MATHEMATICS

QUESTION BANK

for

Summative Assessment -I

CLASS – X

2015 – 16

CHAPTER WISE COVERAGE IN THE FORM
IMPORTANT FORMULAS & CONCEPTS,
MCQ WORKSHEETS AND PRACTICE QUESTIONS

Prepared by

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PREFACE

It gives me great pleasure in presenting the Question Bank for Summative Assessment (SA) - I. It is in accordance with the syllabus of the session 2015–16 for first term (CCE pattern).

Each chapter has important formulas & concepts for quick revision and a large number of multiple-choice questions in the form of Worksheets, which will help students quickly test their knowledge and skill.

A sufficient number of short answer type and long answer type questions are included in the form of PRACTICE QUESTIONS. This Question Bank is also helpful to all the teachers for internal assessment of the students.

Keeping the mind the mental level of a child, every effort has been made to introduce simple multiple choice questions so that the child solve them easily and gets confidence.

I avail this opportunity to convey my sincere thanks to respected sir, Shri S. Vijay Kumar, Director, KVS ZIET Gwalior, respected madam Smt. R. Kalavathi, Deputy Commissioner, KVS RO Hyderabad, respected sir Shri Isampal, Deputy Commissioner, KVS RO Bhopal, respected sir Shri P. V. Sairanga Rao, Deputy Commissioner, KVS RO Varanasi, respected sir Shri P. Deva Kumar, Deputy Commissioner, KVS RO Ahmedabad, respected sir Shri Y. Arun Kumar, Assistant Commissioner(Acad), KVS Headquarter, New Delhi, respected sir Shri Sirimala Sambanna, Assistant Commissioner, KVS RO Hyderabad, respected sir Shri. K. L. Nagaraju, Assistant Commissioner, KVS RO Bangalore, respected sir Shri.Gangadharaiah, Assistant Commissioner, KVS RO Bangalore and respected Shri M.K. Kulshreshtha, Assistant Commissioner, KVS RO Chandigarh for their blessings, motivation and encouragement in bringing out this notes in such an excellent form.

I also extend my special thanks to respected sir Shri. P. S. Raju, Principal, KV Gachibowli, respected Smt. Nirmala Kumari M., Principal, KV Mysore & respected Shri. M. Vishwanatham, Principal, KV Raichur for their kind suggestions and motivation while preparing this Question Bank.

I would like to place on record my thanks to respected sir Shri. P. K. Chandran, Principal, presently working in KV Bambolim. I have started my career in KVS under his guidance, suggestions and motivation.

Inspite of my best efforts to make this Question Bank error free, some errors might have gone unnoticed. I shall be grateful to the students and teacher if the same are brought to my notice. You may send your valuable suggestions, feedback or queries through email to kumarsir34@gmail.com that would be verified by me and the corrections would be incorporated in the next year Question Bank.

M. S. KUMARSWAMY

ISAMPAL
DEPUTY COMMISSIONER

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F. DO-DC./2013-KVS(BGR) Dated:05.09.2013

Dear Shri M.S.Kumarswamy,

It has been brought to my notice the good work done by you with regard to making question bank and worksheets for classes VI to X in Mathematics. I am pleased to look at your good work. Mathematics is one discipline which unfortunately and wrongly perceived as a phobia. May be lack of motivation from teachers and inadequate study habits of students is responsible for this state of affairs. Your work in this regard assumes a great significance. I hope your own students as well as students of other Vidyalayas will benefit by your venture. You may mail the material to all the Kendriya Vidyalayas of the region for their benefit. Keep up the good work.

May God bless!,

Yours sincerely,

(Isampal)

Shri M.S.Kumarswamy
TGT (Maths)
Kendriya Vidyalaya
Donimalai

Copy to: the principals, Kendriya Vidyalayas, Bangalore Region with instructions to make use of the materials prepared by Mr. M.S.Kumarswamy being forwarded separately.

DEDICATED

TO

MY FATHER

LATE SHRI. M. S. MALLAYYA

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SYLLABUS FOR 1^{ST} TERM 2015 – 16
Course Structure
Class X

First Term		**Marks : 90**
UNITS		**MARKS**
I	NUMBER SYSTEM	11
II	ALGEBRA	23
III	GEOMETRY	17
IV	TRIGONOMETRY	22
V	STATISTICS	17
	TOTAL THEORY	**90**

UNIT I : NUMBER SYSTEMS

1. REAL NUMBERS **(15) Periods**

Euclid's division lemma, Fundamental Theorem of Arithmetic - statements after reviewing work done earlier and after illustrating and motivating through examples, Proofs of results - irrationality of $\sqrt{2}, \sqrt{3}, \sqrt{5}$ decimal expansions of rational numbers in terms of terminating/non-terminating recurring decimals.

UNIT II : ALGEBRA

1. POLYNOMIALS **(7) Periods**

Zeros of a polynomial. Relationship between zeros and coefficients of quadratic polynomials. Statement and simple problems on division algorithm for polynomials with real coefficients.

2. PAIR OF LINEAR EQUATIONS IN TWO VARIABLES **(15) Periods**

Pair of linear equations in two variables and their graphical solution. Geometric representation of different possibilities of solutions/inconsistency.

Algebraic conditions for number of solutions. Solution of pair of linear equations in two variables algebraically - by substitution, by elimination and by cross multiplication. Simple situational problems must be included. Simple problems on equations reducible to linear equations may be included.

UNIT III : GEOMETRY

1. TRIANGLES **(15) Periods**

Definitions, examples, counter examples of similar triangles.

1. (Prove) If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.

2. (Motivate) If a line divides two sides of a triangle in the same ratio, the line is parallel to the third side.

3. (Motivate) If in two triangles, the corresponding angles are equal, their corresponding sides are proportional and the triangles are similar.

4. (Motivate) If the corresponding sides of two triangles are proportional, their corresponding angles are equal and the two triangles are similar.

5. (Motivate) If one angle of a triangle is equal to one angle of another triangle and the sides including these angles are proportional, the two triangles are similar.
6. (Motivate) If a perpendicular is drawn from the vertex of the right angle of a right triangle to the hypotenuse, the triangles on each side of the perpendicular are similar to the whole triangle and to each other.
7. (Prove) The ratio of the areas of two similar triangles is equal to the ratio of the squares on their corresponding sides.
8. (Prove) In a right triangle, the square on the hypotenuse is equal to the sum of the squares on the other two sides.
9. (Prove) In a triangle, if the square on one side is equal to sum of the squares on the other two sides, the angles opposite to the first side is a right traingle.

UNIT IV : TRIGONOMETRY

1. INTRODUCTION TO TRIGONOMETRY (10) Periods

Trigonometric ratios of an acute angle of a right-angled triangle. Proof of their existence (well defined); motivate the ratios, whichever are defined at 0^0 & 90^0. Values (with proofs) of the trigonometric ratios of 30^0, 45^0 & 60^0. Relationships between the ratios.

2. TRIGONOMETRIC IDENTITIES (15) Periods

Proof and applications of the identity $\sin^2 A + \cos^2 A = 1$. Only simple identities to be given. Trigonometric ratios of complementary angles.

UNIT VII : STATISTICS AND PROBABILITY

1. STATISTICS (18) Periods

Mean, median and mode of grouped data (bimodal situation to be avoided). Cumulative frequency graph.

CLASS X : CHAPTER - 1
REAL NUMBERS

IMPORTANT FORMULAS & CONCEPTS

EUCLID'S DIVISION LEMMA
Given positive integers a and b, there exist unique integers q and r satisfying a = bq + r, where $0 \le r < b$.
Here we call 'a' as dividend, 'b' as divisor, 'q' as quotient and 'r' as remainder.
$\therefore$ Dividend = (Divisor x Quotient) + Remainder
If in Euclid's lemma r = 0 then b would be HCF of 'a' and 'b'.

NATURAL NUMBERS
Counting numbers are called natural numbers i.e. 1, 2, 3, 4, 5, ……………. are natural numbers.

WHOLE NUMBERS
All counting numbers/natural numbers along with 0 are called whole numbers i.e. 0, 1, 2, 3, 4, 5 ……………. are whole numbers.

INTEGERS
All natural numbers, negative of natural numbers and 0, together are called integers. i.e.
………. – 3, – 2, – 1, 0, 1, 2, 3, 4, ………….. are integers.

ALGORITHM
An **algorithm** is a series of well defined steps which gives a procedure for solving a type of problem.

LEMMA
A **lemma** is a proven statement used for proving another statement.

EUCLID'S DIVISION ALGORITHM
Euclid's division algorithm is a technique to compute the Highest Common Factor (HCF) of two given positive integers. Recall that the HCF of two positive integers *a* and *b* is the largest positive integer *d* that divides both *a* and *b*.

To obtain the HCF of two positive integers, say c and d, with c > d, follow the steps below:
Step 1 : Apply Euclid's division lemma, to *c* and *d*. So, we find whole numbers, *q* and *r* such that $c = dq + r,\ 0 \le r < d$.
Step 2 : If *r* = 0, *d* is the HCF of *c* and *d*. If $r \ne 0$ apply the division lemma to *d* and *r*.
Step 3 : Continue the process till the remainder is zero. The divisor at this stage will be the required HCF.
This algorithm works because HCF (*c*, *d*) = HCF (*d*, *r*) where the symbol HCF (*c*, *d*) denotes the HCF of *c* and *d*, etc.

The Fundamental Theorem of Arithmetic
Every composite number can be expressed (factorised) as a product of primes, and this factorisation is unique, apart from the order in which the prime factors occur.

The prime factorisation of a natural number is unique, except for the order of its factors.

- ❖ HCF is the highest common factor also known as GCD i.e. greatest common divisor.
- ❖ LCM of two numbers is their least common multiple.
- ❖ Property of HCF and LCM of two positive integers 'a' and 'b':

- $HCF(a,b) \times LCM(a,b) = a \times b$
- $LCM(a,b) = \dfrac{a \times b}{HCF(a,b)}$
- $HCF(a,b) = \dfrac{a \times b}{LCM(a,b)}$

PRIME FACTORISATION METHOD TO FIND HCF AND LCM

HCF(a, b) = Product of the smallest power of each common prime factor in the numbers.
LCM(a, b) = Product of the greatest power of each prime factor, involved in the numbers.

RATIONAL NUMBERS

The number in the form of $\frac{p}{q}$ where 'p' and 'q' are integers and $q \neq 0$, e.g. $\frac{2}{3}, \frac{3}{5}, \frac{5}{7}, ...$

Every rational number can be expressed in decimal form and the decimal form will be either terminating or non-terminating repeating. e.g. $\frac{5}{2} = 2.5$ (Terminating), $\frac{2}{3} = 0.66666....\ or\ 0.\bar{6}$ (Non-terminating repeating).

IRRATIONAL NUMBERS

The numbers which are not rational are called irrational numbers. e.g. $\sqrt{2}, \sqrt{3}, \sqrt{5}, etc$.

- *Let p be a prime number. If p divides a2, then p divides a, where a is a positive integer.*
- If p is a positive integer which is not a perfect square, then $\sqrt{m}$ is an irrational, e.g. $\sqrt{2}, \sqrt{5}, \sqrt{6}, \sqrt{8}, ...etc$.
- If p is prime, then $\sqrt{p}$ is also an irrational.

RATIONAL NUMBERS AND THEIR DECIMAL EXPANSIONS

- *Let x be a rational number whose decimal expansion terminates. Then x can be expressed in the form $\frac{p}{q}$ where p and q are coprime, and the prime factorisation of q is of the form 2^n5^m, where n, m are non-negative integers.*

- *Let $x = \frac{p}{q}$ be a rational number, such that the prime factorisation of q is of the form 2^n5^m, where n, m are non-negative integers. Then x has a decimal expansion which terminates.*
- *Let $x = \frac{p}{q}$ be a rational number, such that the prime factorisation of q is not of the form 2^n5^m, where n, m are non-negative integers. Then, x has a decimal expansion which is non-terminating repeating (recurring).*

- *The decimal form of irrational numbers is non-terminating and non-repeating.*
- *Those decimals which are non-terminating and non-repeating will be irrational numbers. e.g. 0.20200200020002……. is a non-terminating and non-repeating decimal, so it irrational.*

MCQ WORKSHEET-I

CLASS X : CHAPTER - 1

REAL NUMBERS

1. A rational number between $\frac{3}{5}$ and $\frac{4}{5}$ is:

(a) $\frac{7}{5}$ (b) $\frac{7}{10}$ (c) $\frac{3}{10}$ (d) $\frac{4}{10}$

2. A rational number between $\frac{1}{2}$ and $\frac{3}{4}$ is:

(a) $\frac{2}{5}$ (b) $\frac{5}{8}$ (c) $\frac{4}{3}$ (d) $\frac{1}{4}$

3. Which one of the following is not a rational number:

(a) $\sqrt{2}$ (b) 0 (c) $\sqrt{4}$ (d) $\sqrt{-16}$

4. Which one of the following is an irrational number:

(a) $\sqrt{4}$ (b) $3\sqrt{8}$ (c) $\sqrt{100}$ (d) $-\sqrt{0.64}$

5. $3\frac{3}{8}$ in decimal form is:

(a) 3.35 (b) 3.375 (c) 33.75 (d) 337.5

6. $\frac{5}{6}$ in the decimal form is:

(a) $0.8\overline{3}$ (b) $0.8\overline{33}$ (c) $0.6\overline{3}$ (d) $0.6\overline{33}$

7. Decimal representation of rational number $\frac{8}{27}$ is:

(a) $0.\overline{296}$ (b) $0.29\overline{6}$ (c) $0.2\overline{96}$ (d) 0.296

8. 0.6666…….. in $\frac{p}{q}$ form is:

(a) $\frac{6}{99}$ (b) $\frac{2}{3}$ (c) $\frac{3}{5}$ (d) $\frac{1}{66}$

9. The value of $\left(\sqrt{5}+\sqrt{2}\right)\left(\sqrt{5}-\sqrt{2}\right)$ is:

(a) 10 (b) 7 (c) 3 (d) $\sqrt{3}$

10. $0.\overline{36}$ in $\frac{p}{q}$ form is:

(a) $\frac{6}{99}$ (b) $\frac{2}{3}$ (c) $\frac{3}{5}$ (d) none of these

MCQ WORKSHEET-II
CLASS X : CHAPTER - 1
REAL NUMBERS

1. $\sqrt{5}-3-2$ is
(a) a rational number (b) a natural number (c) equal to zero (d) an irrational number

2. Let x = $\frac{7}{20\times 25}$ be a rational number. Then x has decimal expansion, which terminates:
(a) after four places of decimal (b) after three places of decimal
(c) after two places of decimal (d) after five places of decimal

3. The decimal expansion of $\frac{63}{72\times 175}$ is
(a) terminating (b) non-terminating
(c) non termination and repeating (d) an irrational number

4. If HCF and LCM of two numbers are 4 and 9696, then the product of the two numbers is:
(a) 9696 (b) 24242 (c) 38784 (d) 4848

5. $\left(2+\sqrt{3}+\sqrt{5}\right)$ is :
(a) a rational number (b) a natural number (c) a integer number (d) an irrational number

6. If $\left(\frac{9}{7}\right)^3\times\left(\frac{49}{81}\right)^{2x-6}=\left(\frac{7}{9}\right)^9$, the value of x is:
(a) 12 (b) 9 (c) 8 (d) 6

7. The number .211 2111 21111….. is a
(a) terminating decimal (b) non-terminating decimal
(c) non termination and non-repeating decimal (d) none of these

8. If $(m)^n$ =32 where m and n are positive integers, then the value of $(n)^{mn}$ is:
(a) 32 (b) 25 (c) 5^{10} (d) 5^{25}

9. The number $0.\overline{57}$ in the $\frac{p}{q}$ form $q\neq 0$ is
(a) $\frac{19}{35}$ (b) $\frac{57}{99}$ (c) $\frac{57}{95}$ (d) $\frac{19}{30}$

10. The number $0.5\overline{7}$ in the $\frac{p}{q}$ form $q\neq 0$ is
(a) $\frac{26}{45}$ (b) $\frac{13}{27}$ (c) $\frac{57}{99}$ (d) $\frac{13}{29}$

11. Any one of the numbers a, a + 2 and a + 4 is a multiple of:
(a) 2 (b) 3 (c) 5 (d) 7

12. If p is a prime number and p divides k^2, then p divides:
(a) $2k^2$ (b) k (c) 3k (d) none of these

MCQ WORKSHEET-III
CLASS X : CHAPTER - 1
REAL NUMBERS

1. π is
(a) a natural number (b) not a real number
(c) a rational number (d) an irrational number

2. The decimal expansion of π
(a) is terminating (b) is non terminating and recurring
(c) is non terminating and non recurring (d) does not exist.

3. Which of the following is not a rational number?
(a) $\sqrt{6}$ (b) $\sqrt{9}$ (c) $\sqrt{25}$ (d) $\sqrt{36}$

4. Which of the following is a rational number?
(a) $\sqrt{36}$ (b) $\sqrt{12}$ (c) $\sqrt{14}$ (d) $\sqrt{21}$

5. If a and b are positive integers, then HCF (a, b) x LCM (a, b) =
(a) a x b (b) a + b (c) a – b (d) a/b

6. If the HCF of two numbers is 1, then the two numbers are called
(a) composite (b) relatively prime or co-prime
(c) perfect (d) irrational numbers

7. The decimal expansion of $\frac{93}{1500}$ will be
(a) terminating (b) non-terminating (c) non-terminating repeating
(d) non-terminating non-repeating.

8. $\sqrt{3}$ is
(a) a natural number (b) not a real number
(c) a rational number (d) an irrational number

9. The HCF of 52 and 130 is
(a) 52 (b) 130 (c) 26 (d) 13

10. For some integer q, every odd integer is of the form
(a) q (b) q + 1 (c) 2q (d) none of these

11. For some integer q, every even integer is of the form
(a) q (b) q + 1 (c) 2q (d) none of these

12. Euclid's division lemma state that for any positive integers a and b, there exist unique integers q and r such that a = bq + r where r must satisfy
(a) $1 < r < b$ (b) $0 < r \le b$ (c) $0 \le r < b$ (d) $0 < r < b$

MCQ WORKSHEET-IV
CLASS X : CHAPTER - 1
REAL NUMBERS

1. A ……… is a proven statement used for proving another statement.
(a) axiom (b) theorem (c) lemma (d) algorithm

2. The product of non-zero rational ad an irrational number is
(a) always rational (b) always irrational (c) rational or irrational (d) one

3. The HCF of smallest composite number and the smallest prime number is
(a) 0 (b) 1 (c) 2 (d) 3

4. Given that HCF(1152, 1664) = 128 the LCM(1152, 1664) is
(a) 14976 (b) 1664 (c) 1152 (d) none of these

5. The HCF of two numbers is 23 and their LCM is 1449. If one of the numbers is 161, then the other number is
(a) 23 (b) 207 (c) 1449 (d) none of these

6. Which one of the following rational number is a non-terminating decimal expansion:
(a) $\frac{33}{50}$ (b) $\frac{66}{180}$ (c) $\frac{6}{15}$ (d) $\frac{41}{1000}$

7. A number when divided by 61 gives 27 quotient and 32 as remainder is
(a) 1679 (b) 1664 (c) 1449 (d) none of these

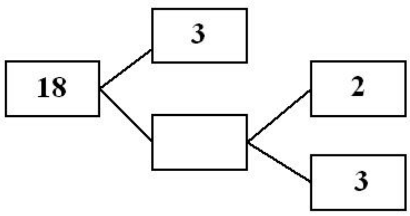
8. The product of L.C.M and H.C.F. of two numbers is equal to
(a) Sum of numbers (b) Difference of numbers
(c) Product of numbers (d) Quotients of numbers

9. L.C.M. of two co-prime numbers is always
(a) product of numbers (b) sum of numbers
(c) difference of numbers (d)none

10. What is the H.C.F. of two consecutive even numbers
(a) 1 (b)2 (c) 4 (d) 8

11. What is the H.C.F. of two consecutive odd numbers
(a) 1 (b) 2 (c) 4 (d) 8

12. The missing number in the following factor tree is
(a) 2 (b) 6 (c) 3 (d) 9



MCQ WORKSHEET-V
CLASS X : CHAPTER - 1
REAL NUMBERS

1. For some integer m, every even integer is of the form
(a) m (b) $m + 1$ (c) $2m$ (d) $2m + 1$

2. For some integer q, every odd integer is of the form
(a) q (b) $q + 1$ (c) $2q$ (d) $2q + 1$

3. $n^2 - 1$ is divisible by 8, if n is
(a) an integer (b) a natural number
(c) an odd integer (d) an even integer

4. If the HCF of 65 and 117 is expressible in the form $65m - 117$, then the value of m is
(a) 4 (b) 2 (c) 1 (d) 3

5. The largest number which divides 70 and 125, leaving remainders 5 and 8, respectively, is
(a) 13 (b) 65 (c) 875 (d) 1750

6. If two positive integers a and b are written as $a = x^3y^2$ and $b = xy^3$; x, y are prime numbers, then HCF (a, b) is
(a) xy (b) xy^2 (c) x^3y^3 (d) x^2y^2

7. If two positive integers p and q can be expressed as $p = ab^2$ and $q = a^3b$; a, b being prime numbers, then LCM (p, q) is
(a) ab (b) a^2b^2 (c) a^3b^2 (d) a^3b^3

8. The product of a non-zero rational and an irrational number is
(a) always irrational (b) always rational
(c) rational or irrational (d) one

9. The least number that is divisible by all the numbers from 1 to 10 (both inclusive) is
(a) 10 (b) 100 (c) 504 (d) 2520

10. The decimal expansion of the rational number $\frac{14587}{1250}$ will terminate after:
(a) one decimal place (b) two decimal places
(c) three decimal places (d) four decimal places

11. The decimal expansion of the rational number $\frac{33}{2^2.5}$ will terminate after
(a) one decimal place (b) two decimal places
(c) three decimal places (d) more than 3 decimal places

PRACTICE QUESTIONS
CLASS X : CHAPTER - 1
REAL NUMBERS

1. Write whether every positive integer can be of the form $4q + 2$, where q is an integer. Justify your answer.

2. "The product of two consecutive positive integers is divisible by 2". Is this statement true or false? Give reasons.

