-3}{5}$.

**Short answer type questions :** **(2 marks)**

21. Which of $\frac{7}{-8}$ and $\frac{-8}{9}$ is greater?

22. Which of $\frac{9}{35}$ and $\frac{4}{7}$ is smaller?

23. Write two rational numbers which are equivalent to 3 .

24. Add the numbers $\frac{-5}{36}$ and $\frac{-7}{12}$.

25. Subtract : $\frac{-32}{13}$ from $\frac{-6}{5}$.

26. Multiply : $\frac{-7}{10}$ by $\frac{-40}{21}$.

27. Simplify : $-32 \times \frac{-7}{36}$.

28. Divide : $\frac{4}{9}$ by $\left(\frac{-5}{12}\right)$

29. Simplify : $(-8) \div \left(\frac{-5}{16}\right)$

30. Simplify : $1 \div \frac{1}{2} + \frac{5}{2}$

**Long answer type questions :** **(3/4 marks)**

31. Write the rational number $\frac{-3}{4}, \frac{5}{-12}, \frac{-7}{16}$ in ascending order.

32. Write the rational number $\frac{2}{3}, \frac{3}{4}, \frac{-5}{6}$ in descending order.

33. The sum of two rational number is $\frac{4}{21}$ , if one of them is $\frac{5}{7}$ , find the other.

34. What should be added to $\frac{-5}{7}$ to get $\frac{-2}{3}$ ?

35. List four rational numbers between –2 and –1 .

36. What should be subtracted from $-\frac{1}{2}$ to get 2 ?

37. If $x = \frac{1}{10}$ and $y = \frac{-3}{8}$, then evaluate $x + y$ and $x–y$.

38. If $a = \frac{-2}{5}$ and $b = \frac{1}{2}$, then find $a \times b$ and $\frac{a}{b}$

39. Find the reciprocal of $\left\{\left(\frac{1}{2}\times\frac{1}{4}\right)+\left(\frac{1}{2}\times 6\right)\right\}$.

40. What should be multiplied with $\frac{-5}{8}$ to obtain the nearest integer?

*Chapter - 10*

# Practical Geometry

You have already learnt how to draw a line segment of given length, perpendicular to a given line segment, angles, circle etc. in your earlier classes. Here you will learn how to draw parallel lines and triangles.

**To draw a line parallel to another line**

Draw a line segment AB =6.8 cm. Take any point P outside it. Using ruler and Compasses draw a line through P parallel to AB.

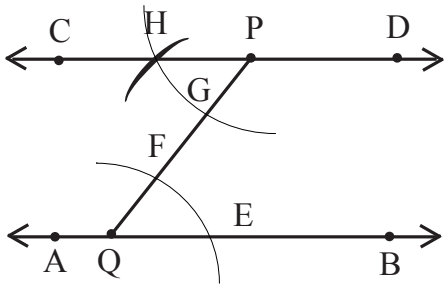
**Construction**

**Step - 1 :** We take a line segment AB = 6.8 cm and a point P outside it.

**Step - 2 :** We take any point Q on AB and join P, Q.

**Step - 3 :** With Q as centre and a convenient radius we draw an arc.

**Step - 4 :** Now, with P as centre and the same radius as in step –3, We draw another arc cutting PQ at G.




**Step - 5 :** Taking G as centre, and arc length EF we draw an arc, which intersect the previous arc at H.

**Step - 6 :** Draw a line $\overleftrightarrow{CD}$ through P and H.

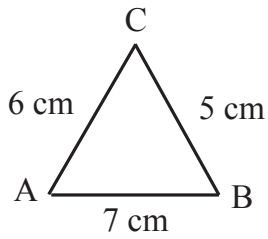
Thus a line $\overleftrightarrow{CD}$ through P parallel to $\overleftrightarrow{AB}$ is drawn

## CONSTRUCTION OF TRIANGLES

### I. 'SSS' Triangle construction

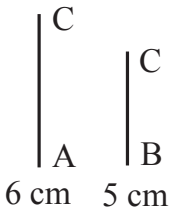
**Example :** Construct a $\Delta$ABC with AB = 7 cm, BC = 5 cm and AC=6 cm

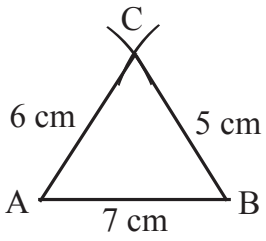
**Solution :** First draw a rough sketch of $\Delta$ABC showing all measurement.




**Steps of construction :**

1. Draw a line segment AB = 7 cm
2. With A as centre and redius 6 cm draw an arc.
3. With B as centre and radius 5 cm, draw another arc, cutting the previous arc at C.
4. Join A, C and B, C
   Thus ABC is the required triangle.

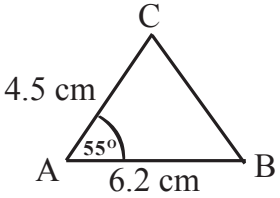



### II. 'SAS' Triangle construction

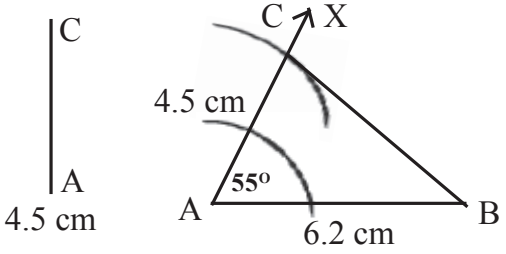
**Example :** Construct a triangle with AB = 6.2 cm, AC = 4.5 cm, $\angle BAC = 55^{O}$.

**Solution :** First draw a rough sketch of $\Delta$ABC showing all measurements.



**Steps of Construction :**

1. Draw a line segment AB = 6.2 cm.
2. Construct $\angle BAC = 55^O$ with the help of protractor.
3. Taking A as centre we draw an arc of radius 4.5 cm which intersect $\overrightarrow{AX}$ at C.
4. Join B, C.
   Thus the $\Delta ABC$ is constructed.

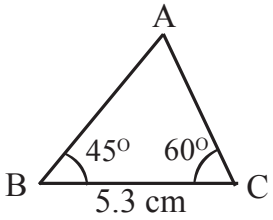



**III. 'ASA' Triangle construction**

**Example :** Construct a $\Delta ABC$ in which BC = 5.3 cm,
$\angle B = 45^O$ and $\angle A = 75^O$.

**Solution :** We know that the sum of the angles of a triangle is $180^0$.

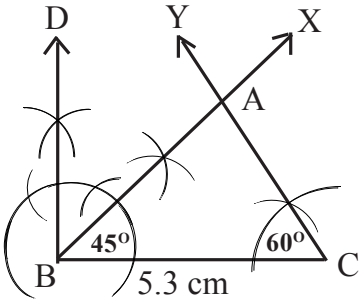
$\therefore \angle A + \angle B + \angle C = 180^O$
or $75^O + 45^O + \angle C = 180^0$
or $\angle C = 60^O$




Thus, we have BC = 5.3 cm, $\angle B = 45^O$ and $\angle C = 60^O$
First we draw a rough sketch of $\Delta$ ABC, as shown.

**Steps of Construction :**

1. Draw a line segment BC = 5.3 cm
2. Constract $\angle CBX = 45^O$ and $\angle BCY = 60^O$
3. Let $\overrightarrow{BX}$ and $\overrightarrow{CY}$ intersect at A.
   Thus, $\Delta ABC$ is the required triangle.



**IV. 'RHS' Triangle construction**

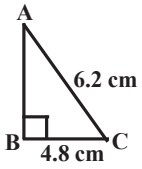
**Example :** Construct a $\Delta$ABC in which base BC = 4.8 cm,

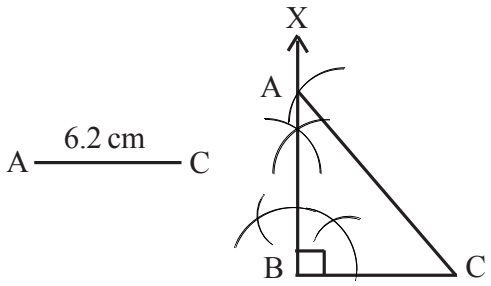
$\angle$ B = $90^O$ and hypotenuse AC = 6.2 cm.

**Solution :** First we draw a rough sketch of $\Delta$ ABC showing all measurements.

**Steps of Construction :**

1. Draw a line segment $\overline{BC}$ = 4.8 cm.
2. Construct $\angle CBX = 90^O$.
3. With C as centre and radius 6.2 cm, draw an arc, cutting $\overrightarrow{BX}$ at A.
4. Join A, C
   Thus $\Delta$ABC is the required triangle.




**Exercise - 10**

**Long answer type questions :** **(3/4 marks)**

1. Draw a linesegment of length 6.3 cm. Draw another line parallel to it at a distance 3cm from it.
2. Draw any traingle ABC. Through A, draw the line parallel to $\overleftrightarrow{BC}$
3. Construct a $\Delta$PQR in which PQ = 5.3 cm, PR = 4.6 cm and QR = 3.8 cm.
4. Construct a $\Delta$XYZ in which XZ = 5.5cm, XY = 6.5 cm and YZ = 5 cm.
5. Construct a $\Delta$PQR in which PQ = 5.5 cm, QR = 6.5 cm, $\angle Q = 40^o$.
6. Construct a $\Delta$ABC in which AB = 5 cm, AC = 4.5 cm and $\angle A = 60^o$. Also draw a perpendicular bisector of BC.
7. Construct a $\Delta$PQR , if PQ = 5 cm, m $\angle$PQR = $105^o$ and m $\angle$QRP = $40^o$.
8. Construct a $\Delta$ABC , if m $\angle A = 60^o$, m $\angle B = 30^o$ and AB = 5.8 cm.
9. Construct an isosceles right angled $\Delta$ABC, where $\angle C = 90^o$ and AC = 6 cm.
10. Construct a right angled $\Delta$PQR, where hypotenuse QR = 5.6 cm and one of whose acute angle measures $30^o$.

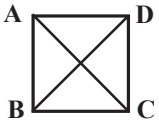
*Chapter - 11*

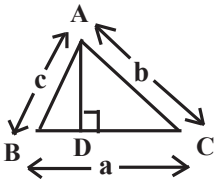
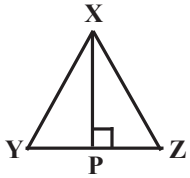
# Perimeter and Area

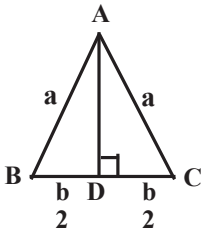
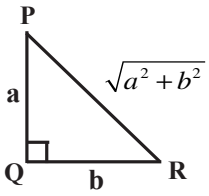
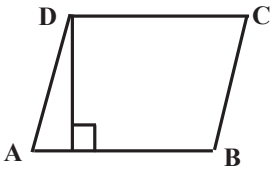
In this chapter, we shall deal with the computation of perimeter and areas of plane figures.