3. "The product of three consecutive positive integers is divisible by 6". Is this statement true or false"? Justify your answer.

4. Write whether the square of any positive integer can be of the form $3m + 2$, where m is a natural number. Justify your answer.

5. A positive integer is of the form $3q + 1$, q being a natural number. Can you write its square in any form other than $3m + 1$, i.e., $3m$ or $3m + 2$ for some integer m? Justify your answer.

6. Show that the square of an odd positive integer is of the form $8m + 1$, for some whole number m.

7. Show that the square of any positive integer is either of the form $4q$ or $4q + 1$ for some integer q.

8. Show that cube of any positive integer is of the form $4m$, $4m + 1$ or $4m + 3$, for some integer m.

9. Show that the square of any positive integer cannot be of the form $5q + 2$ or $5q + 3$ for any integer q.

10. Show that the square of any positive integer cannot be of the form $6m + 2$ or $6m + 5$ for any integer m.

11. Show that the square of any odd integer is of the form $4q + 1$, for some integer q.

12. If n is an odd integer, then show that $n^2 – 1$ is divisible by 8.

13. Prove that if x and y are both odd positive integers, then $x^2 + y^2$ is even but not divisible by 4.

14. Show that the square of an odd positive integer can be of the form $6q + 1$ or $6q + 3$ for some integer q.

15. Show that the cube of a positive integer of the form $6q + r$, q is an integer and $r = 0, 1, 2, 3, 4, 5$ is also of the form $6m + r$.

16. Prove that one and only one out of n, $n + 2$ and $n + 4$ is divisible by 3, where n is any positive integer.

17. Prove that one of any three consecutive positive integers must be divisible by 3.

18. For any positive integer n, prove that $n^3 – n$ is divisible by 6.

19. Show that one and only one out of n, $n + 4$, $n + 8$, $n + 12$ and $n + 16$ is divisible by 5, where n is any positive integer.

20. Show that the product of three consecutive natural numbers is divisble by 6.

21. Show that any positive odd integer is of the form 6q + 1 or 6q + 3 or 6q + 5 where $q \in Z$.

22. Show that any positive even integer is of the form 6q or 6q + 2 or 6q + 4 where $q \in Z$.

23. If a and b are two odd positive integers such that a > b, then prove that one of the two numbers $\frac{a+b}{2}$ and $\frac{a-b}{2}$ is odd and the other is even.

24. Use Euclid's division lemma to show that the cube of any positive integer is of the form 9m, 9m + 1 or 9m + 8.

25. Using Euclid's division algorithm to show that any positive odd integer is of the form 4q+1 or 4q+3, where q is some integer.

26. Use Euclid's division algorithm to find the HCF of 441, 567, 693.

27. Using Euclid's division algorithm, find the largest number that divides 1251, 9377 and 15628 leaving remainders 1, 2 and 3, respectively.

28. Using Euclid's division algorithm, find which of the following pairs of numbers are co-prime:
(i) 231, 396 (ii) 847, 2160

29. Show that 12^n cannot end with the digit 0 or 5 for any natural number *n*.

30. In a morning walk, three persons step off together and their steps measure 40 cm, 42 cm and 45 cm, respectively. What is the minimum distance each should walk so that each can cover the same distance in complete steps?

31. If LCM (480, 672) = 3360, find HCF (480,672).

32. Express 0.69 as a rational number in $\frac{p}{q}$ form.

33. Show that the number of the form 7^n, n∈N cannot have unit digit zero.

34. Using Euclid's Division Algorithm find the HCF of 9828 and 14742.

35. The numbers 525 and 3000 are both divisible only by 3, 5, 15, 25 and 75. What is HCF (525, 3000)? Justify your answer.

36. Explain why 3 × 5 × 7 + 7 is a composite number.

37. Can two numbers have 18 as their HCF and 380 as their LCM? Give reasons.

38. Without actual division find whether the rational number $\frac{1323}{\left(6^3 \times 35^2\right)}$ has a terminating or a non-terminating decimal.

39. Without actually performing the long division, find if $\frac{987}{10500}$ will have terminating or non-terminating (repeating) decimal expansion. Give reasons for your answer.

40. A rational number in its decimal expansion is 327.7081. What can you say about the prime factors of q, when this number is expressed in the form $\frac{p}{q}$? Give reasons.

41. Find the HCF of 81 and 237 and express it as a linear combination of 81 and 237.

42. Find the HCF of 65 and 117 and express it in the form 65m + 117n.

43. If the HCF of 210 and 55 is expressible in the form of 210x5 + 55y, find y.

44. If d is the HCF of 56 and 72, find x, y satisfying d = 56x + 72y. Also show that x and y are not unique.

45. Express the HCF of 468 and 222 as 468x + 222y where x, y are integers in two different ways.

46. Express the HCF of 210 and 55 as 210x + 55y where x, y are integers in two different ways.

47. If the HCF of 408 and 1032 is expressible in the form of 1032m – 408x5, find m.

48. If the HCF of 657 and 963 is expressible in the form of 657n + 963x(-15), find n.

49. A sweet seller has 420 kaju burfis and 130 badam burfis she wants to stack them in such a way that each stack has the same number, and they take up the least area of the tray. What is the number of burfis that can be placed in each stack for this purpose?

50. Find the largest number which divides 245 and 1029 leaving remainder 5 in each case.

51. Find the largest number which divides 2053 and 967 and leaves a remainder of 5 and 7 respectively.

52. Two tankers contain 850 litres and 680 litres of kerosene oil respectively. Find the maximum capacity of a container which can measure the kerosene oil of both the tankers when used an exact number of times.

53. In a morning walk, three persons step off together. Their steps measure 80 cm, 85 cm and 90 cm respectively. What is the minimum distance each should walk so that all can cover the same distance in complete steps?

54. Find the least number which when divided by 12, 16, 24 and 36 leaves a remainder 7 in each case.

55. The length, breadth and height of a room are 825 cm, 675 cm and 450 cm respectively. Find the longest tape which can measure the three dimensions of the room exactly.

56. Determine the smallest 3-digit number which is exactly divisible by 6, 8 and 12.

57. Determine the greatest 3-digit number exactly divisible by 8, 10 and 12.

58. The traffic lights at three different road crossings change after every 48 seconds, 72 seconds and 108 seconds respectively. If they change simultaneously at 7 a.m., at what time will they change simultaneously again?

59. Three tankers contain 403 litres, 434 litres and 465 litres of diesel respectively. Find the maximum capacity of a container that can measure the diesel of the three containers exact number of times.

60. Find the least number which when divided by 6, 15 and 18 leave remainder 5 in each case.

61. Find the smallest 4-digit number which is divisible by 18, 24 and 32.

62. Renu purchases two bags of fertiliser of weights 75 kg and 69 kg. Find the maximum value of weight which can measure the weight of the fertiliser exact number of times.

63. In a seminar, the number, the number of participants in Hindi, English and Mathematics are 60, 84 and 108, respectively. Find the minimum number of rooms required if in each room the same number of participants are to be seated and all of them being in the same subject.

64. 144 cartons of Coke cans and 90 cartons of Pepsi cans are to be stacked in a canteen. If each stack is of the same height and is to contain cartons of the same drink, what would be the greatest number of cartons each stack would have?

65. A merchant has 120 litres of oil of one kind, 180 litres of another kind and 240 litres of third kind. He wants to sell the oil by filling the three kinds of oil in tins of equal capacity. What would be the greatest capacity of such a tin?

66. Express each of the following positive integers as the product of its prime factors: (i) 3825 (ii) 5005 (iii) 7429

67. Express each of the following positive integers as the product of its prime factors: (i) 140 (ii) 156 (iii) 234

68. There is circular path around a sports field. Priya takes 18 minutes to drive one round of the field, while Ravish takes 12 minutes for the same. Suppose they both start at the same point and at the same time and go in the same direction. After how many minutes will they meet again at the starting point?

69. In a morning walk, three persons step off together and their steps measure 80 cm, 85 cm and 90 cm, respectively. What is the minimum distance each should walk so that each can cover the same distance in complete steps?

70. A circular field has a circumference of 360 km. Three cyclists start together and can cycle 48, 60 and 72 km a day, round the field. When will they meet again?

71. Find the smallest number which leaves remainders 8 and 12 when divided by 28 and 32 respectively.

72. Find the smallest number which when increased by 17 is exactly divisible by 520 and 468.

73. Find the greatest numbers that will divide 445, 572 and 699 leaving remainders 4, 5 and 6 respectively.

74. Find the greatest number which divides 2011 and 2423 leaving remainders 9 and 5 respectively

75. Find the greatest number which divides 615 and 963 leaving remainder 6 in each case.

76. Find the greatest number which divides 285 and 1249 leaving remainders 9 and 7 respectively.

77. Find the largest possible positive integer that will divide 398, 436, and 542 leaving remainder 7, 11, 15 respectively.

78. If d is the HCF of 30, 72, find the value of x & y satisfying d = 30x + 72y.

79. State Euclid's Division Lemma.

80. State the Fundamental theorem of Arithmetic.

81. Given that HCF (306, 657) = 9, find the LCM(306, 657).

82. Why the number 4^n, where n is a natural number, cannot end with 0?

83. Why is 5 x 7 x 11 + 7 is a composite number?

84. Explain why 7 x 11 + 13 + 13 and 7 x 6 x 5 x 4 x 3 x 2 x 1 + 5 are composite numbers.

85. In a school there are two sections – section A and section B of class X. There are 32 students in section A and 36 students in section B. Determine the minimum number of books required for their class library so that they can be distributed equally among students of section A or section B.

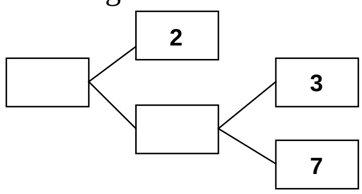
86. Determine the number nearest 110000 but greater than 100000 which is exactly divisible by each of 8, 15 and 21.

87. Three sets of English, Hindi and Mathematics books have to be stacked in such a way that all the books are stored topic wise and the height of each stack is the same. The number of English books is 96, the number of Hindi books is 240 and the number of Mathematics books is 336. Assuming that the books are of the same thickness, determine the number of stacks of English, Hindi and Mathematics books.

88. Using Euclid's division algorithm, find the HCF of 2160 and 3520.

89. Find the HCF and LCM of 144, 180 and 192 by using prime factorization method.

90. Find the missing numbers in the following factorization:



91. Find the HCF and LCM of 17, 23 and 37 by using prime factorization method.

92. If HCF(6, a) = 2 and LCM(6, a) = 60 then find the value of a.

93. If remainder of $\frac{(5m+1)(5m+3)(5m+4)}{5}$ is a natural number then find it.

94. A rational number $\frac{p}{q}$ has a non-terminating repeating decimal expansion. What can you say about q?

95. If $\frac{278}{2^m m}$ has a terminating decimal expansion and m is a positive integer such that 2 < m < 9, then find the value of m.

96. Write the condition to be satisfied by q so that a rational number $\frac{p}{q}$ has a terminating expression.

97. If a and b are positive integers. Show that $\sqrt{2}$ always lies between $\frac{a}{b}$ and $\frac{a^2-2b^2}{b(a+b)}$.

98. Find two rational number and two irrational number between $\sqrt{2}$ and $\sqrt{3}$.

99. Prove that $5-2\sqrt{3}$ is an irrational number.

100. Prove that $15+17\sqrt{3}$ is an irrational number.

101. Prove that $\frac{2\sqrt{3}}{5}$ is an irrational number.

102. Prove that $7+3\sqrt{2}$ is an irrational number.

103. Prove that $2+3\sqrt{5}$ is an irrational number.

104. Prove that $\sqrt{2}+\sqrt{3}$ is an irrational number.

105. Prove that $\sqrt{3}+\sqrt{5}$ is an irrational number.

106. Prove that $7-2\sqrt{3}$ is an irrational number.

107. Prove that $3-\sqrt{5}$ is an irrational number.

108. Prove that $\sqrt{2}$ is an irrational number.

109. Prove that $7-\sqrt{5}$ is an irrational number

110. Show that there is no positive integer 'n' for which $\sqrt{n-1}+\sqrt{n+1}$ is rational.

CLASS X : CHAPTER - 2
POLYNOMIALS

IMPORTANT FORMULAS & CONCEPTS

An algebraic expression of the form $p(x) = a_0 + a_1x + a_2x^2 + a_3x^3 + \ldots\ldots a_nx^n$, where $a \neq 0$, is called a polynomial in variable x of degree n.
Here, $a_0, a_1, a_2, a_3, \ldots\ldots, a_n$ are real numbers and each power of x is a non-negative integer.
e.g. $3x^2 - 5x + 2$ is a polynomial of degree 2.
$3\sqrt{x}+2$ is not a polynomial.

➢ If $p(x)$ is a polynomial in x, the highest power of x in $p(x)$ is called **the degree of the polynomial** $p(x)$. For example, $4x + 2$ is a polynomial in the variable x of degree 1, $2y^2 - 3y + 4$ is a polynomial in the variable y of degree 2,

- ❖ A polynomial of degree 0 is called a constant polynomial.
- ❖ A polynomial $p(x) = ax + b$ of degree 1 is called a linear polynomial.
- ❖ A polynomial $p(x) = ax^2 + bx + c$ of degree 2 is called a quadratic polynomial.
- ❖ A polynomial $p(x) = ax^3 + bx^2 + cx + d$ of degree 3 is called a cubic polynomial.
- ❖ A polynomial $p(x) = ax^4 + bx^3 + cx^2 + dx + e$ of degree 4 is called a bi-quadratic polynomial.

VALUE OF A POLYNOMIAL AT A GIVEN POINT x = k
If $p(x)$ is a polynomial in x, and if k is any real number, then the value obtained by replacing x by k in $p(x)$, is called **the value of $p(x)$ at $x = k$**, and is denoted by $p(k)$.

ZERO OF A POLYNOMIAL
A real number k is said to be a **zero of a polynomial $p(x)$**, if $p(k) = 0$.

- ❖ Geometrically, the zeroes of a polynomial $p(x)$ are precisely the x-coordinates of the points, where the graph of $y = p(x)$ intersects the x -axis.
- ❖ A quadratic polynomial can have at most 2 zeroes and a cubic polynomial can have at most 3 zeroes.
- ❖ In general, a polynomial of degree 'n' has at the most 'n' zeroes.

RELATIONSHIP BETWEEN ZEROES & COEFFICIENTS OF POLYNOMIALS

Type of Polynomial	General form	No. of zeroes	Relationship between zeroes and coefficients
Linear	$ax + b, a \neq 0$	1	$k = -\frac{b}{a}$, i.e. $k = -\frac{\text{Constant term}}{\text{Coefficient of x}}$
Quadratic	$ax^2 + bx + c, a \neq 0$	2	Sum of zeroes $(\alpha+\beta) = -\frac{\text{Coefficient of x}}{\text{Coefficient of x}^2} = -\frac{b}{a}$ Product of zeroes $(\alpha\beta) = \frac{\text{Constant term}}{\text{Coefficient of x}^2} = \frac{c}{a}$
Cubic	$ax^3 + bx^2 + cx + d$, $a \neq 0$	3	Sum of zeroes $(\alpha+\beta+\gamma) = -\frac{\text{Coefficient of x}^2}{\text{Coefficient of x}^3} = -\frac{b}{a}$ Product of sum of zeroes taken two at a time $(\alpha\beta+\beta\gamma+\gamma\alpha) = \frac{\text{Coefficient of x}}{\text{Coefficient of x}^3} = \frac{c}{a}$ Product of zeroes $(\alpha\beta\gamma) = -\frac{\text{Constant term}}{\text{Coefficient of x}^3} = -\frac{d}{a}$

❖ A quadratic polynomial whose zeroes are α and β is given by $p(x) = x^2 - (\alpha + \beta)x + \alpha\beta$
i.e. x^2 – (Sum of zeroes)x + (Product of zeroes)

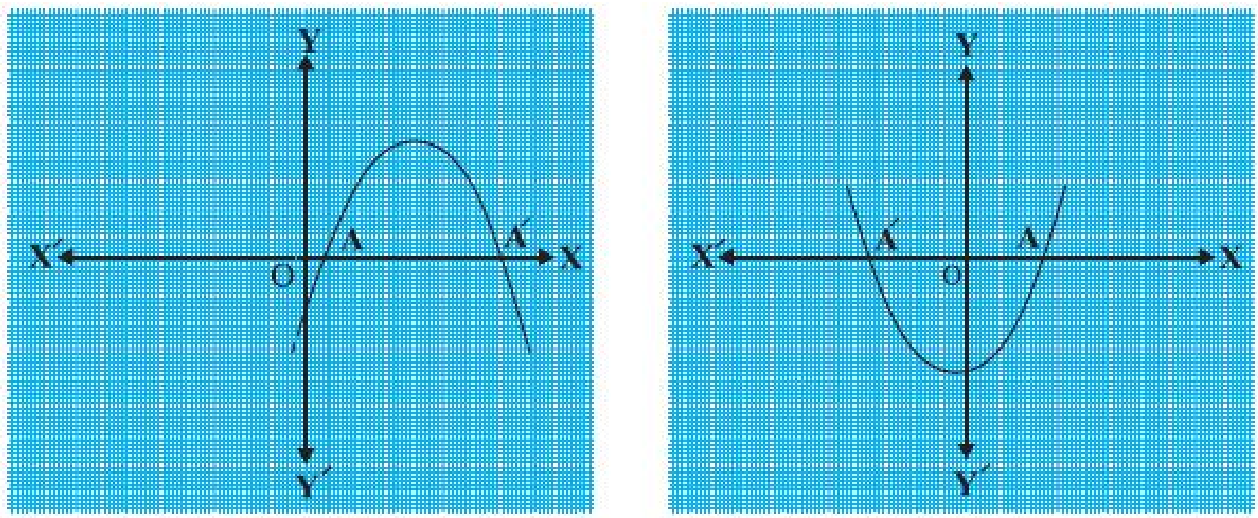
❖ A cubic polynomial whose zeroes are α, β *and* γ is given by
$$p(x) = x^3 - (\alpha + \beta + \gamma)x^2 + (\alpha\beta + \beta\gamma + \gamma\alpha)x - \alpha\beta\gamma$$

The zeroes of a quadratic polynomial $ax^2 + bx + c$, $a \neq 0$, are precisely the *x*-coordinates of the points where the parabola representing $y = ax^2 + bx + c$ intersects the *x*-axis.

In fact, for any quadratic polynomial $ax^2 + bx + c$, $a \neq 0$, the graph of the corresponding equation $y = ax^2 + bx + c$ has one of the two shapes either open upwards like $\cup$ or open downwards like $\cap$ depending on whether $a > 0$ or $a < 0$. (These curves are called **parabolas**.)