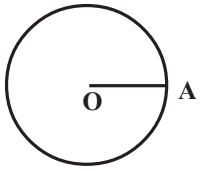
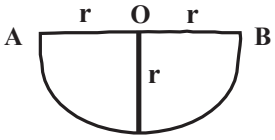
Perimeter is the distance arround a closed figure i.e. perimeter of a plane figure is the length of its boundary.

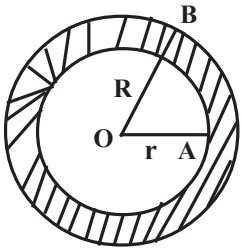
Area is the part of plane or region occupied by the closed figure.

| Sl. No. | Name of plane figure | Perimeter (Unit) | Area (sq. unit) |
|---|---|---|---|
| 1. | **Square :**<br>A quadrilateral whose all sides are equal and all angles are right angle is called a square<br>  <br><br>Here ABCD is a square, where<br>AB = BC = CD = DA = a unit and<br>$\angle A = \angle B = \angle C = \angle D = 90^o$<br>Two diagonals are AC and BD<br>Length of diagonal = $\sqrt{2}$ a unit | 4a | $a^2$ |

| Sl. No. | Name of plane figure | Perimeter (Unit) | Area (sq. unit) |
|---|---|---|---|
| 2. | **Rectangle :**<br>A quadrilateral whose opposite sides are equal and all angles are right angle is called<br>  <br><br>a rectangle. Here PQRS is a rectangle,<br>Length = QR = PS = $l$ unit<br>Breadth = PQ = SR = b unit<br>$\angle P = \angle Q = \angle R = \angle S = 90^{O}$<br>Diagonals are PR and QS<br>Length of diagonal = $\sqrt{l^2 + b^2}$ | 2 ($l$ + b) | $l$ × b |
| 3. | **Triangle :**<br>A closed figure bounded by three line segment is called triangle.<br>Here, in $\Delta$ABC<br>BC = a mit,<br>  <br><br>CA = b unit,<br>AB = c unit<br>AD $\perp$ BC,<br>Base = BC, Height = AD | (a+b+c) | $\frac{1}{2}$ × BC × AD |
| 4. | **Equilateral Triangle :**<br>A triangle whose all sides are equal is called equilateral triangle.<br>Here $\Delta$XYZ is an equilatiral triangle,<br>XY = YZ = ZX = a unit<br>Height (XP) = $\frac{\sqrt{3a}}{2}$ unit<br>  <br> | 3a | $\frac{\sqrt{3}}{4} \times a^2$ |

| Sl. No. | Name of plane figure | Perimeter (Unit) | Area (sq. unit) |
|---|---|---|---|
| 5. | **Isosceles triangle :**<br>A triangle whose two sides are equal is called isosceles triangle.<br>In $\Delta$ABC,<br>AB = AC = a unit<br>BC = b unit<br>AD $\perp$ BC and<br>BD = DC = $\frac{b}{2}$ unit<br>Height (AD) = $\sqrt{a^2-\frac{b^2}{4}}$ unit<br>  | (2a+b) | $\frac{1}{2}\times b\times\sqrt{a^2-\frac{b^2}{4}}$ |
| 6. | **Right angled triangle :**<br>A triangle whose one angle is right angle is called right angled triangle.<br>In $\Delta$PQR<br>$\angle$PQR = $90^0$<br>PQ = a unit<br>QR = b unit<br>Hypotenuse (PR) = $\sqrt{a^2+b^2}$ unit<br>  | $(a+b+\sqrt{a^2+b^2})$ | $\frac{1}{2}\times a\times b$ |
| 7. | **Parallelogram :**<br>A quadrilateral whose opposite sides are parallel is called parallelogram.<br>In ABCD parallelogram<br>  <br>AB \|\| DC and AD \|\| BC<br>AB = DC = $l$ unit, AD = BC = b unit | 2($l$ + b) | (base × height) |

| Sl. No. | Name of plane figure | Perimeter (Unit) | Area (sq. unit) |
|---|---|---|---|
| 8. | **Rhombus :**<br>A parallelogram whose all sides are equal is called rhombus.<br>  <br><br>In ABCD rhombus<br>AB = BC = CD = DA = a unit<br>Diagonal AC = $l_1$ unit<br>BD = $l_2$ unit | 4a | $\frac{1}{2}\times l_1 \times l_2$ |
| 9. | **Circle :**<br>A circle is the set of all point on a plane (2d - space) that are a fixed distance from a central point (centre).<br>Here O is the centre of the circle<br>  <br><br>radius (OA) = $r$ unit<br>The perimeter of a circle is called its circumference and the diameter is twice its radius.<br>$\frac{\text{Circumference}}{\text{Diameter}} = \pi$<br>where $\pi = \frac{22}{7}$ or 3.14 is a constant. | $2\pi r$ | $\pi r^2$ |
| 10. | **Semi-circle :**<br>  <br><br>Here, radius = $r$ unit<br>diameter = $2r$ unit | $(2r + \pi r)$ | $\frac{\pi r^2}{2}$ |

| Sl. No. | Name of plane figure | Perimeter (Unit) | Area (sq. unit) |
|---|---|---|---|
| 11. | **Circular ring :**<br>Radius of innrer circle = r unit<br>Radius of outer circle = R unit<br>Width of the ring = (R - r) unit<br>  <br> | Circumference of inner circle $= 2\pi r$ and outer circle $= 2\ \pi R$ | $\pi\ R^2 -\ \pi r^2$ |

## Exercise - 11

**1. Fill in the blanks :-** **(1-Mark)**

a) All ..... are rectangles.

b) Perimeter of a square = ..... × side. units

c) Side of the square = $\left(\sqrt{.....}\right)$ units

d) Diagonal of the square = ..... × side units

e) Area of the square = $\frac{(\text{diagonal})^2}{.....}$ sq. units

f) Length of the rectangle = (Area ÷ ..... ) units

g) Diagonal of the rctangle = $\sqrt{(\text{length})^2 + (.....)^2}$ units

h) Perimeter of the rectangle = ..... × (length + breadth) units

i) Perimeter of equilateral triangle = (..... × length of a side) units

j) Height of an equilateral triangle = $\left(\frac{.....}{2}\right)$ units

k) Area of a parallelogram = (..... × height) sq. units

l) Circumference of a circle = (..... × Diameter) units

m) Radius of a circle = (Diameter ÷ ..... ) units

n) Area of a circle = $\frac{1}{2}$ × (circumference) × ..... units

o) Circumference of a semicircle = ( $\pi r$ + ..... ) units

**2. Which of the following statements are true (T) and which are false (F) : (1-Mark)**

a) Area of a triangle = (base × height). sq. unit

b) Area of a semicircle is $\frac{\pi r^2}{2}$ sq. unit

c) Circumference of a circle = 2 $\pi r^2$ unit

d) Ratio of circumference of a circle and its diameter is constant.

e) Area of a rhombus = (2 × product of diagonals) sq. unit

f) 1 $m^2$ = 10000 $cm^2$

g) Side of a square is one fourth of its perimeter

h) Diagonal of a square = 2 × (side) unit

i) Area of an equilateral triangle = $\frac{\sqrt{3}}{4}$ × $(side)^2$. sq. unit

j) Radius of a circle = $\frac{\sqrt{Area}}{\pi}$ unit

**3. Very short answer type questions : (1-Mark)**

a) The area of a square is 81 sq. cm. Find its side.

Ans -

b) The length and breadth of a rectangular black board is 3 metre and 1.5 metre. Find its area.

Ans -

c) The side of a square is 3 cm. What is the length of its diagonal?

Ans -

d) The area of a rectangular paper is 96 cm and its length is 12 cm. Find its breadth.

e) The length and breadth of a rectangle are 4 cm and 3 cm. Find the length of diagonals.

f) The base and height of a parallelogram are 7 cm and 8 cm respectively. Find the area of the parallelogram.

g) The side of an equilateral triangle is 2 cm. Find its area.

h) Find the circumference of a circle of radius 7 cm.

i) Each diagonal of a square is 12 cm long, find its area.

j) The radius of a semicircular protractor is 7 cm, find its circumference.

**4. Multiple choice questions : (1-Mark)**

a) The area of a squre is 72 $cm^2$. The length of its diagonal is

i) $6\sqrt{2}$ cm ii) 12 cm ii) $12\sqrt{2}$ cm iv) 8 cm

b) The length of a rectangle is 12 cm and length of its diagonal is 13 cm. The breadth of the rectangle is

i) 1 cm ii) 25 cm iii) 5 cm iv) 12.5 cm

c) The area of a circle is 154 $cm^2$. Its radius is

i) 14 cm ii) 7 cm iii) 49 cm iv) $7\sqrt{2}$ cm

d) Each side of an equilateral triangle is 14 cm, its height is

i) 7 cm ii) $7\sqrt{2}$ cm iii) $7\sqrt{3}$ cm iv) 10 cm

e) The lengths of the diagonals of a rhombus are 12 cm and 15 cm. The area of the rhombus is

i) 180 $cm^2$ ii) 27 $cm^2$ iii) 90 $cm^2$ iv) 360 $cm^2$

f) If the ratio of the areas of two squares is 16:1, then the ratio of their perimeters is

i) 16 : 1 ii) 4 : 1 iii) 1 : 4 iv) 2 : 1

g) The perimeter of the floor of a room is 18 m and its length is 5 m. What is the breadth of the room?

i) 13 cm ii) 4 m iii) 11.5 m iv) 23 m

h) The base and height of a triangle are 5 cm and 4 cm. The area of the triangle is

i) 20 sq. cm ii) 9 sq. cm iii) 10 sq. cm iv) 4.5 sq. cm

i) The area of a parallelogram is 144 $cm^2$ and the height is 10 cm. The base is

i) 12 cm ii) 14.4 cm iii) 22 cm iv) 1.2 cm

j) 1 hactare = ?

i) 1000 $m^2$ ii) 10000 $m^2$ iii) 100 $m^2$ iv) None of these.

**5. Short answer type questions : (2-Marks)**

a) Find the area of the rectangle whose length 12 m and breadth 8.5 m.

Ans -

b) Find the area of a square each of whose side 7.5 m.

Ans -

c) The area of a square field is 64 sq. m. Find the perimeter of the field.

Ans -

d. Find the area of a rhombus, the lengths of whose diagonals are 16 cm and 28 cm.

Ans -

e) Find the area of a parallelogram whose base 12 cm and height 6.5 cm.

f) Find the height of a parallelogram whose area is 54 $cm^2$ and the base is 12 cm.

g) Find the area of a triangle whose base is 24 cm and height is 15 cm.

h) Find the area and perimeter of an equilateral triangle whose each side is 4 cm.

i) The area of an equilateral triangle is $2\sqrt{3}$ $cm^2$. Find the length of each side of the triangle.

j) Find the circumference of a circle of diameter 21 cm.

k) Find the area of a circle of radius 4.9 cm.

l) Find the circumference of a semi-circle of radius 7 cm.

m) Find the area of a right triangle in which height is 7 cm and hypotenuse is 25 cm.

**6. Long answer type questions : (3/4 - Marks)**

a) Find the area of a rectangular field in hectares whose sides are 250 m and 200m.