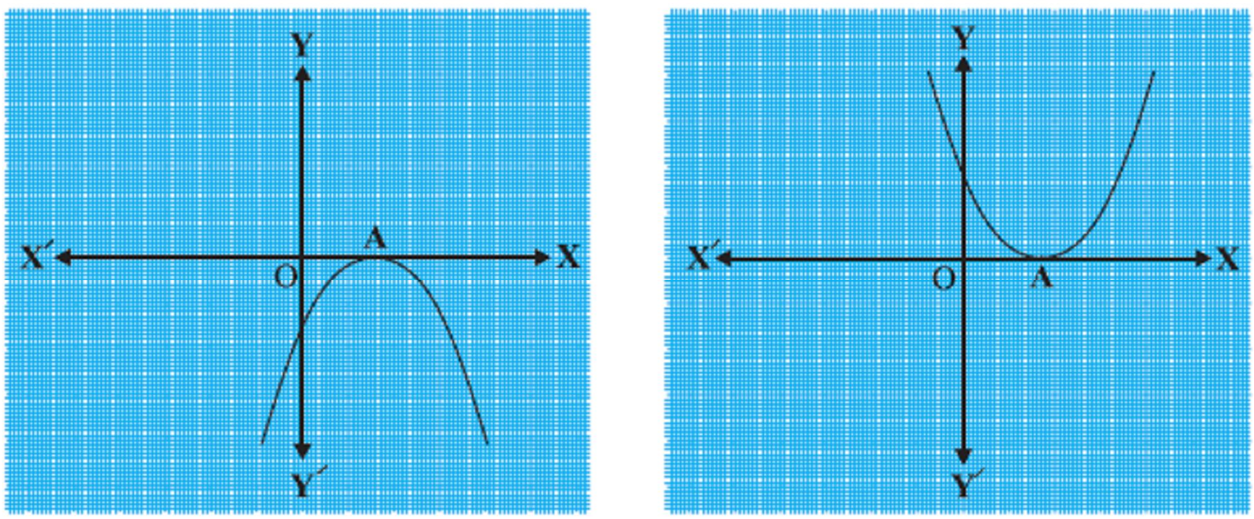
The following three cases can be happen about the graph of quadratic polynomial $ax^2 + bx + c$:

Case (i) : Here, the graph cuts *x*-axis at two distinct points A and A'. The *x*-coordinates of A and A' are the **two zeroes** of the quadratic polynomial $ax^2 + bx + c$ in this case



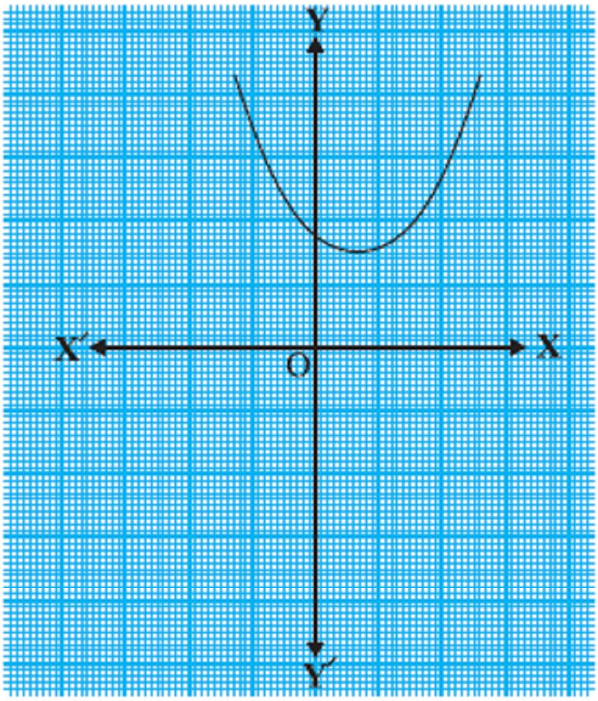
(i) $a > 0$ (ii) $a < 0$

Case (ii) : Here, the graph cuts the *x*-axis at exactly one point, i.e., at two coincident points. So, the two points A and A′ of Case (i) coincide here to become one point A. The *x*-coordinate of A is the **only zero** for the quadratic polynomial $ax^2 + bx + c$ in this case.

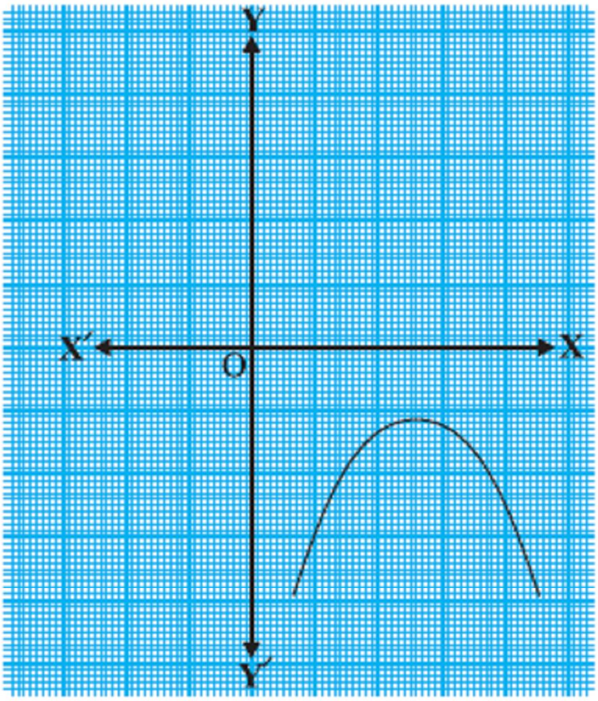


(i) $a > 0$ (ii) $a < 0$

Case (iii) : Here, the graph is either completely above the *x*-axis or completely below the *x*-axis. So, it does not cut the *x*-axis at any point. So, the quadratic polynomial $ax^2 + bx + c$ has **no zero** in this case.



(i)
a > 0



(ii)
a < 0

DIVISION ALGORITHM FOR POLYNOMIALS

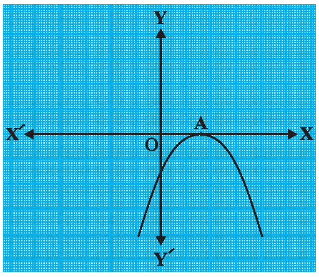
If $p(x)$ and $g(x)$ are any two polynomials with $g(x) \neq 0$, then we can find polynomials $q(x)$ and $r(x)$ such that $p(x) = g(x) \times q(x) + r(x)$,
where $r(x) = 0$ or degree of $r(x)$ < degree of $g(x)$.

- If r(x) = 0, then g(x) is a factor of p(x).
- Dividend = Divisor × Quotient + Remainder

MCQ WORKSHEET-I
CLASS X : CHAPTER - 2
POLYNOMIALS

1. The value of k for which (–4) is a zero of the polynomial $x^2 – x – (2k +2)$ is
(a) 3 (b) 9 (c) 6 (d) –1

2. If the zeroes of the quadratic polynomial ax2 + bx + c, $c \neq 0$ are equal, then
(a) c and a have opposite sign (b) c and b have opposite sign
(c) c and a have the same sign (d) c and b have the same sign



3. The number of zeroes of the polynomial from the graph is
(a) 0 (b) 1 (c) 2 (d) 3

4. If one of the zero of the quadratic polynomial $x^2 +3x + k$ is 2, then the value of k is
(a) 10 (b) –10 (c) 5 (d) –5

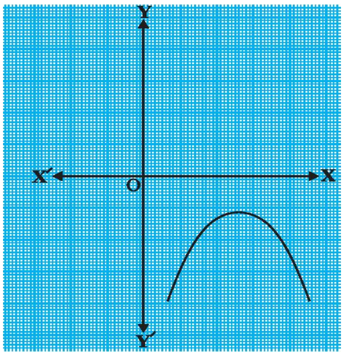
5. A quadratic polynomial whose zeroes are –3 and 4 is
(a) $x^2 – x +12$ (b) $x^2 +x + 12$ (c) $2x^2 + 2x – 24$. (d) none of the above.

6. The relationship between the zeroes and coefficients of the quadratic polynomial $ax^2 + bx + c$ is (a) $\alpha + \beta = \frac{c}{a}$ (b) $\alpha + \beta = \frac{-b}{a}$ (c) $\alpha + \beta = \frac{-c}{a}$ (d) $\alpha + \beta = \frac{b}{a}$

7. The zeroes of the polynomial $x^2 + 7x + 10$ are
(a) 2 and 5 (b) –2 and 5 (c) –2 and –5 (d) 2 and –5

8. The relationship between the zeroes and coefficients of the quadratic polynomial $ax^2 + bx + c$ is (a) $\alpha.\beta = \frac{c}{a}$ (b) $\alpha.\beta = \frac{-b}{a}$ (c) $\alpha.\beta = \frac{-c}{a}$ (d) $\alpha.\beta = \frac{b}{a}$

9. The zeroes of the polynomial $x^2 – 3$ are
(a) 2 and 5 (b) –2 and 5 (c) –2 and –5 (d) none of the above



10. The number of zeroes of the polynomial from the graph is
(a) 0 (b) 1 (c) 2 (d) 3

11. A quadratic polynomial whose sum and product of zeroes are –3 and 2 is
(a) $x^2 – 3x +2$ (b) $x^2 + 3x + 2$ (c) $x^2 + 2x – 3$. (d) $x^2 + 2x + 3$.

12. The zeroes of the quadratic polynomial $x^2 + kx + k$, $k \neq 0$,
(a) cannot both be positive (b) cannot both be negative
(c) are always unequal (d) are always equal

MCQ WORKSHEET-II
CLASS X : CHAPTER - 2
POLYNOMIALS

1. If α, β are the zeroes of the polynomials f(x) = $x^2 + x + 1$, then $\frac{1}{\alpha}+\frac{1}{\beta}$
   (a) 0 (b) 1 (c) –1 (d) none of these

2. If one of the zero of the polynomial f(x) = $(k^2 + 4)x^2 + 13x + 4k$ is reciprocal of the other then k =
   (a) 2 (b) 1 (c) –1 (d) – 2

3. If α, β are the zeroes of the polynomials f(x) = $4x^2 + 3x + 7$, then $\frac{1}{\alpha}+\frac{1}{\beta}$
   (a) $\frac{7}{3}$ (b) $\frac{-7}{3}$ (c) $\frac{3}{7}$ (d) $\frac{-3}{7}$

4. If the sum of the zeroes of the polynomial f(x) = $2x^3 - 3kx^2 + 4x - 5$ is 6, then value of k is
   (a) 2 (b) 4 (c) –2 (d) – 4

5. The zeroes of a polynomial $p(x)$ are precisely the x-coordinates of the points, where the graph of $y = p(x)$ intersects the
   (a) x – axis (b) y – axis (c) origin (d) none of the above

6. If α, β are the zeroes of the polynomials f(x) = $x^2 - p(x + 1) - c$, then $(\alpha+1)(\beta+1)$ =
   (a) c – 1 (b) 1 – c (c) c (d) 1 + c

7. A quadratic polynomial can have at most …….. zeroes
   (a) 0 (b) 1 (c) 2 (d) 3

8. A cubic polynomial can have at most …….. zeroes.
   (a) 0 (b) 1 (c) 2 (d) 3

9. Which are the zeroes of p(x) = $x^2 - 1$:
   (a) 1, –1 (b) – 1, 2 (c) –2, 2 (d) –3, 3

10. Which are the zeroes of p(x) = (x – 1)(x – 2):
    (a) 1, –2 (b) – 1, 2 (c) 1, 2 (d) –1, –2

11. Which of the following is a polynomial?
    $(a) x^2 - 5x + 3$
    $(b) \sqrt{x} + \frac{1}{\sqrt{x}}$
    $(c) x^{3/2} - x + x^{1/2}$
    $(d) x^{1/2} + x + 10$

12. Which of the following is not a polynomial?
    $(a) \sqrt{3}x^2 - 2\sqrt{3}x + 3$
    $(b) \frac{3}{2}x^3 - 5x^2 - \frac{1}{\sqrt{2}}x - 1$
    $(c) x + \frac{1}{x}$
    $(d) 5x^2 - 3x + \sqrt{2}$

MCQ WORKSHEET-III
CLASS X : CHAPTER - 2
POLYNOMIALS

1. If α, β are the zeroes of the polynomials f(x) = $x^2 + 5x + 8$, then $\alpha + \beta$
   (a) 5 (b) –5 (c) 8 (d) none of these

2. If α, β are the zeroes of the polynomials f(x) = $x^2 + 5x + 8$, then $\alpha.\beta$
   (a) 0 (b) 1 (c) –1 (d) none of these

3. On dividing $x^3 + 3x^2 + 3x + 1$ by $x + \pi$ we get remainder:
   $(a) -\pi^3 + 3\pi^2 - 3\pi + 1$
   $(b) \pi^3 - 3\pi^2 + 3\pi + 1$
   $(c) -\pi^3 - 3\pi^2 - 3\pi - 1$
   $(d) -\pi^3 + 3\pi^2 - 3\pi - 1$

4. The zero of p(x) = 9x + 4 is:
   (a) $\frac{4}{9}$ (b) $\frac{9}{4}$ (c) $\frac{-4}{9}$ (d) $\frac{-9}{4}$

5. On dividing $x^3 + 3x^2 + 3x + 1$ by 5 + 2x we get remainder:
   (a) $\frac{8}{27}$ (b) $\frac{-8}{27}$ (c) $\frac{-27}{8}$ (d) $\frac{27}{8}$

6. A quadratic polynomial whose sum and product of zeroes are –3 and 4 is
   (a) $x^2 - 3x + 12$ (b) $x^2 + 3x + 12$ (c) $2x^2 + x - 24$. (d) none of the above.

7. A quadratic polynomial whose zeroes are $\frac{3}{5}$ and $\frac{-1}{2}$ is
   (a) $10x^2 - x - 3$ (b) $10x^2 + x - 3$ (c) $10x^2 - x + 3$ (d) none of the above.

8. A quadratic polynomial whose sum and product of zeroes are 0 and 5 is
   (a) $x^2 - 5$ (b) $x^2 + 5$ (c) $x^2 + x - 5$. (d) none of the above.

9. A quadratic polynomial whose zeroes are 1 and –3 is
   (a) $x^2 - 2x - 3$ (b) $x^2 + 2x - 3$ (c) $x^2 - 2x + 3$ (d) none of the above.

10. A quadratic polynomial whose sum and product of zeroes are –5 and 6 is
    (a) $x^2 - 5x - 6$ (b) $x^2 + 5x - 6$ (c) $x^2 + 5x + 6$ (d) none of the above.

11. Which are the zeroes of p(x) = $x^2 + 3x - 10$:
    (a) 5, –2 (b) –5, 2 (c) –5, –2 (d) none of these

12. Which are the zeroes of p(x) = $6x^2 - 7x - 3$:
    (a) 5, –2 (b) –5, 2 (c) –5, –2 (d) none of these

13. Which are the zeroes of p(x) = $x^2 + 7x + 12$:
    (a) 4, –3 (b) –4, 3 (c) –4, –3 (d) none of these

MCQ WORKSHEET-IV
CLASS X : CHAPTER - 2
POLYNOMIALS

1. The degree of the polynomial whose graph is given below:
(a) 1 (b) 2 (c) ≥ 3 (d) cannot be fixed

2. If the sum of the zeroes of the polynomial 3x2 – kx + 6 is 3, then the value of k is:
(a) 3 (b) –3 (c) 6 (d) 9

3. The other two zeroes of the polynomial x3 – 8x2 + 19x – 12 if tis one zeroes is x = 1 are:
(a) 3, –4 (b) –3, –4 (c) –3, 4 (d) 3, 4

4. The quadratic polynomial, the sum and product of whose zeroes are –3 and 2 is:
(a) $x^2 - 3x + 2$ (b) $x^2 + 3x - 2$ (c) $x^2 + 3x + 2$ (d) none of the these.

5. The third zero of the polynomial, if the sum and product of whose zeroes are –3 and 2 is:
(a) 7 (b) –7 (c) 14 (d) –14

6. If $\sqrt{\frac{5}{3}}$ and $-\sqrt{\frac{5}{3}}$ are two zeroes of the polynomial $3x^4 + 6x^3 - 2x^2 - 10x - 5$, then its other two zeroes are:
(a) –1, –1 (b) 1, –1 (c) 1, 1 (d) 3, –3

7. If a – b, a and a + b are zeroes of the polynomial $x^3 - 3x^2 + x + 1$ the value of (a + b) is
(a) $1 \pm \sqrt{2}$ (b) $-1+\sqrt{2}$ (c) $-1-\sqrt{2}$ (d) 3

8. A real numbers a is called a zero of the polynomial f(x), then
(a) f(a) = –1 (b) f(a) = 1 (c) f(a) = 0 (d) f(a) = –2

9. Which of the following is a polynomial:
(a) $x^2 + \frac{1}{x}$ (b) $2x^2 - 3\sqrt{x} + 1$ (c) $x^2 + x^{-2} + 7$ (d) $3x^2 - 3x + 1$

10. The product and sum of zeroes of the quadratic polynomial ax2 + bx + c respectively are:
(a) $\frac{b}{a}, \frac{c}{a}$ (b) $\frac{c}{a}, \frac{b}{a}$ (c) $\frac{c}{b}, 1$ (d) $\frac{c}{a}, \frac{-b}{a}$

11. The quadratic polynomial, sum and product of whose zeroes are 1 and –12 respectively is
(a) $x^2 - x - 12$ (b) $x^2 + x - 12$ (c) $x^2 - 12x + 1$ (d) $x^2 - 12x - 1$.

12. If the product of two of the zeroes of the polynomial $2x^3 - 9x^2 + 13x - 6$ is 2, the third zero of the polynomial is:
(a) –1 (b) –2 (c) $\frac{3}{2}$ (d) $-\frac{3}{2}$

PRACTICE QUESTIONS

CLASS X : CHAPTER - 2
POLYNOMIALS

1. If $p(x) = 3x^3 – 2x^2 + 6x – 5$, find p(2).

2. Draw the graph of the polynomial $f(x) = x^2 – 2x – 8$.

3. Draw the graph of the polynomial $f(x) = 3 – 2x – x^2$.

4. Draw the graph of the polynomial $f(x) = –3x^2 + 2x – 1$.

5. Draw the graph of the polynomial $f(x) = x^2 – 6x + 9$.

6. Draw the graph of the polynomial $f(x) = x^3$.

7. Draw the graph of the polynomial $f(x) = x^3 – 4x$.

8. Draw the graph of the polynomial $f(x) = x^3 – 2x^2$.

9. Draw the graph of the polynomial $f(x) = –4x^2 + 4x – 1$.

10. Draw the graph of the polynomial $f(x) = 2x^2 – 4x + 5$.

11. Find the quadratic polynomial whose zeroes are $2 + \sqrt{3}$ and $2 – \sqrt{3}$.

12. Find the quadratic polynomial whose zeroes are $\frac{3-\sqrt{3}}{5}$ and $\frac{3+\sqrt{3}}{5}$.

13. Find a quadratic polynomial whose sum and product of zeroes are $\sqrt{2}$ and 3 respectively.

14. Find the zeroes of the polynomial $mx^2 + (m + n)x + n$.

15. If m and n are zeroes of the polynomial $3x^2 + 11x – 4$, find the value of $\frac{m}{n}+\frac{n}{m}$

16. If a and b are zeroes of the polynomial $x^2 – x – 6$, then find a quadratic polynomial whose zeroes are (3a + 2b) and (2a + 3b).

17. If p and q are zeroes of the polynomial $t^2 – 4t + 3$, show that $\frac{1}{p}+\frac{1}{q}-2pq+\frac{14}{3}=0$.

18. If (x – 6) is a factor of $x^3 + ax^2 + bx – b = 0$ and a – b = 7, find the values of a and b.

19. If 2 and – 3 are the zeroes of the polynomial $x^2 + (a + 1)x + b$, then find the value of a and b.

20. Obtain all zeroes of polynomial $f(x) = 2x^4 + x^3 – 14x^2 – 19x – 6$ if two of its zeroes are –2 and –1.

21. Find all the zeroes of the polynomial $2x^3-4x-x^2+2$, if two of its zeroes are $\sqrt{2}$ and $-\sqrt{2}$.

22. Find all the zeroes of the polynomial x^4-3x^3+6x-4, if two of its zeroes are $\sqrt{2}$ and $-\sqrt{2}$.

23. Find all the zeroes of the polynomial $2x^4-9x^3+5x^2+3x-1$, if two of its zeroes are $2+\sqrt{3}$ and $2-\sqrt{3}$.

24. Find all the zeroes of the polynomial $2x^4 + 7x^3 - 19x^2 - 14x + 30$, if two of its zeroes are $\sqrt{2}$ and $-\sqrt{2}$.

25. Find all the zeroes of the polynomial $x^3 + 3x^2 - 2x - 6$, if two of its zeroes are $\sqrt{2}$ and $-\sqrt{2}$.

26. Find all the zeroes of the polynomial $2x^3 - x^2 - 5x - 2$, if two of its zeroes are –1 and 2.

27. Find all the zeroes of the polynomial $x^3 + 3x^2 - 5x - 15$, if two of its zeroes are $\sqrt{5}$ and $-\sqrt{5}$.

28. Find all the zeroes of the polynomial $x^3 - 4x^2 - 3x + 12$, if two of its zeroes are $\sqrt{3}$ and $-\sqrt{3}$.

29. Find all the zeroes of the polynomial $2x^3 + x^2 - 6x - 3$, if two of its zeroes are $\sqrt{3}$ and $-\sqrt{3}$.

30. Find all the zeroes of the polynomial $x^4 + x^3 - 34x^2 - 4x + 120$, if two of its zeroes are 2 and –2.

31. If the polynomial $6x^4 + 8x^3 + 17x^2 + 21x + 7$ is divided by another polynomial $3x^2 + 4x + 1$, the remainder comes out to be (ax + b), find a and b.

32. If the polynomial $x^4 + 2x^3 + 8x^2 + 12x + 18$ is divided by another polynomial $x^2 + 5$, the remainder comes out to be px + q, find the value of p and q.

33. Find the zeroes of a polynomial $x^3 - 5x^2 - 16x + 80$, if its two zeroes are equal in magnitude but opposite in sign.

34. If two zeroes of the polynomial $x^4 + 3x^3 - 20x^2 - 6x + 36$ are $\sqrt{2}$ and $-\sqrt{2}$, find the other zeroes of the polynomial.

35. On dividing $x^3 - 3x^2 + x + 2$ by a polynomial g(x), the quotient and remainder were x – 2 and –2x + 4 respectively. Find g(x).

36. If the product of zeroes of the polynomial $ax^2 - 6x - 6$ is 4, find the value of 'a'.

37. If one zero of the polynomial $(a^2 + 9)x^2 + 13x + 6a$ is reciprocal of the other. Find the value of a.

38. Write a quadratic polynomial, sum of whose zeroes is $2\sqrt{3}$ and their product is 2.

39. Find a polynomial whose zeroes are 2 and –3.

40. Find the zeroes of the quadratic polynomial $x^2 + 5x + 6$ and verify the relationship between the zeroes and the coefficients.

41. Find the sum and product of zeroes of $p(x) = 2(x^2 - 3) + x$.

42. Find a quadratic polynomial, the sum of whose zeroes is 4 and one zero is 5.

43. Find the zeroes of the polynomial $p(x) = \sqrt{2}x^2 - 3x - 2\sqrt{2}$.

44. If α and β are the zeroes of $2x^2 + 5(x - 2)$, then find the product of α and β.

45. Find a quadratic polynomial, the sum and product of whose zeroes are 5 and 3 respectively.

46. Find the zeroes of the quadratic polynomial $f(x) = abx^2 + (b^2 - ac)x - bc$ and verify the relationship between the zeroes and its coefficients.

47. Find the zeroes of the following polynomials by factorisation method and verify the relations between the zeroes and the coefficients of the polynomials:

(i) $4x^2 - 3x - 1$

(ii) $3x^2 + 4x - 4$

(iii) $5t^2 + 12t + 7$

(iv) $t^3 - 2t^2 - 15t$

(v) $2x^2 + \frac{7}{2}x + \frac{3}{4}$

(vi) $4x^2 + 5\sqrt{2}\,x - 3$

(vii) $2s^2 - (1 + 2\sqrt{2})s + \sqrt{2}$

(viii) $v^2 + 4\sqrt{3}\,v - 15$

(ix) $y^2 + \frac{3}{2}\sqrt{5}\,y - 5$

(x) $7y^2 - \frac{11}{3}y - \frac{2}{3}$

48. Find the zeroes of the quadratic polynomial $6x^2 - 7x - 3$ and verify the relationship between the zeroes and the coefficients.

49. Find the zeroes of the polynomial $x^2 + \frac{1}{6}x - 2$, and verify the relation between the coefficients and the zeroes of the polynomial.

50. Find the zeroes of the quadratic polynomial $x^2 + 5x + 6$ and verify the relationship between the zeroes and the coefficients.

51. Find a quadratic polynomial, the sum and product of whose zeroes are $\sqrt{2}$ and $-\frac{3}{2}$, respectively. Also find its zeroes.

52. If one zero of the quadratic polynomial $x^2 + 3x + k$ is 2, then find the value of k

53. Given that two of the zeroes of the cubic polynomial $ax^3 + bx^2 + cx + d$ are 0, find the third zero.

54. Given that one of the zeroes of the cubic polynomial $ax^3 + bx^2 + cx + d$ is zero, then find the product of the other two zeroes.

55. If one of the zeroes of the cubic polynomial $x^3 + ax^2 + bx + c$ is –1, then the product of the other two zeroes

Answer the Questions from 28 to 32 and justify:

56. Can $x^2 - 1$ be the quotient on division of $x^6 + 2x^3 + x - 1$ by a polynomial in x of degree 5?

57. What will the quotient and remainder be on division of $ax^2 + bx + c$ by $px^3 + qx^2 + rx + s$, $p \neq 0$?

58. If on division of a polynomial $p(x)$ by a polynomial $g(x)$, the degree of quotient is zero, what is the relation between the degrees of $p(x)$ and $g(x)$?

59. If on division of a non-zero polynomial $p(x)$ by a polynomial $g(x)$, the remainder is zero, what is the relation between the degrees of $p(x)$ and $g(x)$?

60. Can the quadratic polynomial $x^2 + kx + k$ have equal zeroes for some odd integer $k > 1$?

61. If one of the zeroes of the quadratic polynomial $(k-1)x^2 + k x + 1$ is -3, then the value of k

62. If the zeroes of the quadratic polynomial $x^2 + (a + 1) x + b$ are 2 and –3, then find the value of a and b.

63. If α and β are zeroes of the quadratic polynomial $x^2 - (k + 6)x + 2(2k - 1)$. Find the value of k if $\alpha + \beta = \frac{1}{2}\alpha\beta$.

64. Obtain all the zeroes of $3x^4 + 6x^3 - 2x^2 - 10x + 5$, if two of its zeroes are $\sqrt{\frac{5}{3}}$ and $-\sqrt{\frac{5}{3}}$.

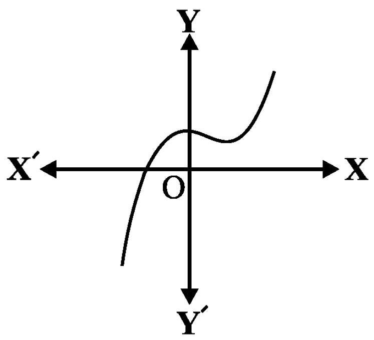
65. Obtain all the zeroes of $x^4 - 7x^3 + 17x^2 - 17x + 6$, if two of its zeroes are 3 and 1.

66. Obtain all the zeroes of $x^4 - 7x^2 + 12$, if two of its zeroes are $\sqrt{3}$ and $-\sqrt{3}$.

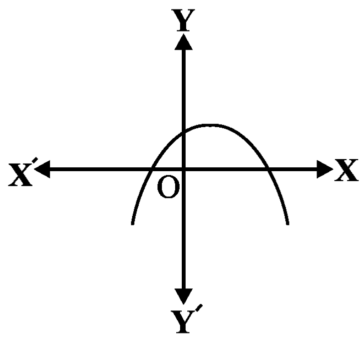
67. Two zeroes of the cubic polynomial $ax^3 + 3x^2 - bx - 6$ are – 1 and – 2. Find the 3rd zero and value of a and b.

68. α, β and γ are the zeroes of cubic polynomial $x^3 + px^2 + qx + 2$ such that $\alpha . \beta + 1 = 0$. Find the value of $2p + q + 5$.

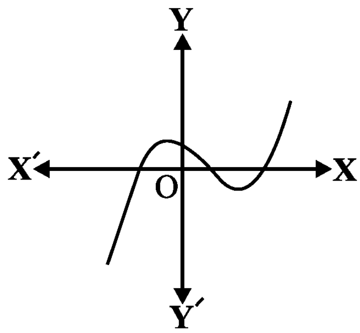
69. Find the number of zeroes in each of the following:



(i)



(ii)



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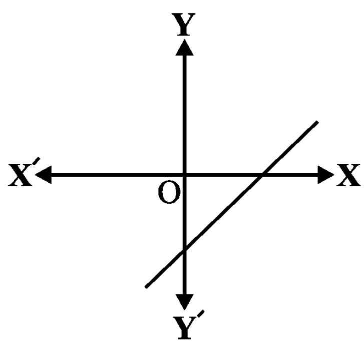

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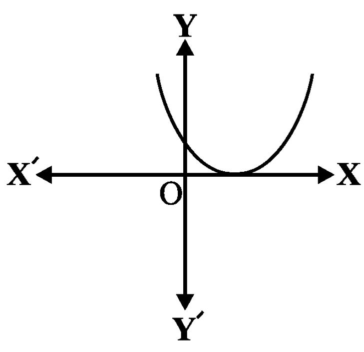
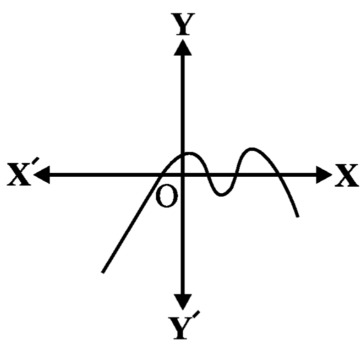


(v)



(vi)

70. If the remainder on division of $x^3 + 2x^2 + kx + 3$ by $x - 3$ is 21, find the quotient and the value of k. Hence, find the zeroes of the cubic polynomial $x^3 + 2x^2 + kx - 18$.

71. Find the zeroes of the polynomial $f(x) = x^3 - 5x^2 - 16x + 80$, if its two zeroes are equal in magnitude but opposite in sign.

72. Find the zeroes of the polynomial $f(x) = x^3 - 5x^2 - 2x + 24$, if it is given that the product of two zeroes is 12.

73. Find the zeroes of the polynomial $f(x) = x^3 - px^2 + qx - r$, if it is given that the sum of two zeroes is zero.

74. If the zeroes of the polynomial $x^3 - 3x^2 + x + 1$ are $a - b$, a, $a + b$, find a and b.

75. If the zeroes of the polynomial $2x^3 - 15x^2 + 37x - 30$ are $a - b$, a, $a + b$, find all the zeroes.

76. If the zeroes of the polynomial $x^3 - 12x^2 + 39x - 28$ are $a - b$, a, $a + b$, find all the zeroes.

77. If the polynomial $x^4 - 6x^3 + 16x^2 - 25x + 10$ is divided by another polynomial $x^2 - 2x + k$, the remainder comes out to be $x + a$, find k and a.

78. If the polynomial $6x^4 + 8x^3 - 5x^2 + ax + b$ is exactly divisible by the polynomial $2x^2 - 5$, then find the values of a and b.

79. Find a cubic polynomial with the sum, sum of the product of its zeroes taken two at a time, and the product of its zeroes as 2, –7, –14 respectively.

80. Find a cubic polynomial with the sum, sum of the product of its zeroes taken two at a time, and the product of its zeroes as 3, –1, –3 respectively.

81. Find a cubic polynomial whose zeroes are 3, $\frac{1}{2}$ and –1.

82. Find a cubic polynomial whose zeroes are –2, –3 and –1.

83. Find a cubic polynomial whose zeroes are 3, 5 and –2.

84. Verify that 5, –2 and $\frac{1}{3}$ are the zeroes of the cubic polynomial $p(x) = 3x^3 - 10x^2 - 27x + 10$ and verify the relation between its zeroes and coefficients.

85. Verify that 3, –2 and 1 are the zeroes of the cubic polynomial $p(x) = x^3 - 2x^2 - 5x + 6$ and verify the relation between its zeroes and coefficients.

86. Verify that the numbers given alongside of the cubic polynomials below are their zeroes. Also verify the relationship between the zeroes and the coefficients in each case:

(i) $2x^3 + x^2 - 5x + 2$; $\frac{1}{2}$, 1, – 2 (ii) $x^3 - 4x^2 + 5x - 2$; 2, 1, 1

87. Find the quotient and remainder when $4x^3 + 2x^2 + 5x - 6$ is divided by $2x^2 + 3x + 1$.

88. On dividing $x^4 - 5x + 6$ by a polynomial g(x), the quotient and remainder were $-x^2 - 2$ and $-5x + 10$ respectively. Find g(x).

89. Given that $\sqrt{2}$ is a zero of the cubic polynomial $6x^3 + \sqrt{2}\,x^2 - 10x - 4\sqrt{2}$, find its other two zeroes.

90. Given that the zeroes of the cubic polynomial $x^3 - 6x^2 + 3x + 10$ are of the form a, $a + b$, $a + 2b$ for some real numbers a and b, find the values of a and b as well as the zeroes of the given polynomial.

91. For which values of a and b, are the zeroes of $q(x) = x^3 + 2x^2 + a$ also the zeroes of the polynomial $p(x) = x^5 - x^4 - 4x^3 + 3x^2 + 3x + b$? Which zeroes of $p(x)$ are not the zeroes of $q(x)$?

92. Find k so that $x^2 + 2x + k$ is a factor of $2x^4 + x^3 - 14x^2 + 5x + 6$. Also find all the zeroes of the two polynomials.

93. Given that $x - \sqrt{5}$ is a factor of the cubic polynomial $x^3 - 3\sqrt{5}x + 13x - 3\sqrt{5}$, find all the zeroes of the polynomial.

94. For each of the following, find a quadratic polynomial whose sum and product respectively of the zeroes are as given. Also find the zeroes of these polynomials by factorisation.

$(i)\frac{-8}{3},\frac{4}{3}$ $\quad(ii)\frac{21}{8},\frac{5}{16}$

$(iii)-2\sqrt{3},-9$ $\quad(iv)\frac{-3}{2\sqrt{5}},-\frac{1}{2}$

95. If α and β are the zeroes of the quadratic polynomial $f(x) = x^2 - 3x - 2$, then find a quadratic polynomial whose zeroes are $\frac{1}{2\alpha+\beta}$ and $\frac{1}{2\beta+\alpha}$.

96. If α and β are the zeroes of the quadratic polynomial $f(x) = 2x^2 - 5x + 7$, then find a quadratic polynomial whose zeroes are $2\alpha+3\beta$ and $2\beta+3\alpha$.

97. If α and β are the zeroes of the quadratic polynomial $f(x) = x^2 - 1$, then find a quadratic polynomial whose zeroes are $\frac{2\alpha}{\beta}$ and $\frac{2\beta}{\alpha}$.

98. If α and β are the zeroes of the quadratic polynomial $f(x) = 6x^2 + x - 2$, then find the value of

$(i)\alpha-\beta$ $\quad(ii)\alpha^2+\beta^2$ $\quad(iii)\alpha^4+\beta^4$ $\quad(iv)\alpha\beta^2+\alpha^2\beta$

$(v)\frac{1}{\alpha}+\frac{1}{\beta}$ $\quad(vi)\frac{1}{\alpha}+\frac{1}{\beta}-\alpha\beta$ $\quad(vii)\frac{1}{\alpha}-\frac{1}{\beta}$ $\quad(viii)\alpha^3+\beta^3$

$(ix)\frac{\alpha}{\beta}+\frac{\beta}{\alpha}$ $\quad(x)\frac{\alpha^2}{\beta}+\frac{\beta^2}{\alpha}$ $\quad(xi)\frac{\alpha}{\beta}+\frac{\beta}{\alpha}+2\left(\frac{1}{\alpha}+\frac{1}{\beta}\right)+3\alpha\beta$

$(xii)\alpha^4\beta^3+\alpha^3\beta^4$ $\quad(xiii)\frac{1}{\alpha}+\frac{1}{\beta}-2\alpha\beta$ $\quad(xiv)\frac{\alpha^2}{\beta^2}+\frac{\beta^2}{\alpha^2}$

99. If α and β are the zeroes of the quadratic polynomial $f(x) = 4x^2 - 5x - 1$, then find the value of

$(i)\alpha-\beta$ $\quad(ii)\alpha^2+\beta^2$ $\quad(iii)\alpha^4+\beta^4$ $\quad(iv)\alpha\beta^2+\alpha^2\beta$

$(v)\frac{1}{\alpha}+\frac{1}{\beta}$ $\quad(vi)\frac{1}{\alpha}+\frac{1}{\beta}-\alpha\beta$ $\quad(vii)\frac{1}{\alpha}-\frac{1}{\beta}$ $\quad(viii)\alpha^3+\beta^3$

$(ix)\frac{\alpha}{\beta}+\frac{\beta}{\alpha}$ $\quad(x)\frac{\alpha^2}{\beta}+\frac{\beta^2}{\alpha}$ $\quad(xi)\frac{\alpha}{\beta}+\frac{\beta}{\alpha}+2\left(\frac{1}{\alpha}+\frac{1}{\beta}\right)+3\alpha\beta$

$(xii)\alpha^4\beta^3+\alpha^3\beta^4$ $\quad(xiii)\frac{1}{\alpha}+\frac{1}{\beta}-2\alpha\beta$ $\quad(xiv)\frac{\alpha^2}{\beta^2}+\frac{\beta^2}{\alpha^2}$

100. If α and β are the zeroes of the quadratic polynomial f(x) = $x^2 + x - 2$, then find the value of

$(i)\alpha - \beta$ $\quad (ii)\alpha^2 + \beta^2$ $\quad (iii)\alpha^4 + \beta^4$ $\quad (iv)\alpha\beta^2 + \alpha^2\beta$

$(v)\frac{1}{\alpha} + \frac{1}{\beta}$ $\quad (vi)\frac{1}{\alpha} + \frac{1}{\beta} - \alpha\beta$ $\quad (vii)\frac{1}{\alpha} - \frac{1}{\beta}$ $\quad (viii)\alpha^3 + \beta^3$

$(ix)\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$ $\quad (x)\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha}$ $\quad (xi)\frac{\alpha}{\beta} + \frac{\beta}{\alpha} + 2\left(\frac{1}{\alpha} + \frac{1}{\beta}\right) + 3\alpha\beta$

$(xii)\alpha^4\beta^3 + \alpha^3\beta^4$ $\quad (xiii)\frac{1}{\alpha} + \frac{1}{\beta} - 2\alpha\beta$ $\quad (xiv)\frac{\alpha^2}{\beta^2} + \frac{\beta^2}{\alpha^2}$

101. If α and β are the zeroes of the quadratic polynomial f(x) = $x^2 - 5x + 4$, then find the value of

$(i)\alpha - \beta$ $\quad (ii)\alpha^2 + \beta^2$ $\quad (iii)\alpha^4 + \beta^4$ $\quad (iv)\alpha\beta^2 + \alpha^2\beta$

$(v)\frac{1}{\alpha} + \frac{1}{\beta}$ $\quad (vi)\frac{1}{\alpha} + \frac{1}{\beta} - \alpha\beta$ $\quad (vii)\frac{1}{\alpha} - \frac{1}{\beta}$ $\quad (viii)\alpha^3 + \beta^3$

$(ix)\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$ $\quad (x)\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha}$ $\quad (xi)\frac{\alpha}{\beta} + \frac{\beta}{\alpha} + 2\left(\frac{1}{\alpha} + \frac{1}{\beta}\right) + 3\alpha\beta$

$(xii)\alpha^4\beta^3 + \alpha^3\beta^4$ $\quad (xiii)\frac{1}{\alpha} + \frac{1}{\beta} - 2\alpha\beta$ $\quad (xiv)\frac{\alpha^2}{\beta^2} + \frac{\beta^2}{\alpha^2}$

102. If α and β are the zeroes of the quadratic polynomial f(x) = $x^2 - 2x + 3$, then find a quadratic polynomial whose zeroes are $\alpha + 2$ and $\beta + 2$

103. If α and β are the zeroes of the quadratic polynomial f(x) = $3x^2 - 4x + 1$, then find a quadratic polynomial whose zeroes are $\frac{\alpha^2}{\beta}$ and $\frac{\beta^2}{\alpha}$.

104. If α and β are the zeroes of the quadratic polynomial f(x) = $x^2 - 2x + 3$, then find a quadratic polynomial whose zeroes are $\frac{\alpha - 1}{\alpha + 1}$ and $\frac{\beta - 1}{\beta + 1}$.

105. If α and β are the zeroes of the quadratic polynomial f(x) = $x^2 - p(x + 1) - c$, show that $(\alpha + 1)(\beta + 1) = 1 - c$.

106. If α and β are the zeroes of the quadratic polynomial such that $\alpha + \beta = 24$ and $\alpha - \beta = 8$, find a quadratic polynomial having α and β as its zeroes.

107. If sum of the squares of zeroes of the quadratic polynomial f(x) = $x^2 - 8x + k$ is 40, find the value of k.

108. If α and β are the zeroes of the quadratic polynomial f(x) = $kx^2 + 4x + 4$ such that $\alpha^2 + \beta^2 = 24$, find the value of k.

109. If α and β are the zeroes of the quadratic polynomial f(x) = $2x^2 + 5x + k$ such that $\alpha^2 + \beta^2 + \alpha\beta = \frac{21}{4}$, find the value of k.

110. What must be subtracted from $8x^4 + 14x^3 - 2x^2 + 7x - 8$ so that the resulting polynomial is exactly divisible by $4x^2 + 3x - 2$.

111. What must be subtracted from $4x^4 + 2x^3 - 2x^2 + x - 1$ so that the resulting polynomial is exactly divisible by $x^2 + 2x - 3$.

112. Find all the zeroes of the polynomial $x^4 - 6x^3 - 26x^2 + 138x - 35$, if two of its zeroes are $2+\sqrt{3}$ and $2-\sqrt{3}$.