**Solution :** Given length of the rectangular field = 250 m. Breadth of the rectangular field = 200 m. We know that the area of the rectangular field = Length × Breadth

$= (250 \times 200)\ m^2$

$= 50000\ m^2$

$= 5$ hectares [ $\because$ $10000\ m^2 = 1$ hectare]

$\therefore$ The area of the rectangular field is 5 hectares.

b) A wall tile measures 10cm × 12cm. How many tiles will be required to cover a wall of size 3m × 4m? Find the total cost of the tiles of the rate of ₹ 15 per tile.

Ans -

c) A rectangular field measuring 40 m by 25 m is to be surrounded externally by a path which is 2m wide. Calculate the cost of levelling the path at the rate of ₹10 per square meter.

Ans -

d) The area of a square is 36 $cm^2$. Find the area of the square obtained by joining the midpoints of the sides of the square.

Ans -

e) Find the area of a rectangular plot, one side of which measures 12 m and the diagonal is 37 m.

f) A square lawn is surrounded by a path 2 m wide. If the area of the path is 176 $m^2$, find the area of the lawn.

g) The base of a triangular field is three times its height. If the cost of cultivating the field at ₹3000 per hectare is ₹ 40,500. Find its base and height.

h) Find the area of an isosceles triangle having base 8 cm and length of each of the equal sides 5 cm.

i) Find the area of a right triangle whose base 3.5 m and hypotenuse 3.7 m.

j) The base of a parallelogram is thrice its height. If its area is 768 $cm^2$, find the base and the height.

k) Find the perimeter of a rhombus whose length of diagonals are 18 cm and 24 cm.

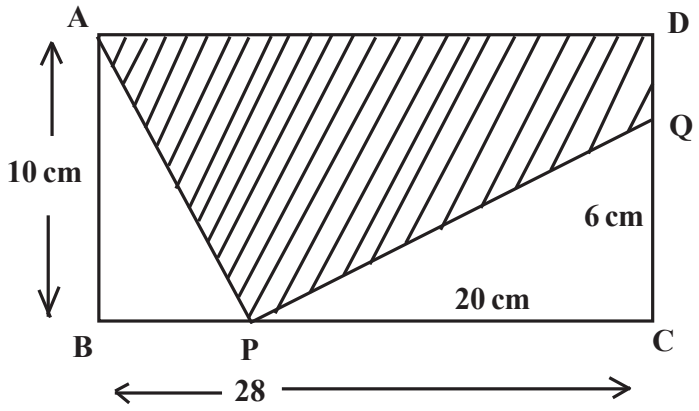
l) The diameter of a wheel of a car is 49 cm. Find the distance travelled by the car during the period in which the wheel makes 50 revolutions.

m) A racetrack is in the form of a ring whose inner circumference is 264 m and the outer circumference is 308 m. Find the area of the track and width of the track.

n) The areas of two circles are in the ratio 36 : 49. Find the ratio of their cicumferences.

o) The minute hand of a circular clock is 14 cm long. How far does the tip of the minute hand move in 30 minutes.

p) In the given figure, ABCD is a rectangle. Find the area of the shaded portion in the figure.



*Chapter - 12*

# Algebraic Expression

Algebraic expressions are formed from variables and constants. We use the operations of addition, subtraction, multiplication and division on the variables and constants to form expressions. For example, the expression 4xy + 7 is formed from the variable x and y and constant 4 and 7. The constant 4 and the variables x and y are multiplied to give the product 4xy and constant 7 is added to this product to give the expression.

**Terms of an expression**

Expressions are made up of terms. Terms are added to make an expression. For example, the addition of the terms 4xy and 7 gives the expression 4xy + 7.

A term is a product of factors. The term 4xy in the expression 4xy + 7 is a product of factors x, y and 4. Factors containing variables are said to be algebraic factors.

**Coefficients**

The coefficient is the numerical factor in the term. Sometimes anyone factor in a term is called the coefficient of the remaining part of them. Thus in 5xy, 5 is the coefficient of the term. It is also the coefficient of xy.

**Like terms and unlike terms**

Terms which have the same algebraic factors are like terms. Thus, term 4xy and -3xy are like terms.

Terms which have different algebraic factors are unlike terms. Thus, terms 4xy and –3x are not like terms.

**Monomials, Binomials, Trinomials and Polynomials**

Any expression with one or more terms is called a polynomial.

For example, the expression ab + b + 5, $3x^2$ - 5x + 2 are polynomial.

Any expression which contains two unlike terms is called a binomial. For example, x + y, m –5, mn + 6n are binomials.

Any expression with one term is called a monomial. For example, 5xy, –5xy etc. are monomial.

An expression which contains three terms is called a trinomial.

For example x + y + 7, ab–a – b, m + n –7 are trinomials.

**Adding and subtracting like terms**

The sum of two or more like terms is a like term with a numerical coefficient equal to the sum of the numerical coefficients of all the like terms.

Similarly, the difference between two like terms is a like term with a numerical coefficient equal to the difference between the numerical coefficients of the two like terms.

Unlike terms cannot be added or subtracted the way like terms are added or subtracted.

Thus the sum of $4x^2 + 5x$ and $2x + 3$ is $4x^2 + 7x + 3$; the like terms 5x and 2x add to 7x, the unlike terms $4x^2$ and 3 are left as they are.

When we add two algebraic expressions, the like terms are added as given above; the unlike terms are left as they are.

**Finding the value of an expression**

In situations such as solving an equation and using a formula, we have to find the value of an expression. The value of the expression depends on the value of the variable from which the expression is formed. Thus, the value of 9x–2 for x = 5 is 43, since 9 (5) –2 = 45–2 = 43.

**Perimeter formulas**

1. The perimeter of an equilateral triangle = 3 × the length of its side.
2. The perimeter of a square = 4 × the length of the side of the square.
3. The perimeter of a regular pentagon = 5 × the length of the side of the pentagon and so on.

**Area formulas**

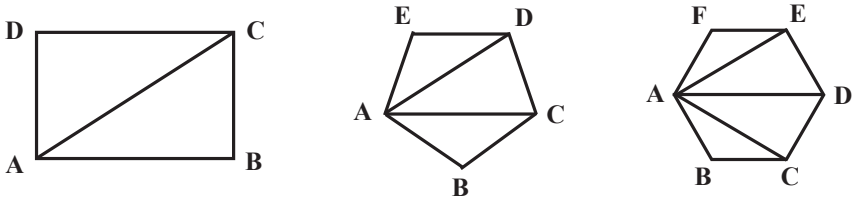
1. The area of the square = $l^2$, where $l$ is the length of a square.
2. The area of the rectangle = $l \times b$, where $l$ is the length of the rectangle and b is the breadth of the rectangle.
3. Area of the triangle = $\frac{1}{2}$ bh, where b stands for the base and h for the height of a triangle.

**Rule for number patterns**

The general nth term of a number pattern (or a sequence) is an expression in $n$. Thus the nth term of the number pattern 11, 21, 31, 41, ..... is $(10n + 1)$.

If a natural number is denoted by n, 2n is an even number and $(2n + 1)$ is an odd number.

**Pattern in geometry**




The number of diagonals we can draw from one vertex of a polygon of n sides is (n –3).

## Exercise - 12

**Very short answer type questions :** **(1-mark)**

1. What are the coefficients of y in the following expressions?

   a) 4x–7y  b) 8 + yz  c) 3y + x

Ans - a) Coefficient y is –7

2. Find the values of the following expressions for x = 4.

   a) x + 7  b) 20 –4$x^2$  c) 4x –7

Ans -

3. Subtract :

   a) –6$y^2$ from 2$y^2$  b) 3xy from –2xy  c) –3a from 4a

Ans -

4. Write the algebraic expressions in the following cases

   a) Subtract x from y,

   b) Number x and z both squared and added

   c) Product of numbers x and y subtracted from 5

Ans -

5. Find the value of the following expression for a = 2, b = 3

   a) 2a + b  b) a - 3b  c) 2a - 5b

6. Add and subtract

   a) 2m + 3n, m - n  b) 2mn + 7, 3mn + 5  c) 3xy + 4x, 7xy +6y

7. Classify the following expressions as a monomial, a binomial or a trinomial

   a) 2x – 3y  b) x + y – 6  c) 2xy

**Fill in the blanks :** **(1 mark)**

1. An expression with only one term is called a _____

Ans - An expression with only one term is called a monomial.

2. When terms have the same algebraic factors, they are _____ terms.
3. The nth term of the number patern 11, 21, 31, 41, ..... is _____
4. A symbol which takes various numerical values is known as _____
5. A symbol having fixed numerical value is called a _____
6. An algebraic expression containing three terms is called a _____
7. An algebraic expression containing two terms is called a _____
8. The number of diagonals we can draw from one vertex of a polygon of n sides is _____

**Which of the following statements are True (T) and which are False(F) :**

1. Any expression with one or more terms is called a polynomial. – T
2. The expression ($4x^2 – 3xy$) consists of three terms.
3. A variable can take various values.
4. Constant has a fixed value.
5. The number z multiplied by itself is 2z.
6. If we denote the length of a square by $l$, then the area of the square = 2 $l$.
7. The coefficient is the numerical factor in the term. -
8. The perimeter of a square = 4$l$, where $l$ = the length of the side of the square.

**Multiple choice questions (choose the correct answer) :** **(1 mark)**

1. An expression with one or more terms is called a

   a) binomial b) monomial c) trinomial d) polynomial

Ans - d) An expression with one or more terms is called a polynomial

2. An expression with only one term is called a

   a) polynomial b) binomial c) trinomial d) monomial

3. An expression which contains three terms is called a

   a) trinomial b) polynomial c) binomial d) monomial

4. Sum of the numbers a and b subtracted from their product is

   a) ab - a + b b) ab - (a + b)

   c) (a + b) - ab d) (a - b) - ab

5. Subtract : $(a - b)$ from $(a + b)$ is

a) $2b$ b) $2a$ c) $2(a + b)$ c) $2(a - b)$

6. The value of the expression $4x - 3$ for $x = -2$ is

a) -6 b) 11 c) -11 d) 6

7. The value of the expression $a^2 - b^2$ for $a = 5, b = 2$ is

a) 21 b) –21 c) 20 d) –20

8. If a natural number is denoted by n, then is $(2n + 1)$

a) an even number b) an odd number

c) a prime number d) a square number

**Short answer type questions :** **(2 marks)**

1. Add : $5x^2 - 7x + 3, -8x^2 + 2x - 5$ and $7x^2 - x - 2$

Ans - Required sum

$= (5x^2 - 7x + 3) + (-8x^2 + 2x - 5) + (7x^2 - x - 2)$

$= 5x^2 - 8x^2 + 7x^2 - 7x + 2x - x + 3 - 5 - 2$ (Collecting like terms)

$= (5 - 8 + 7)x^2 + (-7 + 2 - 1)x + (3 - 5 - 2)$ (Adding like terms)