113. Find the values of a and b so that $x^4 + x^3 + 8x^2 + ax + b$ is divisible by $x^2 + 1$.

114. If the polynomial $f(x) = x^4 - 6x^3 + 16x^2 - 25x + 10$ is divided by another polynomial $x^2 - 2x + k$, the remainder comes out to be $x + a$, find k and a.

115. If α and β are the zeroes of the quadratic polynomial $f(x) = x^2 - 2x - 8$, then find the value of

(i) $\alpha - \beta$ (ii) $\alpha^2 + \beta^2$ (iii) $\alpha^4 + \beta^4$ (iv) $\alpha\beta^2 + \alpha^2\beta$

(v) $\frac{1}{\alpha} + \frac{1}{\beta}$ (vi) $\frac{1}{\alpha} + \frac{1}{\beta} - \alpha\beta$ (vii) $\frac{1}{\alpha} - \frac{1}{\beta}$ (viii) $\alpha^3 + \beta^3$

(ix) $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$ (x) $\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha}$ (xi) $\frac{\alpha}{\beta} + \frac{\beta}{\alpha} + 2\left(\frac{1}{\alpha} + \frac{1}{\beta}\right) + 3\alpha\beta$

(xii) $\alpha^4\beta^3 + \alpha^3\beta^4$ (xiii) $\frac{1}{\alpha} + \frac{1}{\beta} - 2\alpha\beta$ (xiv) $\frac{\alpha^2}{\beta^2} + \frac{\beta^2}{\alpha^2}$

CLASS X : CHAPTER - 3
PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

IMPORTANT FORMULAS & CONCEPTS

- An equation of the form ax + by + c = 0, where a, b and c are real numbers ($a \neq 0, b \neq 0$), is called a linear equation in two variables x and y.
- The numbers a and b are called the coefficients of the equation ax + by + c = 0 and the number c is called the constant of the equation ax + by + c = 0.

Two linear equations in the same two variables are called a pair of linear equations in two variables. The most general form of a pair of linear equations is

$$a_1x + b_1y + c_1 = 0$$
$$a_2x + b_2y + c_2 = 0$$

where a_1, a_2, b_1, b_2, c_1, c_2 are real numbers, such that $a_1^2 + b_1^2 \neq 0$, $a_2^2 + b_2^2 \neq 0$.

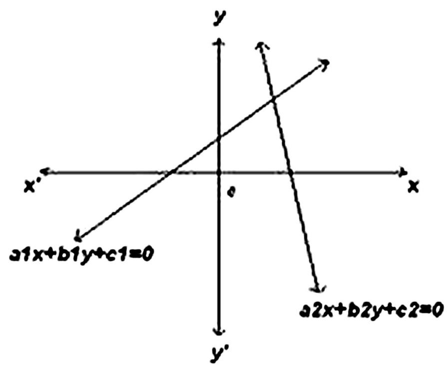
CONSISTENT SYSTEM
A system of simultaneous linear equations is said to be consistent, if it has at least one solution.

INCONSISTENT SYSTEM
A system of simultaneous linear equations is said to be inconsistent, if it has no solution.

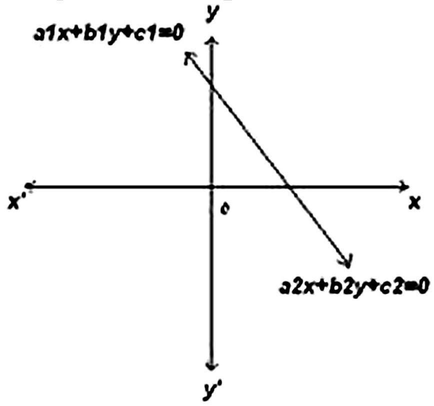
METHOD TO SOLVE A PAIR OF LINEAR EQUATION OF TWO VARIABLES
A pair of linear equations in two variables can be represented, and solved, by the:
(i) graphical method (ii) algebraic method

GRAPHICAL METHOD OF SOLUTION OF A PAIR OF LINEAR EQUATIONS
The graph of a pair of linear equations in two variables is represented by two lines.

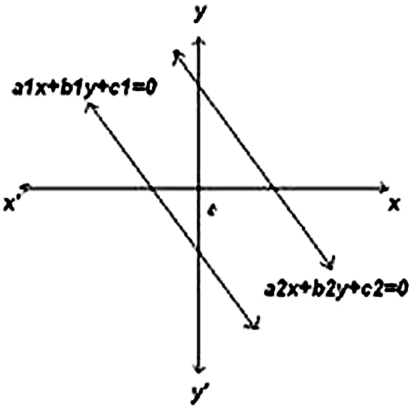
1. If the lines intersect at a point, then that point gives the unique solution of the two equations. In this case, the pair of equations is **consistent**.



2. If the lines coincide, then there are infinitely many solutions — each point on the line being a solution. In this case, the pair of equations is **dependent (consistent)**.



3. If the lines are parallel, then the pair of equations has no solution. In this case, the pair of equations is **inconsistent**.



Algebraic interpretation of pair of linear equations in two variables

The pair of linear equations represented by these lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$

1. If $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ then the pair of linear equations has exactly one solution.

2. If $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ then the pair of linear equations has infinitely many solutions.

3. If $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ then the pair of linear equations has no solution.

S. No.	Pair of lines	Compare the ratios	Graphical representation	Algebraic interpretation
1	$a_1x + b_1y + c_1 = 0$ $a_2x + b_2y + c_2 = 0$	$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$	Intersecting lines	Unique solution (Exactly one solution)
2	$a_1x + b_1y + c_1 = 0$ $a_2x + b_2y + c_2 = 0$	$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$	Coincident lines	Infinitely many solutions
3	$a_1x + b_1y + c_1 = 0$ $a_2x + b_2y + c_2 = 0$	$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$	Parallel lines	No solution

ALGEBRAIC METHODS OF SOLVING A PAIR OF LINEAR EQUATIONS

Substitution Method

Following are the steps to solve the pair of linear equations by substitution method:

$a_1x + b_1y + c_1 = 0$ … (i) and

$a_2x + b_2y + c_2 = 0$ … (ii)

Step 1: We pick either of the equations and write one variable in terms of the other

$y = -\frac{a_1}{b_1}x - \frac{c_1}{b_1}$ … (iii)

Step 2: Substitute the value of x in equation (i) from equation (iii) obtained in step 1.

Step 3: Substituting this value of y in equation (iii) obtained in step 1, we get the values of x and y.

Elimination Method

Following are the steps to solve the pair of linear equations by elimination method:

Step 1: First multiply both the equations by some suitable non-zero constants to make the coefficients of one variable (either x or y) numerically equal.

Step 2: Then add or subtract one equation from the other so that one variable gets eliminated.

- If you get an equation in one variable, go to Step 3.
- If in Step 2, we obtain a true statement involving no variable, then the original pair of equations has infinitely many solutions.

- ❖ If in Step 2, we obtain a false statement involving no variable, then the original pair of equations has no solution, i.e., it is inconsistent.

Step 3: Solve the equation in one variable (x or y) so obtained to get its value.
Step 4: Substitute this value of x (or y) in either of the original equations to get the value of the other variable.

Cross - Multiplication Method

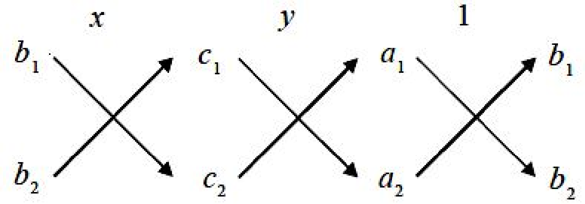
Let the pair of linear equations be:

$a_1x + b_1y + c_1 = 0$ … (1) and
$a_2x + b_2y + c_2 = 0$ … (2)

$$\frac{x}{b_1c_2 - b_2c_1} = \frac{y}{c_1a_2 - c_2a_1} = \frac{1}{a_1b_2 - a_2b_1} \quad \text{…………. (3)}$$

$$\Rightarrow x = \frac{b_1c_2 - b_2c_1}{a_1b_2 - a_2b_1} \quad and \quad y = \frac{c_1a_2 - c_2a_1}{a_1b_2 - a_2b_1}$$

In remembering the above result, the following diagram may be helpful :



The arrows between the two numbers indicate that they are to be multiplied and the second product is to be subtracted from the first.

For solving a pair of linear equations by this method, we will follow the following steps :
Step 1 : Write the given equations in the form (1) and (2).
Step 2 : Taking the help of the diagram above, write Equations as given in (3).
Step 3 : Find *x* and *y*, provided $a_1b_2 - a_2b_1 \neq 0$
Step 2 above gives you an indication of why this method is called the **cross-multiplication method**.

MCQ WORKSHEET-I

CLASS X : CHAPTER - 3

PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

1. The pair of equations y = 0 and y = –7 has
(a) one solution (b) two solution (c) infinitely many solutions (d) no solution

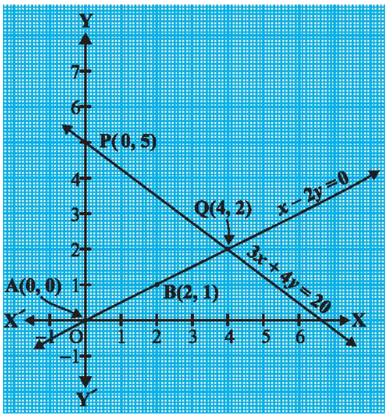
2. The pair of equations x = a and y = b graphically represents the lines which are
(a) parallel (b) intersecting at (a, b)
(c) coincident (d) intersecting at (b, a)

3. The value of c for which the pair of equations cx – y = 2 and 6x – 2y = 3 will have infinitely many solutions is
(a) 3 (b) – 3 (c) – 12 (d) no value

4. When lines l_1 and l_2 are coincident, then the graphical solution system of linear equation have
(a) infinite number of solutions (b) unique solution
(c) no solution (d) one solution

5. When lines l_1 and l_2 are parallel, then the graphical solution system of linear equation have
(a) infinite number of solutions (b) unique solution
(c) no solution (d) one solution

6. The coordinates of the vertices of triangle formed between the lines and y-axis from the graph is
(a) (0, 5), (0, 0) and (6.5,0) (b) (4,2), (0, 0) and (6.5,0)
(c) (4,2), (0, 0) and (0,5) (d) none of these



7. Five years ago Nuri was thrice old as Sonu. Ten years later, Nuri will be twice as old as Sonu. The present age, in years, of Nuri and Sonu are respectively
(a) 50 and 20 (b) 60 and 30 (c) 70 and 40 (d) 40 and 10

8. The pair of equations 5x – 15y = 8 and 3x – 9y = 24/5 has
(a) infinite number of solutions (b) unique solution
(c) no solution (d) one solution

9. The pair of equations x + 2y + 5 = 0 and –3x – 6y + 1 = 0 have
(a) infinite number of solutions (b) unique solution
(c) no solution (d) one solution

10. The sum of the digits of a two digit number is 9. If 27 is added to it, the digits of the numbers get reversed. The number is
(a) 36 (b) 72 (c) 63 (d) 25

MCQ WORKSHEET-II
CLASS X : CHAPTER - 3
PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

1. If a pair of equation is consistent, then the lines will be
   (a) parallel (b) always coincident
   (c) always intersecting (d) intersecting or coincident

2. The solution of the equations x + y = 14 and x – y =4 is
   (a) x = 9 and y = 5 (b) x = 5 and y = 9 (c) x = 7 and y = 7 (d) x = 10 and y = 4

3. The sum of the numerator and denominator of a fraction is 12. If the denominator is increased by b3, the fraction becomes ½ , then the fraction
   (a) $\frac{4}{7}$ (b) $\frac{5}{7}$ (c) $\frac{6}{7}$ (d) $\frac{3}{7}$

4. The value of k for which the system of equations x – 2y = 3 and 3x + ky = 1 has a unique solution is
   (a) k = – 6 (b) k ≠ – 6 (c) k = 0 (d) no value

5. If a pair of equation is inconsistent, then the lines will be
   (a) parallel (b) always coincident
   (c) always intersecting (d) intersecting or coincident

6. The value of k for which the system of equations 2x + 3y = 5 and 4x + ky = 10 has infinite many solution is
   (a) k = – 3 (b) k ≠ – 3 (c) k = 0 (d) none of these

7. The value of k for which the system of equations kx – y = 2 and 6x – 2y = 3 has a unique solution is
   (a) k = – 3 (b) k ≠ – 3 (c) k = 0 (d) k ≠ 0

8. Sum of two numbers is 35 and their difference is 13, then the numbers are
   (a) 24 and 12 (b) 24 and 11 (c) 12 and 11 (d) none of these

9. The solution of the equations 0.4x + 0.3y = 1.7 and 0.7x – 0.2y = 0.8 is
   (a) x = 1 and y = 2 (b) x = 2 and y = 3 (c) x = 3 and y = 4 (d) x = 5 and y = 4

10. The solution of the equations x + 2y = 1.5 and 2x + y = 1.5 is
    (a) x = 1 and y = 1 (b) x = 1.5 and y = 1.5(c) x = 0.5 and y = 0.5(d) none of these

11. The value of k for which the system of equations x + 2y = 3 and 5x + ky + 7 = 0 has no solution is
    (a) 10 (b) 6 (c) 3 (d) 1

12. The value of k for which the system of equations 3x + 5y = 0 and kx + 10y = 0 has a non-zero solution is
    (a) 0 (b) 2 (c) 6 (d) 8

MCQ WORKSHEET-II
CLASS X : CHAPTER - 3
PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

1. Sum of two numbers is 50 and their difference is 10, then the numbers are
   (a) 30 and 20 (b) 24 and 14 (c) 12 and 2 (d) none of these

2. The sum of the digits of a two-digit number is 12. The number obtained by interchanging its digit exceeds the given number by 18, then the number is
   (a) 72 (b) 75 (c) 57 (d) none of these

3. The sum of a two-digit number and the number obtained by interchanging its digit is 99. If the digits differ by 3, then the number is
   (a) 36 (b) 33 (c) 66 (d) none of these

4. Seven times a two-digit number is equal to four times the number obtained by reversing the order of its digit. If the difference between the digits is 3, then the number is
   (a) 36 (b) 33 (c) 66 (d) none of these

5. A two-digit number is 4 more than 6 times the sum of its digits. If 18 is subtracted from the number, the digits are reversed, then the number is
   (a) 36 (b) 46 (c) 64 (d) none of these

6. The sum of two numbers is 1000 and the difference between their squares is 25600, then the numbers are
   (a) 616 and 384 (b) 628 and 372 (c) 564 and 436 (d) none of these

7. Five years ago, A was thrice as old as B and ten years later A shall be twice as old as B, then the present age of A is
   (a) 20 (b) 50 (c) 30 (d) none of these

8. The sum of thrice the first and the second is 142 and four times the first exceeds the second by 138, then the numbers are
   (a) 40 and 20 (b) 40 and 22 (c) 12 and 22 (d) none of these

9. The sum of twice the first and thrice the second is 92 and four times the first exceeds seven times the second by 2, then the numbers are
   (a) 25 and 20 (b) 25 and 14 (c) 14 and 22 (d) none of these

10. The difference between two numbers is 14 and the difference between their squares is 448, then the numbers are
    (a) 25 and 9 (b) 22 and 9 (c) 23 and 9 (d) none of these

11. The solution of the system of linear equations $\frac{x}{a}+\frac{y}{b}=a+b; \frac{x}{a^2}+\frac{y}{b^2}=2$ are
    (a) x = a and y = b (b) $x = a^2$ and $y = b^2$ (c) x = 1 and y = 1 (d) none of these

12. The solution of the system of linear equations $2(ax-by)+(a+4b)=0; 2(bx+ay)+(b-4a)=0$ are
    (a) x = a and y = b (b) x = –1 and y = –1 (c) x = 1 and y = 1 (d) none of these

MCQ WORKSHEET-III

CLASS X : CHAPTER - 3

PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

1. The pair of equations 3x + 4y = 18 and 4x + $\frac{16}{3}$y = 24 has

(a) infinite number of solutions (b) unique solution
(c) no solution (d) cannot say anything

2. If the pair of equations 2x + 3y = 7 and kx + $\frac{9}{2}$y = 12 have no solution, then the value of k is:

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

3. The equations x – y = 0.9 and $\frac{11}{x+y}=2$ have the solution:

(a) x = 5 and y = a (b) x = 3, 2 and y = 2, 3 (c) x = 3 and y = 2 (d) none of these

4. If bx + ay = $a^2 + b^2$ and ax – by = 0, then the value of x – y equals:
(a) a – b (b) b – a (c) $a^2 – b^2$ (d) $b^2 + a^2$.

5. If 2x + 3y = 0 and 4x – 3y = 0, then x + y equals:
(a) 0 (b) – 1 (c) 1 (d) 2

6. If $\sqrt{a}x-\sqrt{b}y=b-a$ and $\sqrt{b}x-\sqrt{a}y=0$, then the value of x, y is:
(a) a + b (b) a – b (c) $\sqrt{ab}$ (d) $-\sqrt{ab}$

7. If $\frac{2}{x}+\frac{3}{y}=13$ and $\frac{5}{x}-\frac{4}{y}=-2$, then x + y equals:

(a) $\frac{1}{6}$ (b) $-\frac{1}{6}$ (c) $\frac{5}{6}$ (d) $-\frac{5}{6}$

8. If 31x + 43y = 117 and 43 + 31y = 105, then value of x – y is:
(a) $\frac{1}{3}$ (b) – 3 (c) 3 (d) $-\frac{1}{3}$

9. If 19x – 17y = 55 and 17x – 19y = 53, then the value of x – y is:
(a) $\frac{1}{3}$ (b) – 3 (c) 3 (d) 5

10. If $\frac{x}{2}+y=0.8$ and $\frac{7}{\left(x+\frac{y}{2}\right)}=10$, then the value of x + y is:

(a) 1 (b) – 0.8 (c) 0.6 (d) 0.5

11. If (6, k) is a solution of the equation 3x + y – 22 = 0, then the value of k is:
(a) 4 (b) –4 (c) 3 (d) –3

12. If 3x –5y = 1, $\frac{2x}{x-y} = 4$, then the value of x + y is

(a) $\frac{1}{3}$ (b) – 3 (c) 3 (d) $-\frac{1}{3}$

13. If 3x + 2y = 13 and 3x – 2y = 5, then the value of x + y is:

(a) 5 (b) 3 (c) 7 (d) none of these

14. If the pair of equations 2x + 3y = 5 and 5x + $\frac{15}{2}$y = k represent two coincident lines, then the value of k is:

(a) –5 (b) $\frac{-25}{2}$ (c) $\frac{25}{2}$ (d) $\frac{-5}{2}$

15. Rs. 4900 were divided among 150 children. If each girl gets Rs. 50 and a boy gets Rs. 25, then the number of boys is:

(a) 100 (b) 102 (c) 104 (d) 105

PRACTICE QUESTIONS
CLASS X : CHAPTER - 3
PAIR OF LINEAR EQUATIONS IN TWO VARIABLES
SOLVING EQUATIONS

Solve for x and y:

1. $11x + 15y + 23 = 0$; $7x - 2y - 20 = 0$.

2. $2x + y = 7$; $4x - 3y + 1 = 0$.

3. $23x - 29y = 98$; $29x - 23y = 110$.

4. $2x + 5y = \frac{8}{3}$; $3x - 2y = \frac{5}{6}$.

5. $4x - 3y = 8$; $6x - y = \frac{29}{3}$.

6. $2x - \frac{3}{4}y = 3$; $5x = 2y + 7$.

7. $2x - 3y = 13$; $7x - 2y = 20$.

8. $3x - 5y - 19 = 0$; $-7x + 3y + 1 = 0$.

9. $2x - 3y + 8 = 0$; $x - 4y + 7 = 0$.

10. $x + y = 5xy; 3x + 2y = 13xy; x \neq 0, y \neq 0$.

11. $152x - 378y = -74; -378x + 152y = -604$.

12. $47x + 31y = 63; 31x + 47y = 15$.

13. $71x + 37y = 253$; $37x + 71y = 287$.

14. $37x + 43y = 123$; $43x + 37y = 117$.

15. $217x + 131y = 913$; $131x + 217y = 827$.

16. $41x - 17y = 99$; $17x - 41y = 75$.