$= 4x^2 - 6x - 4$

2. Subtract : $(2x^2 - 5x + 7)$ from $(3x^2 + 4x - 6)$

Ans -

3. Add : $(3x + 5y)$ and $(5x - 7y)$

Ans -

4. If $t = 5$, find the value of $t^3 - 10(t - 5)$

5. When $a = 1, b = -1$, find the value of the expression $a^3 - b^3$.

6. Find the value of the expression $5n^2 + 5n - 2$, when $n = 2$.

7. What should be added to $x^2 + xy + y^2$ to obtain $4x^2 - 5xy$?

**Long answer type questions :** **(3/4 marks)**

1. From the sum of $6x - 4y - 4z$ and $2x + 4y - 7$, Subtract the sum of $13x - 4y + 7z$ and $-6z + 6x + 3y$.

Ans - We first add $6x - 4y - 4z$ and $2x + 4y - 7$

$6x - 4y - 4z$

$2x + 4y \qquad -7$

$8x \qquad -4z \qquad -7$ ..... (i)

We then add $13x - 4y + 7z$ and $-6z + 6x + 3y$

$13x - 4y + 7z$

$6z + 3y - 6z$

$19x - y + z$ ..... ... (ii)

Now we subtract sum (ii) from the sum (i)

$8x \qquad -4z - 7$

$19x - y + z$

$(-) \qquad (+) \quad (-)$

$-11x + y - 5z - 7$

2. From the sum of $4 + 3x$ and $5 - 4x + 2x^2$, subtract the sum of $3x^2 - 5x$ and $-x^2 + 2x + 5$.

Ans -

3. What should be the value of $a$ if the value of $4x^2 + 5x - a$ is equal to 8, when $x = 1$.

4. Simplify the expression and find its value when $a = -2$ and $b = 3$,

$3a^2 - 5(a^2 + ab) + 7 + 4ab$

5. Take away $\left(\frac{8}{5}x^2 - \frac{2}{3}x^3 + \frac{3}{2}x - 1\right)$ from $\left(\frac{x^3}{5} - \frac{3}{2}x^2 + \frac{2}{3}x + \frac{1}{4}\right)$

6. What should be taken away from $y^3 - 3xy^2 - 4x^2y$ to obtain $2y^3 - 9xy^2 - 6x^2y - x^3$?

## *Chapter - 13*

# Exponents and Powers

The mass of Earth is 5, 970, 000,000,000,000,000,000, 000kg. The width of our Milky Way Galaxy from edge to edge is 946,000,000,000,000,000 km. Can you read these number?

These very large numbers are difficult to read, understand and compare. To make these numbers easy to read, understand and compare, we use exponents.

**Exponents**

The short notation $10^4$ stands for the product $10\times10\times10\times10$. Here '10' is called the base and '4' the exponent. The number $10^4$ is read as 10 raised to the power of 4. $10^4$ is called the exponential form of 10,000.

**Laws of exponents**

Numbers in exponential form obey certain laws which are as follows :

For any non-zero integers *a* and *b* and whole numbers *m* and *n*,

i) $a^m \times a^n = a^{m+n}$

ii) $a^m \div a^n = a^{m-n}$, $m > n$

iii) $(a^m)^n = a^{mn}$

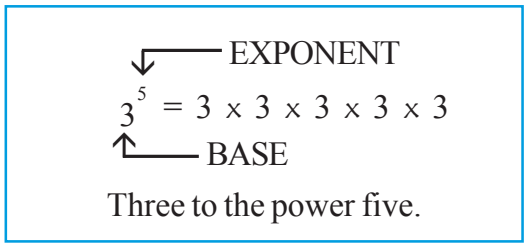
iv) $(ab)^m = a^m b^m$

v) $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$

vi) $a^o = 1$

vii) $(-1)^{\text{even number}}$

viii) $(-1)^{\text{odd number}}$




**Few examples of numbers in exponential form with respect to different bases :**

| Expression | Base | Exponent | Meaning |
|---|---|---|---|
| $3^2$ | 3 | 2 | 3 x 3 |
| $5^2$ | 5 | 2 | 5 x 5 |
| $7^3$ | 7 | 3 | 7 x 7 x 7 |
| $13^1$ | 13 | 1 | 13 |
| $(-6)^2$ | -6 | 2 | (-6) x (-6) |
| $x^4$ | x | 4 | x x x x x x x |
| $x^n$ | x | n | x x x x....upto n factors |

## Exercise - 13

**1. Fill in the blanks :** **(1 mark)**

a) $2^{10} \times 2^8 = 2$

b) $(3^2)^{\circ}$ = .....

c) $(-1)^{19}$ = .....

d) If $2^x = 8$, then x = .....

e) $8 \div \left(\frac{1}{2^4}\right)^{\circ}$ = .....

f) $4^6 \div 4^8$ = .....

g) $(9^{\circ} - 7^{\circ}) \times (9 + 7)$ = .....

h) $(-1)^{100}$ = .....

i) $(25)^4 \div 5^5$ = .....

j) $[(5^2)^3 \times 5^4] \div 5^7 =$ .....

**2. Answer True (T) or False (F) :** **(1 mark)**

a) $(3^6)^2 = 3^{36}$

b) $10 \times 10^{11} = 100^{11}$

c) $2^3 < 7^2$

d) $2^2 \times 3^3 = 6^5$

e) $7^O = (100)^O$

**3. Multiple choice questions (MCQs) :** **(1 mark)**

a) Which of the following statement is true?

i) $4^3 > 3^4$ ii) $2^2 + 3^2 = (2+3)^2$

iii) $3^5 < 5^3$ iv) $2^8 > 8^2$

b) $16^2$ as a power of 2 is

i) $2^6$ ii) $2^8$ iii) $2^4$ iv) $2^{16}$

c) Simplify : $(2^4 \times 2^5) \div (2^2 \times 2^3)$.

i) 214 ii) 16 iii) 32 iv) $\frac{1}{2^4}$

d) If $3^n = 27$, then $3^{n-2}$ equals :

i) 3 ii) 0 iii) 1 iv) 9

e) The value of $(5^2 - 4^2) \times \frac{1}{3^2}$ is equal to

i) 1 ii) 0 iii) –1 iv) $\frac{1}{3}$

f) If x = 2 and y = 3, the value of $\left(\frac{1}{x^x} + \frac{1}{y^y}\right)$ is

i) $\frac{31}{108}$ ii) $\frac{31}{108}$ iii) $\frac{125}{171}$ iv) $\frac{153}{222}$

g) $0.00003 \times 10^6$ is

i) greater than 1 ii) less than 1

iii) between 0 and 1 iv) none of these.

h) $(4^3)^4 \div (4^2)^3 \times (4^5)^0 =$ .....

i) $6^4$ ii) $4^6$ iii) $2^6$ iv) $6^2$

i) The value of x in $2^{x+2} = 256$ is

i) -6 ii) 6 iii) 4 iv) 0

j) The value of $7^0 + 8^0 - 9^0$ is

i) -1 ii) 2 iii) 1 iv) 0

**4. Very short answer type questions : (1 mark)**

a) Express 128 as a power of 2.

Ans -

b) Express the prime factorisation of 300 using exponents.

Ans -

c) Find the value of $2^2 + 3^3 + 4^3$

Ans -

d) Express $2 \times \mathbf{2} \times a \times a$ in the exponential form.

e) Which one is greater $2^{10}$ or $10^2$?

f) Find the value of $5^4$.

g) Write $(-5m)^3$ in the exponential form.

h) Write 4,985 in the standard form.

i) Find the value of $(5^{-1} \times 3^{-1})^{-1}$

j) Evaluate : $\left(\frac{-2}{3}\right)^3$

**5. Short answer type questions : (2 marks)**

a) Simplify : $(-3) \times (-2)^5$

Ans : $(-3) \times (-2)^5 = (-3) \times (-1)^5 \times 2^5 = (-3) \times (-1) \times 32 = 3 \times 32 = 96$

b) Write 120719 in the expanded form.

Ans :

c) Express 3908.78 in the standard form.

Ans :

d) Find the number from the expanded form of $7 \times 10^4 + 2 \times 10^2 + 3 \times 10^1$

e) Write in the standard form : The distance between Earth and Saturn is about 1,600,000,000 km.

f) Find $x$, so that $\left(\frac{3}{5}\right)^3 \times \left(\frac{3}{5}\right)^{-6} = \left(\frac{3}{5}\right)^{2x-1}$

g) Simplify : $(-2)^3 \times (-10)^3$

h) Express $\frac{81}{256}$ in the exponential form.

i) Prove that $a^0 = 1$

j) Expand : $\left(\frac{-3}{7}\right)^4$

**6. Long answer type questions :** **(3/4 marks)**

a) Compare the numbers : $2.7 \times 10^{12}$; $1.5 \times 10^8$

$2.7 \times 10^{12} = 2.7 \times 10^4 \times 10^8 = 27 \times 10^3 \times 10^8 = 27000 \times 10^8$

$1.5 \times 10^8$

$\because$ $27000 > 1.5$

$\therefore$ $27000 \times 10^8 > 1.5 \times 10^8$

**i.e.** $2.7 \times 10^{12} > 1.5 \times 10^8$

b) Simplify : $\left(\frac{2^4 \times 3^5 \times 8}{3^3 \times 18}\right)$ and write the result in exponential form.

Ans :

c) Simplify : $\frac{5^4 \times 7^5 \times 2^9}{8 \times 49 \times 25}$

d) Express $384 \times 147$ as a product of prime factors only in exponenetial form.

e) Simplify : $\frac{2^5 \times 3^4 \times 16}{3^2 \times 64}$

## *Chapter - 14*

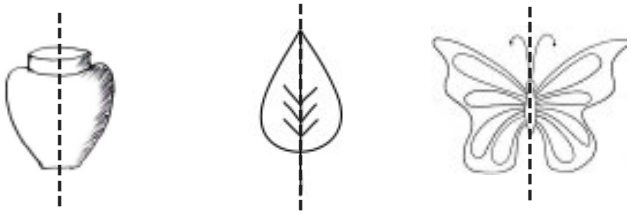
# Symmetry

Something is symmetrical when it is the same on both sides. A shape has symmetry if a central dividing line can be drawn on it, to show that both sides of the shape are exactly the same.

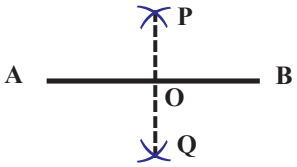
Each of the following capital letters of the English alphabet are symmetrical about the dotted line which is the axis of symmetry.

A, B, C, D, E, H, M, O, T, V, W, X, Y

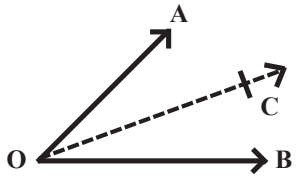
- The following pictures show some man made objects, some found in nature which are symmetric.



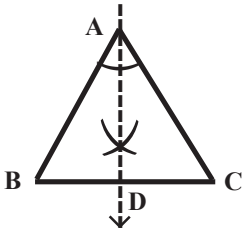
- A line segment AB is symmetrical about its perpendicular POQ bisector.



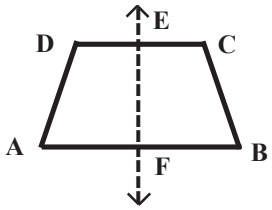
- A given angle $\angle AOB$ having arms OA and OB is symmetrical about the bisector OC.



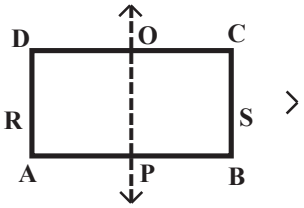

- A isosceles triangle is symmetrical about the bisector of the angle included between the equal sides.



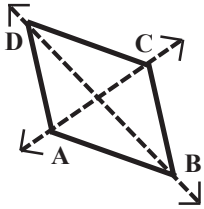

- Let ABCD be an isosceles trapezium in which AB || DC and AD = BC. Let E and F be the midpoints of AB and DC respectively. Then, trap. ABCD is symmetrical about EF.



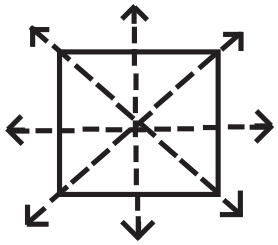

- A rectangle has two lines of symmetry, each one of the which is the line joining the midpoints of opposite side.



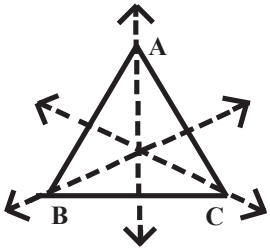

- A rhombus is symmetrical about each one of its diagonals.



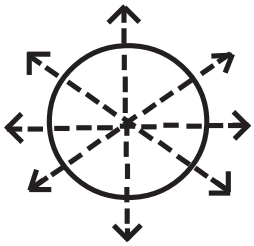
- A squre has 4 lines of symmetry, namely, the diagonals and the lines joining the midpoints of its opposite sides.



- An equilateral triangle is symmetrical about each one of the bisectors of its interior angles.




- A circle is symmetrical about each one of its diameters.



**Rotational Symmetry**

The Rotational symmetry of a shape explains that when an object is rotated on its own axis or rotated around a centre point, the shape of the object looks the same. Many geometrical shapes appear to be symmetrical when they are rotated 180 degrees or with some angles, clockwise or anticlockwise.

For an object that has rotational symmetry, the fixed point around which the rotation occurs is called the centre of rotation and the angle of turning during rotation is called the angle of rotation.

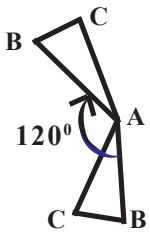
**To describe a rotation fully you need to give the–**

i) Centre of rotation i.e., the point about the object is turning or rotating.

ii) Angle of rotation.

iii) Direction of rotation (clockwise or anticlockwise).

The given picture shows the clockwise rotation of a triangle ABC through $120^0$ about a centre of rotation "A". After a rotation the pre-image and the image are congruent.




**Order of Rotational symmetry**

The number of positions in which a figure can be rotated and still appears exactly as it did before the rotation, is called the order of symmetry.

## Exerciese - 14

**Choose the correct answer :** **(1 mark)**

1) A scalene triangle has–

   a) No line of symmetry. b) One line of symmetry.

   c) Two line of symmetry. d) Three line of symmetry.

2) A rectangle is symmetrical about–

   a) Each one of its sides. b) Each one of its diagonals.

   c) A line joining the mid points of its opposite sides.

   d) None of these.

3) Which of the following alphabet has vertical line of symmetry?

   a) M b) B c) Q d) E

4) Which of the following shapes does not have a rotational symmetry?

   a)  b)  c)  d) 

7) The order of rotational symmetry for the given flower is :

   a) 4 b) 6

   c) 8 d) 2

**Which of the following statements are True (T) and which are False (F) :** **(1 mark)**

6) A parallelogram has no line of symmetry.

7) A square has four lines of symmetry.

8) English alphabet 'S' has one line of symmetry.

9) An equilateral triangle has a rotational symmetry of order 3.

10) A rectangle is symmetrical about each one of its diagonals.

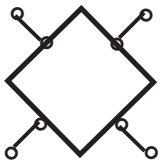
**Fill in the blanks :** **(1 mark)**

11) There are _____ lines of symmetry in an isosecles triangle

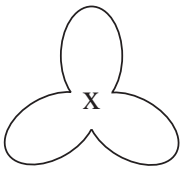
12) The letter 'H' has _____ lines of symmetry.

13) The square has a rotational symmetry of order _____.

14) The number of lines of symmetry of the given figur is _____.



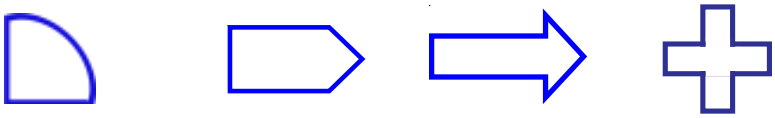
15) The given figure has rotational symmetry of order_____




**Short answer type questions :** **(2 marks)**

16) Write two letters of the English alphabet which have two lines of symmetry and rotational symmetry of order 2.

17. Draw the line of symmetry of each of the following figures :



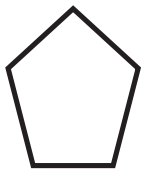
i) ii) iii) iv)

18) Give an example of a figure that has a line of symmetry but does not have rotational symmetry.

19) State the order of rotational symmetry of the following figures :

Equilateral triangle

(i)



Regular pentagon

(ii)

20) What letters of the English alphabet have reflectional symmetry about a vertical mirror.

**Long answer type questions :** **(3/4 marks)**

21) Complete the following table :

| English Alphabet Letter | Line of Symmetry | Number of Lines of Symmetry | Rotational symmetry | Order of rotational symmetry |
|---|---|---|---|---|
| N | Nil | 0 | Yes | 2 |
| A | | | | |
| X | | | | |
| I | | | | |
| F | | | | |
| M | | | | |
| S | | | | |

*Chapter - 15*

# Visualising Solid Shapes

The circle, the square, the triangle, the rectangle, the quadrilateral etc are the example of plane figures. Plane figures are of two-dimensions (2-D)

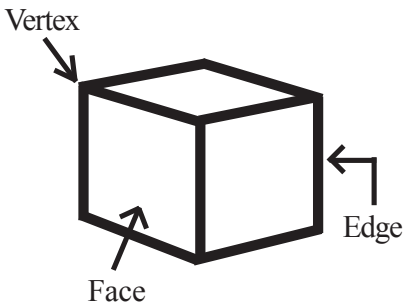
Triangle Quadrilateral Circle Square

The cuboid, the sphere, the cylinder, the cone, the pyramid etc. are examples of solid shapes. The solid shapes are of three dimension (3-D)

Cuboid Cube Sphere Cylinder Cone Pyramid

**Vertices, edges and faces :**

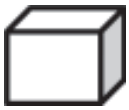
The corners of a solid shape are called vertices. The line segments of the skeleton are edges and its flat surfaces are called its faces.

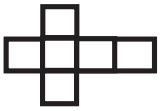


**Nets for building 3-D shapes :**

A net is a skeleton outline of a solid that can be folded to make it. Solid shapes can be drawn on a flat surface. We call this 2-D representation of a 3-D solid.

i) Cube





Net of Cube

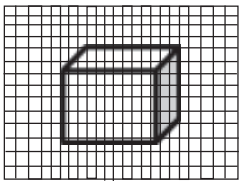
ii) Cone

Net of Cone

**Sketches of solid**

**i) Oblique sketch**

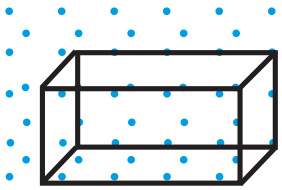
It is sketch, that does not have proportional length.



Oblique Sketch

**ii) Isometric sketch**

It is drawn on an isometric dot paper and the measurements are kept proportional.

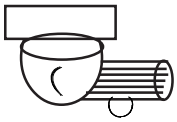


Isometric Sketch

**Viewing different sections of a solid and**
**Views from front, side and top**

A solid can be viewed in many ways, For example by slicing

Slicing

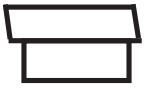


Shadow

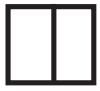
2-D shadow play front view, sideview, top view etc.

Building

Front



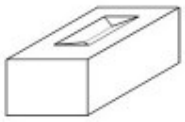
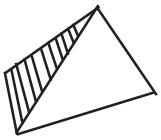
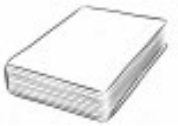
Side View



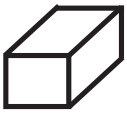
Top View

## Exercise - 15

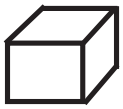
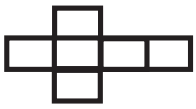
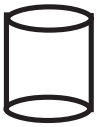
**1. Name the geometrical shapes :** **(Mark- 1)**

| | Objects | Geometrical shape |
|---|---|---|
| **Example** |  Brick | Cuboid |
| i) |  Ball | ..... |
| ii) |  Ice cream | ..... |
| iii) |  Pipe | ..... |
| iv) |  Sculpture | ..... |
| v) |  Bowl | ..... |
| vi) |  Book | ..... |
| vii) |  Dice | ..... |

**2. Complete the following tables. :** **(Marks - 2)**

| | Figures | Nos. of Faces | Nos. of Vertices | Nos. of edges |
|---|---|---|---|---|
| Example |  | 4 | 4 | 6 |
| i) |  | | | |
| ii) |  | | | |
| iii) |  | | | |
| iv) |  | | | |

**3. Make the nets of the following solids :** **(Marks - 2)**

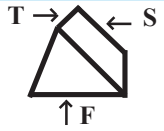
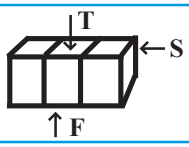
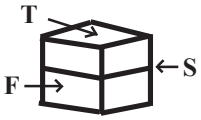
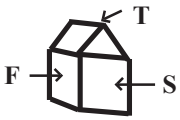
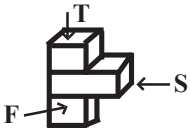
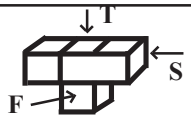
| | Figure | Nets |
|---|---|---|
| Example |  |  |
| i) |  | |
| ii) |  | |
| iii) |  | |

| | Figure | Nets |
|---|---|---|
| iv) |  | |
| v) |  | |

**4. Draw shadows of the following 3-D objects.** **(Marks - 2)**

| | Figure | Nets |
|---|---|---|
| **Example** |  Sphere |  |
| i | Cone | |
| ii | Cube | |
| iii | Prism | |
| iv | Cylinder | |
| v | Cuboid | |

5. **Draw the three views of the given solids.** **(Marks - 3)**

| | Solid | Frong Vies | Top View | Side View |
|---|---|---|---|---|
| |   |  |  |  |
| i) |   | | | |
| ii) |   | | | |
| iii) |   | | | |
| vi) |   | | | |
| v) |   | | | |

6. **Match the Column A with Column B.** **(Marks - 5)**

| | A | B |
|---|---|---|
| i) |  | a) Prism |
| ii) |  | b) Cylinder |
| iii) |  | c) Cone |
| iv) |  | d) Cube |
| v) |  | e) Rectangle |
| | | f) Sphere |