17. $\frac{5}{x} + 6y = 13; \quad \frac{3}{x} + 4y = 7, \quad x \neq 0$

18. $\frac{2}{x} + \frac{3}{y} = \frac{9}{xy}; \quad \frac{4}{x} + \frac{9}{y} = \frac{21}{xy} \quad (x \neq 0, y \neq 0)$

19. $\frac{5}{x} - \frac{3}{y} = 1; \quad \frac{3}{2x} + \frac{2}{3y} = 5 \quad (x \neq 0, y \neq 0)$

20. $\frac{1}{7x} + \frac{1}{6y} = 3; \quad \frac{1}{2x} - \frac{1}{3y} = 5 \quad (x \neq 0, y \neq 0)$

21. $\frac{3}{x}-\frac{1}{y}+9=0; \quad \frac{2}{x}+\frac{3}{y}=5 \quad (x\neq 0, y\neq 0)$

22. $2x-\frac{3}{y}=9; \quad 3x+\frac{7}{y}=2, \quad y\neq 0$

23. $x+\frac{6}{y}=6; \quad 3x-\frac{8}{y}=5, \quad y\neq 0$

24. $\frac{4}{x}+5y=7; \quad \frac{3}{x}+4y=5, \quad x\neq 0$

25. $\frac{x}{3}+\frac{y}{4}=11; \quad \frac{5x}{6}-\frac{y}{3}+7=0$

26. $\frac{x+y-8}{2}=\frac{x+2y-14}{3}=\frac{3x+y-12}{11}$

27. $\frac{x+y}{xy}=2; \frac{x-y}{xy}=6, \ x\neq 0, y\neq 0.$

28. $\frac{xy}{x+y}=\frac{6}{5}; \frac{xy}{y-x}=6; x+y\neq 0, y-x\neq 0.$

29. $\frac{3x+9y}{xy}=11; \quad \frac{6x+3y}{xy}=7, \ x\neq 0, y\neq 0.$

30. $\frac{x+1}{2}+\frac{y-1}{3}=8; \quad \frac{x-1}{3}+\frac{y+1}{2}=9.$

31. $\frac{5}{x-1}+\frac{1}{y-2}=2; \quad \frac{6}{x-1}-\frac{3}{y-2}=1, \ x\neq 1 \ and \ y\neq 2.$

32. $\frac{2x+5y}{xy}=6; \ \frac{4x-5y}{xy}=-3, \ x\neq 0 \ and \ y\neq 0$

33. $\frac{1}{2(2x+3y)}+\frac{12}{7(3x-2y)}=\frac{1}{2}; \quad \frac{7}{(2x+3y)}+\frac{4}{(3x-2y)}=2.$

34. $\frac{1}{2(x+2y)}+\frac{5}{3(3x-2y)}=-\frac{3}{2}; \frac{5}{4(x+2y)}-\frac{3}{5(3x-2y)}=\frac{61}{60}.$

35. $\frac{5}{x+1}-\frac{2}{y-1}=\frac{1}{2}; \quad \frac{10}{x+1}+\frac{2}{y-2}=\frac{5}{2}, \ x\neq -1 \ and \ y\neq 1.$

36. $\frac{3}{x+y}+\frac{2}{x-y}=2; \quad \frac{9}{x+y}-\frac{4}{x-y}=1, \quad x+y\neq 0 \ and \ x-y\neq 0.$

37. $\frac{57}{x+y}+\frac{6}{x-y}=5; \quad \frac{38}{x+y}+\frac{21}{x-y}=9, \quad x+y\neq 0 \ and \ x-y\neq 0.$

38. $\frac{40}{x+y}+\frac{2}{x-y}=2; \quad \frac{25}{x+y}-\frac{3}{x-y}=1, \quad x+y\neq 0 \ and \ x-y\neq 0.$

39. $\frac{44}{x+y}+\frac{30}{x-y}=10; \quad \frac{55}{x+y}+\frac{40}{x-y}=13, \quad x+y\neq 0 \ and \ x-y\neq 0.$

40. $\frac{b}{a}x+\frac{a}{b}y=a^2+b^2; x+y=2ab$

41. $ax+by=a-b; bx-ay=a+b$.

42. $\frac{b^2x}{a}+\frac{a^2y}{b}=ab(a+b); b^2x+a^2y=2a^2b^2$

43. $2(ax-by)+(a+4b)=0; 2(bx+ay)+(b-4a)=0$

44. $(a-b)x+(a+b)y=a^2-2ab-b^2; (a+b)(x+y)=a^2+b^2$

45. $\frac{x}{a}+\frac{y}{b}=a+b; \frac{x}{a^2}+\frac{y}{b^2}=2$

46. $\frac{ax}{b}-\frac{by}{a}=a+b;\ \ ax-by=2ab.$

47. $\frac{x}{a}=\frac{y}{b};\quad ax+by=a^2+b^2$

48. $2ax+3by=a+2b;\quad 3ax+2by=2a+b.$

49. $\frac{a}{x}-\frac{b}{y}=0;\quad \frac{ab^2}{x}+\frac{a^2b}{y}=a^2+b^2, where\ \ x\neq 0\ \ and\ \ y\neq 0.$

50. $mx-ny=m^2-n^2;\quad x+y=2m.$

51. $6(ax+by)=3a+2b;\quad 6(bx-ay)=3b-2a.$

52. $\frac{x}{a}+\frac{y}{b}=2;\quad ax-by=a^2-b^2.$

53. $\frac{bx}{a}-\frac{ay}{b}+a+b=0;\ \ bx-ay+2ab=0.$

54. $ax-by=a^2+b^2;\ \ x+y=2a.$

55. $\frac{3a}{x}-\frac{2b}{y}+5=0;\ \ \frac{a}{x}+\frac{3b}{y}-2=0\ \ (x\neq 0, y\neq 0).$

PRACTICE QUESTIONS

CLASS X : CHAPTER - 3

PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

CONDITIONS FOR SOLVING LINEAR EQUATIONS

1. Find the value of k, so that the following system of equations has no solution:
$3x - y - 5 = 0;\ 6x - 2y - k = 0.$

2. Find the value of k, so that the following system of equations has a non-zero solution:
$3x + 5y = 0;\ kx + 10y = 0.$

Find the value of k, so that the following system of equations has no solution:

3. $3x + y = 1; \quad (2k-1)x + (k-1)y = (2k-1).$

4. $3x + y = 1; \quad (2k-1)x + (k-1)y = (2k+1).$

5. $x - 2y = 3; \quad 3x + ky = 1.$

6. $x + 2y = 5; \quad 3x + ky + 15 = 0.$

7. $kx + 2y = 5; \quad 3x - 4y = 10.$

8. $x + 2y = 3; \quad 5x + ky + 7 = 0.$

9. $8x + 5y = 9; \quad kx + 10y = 15.$

10. $(3k+1)x + 3y - 2 = 0; \quad (k^2+1)x + (k-2)y - 5 = 0.$

11. $kx + 3y = 3; \quad 12x + ky = 6.$

Find the value of k, so that the following system of equations has a unique solution:

12. $x - 2y = 3; \quad 3x + ky = 1.$

13. $x + 2y = 5; \quad 3x + ky + 15 = 0.$

14. $kx + 2y = 5; \quad 3x - 4y = 10.$

15. $x + 2y = 3; \quad 5x + ky + 7 = 0.$

16. $8x + 5y = 9; \quad kx + 10y = 15.$

17. $kx + 3y = (k-3); \quad 12x + ky = k.$

18. $kx + 2y = 5; \quad 3x + y = 1.$

19. $x - 2y = 3; \quad 3x + ky = 1.$

20. $4x - 5y = k; \quad 2x - 3y = 12.$

For what value of k, the following pair of linear equations has infinite number of solutions:

21. $kx + 3y = (2k+1); \quad 2(k+1)x + 9y = (7k+1).$

22. $2x + 3y = 2; \quad (k+2)x + (2k+1)y = 2(k-1).$

23. $x + (2k-1)y = 4; \quad kx + 6y = k + 6.$

24. $(k-1)x - y = 5; \quad (k+1)x + (1-k)y = (3k+1).$

25. $x + (k+1)y = 5; \quad (k+1)x + 9y = (8k-1).$

26. $2x + 3y = 7; \quad (k-1)x + (k+2)y = 3k.$

27. $2x + (k-2)y = k; \quad 6x + (2k-1)y = (2k+5).$

Find the value of a and b for which each of the following systems of linear equations has a infinite number of solutions:

28. $(a-1)x + 3y = 2; \quad 6x + (1-2b)y = 6.$

29. $2x - 3y = 7; \quad (a+b)x - (a+b-3)y = 4a + b.$

30. $2x + 3y = 7; \quad (a+b+1)x + (a+2b+2)y = 4(a+b)+1.$

31. $2x + 3y = 7; \quad a(x+y) - b(x-y) = 3a + b - 2$

32. $(2a-1)x + 3y = 5; \quad 3x + (b-1)y = 2.$

33. Find the value of k, so that the following system of equations has a non-zero solution:
5x – 3y = 0; 2x + ky = 0.

Show that the following system of the equations has a unique solution and hence find the solution of the given system of equations.

34. $\frac{x}{3} + \frac{y}{2} = 3; \quad x - 2y = 2$

35. $3x + 5y = 12; \quad 5x + 3y = 4.$

PRACTICE QUESTIONS
CLASS X : CHAPTER - 3
PAIR OF LINEAR EQUATIONS IN TWO VARIABLES
GRAPHICAL QUESTIONS

Solve each of the following system of linear equations graphically:

1. $x+2y=3; \quad 4x+3y=2.$

2. $2x+3y=8; \quad x-2y+3=0.$

3. $x+2y+2=0; \; 3x+2y-2=0.$

4. $4x+3y=5; \quad 2y-x=7.$

5. $2x-3y=1; \quad 3x-4y=1.$

6. $2x+3y=4; \quad 3x-y=-5.$

7. $x-y+1=0; \quad 3x+2y-12=0.$

8. $3x+2y=4; \quad 2x-3y=7.$

9. $2x+3y=2; \quad x-2y=8.$

10. $2x-5y+4=0; \quad 2x+y-8=0.$

11. $3x+y+1=0; \quad 2x-3y+8=0.$

12. Solve the following system of linear equations graphically: $2x-3y-17=0; \quad 4x+y-13=0$. Shade the region bounded by the above lines and x-axis.

13. Solve the following system of linear equations graphically: $2x+3y=4; \quad 3x-y=-5$. Shade the region bounded by the above lines and y-axis.

14. Solve the following system of linear equations graphically: $4x-y=4; \quad 3x+2y=14.$. Shade the region bounded by the above lines and y-axis.

15. Solve the following system of linear equations graphically: $x+2y=5; \quad 2x-3y=-4.$. Shade the region bounded by the above lines and y-axis.

16. Draw the graphs of the equations $4x-y-8=0; \quad 2x-3y+6=0$. Also determine the vertices of the triangle formed by the lines and x-axis.

17. Solve the following system of linear equations graphically: $2x-y=1; \quad x-y=-1$. Shade the region bounded by the above lines and y-axis.

18. Solve the following system of linear equations graphically: $5x-y=7; \quad x-y+1=0$. Calculate the area bounded by these lines and y-axis.

19. Solve the following system of linear equations graphically: $4x-3y+4=0$; $4x+3y-20=0$. Calculate the area bounded by these lines and x-axis.

20. Solve the following system of linear equations graphically: $4x-5y-20=0$; $3x+5y-15=0$. Find the coordinates of the vertices of the triangle formed by these lines and y-axis.

21. Solve the following system of linear equations graphically: $2x-5y+4=0$; $2x+y-8=0$. Find the points where these lines meet the y-axis.

22. Solve the following system of linear equations graphically: $2x+y-5=0$; $x+y-3=0$. Find the points where these lines meet the y-axis.

23. Solve the following system of linear equations graphically: $4x-5y+16=0$; $2x+y-6=0$. Find the coordinates of the vertices of the triangle formed by these lines and y-axis.

24. Draw the graphs of the equations $x - y + 1 = 0$ and $3x + 2y - 12 = 0$. Determine the coordinates of the vertices of the triangle formed by these lines and the *x*-axis, and shade the triangular region.

25. Solve the following system of linear equations graphically: $3x+y-11=0$; $x-y-1=0$. Shade the region bounded by these lines and the y-axis. Find the points where these lines cut the y-axis.

PRACTICE QUESTIONS
CLASS X : CHAPTER – 3
PAIR OF LINEAR EQUATIONS IN TWO VARIABLES
WORD PROBLEMS

I. NUMBER BASED QUESTIONS

SIMPLE PROBLEMS

1. The sum of two numbers is 137 and their difference is 43. Find the numbers.

2. The sum of thrice the first and the second is 142 and four times the first exceeds the second by 138, then find the numbers.

3. Sum of two numbers is 50 and their difference is 10, then find the numbers.

4. The sum of twice the first and thrice the second is 92 and four times the first exceeds seven times the second by 2, then find the numbers.

5. The sum of two numbers is 1000 and the difference between their squares is 25600, then find the numbers.

6. The difference between two numbers is 14 and the difference between their squares is 448, then find the numbers.

7. The sum of two natural numbers is 8 and the sum of their reciprocals is $\frac{8}{15}$. Find the numbers.

TWO-DIGIT PROBLEMS

1. The sum of the digits of a two digit number is 12. The number obtained by interchanging the two digits exceeds the given number by 18. Find the number.

2. Seven times a two-digit number is equal to four times the number obtained by reversing the order of its digit. If the difference between the digits is 3, then find the number.

3. The sum of the digits of a two digit number is 9. Also, nine times this number is twice the number obtained by reversing the order of the digits. Find the number.

4. The sum of the digits of a two digit number is 9. If 27 is added to it, the digits of the numbers get reversed. Find the number.

5. The sum of a two-digit number and the number obtained by reversing the digits is 66. If the digits of the number differ by 2, find the number. How many such numbers are there?

6. A two-digit number is 4 more than 6 times the sum of its digit. If 18 is subtracted from the number, the digits are reversed. Find the number.

7. The sum of a two-digit number and the number obtained by reversing the digits is 99. If the digits differ by 3, find the number.

8. The sum of a two-digit number and the number formed by interchanging its digit is 110. If 10 is subtracted from the original number, the new number is 4 more than 5 times the sum of the digits of the original number. Find the original number.

9. A two-digit number is 3 more than 4 times the sum of its digit. If 18 is added to the number, the digits are reversed. Find the number.

10. The sum of the digits of a two digit number is 15. The number obtained by interchanging the two digits exceeds the given number by 9. Find the number.

FRACTION PROBLEMS

1. A fraction becomes $\frac{9}{11}$, if 2 is added to both the numerator and the denominator. If 3 is added to both the numerator and the denominator it becomes $\frac{5}{6}$. Find the fraction.

2. The sum of numerator and denominator of a fraction is 12. If the denominator is increased by 3 then the fraction becomes $\frac{1}{2}$. Find the fraction.

3. If 1 is added to both the numerator and denominator of a given fraction, it becomes $\frac{4}{5}$. If however, 5 is subtracted from both the numerator and denominator, the fraction becomes $\frac{1}{2}$. Find the fraction.

4. In a given fraction, if the numerator is multiplied by 2 and the denominator is reduced by 5, we get $\frac{6}{5}$. But if the numerator of the given fraction is increased by 8 and the denominator is doubled, we get $\frac{2}{5}$. Find the fraction.

5. The denominator of a fraction is greater than its numerator by 11. If 8 is added to both its numerator and denominator, it reduces to $\frac{1}{3}$. Find the fraction.

II. AGE RELATED QUESTIONS

1. Ten years hence, a man's age will be twice the age of his son. Ten years ago, man was four times as old as his son. Find their present ages.

2. A man's age is three times the sum of the ages of his two sons. After 5 years his age will be twice the sum of the ages of his two sons. Find the age of the man.

3. If twice the son's age in years is added to the mother's age, the sum is 70 years. But if twice the mother's age is added to the son's age, the sum is 95 years. Find the age of the mother and her son.

4. Five years ago Nuri was thrice old as Sonu. Ten years later, Nuri will be twice as old as Sonu. Find the present age of Nuri and Sonu.

5. The present age of a woman is 3 years more than three times the age of her daughter. Three years hence, the woman's age will be 10 years more than twice the age of her daughter. Find their present ages.

6. Two years ago, a man was 5 times as old as his son. Two years later his age will be 8 more than three times the age of the son. Find the present ages of the man and his son.

7. I am three times as old as my son. Five years later, I shall be two and a half times as old as my son. How old am I and how old is my son?

8. A and B are friends and their ages differ by 2 years. A's father D is twice as old as A and B is twice as old as his sister C. The age of D and C differ by 40 years. Find the ages of A and B.

9. The ages of two friends Ani and Biju differ by 3 years. Ani's father Dharam is twice as old as Ani and Biju is twice as old as his sister Cathy. The ages of Cathy and Dharam differ by 30 years. Find the ages of Ani and Biju.

10. Five years hence, the age of Jacob will be three times that of his son. Five years ago, Jacob's age was seven times that of his son. What are their present ages?

11. A father is three times as old as his son. In 12 years time, he will be twice as old as his son. Find their present ages.

III. SPEED, DISTANCE AND TIME RELATED QUESTIONS

1. A boat goes 30 km upstream and 44 km downstream in 10 hours. In 13 hours, it can go 40 km upstream and 55 km down-stream. Determine the speed of the stream and that of the boat in still water.

2. Places A and B are 100 km apart on a highway. One car starts from A and another from B at the same time. If the cars travel in the same direction at different speeds, they meet in 5 hours. If they travel towards each other, they meet in 1 hour. What are the speeds of the two cars?

3. Points A and B are 90 km apart from each other on a highway. A car starts from A and another from B at the same time. If they go in the same direction they meet in 9 hours and if they go in opposite directions they meet in $\frac{9}{4}$ hours. Find their speeds.

4. A train covered a certain distance at a uniform speed. If the train would have been 10 km/h faster, it would have taken 2 hours less than the scheduled time. And, if the train were slower by 10 km/h; it would have taken 3 hours more than the scheduled time. Find the distance covered by the train.

5. Ritu can row downstream 20 km in 2 hours, and upstream 4 km in 2 hours. Find her speed of rowing in still water and the speed of the current.

6. Roohi travels 300 km to her home partly by train and partly by bus. She takes 4 hours if she travels 60 km by train and the remaining by bus. If she travels 100 km by train and the remaining by bus, she takes 10 minutes longer. Find the speed of the train and the bus separately.

7. A boat goes 30 km upstream and 44 km downstream in 10 hours. In 13 hours, it can go 40 km upstream and 55 km down-stream. Determine the speed of the stream and that of the boat in still water.

8. A man travels 370 km partly by train and partly by car. If he covers 250 km by train and the rest by car, it takes him 4 hours. But if he travels 130 km by train and the rest by car, he takes 18 minutes longer. Find the speed of the train and that of the car.

9. A boat covers 32 km upstream and 36 km downstream in 7 hours. In 9 hours, it can cover 40 km upstream and 48 km down-stream. Find the speed of the stream and that of the boat in still water.

10. Two places A and B are 120 km apart on a highway. A car starts from A and another from B at the same time. If the cars move in the same direction at different speeds, they meet in 6 hours. If they travel towards each other, they meet in 1 hours 12 minutes. Find the speeds of the two cars.

IV. GEOMETRICAL FIGURES RELATED QUESTIONS

1. The area of a rectangle gets reduced by 9 square units, if its length is reduced by 5 units and breadth is increased by 3 units. If we increase the length by 3 units and the breadth by 2 units, the area increases by 67 square units. Find the dimensions of the rectangle.

2. The length of a room exceeds its breadth by 3 metres. If the length is increased by 3 metres and the breadth is decreased by 2 metres, the area remains the same. Find the length and the breadth of the room.

3. The area of a rectangle gets reduced by $8m^2$, if its length is reduced by 5m and breadth is increased by 3m. If we increase the length by 3m and the breadth by 2m, the area increases by $74m^2$. Find the length and the breadth of the rectangle.

4. In a ΔABC, $\angle C = 3\angle B = 2(\angle A + \angle B)$. Find the angles.

5. Find the four angles of a cyclic quadrilateral ABCD in which $\angle A = (2x – 1)^0$, $\angle B = (y + 5)^0$, $\angle C = (2y + 15)^0$ and $\angle D = (4x – 7)^0$.

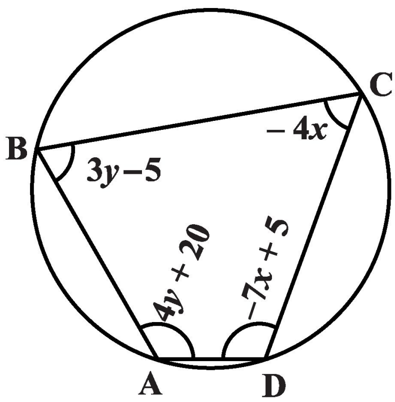
6. The area of a rectangle remains the same if the length is increased by 7m and the breadth is decreased by 3m. The area remains unaffected if the length is decreased by 7m and the breadth is increased by 5m. Find the dimensions of the rectangle.

7. The larger of two supplementary angles exceeds the smaller by 18 degrees. Find them.

8. In a ΔABC, $\angle A = x^0$, $\angle B = (3x – 2)^0$, $\angle C = y^0$. Also, $\angle C – \angle B = 9^0$. Find the three angles.

9. Half the perimeter of a rectangular garden, whose length is 4 m more than its width, is 36 m. Find the dimensions of the garden.