## Sample Question

**Class - VII**
**Subject - Mathematics**
**Half-Yearly Examination**

**Time - 3 hours** **Full Marks - 100**

**Group - A** **(20 Makrs)**

**1. Answer the following questions :** **2×5=10**

i) Choose the largest number : 113, 92, 156

ii) Divide : $99 \div 11$

iii) Which one is smaller : $\frac{1}{9}, \frac{2}{9}$

iv) Fill in the gap : $13 + 7 + 10 = 10 + 13 +$ _____

v) Multiply : $2.5 \times 0.4$

**2. Fill in the blanks :** **3×2=6**

i) _____ , 27, 28, _____ , _____ , 31

ii) _____ , _____ , 50, 52, _____ , 56

**3. Match the column :** **4×1=4**

| **A** | **B** |
|---|---|
| i) $5 \times 4$ | a) 21 |
| ii) $3 \times 7$ | b) 20 |
| iii) $8 \times 5$ | c) 27 |
| vi) $9 \times 3$ | d) 40 |

**Group - B** **(40 Marks)**

**Answer the following questions :** **1×10=10**

4. Find the mean of the following numbers

1, 2, 3, 4, 19, 11, 2

5. Additive inverse of -2 is–

i) –2 ii) 2 iii) $\frac{1}{2}$ iv) 0

6. Find the value : $\frac{2}{3}$ of a day.

7. Fill in the blank : If two angles are complementary, the sum of their measures is _____

8. Fill in the blank : $3 - (-3) =$ _____

9. Solve : $6x = 30$

10. The mode of 1, 2, 3, 5, 3, 3, 0, 1 is

    i) 1 ii) 5 iii) 0 iv) 3

11. Reciprocal of $\frac{1}{3}$ is 3 (True / False)

12. Write True / False : $\frac{3}{5} \times \frac{7}{8} = \frac{22}{35}$

13. Find the correct answer :

    i) AB is a line segment.

    ii) AB is a line.

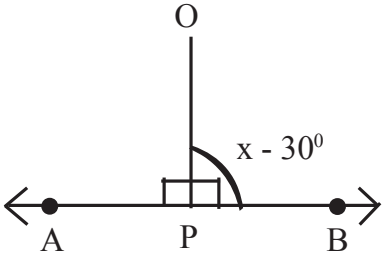
    iii) AB is a ray.


**Answer the following questions :** **2×9=18**

14. Find the sum : $\frac{3}{5} + \frac{7}{5}$

15. Solve : $3x + 1 = 10$

16. In the given figure $OP \perp AB$ find the value of $x$.

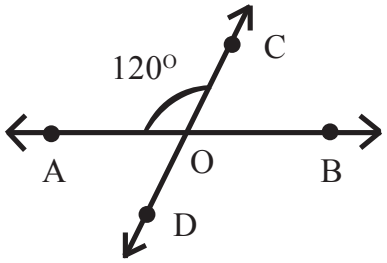



17. Write the following statement as an equation. If you add 5 to x, you get 11.

18. In the given figure lines AB and CD intersect each other at O.

If $\angle AOC = 120^O$, find

$\angle AOD$ and $\angle BOD$.




19. Find the value of $\frac{3}{5}$ of 200 kg.

20. Write the given numbers in ascending order : 0, –2, 2, –5

21. Find the product : $\frac{5}{3} \times \frac{18}{10}$

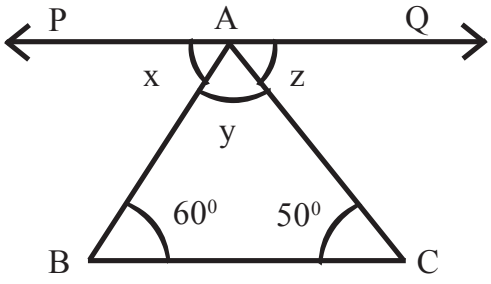
22. Find the range of the following numbers : 3, 1, 2, 10, 7

**Answer the following questions :** **3×4=12**

23. Difference of two numbers is 27. If larger number is 17, find the smaller number.

24. From the figure find *x, y* and *z*.

Given PQ || BC.




25. The rainfall (in mm) in a city on 7 days of a certain week was recorded as follows :

| Day | Mon | Tue | Wed | Thurs | Fri | Sat | Sun |
|---|---|---|---|---|---|---|---|
| Rainfall (in mm) | 0.0 | 12.2 | 2.1 | 0.0 | 20.5 | 5.5 | 1.0 |

i) Find the range of the rainfall.

ii) Find the mean rainfall for the week.

iii) On which day was the rainfall maximum?

26. Lipika reads a book for $1\frac{3}{4}$ hours everyday. She reads the entire book in 6 days. How many hours in all were required by her to read the book?

**Group - C** **(40 Marks)**

**Answer the following questions :** **1×6=6**

27. Choose the correct answer :

The number of lines of symmetry in an equilateral triangle is

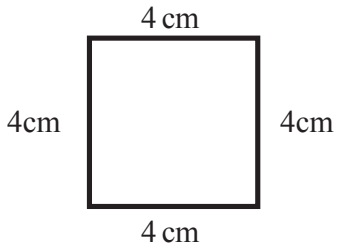
i) 4 ii) 1 iii) 3

28. Area of a circle is $\pi \times (\text{radius})^2$. (True / False)

29. Anima reads $\frac{2}{5}$ part of a book which contains 55 pages. Find the number of pages she reads.

30. Area of a square is .....

31. Find the perimeter of the square given below :




32. Solve : $4(m+3) = 18$

**Answer the following questions :** **2×5=10**

33. Multiply : $\frac{5}{8}$ of $3\frac{5}{6}$

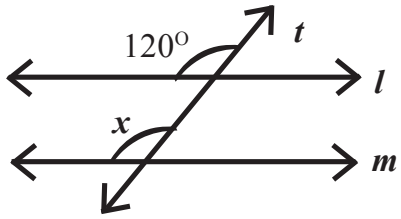
34. The perimeter of a square is 44 cm. Find the area of the square.

35. Find the product : $(-1) \times (-1) \times (-1) \times (-1)$

36. Write the equation :

If you add 3 to one-third of $x$, you get 30.

37. If $l \parallel m$ and $t$ is a transversal, find $x$.



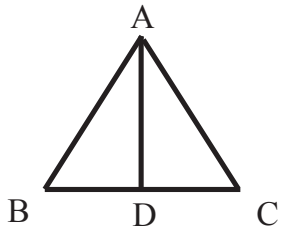
**Answer the following questions :** **3×4=12**

38. Find the median of the following observations :

    8, 5, 1, 3, 9, 2, 7

39. If the circumference of a circle is 154 m, find the area of the circle.

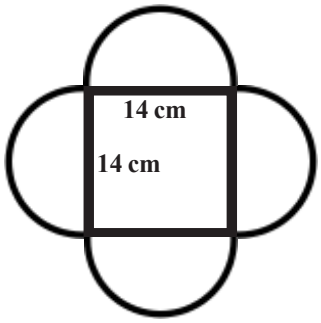
40. In the given figure AB = AC and D is the mid-point of BC. Prove that $\Delta ABD \cong \Delta ACD$.



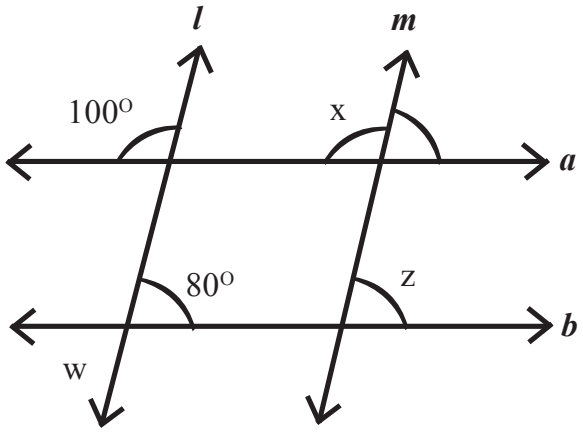

41. Solve : $4 + 5(p - 1) = 34$

**Answer the following questions :** **4×3=12**

42. Find the perimeter of the given shape.




43. In the given figure $l \parallel m$, find x, y, z and w and $a \parallel b$.




44. A wire is in the shape of a rectangle. Its length is 40 cm and breadth is 22 cm. If the same wire is rebent in the shape of a square, what will be the measure of each side. Also find which shape encloses more area?

## Sample Question

**Class - VII**

**Subject - Mathematics**

**Annual Examination**

**Time - 3 hours** **Full Marks - 100**

**Group - A** **(20 Makrs)**

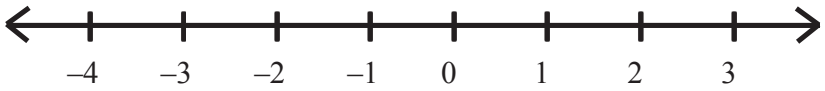
**1. Answer the following questions :** **2×5=10**

i) Which of the following products is an odd numbers :

a) $9 \times 2$ b) $5 \times 3$ c) $15 \times 4$ d) $3 \times 20$

ii) Which one is smaller : $\frac{3}{7}, \frac{5}{7}, \frac{1}{7}$

iii) Find the negative numbers from the number line given below :




iv) Fill in the gaps : $3 \times 5 \times$ ____ = ____ $\times 5 \times 1 = 30$

v) Multiply : $1.5 \times 0.5$

**2. Answer the following questions :** **3×2=6**

**Fill in the blanks :**

i) 107, 110, ____, ____, 119, 122, ____

ii) 45, 43, ____, ____, 37, ____

**3. Match the columns :** **4×1=4**

| **A** | **B** |
|---|---|
| i) $3 \times 9$ | a) 21 |
| ii) $5 \times 4$ | b) 4 |
| iii) $20 \div 5$ | c) 20 |
| iv) $3 \times 7$ | d) 27 |

**Group - B** **(40 Marks)**

**4. Answer the following questions :** **1×10=10**

i) The greatest angle of a right angled triangle is

a) $120^{O}$ b) $180^{O}$ c) $90^{O}$ d) $60^{O}$

ii) Which is not the condition for two traingles to be congruent -

a) RHS b) SAS c) AAA d) ASA

iii) Find the least form of the ratio ₹ 5 : 80 paise.

iv) Express 0.3 in percentage.

v) –1 is a rational number, True or False.

vi) What is the co-efficient of $x^2$ in the expression $3 - x + 2x^2$

vii) Add : $\frac{2}{7} + \frac{5}{7}$

viii) Which one is greater : $\frac{1}{3}, \frac{5}{3}$ ?

ix) A cube has 8 edges. (True / False)

x) **Fill in the blank :**

The sum of three angles of a triangle is .....