10. ABCD is a cyclic quadrilateral. Find the angles of the cyclic quadrilateral.



V. TIME AND WORK RELATED QUESTIONS

1. 2 men and 7 boys can do a piece of work in 4 days. The same work is done in 3 days by 4 men and 4 boys. How long would it take one man and one boy to do it alone.

2. 2 women and 5 men can together finish an embroidery work in 4 days, while 3 women and 6 men can finish it in 3 days. Find the time taken by 1 woman alone to finish the work, and also that taken by 1 man alone.

3. 8 men and 12 boys can finish a piece of work in 10 days while 6 men and 8 boys finish it in 14 days. Find the time taken by one man alone and by one boy alone to finish the work.

4. 8 men and 12 boys can finish a piece of work in 5 days while 6 men and 8 boys finish it in 7 days. Find the time taken by 1 man alone and by 1 boy alone to finish the work.

5. 2 men and 5 boys can do a piece of work in 4 days. The same work is done by 3 men and 6 boys in 3 days. . Find the time taken by 1 man alone and by 1 boy alone to finish the work.

VI. REASONING BASED QUESTIONS

1. One says, “Give me a hundred, friend! I shall then become twice as rich as you”. The other replies, “If you give me ten, I shall be six times as rich as you”. Tell me what is the amount of their (respective) capital?

2. The students of a class are made to stand in rows. If 3 students are extra in a row, there would be 1 row less. If 3 students are less in a row, there would be 2 rows more. Find the number of students in the class.

3. Yash scored 40 marks in a test, getting 3 marks for each right answer and losing 1 mark for each wrong answer. Had 4 marks been awarded for each correct answer and 2 marks been deducted for each incorrect answer, then Yash would have scored 50 marks. How many questions were there in the test?

4. A part of monthly hostel charges is fixed and the remaining depends on the number of days one has taken food in the mess. When a student A takes food for 20 days she has to pay Rs 1000 as hostel charges whereas a student B, who takes food for 26 days, pays Rs 1180 as hostel charges. Find the fixed charges and the cost of food per day.

5. From a bus stand in Bangalore , if we buy 2 tickets to Malleswaram and 3 tickets to Yeshwanthpur, the total cost is Rs 46; but if we buy 3 tickets to Malleswaram and 5 tickets to Yeshwanthpur the total cost is Rs 74. Find the fares from the bus stand to Malleswaram, and to Yeshwanthpur.

6. The cost of 5 oranges and 3 apples is Rs 35 and the cost of 2 oranges and 4 apples is Rs 28. Find the cost of an orange and an apple.

7. A lending library has a fixed charge for the first three days and an additional charge for each day thereafter. Saritha paid Rs 27 for a book kept for seven days, while Susy paid Rs 21 for the book she kept for five days. Find the fixed charge and the charge for each extra day.

8. Meena went to a bank to withdraw Rs 2000. She asked the cashier to give her Rs 50 and Rs 100 notes only. Meena got 25 notes in all. Find how many notes of Rs 50 and Rs 100 she received.

9. The ratio of incomes of two persons is 9 : 7 and the ratio of their expenditures is 4 : 3. If each of them manages to save Rs 2000 per month, find their monthly incomes.

10. The taxi charges in a city consist of a fixed charge together with the charge for the distance covered. For a distance of 10 km, the charge paid is Rs 105 and for a journey of 15 km, the charge paid is Rs 155. What are the fixed charges and the charge per km? How much does a person have to pay for travelling a distance of 25 km?

11. The coach of a cricket team buys 7 bats and 6 balls for Rs 3800. Later, she buys 3 bats and 5 balls for Rs 1750. Find the cost of each bat and each ball.

12. The cost of 2 pencils and 3 erasers is Rs 9 and the cost of 4 pencils and 6 erasers is Rs 18. Find the cost of each pencil and each eraser.

13. 5 pencils and 7 pens together cost Rs 50, whereas 7 pencils and 5 pens together cost Rs 46. Find the cost of one pencil and that of one pen.

14. The students of a class are made to stand in rows. If 4 students are extra in a row, there would be 2 rows less. If 4 students are less in a row, there would be 4 rows more. Find the number of students in the class.

15. A and B each has some money. If A gives Rs. 30 to B then B will have twice the money left with A. But if B gives Rs. 10 to A then A will have thrice as much as is left with B. How much money does each have?

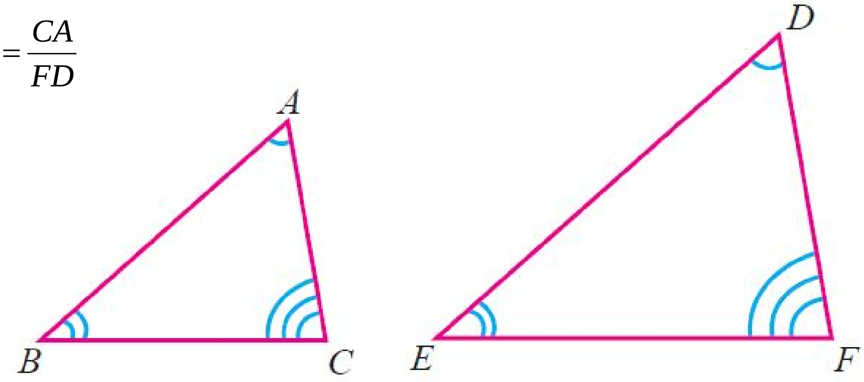
CLASS X : CHAPTER - 6
TRIANGLES

IMPORTANT FORMULAS & CONCEPTS

All those objects which have the same shape but different sizes are called similar objects.
Two triangles are similar if
(i) their corresponding angles are equal (or)
(ii) their corresponding sides have lengths in the same ratio (or proportional)

Two triangles ΔABC and ΔDEF are similar if
$(i) \angle A = \angle D, \angle B = \angle E, \angle C = \angle F$

$(ii) \frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{FD}$



Basic Proportionality theorem or Thales Theorem
If a straight line is drawn parallel to one side of a triangle intersecting the other two sides, then it divides the two sides in the same ratio.

If in a ΔABC, a straight line *DE* parallel to *BC*, intersects *AB* at *D* and *AC* at *E*, then
$(i) \frac{AB}{AD} = \frac{AC}{AE}$ $(ii) \frac{AB}{DB} = \frac{AC}{EC}$

Converse of Basic Proportionality Theorem (Converse of Thales Theorem)
If a straight line divides any two sides of a triangle in the same ratio, then the line must be parallel to the third side.

Angle Bisector Theorem
The internal (external) bisector of an angle of a triangle divides the opposite side internally (externally) in the ratio of the corresponding sides containing the angle.

Converse of Angle Bisector Theorem
If a straight line through one vertex of a triangle divides the opposite side internally (externally) in the ratio of the other two sides, then the line bisects the angle internally (externally) at the vertex.

Criteria for similarity of triangles
The following three criteria are sufficient to prove that two triangles are similar.

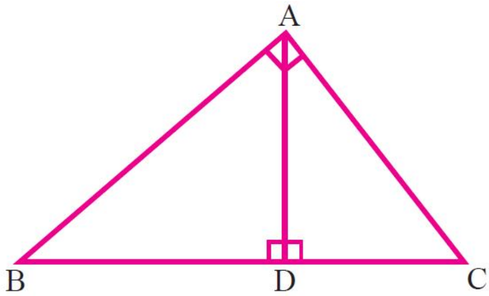
(i) AAA(Angle-Angle-Angle) similarity criterion
If in two triangles, corresponding angles are equal, then their corresponding sides are in the same ratio (or proportion) and hence the two triangles are similar.
Remark: If two angles of one triangle are respectively equal to two angles of another triangle, then the two triangles are similar.

(ii) SSS (Side-Side-Side) similarity criterion for Two Triangles
In two triangles, if the sides of one triangle are proportional (in the same ratio) to the sides of the other triangle, then their corresponding angles are equal and hence the two triangles are similar.

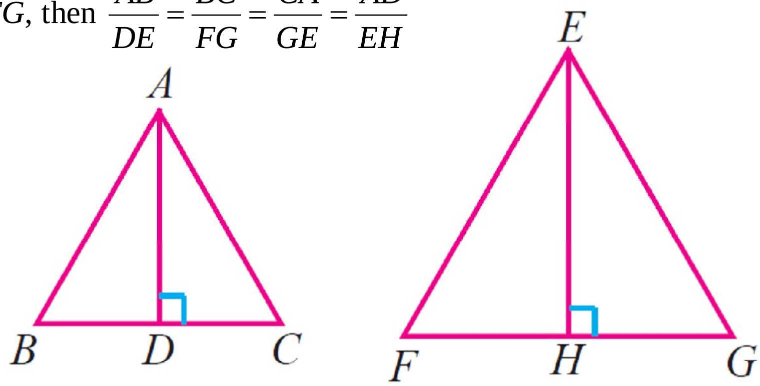
(iii) SAS (Side-Angle-Side) similarity criterion for Two Triangles
If one angle of a triangle is equal to one angle of the other triangle and if the corresponding sides including these angles are proportional, then the two triangles are similar.

Areas of Similar Triangles
The ratio of the areas of two similar triangles is equal to the ratio of the squares of their corresponding sides.

If a perpendicular is drawn from the vertex of a right angled triangle to its hypotenuse, then the triangles on each side of the perpendicular are similar to the whole triangle.
Here, (a) $\Delta DBA + \Delta ABC$
(b) $\Delta DAC + \Delta ABC$
(c) $\Delta DBA + \Delta DAC$



If two triangles are similar, then the ratio of the corresponding sides is equal to the ratio of their corresponding altitudes.
i.e., if $\Delta ABC + \Delta EFG$, then $\frac{AB}{DE} = \frac{BC}{FG} = \frac{CA}{GE} = \frac{AD}{EH}$



If two triangles are similar, then the ratio of the corresponding sides is equal to the ratio of the corresponding perimeters.
If $\Delta ABC + \Delta EFG$, then $\frac{AB}{DE} = \frac{BC}{FG} = \frac{CA}{GE} = \frac{AB + BC + CA}{DE + FG + GE}$

Pythagoras theorem (Baudhayan theorem)
In a right angled triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

Converse of Pythagoras theorem
In a triangle, if the square of one side is equal to the sum of the squares of the other two sides, then the angle opposite to the first side is a right angle.

MCQ WORKSHEET-I

CLASS X : CHAPTER - 6

TRIANGLES

1. If in triangle ABC and DEF, $\frac{AB}{DE} = \frac{BC}{FD}$, then they will be similar when

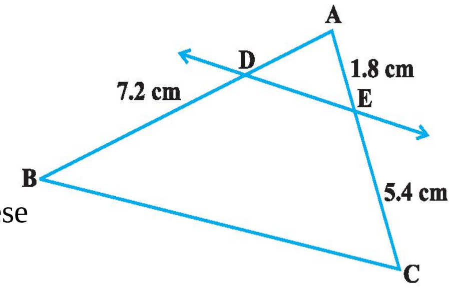
(a) $\angle B = \angle E$ (b) $\angle A = \angle D$ (c) $\angle B = \angle D$ (d) $\angle A = \angle F$

2. It is given that $\Delta ABC \sim \Delta PQR$ with $\frac{BC}{QR} = \frac{1}{3}$, then $\frac{ar(\Delta ABC)}{ar(\Delta PQR)}$ is equal to

(a) 9 (b) 3 (c) $\frac{1}{3}$ (d) $\frac{1}{9}$

3. In ΔABC, DE || BC and AD = 4cm, AB = 9cm. AC = 13.5 cm then the value of EC is

(a) 6 cm (b) 7.5 cm (c) 9 cm (d) none of these



4. In figure DE || BC then the value of AD is

(a) 2 cm (b) 2.4 cm (c) 3 cm (d) none of the above

5. ABC and BDE are two equilateral triangles such that $BD = \frac{2}{3}BC$. The ratio of the areas of triangles ABC and BDE are

(a) 2 : 3 (b) 3 : 2 (c) 4 : 9 (d) 9 : 4

6. A ladder is placed against a wall such that its foot is at distance of 2.5 m from the wall and its top reaches a window 6 m above the ground. The length of the ladder is

(a) 6.5 m (b) 7.5 m (c) 8.5 m (d) 9.5 m

7. If the corresponding sides of two similar triangles are in the ratio 4 : 9, then the areas of these triangles are in the ratio is

(a) 2 : 3 (b) 3 : 2 (c) 81 : 16 (d) 16 : 81

8. If $\Delta ABC \sim \Delta PQR$, BC = 8 cm and QR = 6 cm, the ratio of the areas of Δ ABC and Δ PQR is

(a) 8 : 6 (b) 6 : 8 (c) 64 : 36 (d) 9 : 16

9. If $\Delta ABC \sim \Delta PQR$, area of Δ ABC = 81cm^2, area of Δ PQR = 144cm^2 and QR = 6 cm, then length of BC is

(a) 4 cm (b) 4.5 cm (c) 9 cm (d) 12 cm

10. Sides of triangles are given below. Which of these is a right triangle?

(a) 7 cm, 5 cm, 24 cm (b) 34 cm, 30 cm, 16 cm
(c) 4 cm, 3 cm, 7 cm (d) 8 cm, 12 cm, 14 cm

11. If a ladder 10 m long reaches a window 8 m above the ground, then the distance of the foot of the ladder from the base of the wall is

(a) 18 m (b) 8 m (c) 6 m (d) 4 m

12. A girl walks 200 towards East and the she walks 150m towards North. The distance of the girl from the starting point is

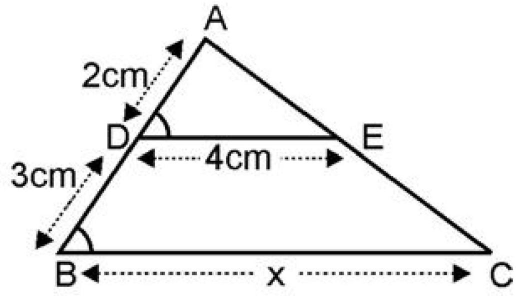
(a) 350m (b) 250m (c) 300m (d) 225m

MCQ WORKSHEET-II

CLASS X : CHAPTER - 6

TRIANGLES

1. In the given figure, if DE || BC, then x equals
(a) 6 cm (b) 10 cm (c) 8 cm (d) 12.5 cm

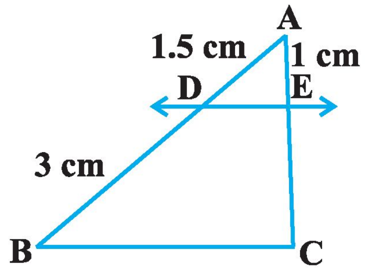


2. All _____________triangles are similar.
(a) isosceles (b) equilateral (c) scalene
(d) right angled

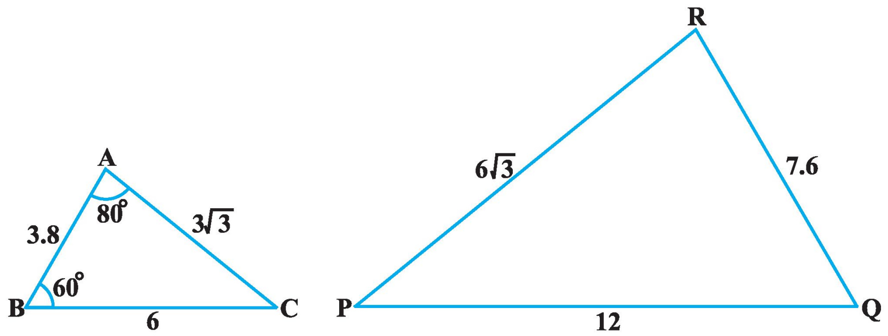
3. All circles are ___________
(a) congruent (b) similar (c) not similar
(d) none of these

4. All squares are ___________
(a) congruent (b) similar (c) not similar (d) none of these

5. In the given fig DE || BC then the value of EC is
(a) 1 cm (b) 2 cm (c) 3 cm (d) 4 cm



6. In the given below figure, the value of $\angle P$ is
(a) 60^0 (b) 80^0 (c) 40^0 (d) 100^0



7. A girl of height 90 cm is walking away from the base of a lamp-post at a speed of 1.2 m/s. If the lamp is 3.6 m above the ground, then the length of her shadow after 4 seconds.
(a) 1.2 m (b) 1.6 m (c) 2 m (d) none of these

8. A vertical pole of length 6 m casts a shadow 4 m long on the ground and at the same time a tower casts a shadow 28 m long. Find the height of the tower.
(a) 42 m (b) 48 m (c) 54 m (d) none of these

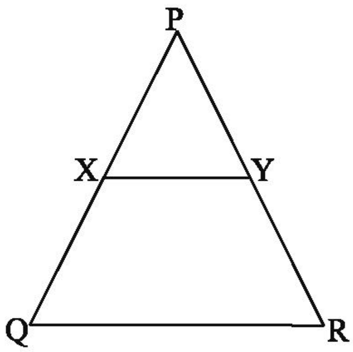
9. $\Delta ABC \sim \Delta DEF$ and their areas be, respectively, 64 cm^2 and 121 cm^2. If EF = 15.4 cm, the value of BC is.
(a) 11.2 cm (b) 15.4 cm (c) 6.4 cm (d) none of these

10. ABC and BDE are two equilateral triangles such that D is the midpoint of BC. Ratio of the areas of triangles ABC and BDE is
(a) 2 : 1 (b) 1 : 2 (c) 4 : 1 (d) 1 : 4

11. Areas of two similar triangles are in the ratio 4 : 9. Sides of these triangles are in the ratio
(a) 2 : 3 (b) 4 : 9 (c) 81 : 16 (d) 16 : 81

MCQ WORKSHEET-III
CLASS X : CHAPTER - 6
TRIANGLES

1. In the following fig. XY || QR and $\frac{PX}{XQ} = \frac{PY}{YR} = \frac{1}{2}$, then



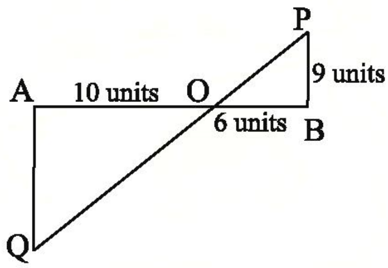
(*i*) XY = QR

(*ii*) $XY = \frac{1}{3} QR$

(*iii*) $XY^2 = QR^2$

(*iv*) $XY = \frac{1}{2} QR$

2. In the following fig QA ⊥ AB and PB ⊥ AB, then AQ is:



(i) 15 units (ii) 8 units (iii) 5 units (iv) 9 units

3. The ratio of the areas of two similar triangles is equal to the:

(i) ratio of their corresponding sides

(ii) ratio of their corresponding attitudes

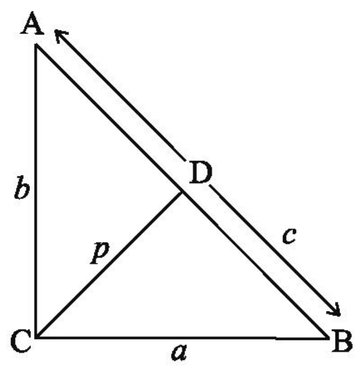
(iii) ratio of the squares of their corresponding sides

(iv) ratio of the squares of their perimeter

4. The areas of two similar triangles are 144 cm^2 and 81 cm^2. If one median of the first triangle is 16 cm, length of corresponding median of the second triangle is:

(i) 9 cm (ii) 27 cm (iii) 12 cm (iv) 16 cm

5. In a right triangle ABC, in which ∠C = 90° and CD ⊥AB. If BC = *a*, CA = *b*, AB = *c* and CD = *p*.



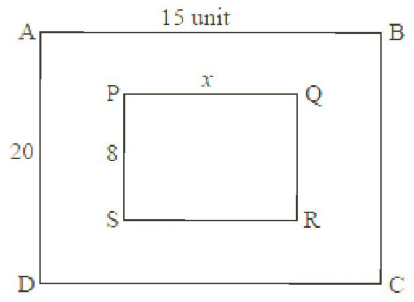
(*i*) $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$

(*ii*) $\frac{1}{p^2} \neq \frac{1}{a^2} + \frac{1}{b^2}$

(*iii*) $\frac{1}{p^2} < \frac{1}{a^2} + \frac{1}{b^2}$

(*iv*) $\frac{1}{p^2} > \frac{1}{a^2} + \frac{1}{b^2}$

6. Given Quad. ABCD ~ Quad PQRS then x is:



(i) 13 units

(ii) 12 units

(iii) 6 units

(iv) 15 units

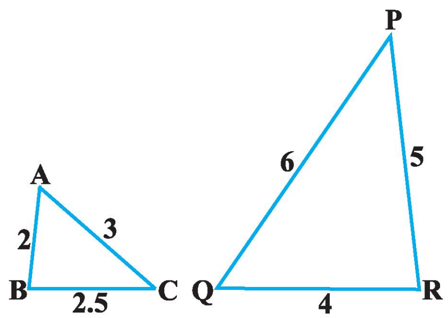
7. If $\Delta ABC \sim \Delta DEF$, ar($\Delta$DEF) = 100 cm^2 and AB/DE = 1/2 then ar(ΔABC) is:

(i) 50 cm^2 (ii) 25 cm^2 (iii) 4 cm^2 (iv) None of the above.