**5. Answer the following questions :** **2×9=18**

i) Write two rational numbers betwen $\frac{1}{9}$ and $\frac{5}{9}$

ii) Find the sum : $2x^2 + (-x^2) - (-3x^2)$

iii) Find the value of $(x - y)^2$, when $x = 5, y = -1$

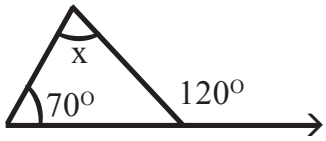
iv) What do you mean by 3% profit.

v) Fill in the box with appropriate symbol from $>, =, <$ : 0 ☐ $\frac{-1}{5}$

vi) Is it possible to form a triangle with angles $30^0, 60^0, 80^0$?

vii) Find the value of $\frac{2}{5} \div \frac{1}{2}$

viii) Find the value of $x$ from the given figure.




ix) Find the value of $2\frac{1}{3} - 1\frac{1}{5}$

**6. Answer the following questions :** **3×4=12**

i) If 250 marbles are divided to Anish and Manish in the ratio 3 : 2, how many marbles will each get?

ii) In an examination Manisha obtained 480 marks out of 600 marks. What percent of mark did she get?

iii) One angle of a triangle is $40^O$ and the remaining two angles are in the ratio 3 : 4. Find the remaining two angles.

iv) Add : $x + y - z,\ x - y + z,\ y + z - x$

**Group - C** **(40 Marks)**

**7. Answer the following questions :** **1×6=6**

i) $a^m \div a^n =$ _____?

ii) What are number of altitudes of a triangle?

iii) Subtract : $\frac{-2}{3}$ from 1

iv) Convert $\frac{1}{25}$ to percents.

v) Find the value of $\frac{-1}{7} \times \frac{-21}{3}$

vi) Each angle of an equilateral triangle is .....

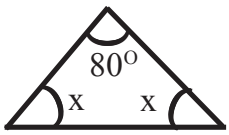
**8. Answer the following questions :** **2×5=10**

i) Find the value of $2 \div (3^O + 5^O)$

ii) If x : y = 2 : 3 and y : z = 5 : 4, find x : z.

iii) Subtract : $2x^2 - 15$ from $-x^3 + 5$

iv) From the given figure
find the value of x.




v) If a, b and c represent the number of faces, edges and vertices of a cube, find the value of a - b + c.

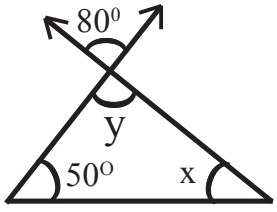
**9. Answer the following questions :** **3×4=12**

i) Represent $\frac{-1}{3}$ and $\frac{2}{5}$ on the number line.

ii) Find the simplest value : $\frac{25 \times 5^2 \times t^8}{10^3 \times t^4}$

iii) What should be taken away from $3x^2 - 4y^2 + 5xy + 20$ to obtain $-x^2 - y^2 + 6xy + 20$?

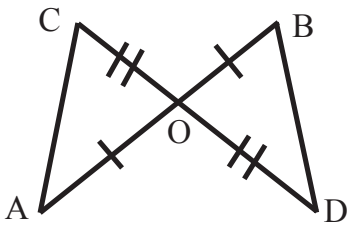
iv) From the given figure
find the value of x and y.



**10. Answer the following questions :** **4×3=12**

i) An item was sold for ₹ 570 at a loss of 5%. What was its cost price?

ii) In the given figure
OA = OB and OC = OD
Prove that AC = BD.




iii) Construct a triangle PQR, given PQ = 3 cm, PR = 5.5 cm and $\angle PQR = 60^{O}$

# Answer Sheet

## Exercise–1 (Integers)

**1.** ii) 1, iii) –7, iv) 5, v) a, vi) 0, vii) undefined, viii) $-7 < 0$

**2.** ii) F, iii) T, iv) F, v) T, vi) F, vii) T ;

**3.** (i) (a), (ii) (b), (iii) (b), (iv) (a), (v) (a) ;

**4.** ii) $\frac{1}{5}$, iii) –11, iv) 1, v) 300 ;

**5.** ii) Smallest = –11, Largest = 7 ; iii) 25, iv) 390, v) –13

**6.** ii) –73500, iii) (a) (iii), (b) (iv), (c) (i), (d) (ii); iv) ₹72,
v) $32^{O}$C, vi) 1300 km, vii) 83, viii) 92.

## Exercise–2 (Fractions and Decimals)

**1.** i) T, ii) T, iii) F, iv) T, v) T, vi) F, vii) F, viii) F

**2.** i) $\frac{3}{7}$, ii) $\frac{1}{3}$, iii) $\frac{3}{4}$, iv) $\frac{1}{2}$, v) $\frac{1}{8}$

**3.** i) $\frac{3}{4}$, ii) $\frac{4}{5}$, iii) 1, iv) 1, v) 5.13

**4.** i) Multiplication, ii) 20, iii) 1, iv) 0.053, v) 5, vi) 72, vii) 40, viii) $\frac{5}{73}$, ix) 0.17, x) 1000

**5.** i) 1, ii) $\frac{49}{60}$, iii) 18, iv) $4\frac{1}{5}$, v) 6.6, vi) 0.02361, vii) $159\frac{3}{8}$, viii) $5\frac{5}{342}$

**6.** i) 15 km, ii) 5 nos., iii) 5 hrs iv) $8\frac{8}{9}$ kg, v) 1968.75 $m^2$,

vi) (a) 0.3853, (b) 0.000378; vii) 8.2, viii) 29.1 cm, ix) 68.89 $cm^2$,

x) 61986.3, xi) 0.3552, xii) $101.01 \times 0.01$, xiii) $\frac{275}{282}$, xiv) $2\frac{4}{5}$

## Exercise–3 (Data Handling)

1. (d) 2. (a) 3. (a) 4. (c) 5. (b) 6. (c) 7. T 8. F 9. F 10. T 11. F
12. 3 13. 5.6 14. 153 15. 10 16. 58 17. 149 cm 18. 42 years 19. 14
20. 10 21. $\frac{2}{5}$ 22. 20 23. 34 24. 49 27. (i) A (ii) B (iii) A (iv) C (v) A.
28. (i) Unlikely (ii) Likely (iii) Likely. 29. (i) $\frac{15}{32}$ (ii) $\frac{1}{4}$ (iii) $\frac{1}{8}$ (iv) $\frac{3}{32}$ (v) $\frac{1}{32}$
(vi) $\frac{1}{32}$

## Exercise–4 (Simple Equations)

**1.** a) 13, b) –77, c) 42, d) 0, e) Solution;

**2.** a) F, b) T, c) T, d) F, e) F

**3.** a) (i) $\frac{3}{4}t = 15$, (ii) $7m+7=77$, (iii) $\frac{1}{4} \times -4 = 4$, (iv) $6x - 5 = 7$, (v) $8-3x=2$

b) (i) Three-fifth of p is 6, (ii) 2 is subtracted from 4 times of y give 18,
(iii) The sum of three times of $x$ and 4 is 25 ; c) (i) –3, (ii) – 4

**4.** a) (iv), b) (iii), c) (iii), d) (ii), e) (iii), f) (iv), g) (iii), h) (iv), i) (ii), j) (i)

**5.** a) (i) –2, (ii) $\frac{9}{20}$, (iii) 10, (iv) $\frac{1}{2}$, (v) –1

b) (i) 26, 27 (ii) 6, (iii) 35 years, (iv) 45 kg, (v) $112^o, 68^o$

**6.** a) 20, b) $\frac{-6}{5}$ c) $\frac{64}{31}$ d) Sachin : 132 runs, Rahul : 66 runs; e) 50 m., 25 m.

## Exercise–5 (Lines and Angles)

**1.** a) $360^{O}$, b) Vertically opposite angles, c) $90^{O}$, d) $180^{O}$, e) equal, f)$180^{O}$, g) $15^{O}$

**2.** a) F, b) F, c) T, d) F, e) T, f) T, g) T, h) F, i) F, j) F;

**3.** a) $60^{O}$, c) $135^{O}$, d) $74^{O}$, e) $34^{O}$ ;

**4.** (i) (b), (ii) (a), (iii) (c), (iv) (a), (v) (c) ;

**5.** a) $120^{O}$, b) $92^{O}$, c) $71^{O}$, $109^{O}$; d) $29^{O}$, $119^{O}$; e) $20^{O}$ ;

**6.** a) $60^{O}$, b) $135^{O}$, c) $50^{O}$, $145^{O}$, $35^{O}$ ; d) $70^{O}$, $110^{O}$, $70^{O}$;
e) (a) (ii), (b) (iii), (c) (iv), (d) (i)

## Exercise–6 (Triangle)

**Very short answer type questions :**

2. 3, 3. (a) $110^{O}$, (b) $120^{O}$, (c) $90^{O}$; 4. (a) $60^{O}$, (b) $40^{O}$, (c) $50^{O}$,
5. $60^{O}$, 6. hypotenuse, 7. $\angle C = 80^{O}$, 8. $54^{O}$

**Fill in the blanks :**

2. 3, 3. $180^{O}$, 4. $60^{O}$, 5. greater than, 6. right angled, 7. equilateral triangle,
8. isosceles triangle, 9. interior opposite angles, 10. sum of the squares on the legs.

**Say True or False :**

2. F, 3. F, 4. T, 5. T, 6. T, 7. F, 8. T, 9. T, 10. F, 11. T

**MCQ :**

2. a, 3. b, 4. d, 5. a, 6. b, 7. b, 8. c, 9. a, 10. a

**Short answer type questions :**

2. $50^{O}$, 3. a) $30^{O}$, b) $50^{O}$ ; 4. a) Not possible, b) Possible,
5. 24 cm, 6. a) 10, b) 17 ; 7. $50^{O}$, 8. $52^{O}$, $78^{O}$, $50^{O}$ ; 9. $45^{O}$, $60^{O}$, $75^{O}$

**Long answer type questions :**

2. $40^{O}$, $60^{O}$, $80^{O}$ ; 3. $30^{O}$, $70^{O}$ ; 4. 26 m., 5. 16 m., 7. $45^{O}$, $75^{O}$, $60^{O}$

## Exercise–7 (Congruence of Triangle)

**1.** ii) Equal, iii) $80^0$, iv) Equal, v) $\angle BAC$, vi) PQ, vii) Exact, viii) $F_1 \cong F_2$

**2.** ii) F, iii) T, iv) F, v) F, vi) T, vii) T

**3.** ii) (a) , iii) (a), iv) (b), v) (a)

**4.** ii) RHS, iii) ASA, v) Yes, vi) 5 cm.

**5.** ii) AC=7 cm, DE=12 cm; iii) x=3, iv) a=10, b=$50^O$; v) $\Delta$RSP, SAS

**6.** ii) (a) PQ=PR, QM=RM, PM=PM; (b) SSS, iv) a) Yes, SAS;
b) Yes, v) Yes, by SAS criterion ;
vii) $\angle XPY = \angle ROQ$, XY= RQ, PX = OR, Yes, by RHS

## Exercise–8 (Comparing Quantities)

**1.** i) T, ii) F, iii) T, iv) F, v) T, vi) T, vii) F, viii) T

**2.** i) 2 : 1, ii) 6 : 1, iii) 6 : 1, iv) 1 : 10, v) 4 : 1

**3.** i) 60%, ii) 70%, iii) 85%, iv) $37\frac{1}{2}$ %, v) $53\frac{11}{13}$ %

**4.** i) 9%, ii) 200, iii) 450, iv) ₹ 5500, v ) ₹ 288

**5.** i) 95%, ii) ₹ 225.60, iii) ₹ 600, iv) ₹ 3840, v) ₹ 2016,
vi) 20%, vii) 20%, viii) 10%, ix) 4000; 6. (i) (b), (ii) (c),
(iii) (e), (iv) (a), (v) (d)

## Exercise–9 (Rational Numbers)

1. (c) 2. (d) 3. (c) 4. (c) 5. (a) 6. Smaller 7) $\frac{-3}{4}$ 8) Smaller 9. same 10. $\frac{-2}{3}$

11. false 12. true 13. true 14. true 15. false 16. $x = -20$ 17. $\frac{-60}{-80}$

18. $\frac{75}{-80}$ 19. $\frac{-14}{-30}, \frac{21}{45}$ 20. $\frac{-5}{3}$ 21. $\frac{7}{-8}$ 22. $\frac{9}{35}$ 23. $\frac{12}{4}, \frac{15}{5}$ 24. $\frac{-13}{18}$ 25. $1\frac{17}{65}$

26. $1\frac{1}{3}$ 27. $6\frac{2}{9}$ 28. $-1\frac{1}{15}$ 29. $25\frac{3}{5}$ 30. $4\frac{1}{2}$ 31. $\frac{-3}{4} < \frac{-7}{16} < \frac{5}{-12}$ 32. $\frac{3}{4} > \frac{2}{3} > \frac{-5}{6}$

33. $\frac{-11}{24}$ 34. $\frac{1}{21}$ 35. $\frac{-9}{5}, \frac{-8}{5}, \frac{-7}{5}, \frac{-6}{5}$ 36. $\frac{-5}{2}$ 37. $\frac{-11}{40}, \frac{19}{40}$ 38. $\frac{-1}{5}, \frac{-4}{5}$

39. $\frac{8}{25}$ 40. $\frac{8}{5}$

## Exercise–10 (Practical Geometry)

**Nil**

## Exercise–11 (Perimeter and Area)

**1.** a) Square, b) 4, c) Area, d) $\sqrt{2}$ , e) 2, f) Breadth, g) Breadth, h) 2, i) 3, j) $\sqrt{3}$ × side, k) Base, l) $\pi$, m) 2, n) radius, o) 2r;

**2.** a) F, b) T, c) F, d) T, e) F, f) T, g) T, h) F, i) T, j) T.

**3.** a) 9 cm, b) 4.5 sq. m, c) $3\sqrt{2}$ cm, d) 8 cm, e) 5 cm, f) 56 sq. cm, g) $\sqrt{3}$ sq. cm, h) 44 cm, i) 72 sq. cm, j) 36 cm

**4.** (a) (ii), (b) (iii), (c) (ii), (d) (iii), (e) (iii), (f) (ii), (g) (ii), (h) (iii), (i) (ii), (j) (ii);

**5.** a) 102 sq.m, b) 56.25 sq. m., c) 32 m., d) 224 sq. cm, e) 78 sq. cm, f) 4.5 cm, g) 180 sq. cm, h) $4\sqrt{3}$ sq. cm, 12 cm; i) 10 cm, j) 66 cm, k) 75.46 sq. cm, l) 36 cm, m) 84 sq. cm.

**6.** b) ₹ 1000, ₹ 15000; c) ₹ 2760, d) 18 sq. cm, e) 420 sq. m, f) 400 sq. m, g) 900 m., 300 m; h) 12 sq. cm, i) 4.2 sq. m, j) 48 cm, 16 cm; k) 60 cm, l) 77 m, m) 2002 sq.m, 7 m.; n) 6 : 7, o) 44 cm, p) 180 sq. cm

## Exercise–12 (Algebraic Expression)

**Very short answer type questions :**

1. a) –7, b) z, c) 3;
2. a) 11, b) –44, c) 9 ;
3. a) $8x^2$, b) –5xy, c) 7a
4. a) y – x, b) $x^2 + z^2$, c) 5 –xy;
5. a) 7, b) –7, c) –11
6. a) 3m+2n, m+4n ; b) 5mn+12, –mn+2;
7. 2x–3y binomial, x+y–6 trinomial, 2xy monomial

**Fill in the blanks :**

2. Like terms, 3. 10n + i, 4. Variable, 5. Constant, 6. Trinomial, 7. Binomial, 8. n – 3

**Say True or False :**

2. F, 3. T, 4. T, 5. F, 6. F, 7. T, 8. T

**MCQ :**

2. d, 3. a, 4. b, 5. a, 6. c, 7. a, 8. b

**Short answer type questions :**

2. $x^2 + 9x–13$, 3. 8x – 2y , 4. 125, 5. 2, 6. 28, 7. $3x^2 – 6xy – y^2$

**Long answer type questions :**

2. 2x+4, 3. 1, 4. $–2a^2 – ab + 7$, 5

5. $\frac{13}{15}x^3 - \frac{31}{10}x^2 - \frac{5}{6}x + \frac{5}{4}$

6. $x^3 + 2x^2y – 6xy^2 – y^3$

## Exercise–13 (Exponents and Powers)

**1.** a) 18, b) 1, c) –1, d) 3, e) 8, f) $\frac{1}{16}$ , g) 0, h) 1, i) $5^3$, j) $5^3$

**2.** a) F, b) F, c) T, d) F, e) T ;

**3.** a) (iv), b) (ii), c) (ii), d) (i), e) (i), f) (ii), g) (i), h) (ii), i) (ii), j) (iii)

**4.** a) $2^7$, b) $2^3 \times 3 \times 5^2$, c) 95, d) $2^2 \times a^2$, e) $2^{10} > 10^2$, f) 625, g) $(–5)^3 \times m^3$,

h) $4.985 \times 10^3$, i) 15, j) $\frac{8}{27}$

**5.** a) 96, b) $1\times10^5+2\times10^4+0\times10^3+7\times10^2+1\times10^1+9\times10^0$, c) $3.90878\times10^3$,

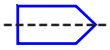
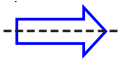
d) 70230, e) 1.6×106 kg, f) x = -1, g) 8000, h) $\left(\frac{3}{4}\right)^4$, j) $\frac{(-3)\times(-3)\times(-3)\times(-3)}{7\times7\times7\times7}$

**6.** a) $2.7 \times 10^{12} > 1.5 \times 10^8$, b) $2^6$, c) 516800, d) $2^7\times 3^2 \times 7^2$, e) 72

## Exercise– 14 (Symmetry)

1. a, 2. c, 3. a, 4. a, 5. c, 6. T, 7. T, 8. F,

9. T, 10. F 11. 1 12. 2 13.4 14. 4 15. 3 16. H, I

17. i)  ii)  iii)  iv) 

18. Isosceles Triangle 19. (i) 3 (ii) 5 20. A, H, I, M, O, T, U, V, W, X, Y

21

| English alphabet letter | Line of symmetry | Number of lines of symmetry | Rational symmetry | Order of rotational symmetry |
|---|---|---|---|---|
| N | Nil | 0 | Yes | 2 |
| A | Yes | 1 | No | 0 |
| X | Yes | 2 | Yes | 2 |
| I | Yes | 2 | Yes | 2 |
| F | No | 0 | No | 0 |
| M | Yes | 1 | No | 0 |
| S | No | 0 | Yes | 2 |

## Exercise–15 (Visualising Solid Shape)

**1.** i) Sphere, ii) Cone, iii) Cylinder, iv) Prism, v) Hemi Sphere, vi) Cuboid, vii)Cube

**2.** i) 6, 8, 12 ; ii) 5, 5, 8 ; iii) 9, 9, 16 ; iv) 6, 8, 12

**6.** i) (e), ii) (c), iii) (d), iv) (b), v) (a)

## Sample Question - 1

**1.** i) 156, ii) 9, iii) $\frac{1}{9}$, iv) 7, v) 1 ; **2.** i) 26, 29, 30 ; ii) 46, 48, 54 **3.** i) (b), ii) (a), iii) (d), iv) (c);
**4.** 6, **5.** (ii) **6.** 16 hours, **7.** $90^{O}$, **8.** 6, **9.** 5, **10.** (iv), **11.** True, **12.** False, **13.** (ii),
**14.** 2, **15.** 3, **16.** $120^{O}$, **17.** x + 5=11, **18.** $60^{O}$, $120^{O}$ ; **19.** 120 kg, **20.** –5, –2, 0, 2; **21.** 3,
**22.** 9, **23.** –10, **24.** $x=60^{O}$, $y=70^{O}$, $z=50^{O}$; **25.** (i) 20.5 mm, (ii) 5.9 mm, (iii) Friday; **26.** $10\frac{1}{2}$ hours,
**27.** (iii), **28.** True, **29.** 22, **30.** side × side, **31.** 16 cm, **32.** $m=\frac{3}{2}$, **33.** $\frac{115}{18}$, **34.** 121 $cm^2$, **35.** 1,
**36.** $\frac{x}{3}+3=30$, **37.** $120^{O}$, **38.** 5, **39.** 1886.5 $m^2$, **41.** P=7, **42.** 88 cm,
**43.** $x=100^{O}$, $y = z = w = 80^{O}$; **44.** 31cm, square.

## Sample Question - 2

**1.** i) (b), ii) $\frac{1}{7}$, iii) –1, –2, –3, –4 ; iv) 2, 6 ; v) 0.75 ;

**2.** i) 113, 116, 125; ii) 41, 39, 35 ;

**3.** i) (d), ii) (c), iii) (b), iv) (a)

**4.** i) (c), ii) (c), iii) 25 : 4, iv) 30%, v) True, vi) 2, vii) 1, viii) $\frac{5}{3}$, ix) False, x) $180^{O}$

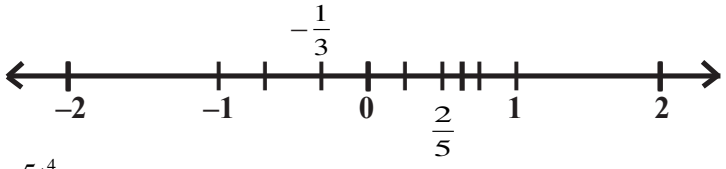
**5.** i) $\frac{2}{9}, \frac{4}{9}$ ii) $4x^2$, iii) 36, iv) Profit is ₹ 3 per hundred rupees, v) >, vi) No, vii) $\frac{4}{5}$, viii) $50^{O}$,
ix) $1\frac{2}{15}$

**6.** i) 150, 100 ; ii) 80%, iii) $60^{O}$, $80^{O}$ ; iv) x + y + z

**7.** i) $a^{m-n}$, ii) 3, iii) $1\frac{2}{3}$, iv) 4%, v) 1, vi) $60^{O}$

**8.** i) 1, ii) 5 : 6, iii) $-x^3-2x^2+20$, iv) 50, v) 2

**9.** i)




ii) $\frac{5t^4}{8}$, iii) $4x^2-3y^2-xy$, iv) $y=80^{O}$, $x=50^{O}$ ;

**10.** i) ₹ 600