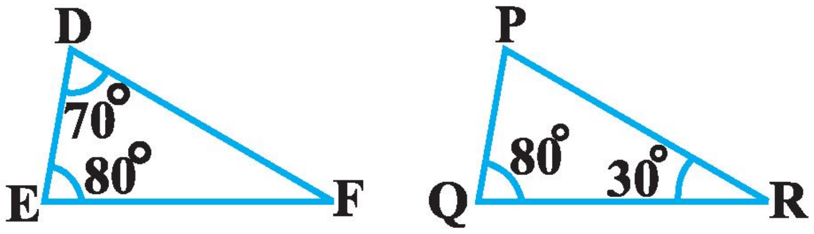
8. If the three sides of a triangle are a, $\sqrt{3}$a, $\sqrt{2}$a, then the measure of the angle opposite to the longest side is:

(i) 45° (ii) 30° (iii) 60° (iv) 90°

9. The similarity criterion used for the similarity of the given triangles shown in fig (iii) is
(a) AAA (b) SSS (c) SAS (d) AA



10. The similarity criterion used for the similarity of the given triangles shown in fig (iv) is
(a) AAA (b) SSS (c) SAS (d) AA



MCQ WORKSHEET-IV
CLASS X : CHAPTER - 6
TRIANGLES

1. A vertical pole of length 20 m casts a shadow 10 m long on the ground and at the same time a tower casts a shadow 50 m long, then the height of the tower.
(a) 100 m (b) 120 m (c) 25 m (d) none of these

2. The areas of two similar triangles are in the ratio 4 : 9. The corresponding sides of these triangles are in the ratio
(a) 2 : 3 (b) 4 : 9 (c) 81 : 16 (d) 16 : 81

3. The areas of two similar triangles ΔABC and ΔDEF are 144 cm^2 and 81 cm^2, respectively. If the longest side of larger ΔABC be 36 cm, then the longest side of the similar triangle ΔDEF is
(a) 20 cm (b) 26 cm (c) 27 cm (d) 30 cm

4. The areas of two similar triangles are in respectively 9 cm^2 and 16 cm^2. The ratio of their corresponding sides is
(a) 2 : 3 (b) 3 : 4 (c) 4 : 3 (d) 4 : 5

5. Two isosceles triangles have equal angles and their areas are in the ratio 16 : 25. The ratio of their corresponding heights is
(a) 3 : 2 (b) 5 : 4 (c) 5 : 7 (d) 4 : 5

6. If ΔABC and ΔDEF are similar such that 2AB = DE and BC = 8 cm, then EF =
(a) 16 cm (b) 112 cm (c) 8 cm (d) 4 cm

7. XY is drawn parallel to the base BC of a ΔABC cutting AB at X and AC at Y. If AB = 4BX and YC = 2 cm, then AY =
(a) 2 cm (b) 6 cm (c) 8 cm (d) 4 cm

8. Two poles of height 6 m and 11 m stand vertically upright on a plane ground. If the distance between their foot is 12 m, the distance between their tops is
(a) 14 cm (b) 12 cm (c) 13 cm (d) 11 cm

9. If D, E, F are midpoints of sides BC, CA and AB respectively of ΔABC, then the ratio of the areas of triangles DEF and ABC is
(a) 2 : 3 (b) 1 : 4 (c) 1 : 2 (d) 4 : 5

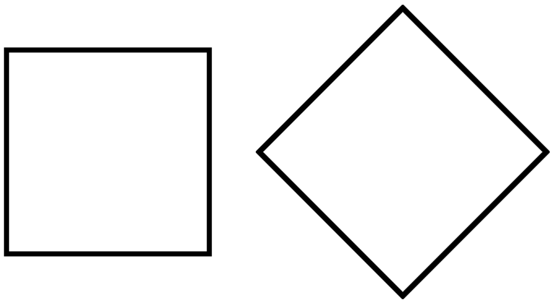
10. If ΔABC and ΔDEF are two triangles such that $\frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{FD} = \frac{2}{5}$, then $\frac{ar(\Delta ABC)}{ar(\Delta DEF)} =$
(a) 2 : 5 (b) 4 : 25 (c) 4 : 15 (d) 8 : 125

11. In triangles ABC and DEF, $\angle A = \angle E = 40^0$, AB : ED = AC : EF and $\angle F = 65^0$, then $\angle B$ =
(a) 35^0 (b) 65^0 (c) 75^0 (d) 85^0

12. If ABC and DEF are similar triangles such that $\angle A = 47^0$ and $\angle E = 83^0$, then $\angle C$=
(a) 50^0 (b) 60^0 (c) 70^0 (d) 80^0

PRACTICE QUESTIONS
CLASS X : CHAPTER - 6
TRIANGLES

1. State whether the following pairs of polygons are similar or not:



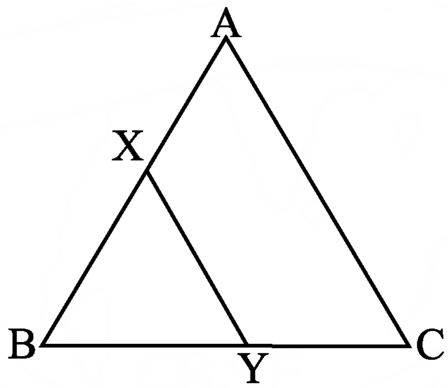
2. In triangle ABC, DE || BC and $\frac{AD}{DB} = \frac{3}{5}$.If AC = 4.8 cm, find AE.

3. A girl of height 90 cm is walking away from the base of a lamp post at a speed of 1.2m/s. If the lamp is 3.6 m above the ground, find the length of her shadow after 4 seconds.

4. Diagonals of a trapezium ABCD with AB || CD intersects at O. If AB = 2CD, find the ratio of areas of triangles AOB and COD.

5. Prove that the areas of two similar triangles are in the ratio of squares of their corresponding altitudes.

6. In the below figure, the line segment XY is parallel to side AC of ΔABC and it divides the triangle into two equal parts of equal areas. Find the ratio $\frac{AX}{AB}$.



7. In a triangle, if square of one side is equal to the sum of the squares of the other two sides, then the angle opposite the first side is a right angle. Prove it.

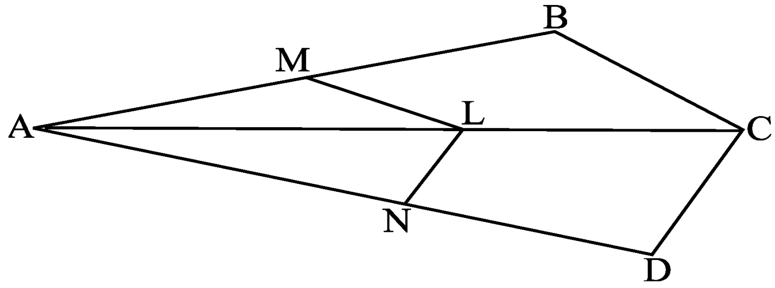
8. E is a point on the side AD produced of a ||gm ABCD and BE intersects CD at F. Show that ΔABE ~ ΔCFB.

9. Complete the sentence: Two polygons of the same number of sides are similar if…….

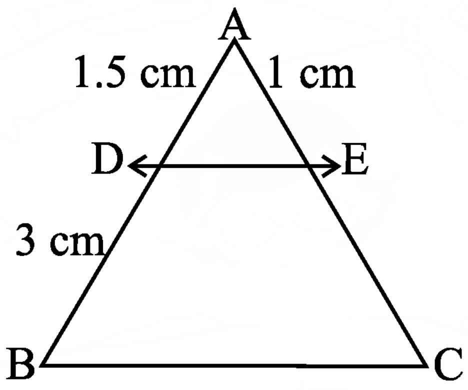
10. In ΔABC, AD ⊥ BC. Prove that $AB^2 – BD^2 = AC^2 – CD^2$.

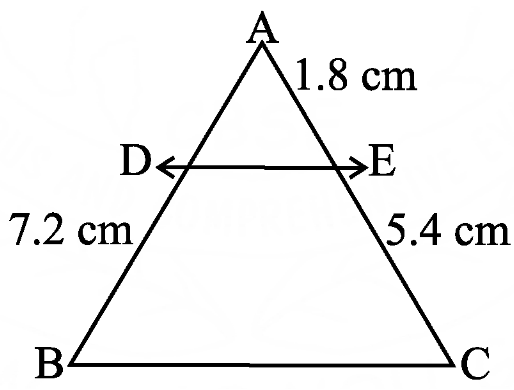
11. AD is a median of ΔABC. The bisector of ∠ADB and ∠ADC meet AB and AC in E and F respectively. Prove that EF || BC.

12. State and prove the Basic Proportionality theorem. In the below figure, if LM || CB and LN || CD, prove that $\frac{AM}{AB} = \frac{AN}{AD}$.



13. In the below figure, DE || BC, find EC





14. In the above right sided figure, DE || BC, find AD.

15. In given figure $\frac{AD}{DB} = \frac{AE}{EC}$ and $\angle AED = \angle ABC$. Show that AB = AC

16. $\Delta ABC \sim \Delta DEF$, such that ar($\Delta$ABC) = 64 cm^2 and ar(ΔDEF) = 121 cm2. If EF = 15.4 cm, find BC.

17. ABC and BDE are two equilateral triangles such that D is the midpoint of BC. What is the ratio of the areas of triangles ABC and BDE.

18. Sides of 2 similar triangles are in the ratio 4 : 9. What is the ratio areas of these triangles.

19. Sides of a triangle are 7cm, 24 cm, 25 cm. Will it form a right triangle? Why or why not?

20. Find $\angle B$ in ΔABC , if AB = $6\sqrt{3}$ cm, AC = 12 cm and BC = 6 cm.

21. Prove that "If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio".

22. Prove that "If a line divides any two sides of a triangle in the same ratio, then the line is parallel to the third side."

23. If a line intersects sides AB and AC of a ΔABC at D and E respectively and is parallel to BC, prove that $\frac{AD}{AB} = \frac{AE}{AC}$

24. ABCD is a trapezium in which AB || DC and its diagonals intersect each other at the point O. Show that $\frac{AO}{BO} = \frac{CO}{DO}$

25. Prove that “If in two triangles, corresponding angles are equal, then their corresponding sides are in the same ratio (or proportion) and hence the two triangles are similar.

26. Prove that “If one angle of a triangle is equal to one angle of the other triangle and the sides including these angles are proportional, then the two triangles are similar.

27. Prove that “If in two triangles, sides of one triangle are proportional to (i.e., in the same ratio of) the sides of the other triangle, then their corresponding angles are equal and hence the two triangles are similar.

28. D is a point on the side BC of a triangle ABC such that ∠ADC = ∠BAC. Show that CA^2 = CB.CD.

29. Sides AB and BC and median AD of a triangle ABC are respectively proportional to sides PQ and QR and median PM of ΔPQR. Show that ΔABC ~ ΔPQR.

30. Sides AB and AC and median AD of a triangle ABC are respectively proportional to sides PQ and PR and median PM of another triangle PQR. Show that ΔABC ~ ΔPQR.

31. If AD and PM are medians of triangles ABC and PQR, respectively where ΔABC ~ ΔPQR, prove that $\frac{AB}{PQ} = \frac{AD}{PM}$

32. A vertical pole of length 6 m casts a shadow 4 m long on the ground and at the same time a tower casts a shadow 28 m long. Find the height of the tower.

33. Prove that “The ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides.”

34. If the areas of two similar triangles are equal, prove that they are congruent.

35. D, E and F are respectively the mid-points of sides AB, BC and CA of ΔABC. Find the ratio of the areas of ΔDEF and ΔABC.

36. Prove that the ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding medians.

37. Prove that the area of an equilateral triangle described on one side of a square is equal to half the area of the equilateral triangle described on one of its diagonals.

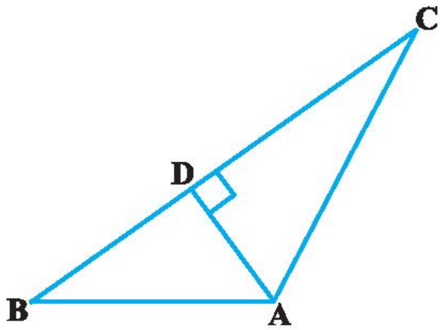
38. Prove that “If a perpendicular is drawn from the vertex of the right angle of a right triangle to the hypotenuse then triangles on both sides of the perpendicular are similar to the whole triangle and to each other.”

39. Prove that “In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

40. O is any point inside a rectangle ABCD. Prove that $OB^2 + OD^2 = OA^2 + OC^2$.

41. Prove that the sum of the squares of the sides of a rhombus is equal to the sum of the squares of its diagonals.

42. In Fig., if AD ⊥ BC, prove that $AB^2 + CD^2 = BD^2 + AC^2$.



43. BL and CM are medians of a triangle ABC right angled at A. Prove that $4(BL^2 + CM^2) = 5\ BC^2$.

44. An aeroplane leaves an airport and flies due north at a speed of 1000 km per hour. At the same time, another aeroplane leaves the same airport and flies due west at a speed of 1200 km per hour. How far apart will be the two planes after $1^{1/2}$ hours?

45. D and E are points on the sides CA and CB respectively of a triangle ABC right angled at C. Prove that $AE^2 + BD^2 = AB^2 + DE^2$.

46. The perpendicular from A on side BC of a ΔABC intersects BC at D such that DB = 3 CD. Prove that $2AB^2 = 2AC^2 + BC^2$.

47. In an equilateral triangle ABC, D is a point on side BC such that BD = $\frac{1}{3}$BC. Prove that $9AD^2 = 7AB^2$.

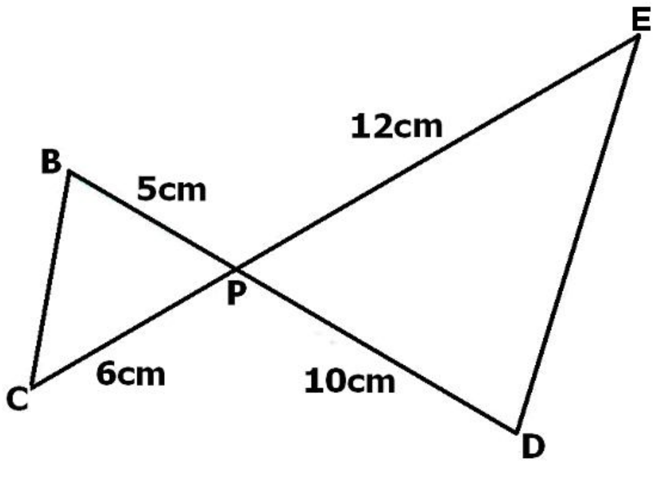
48. P and Q are the points on the sides DE and DF of a triangle DEF such that DP = 5 cm, DE = 15 cm, DQ= 6 cm and QF = 18 cm. Is PQ|| EF? Give reasons for your answer.

49. Is the triangle with sides 25 cm, 5 cm and 24 cm a right triangle? Give reasons for your answer.

50. It is given that Δ DEF ~ Δ RPQ. Is it true to say that ∠D = ∠R and ∠F = ∠P? Why?

51. A and B are respectively the points on the sides PQ and PR of a triangle PQR such that PQ = 12.5 cm, PA = 5 cm, BR= 6 cm and PB = 4 cm. Is AB || QR? Give reasons for your answer.

52. In the below Figure, BD and CE intersect each other at the point P. Is Δ PBC ~ ΔPDE? Why?



53. In triangles PQR and MST, ∠P = 55°, ∠Q = 25°, ∠M = 100° and ∠S = 25°. Is Δ QPR ~ Δ TSM? Why?

54. Is the following statement true? Why? “Two quadrilaterals are similar, if their corresponding angles are equal”.

55. Two sides and the perimeter of one triangle are respectively three times the corresponding sides and the perimeter of the other triangle. Are the two triangles similar? Why?

56. If in two right triangles, one of the acute angles of one triangle is equal to an acute angle of the other triangle, can you say that the two triangles will be similar? Why?

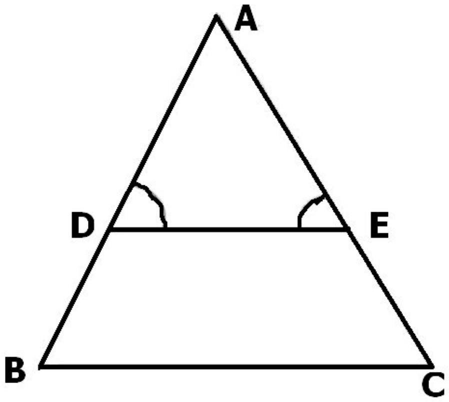
57. The ratio of the corresponding altitudes of two similar triangles is 3 : 5. Is it correct to say that ratio of their areas is 6 : 5 ? Why?

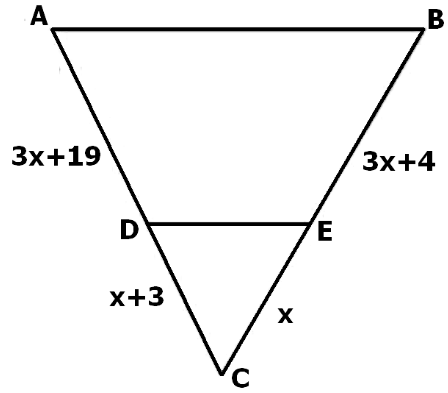
58. D is a point on side QR of ΔPQR such that PD $\perp$ QR. Will it be correct to say that ΔPQD ~ Δ RPD? Why?

59. Is it true to say that if in two triangles, an angle of one triangle is equal to an angle of another triangle and two sides of one triangle are proportional to the two sides of the other triangle, then the triangles are similar? Give reasons for your answer

60. Legs (sides other than the hypotenuse) of a right triangle are of lengths 16cm and 8 cm. Find the length of the side of the largest square that can be inscribed in the triangle.

61. In the below Figure, $\angle D = \angle E$ and $\frac{AD}{DB} = \frac{AE}{EC}$. Prove that BAC is an isosceles triangle.





62. Find the value of x for which DE || AB in the above right sided Figure.

63. In a Δ PQR, $PR^2 - PQ^2 = QR^2$ and M is a point on side PR such that QM $\perp$ PR. Prove that QM^2 = PM × MR.

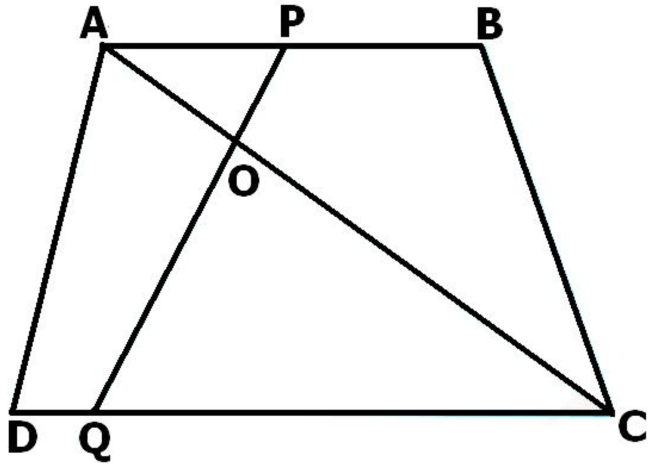
64. Hypotenuse of a right triangle is 25 cm and out of the remaining two sides, one is longer than the other by 5 cm. Find the lengths of the other two sides.

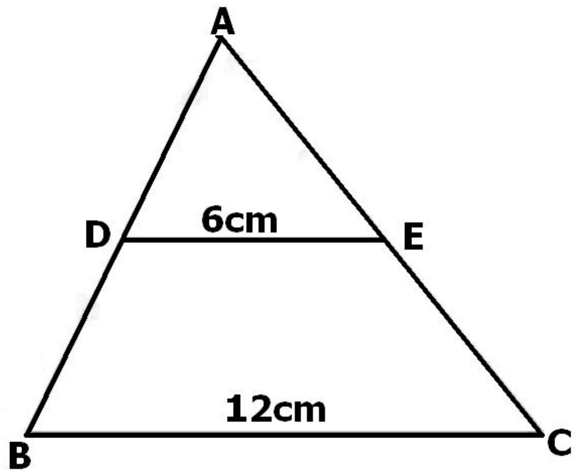
65. Diagonals of a trapezium PQRS intersect each other at the point O, PQ || RS and PQ = 3 RS. Find the ratio of the areas of triangles POQ and ROS.

66. Find the altitude of an equilateral triangle of side 8 cm.

67. If Δ ABC ~ Δ DEF, AB = 4 cm, DE = 6 cm, EF = 9 cm and FD = 12 cm, find the perimeter of Δ ABC.

68. In the below figure, if AB|| DC and AC and PQ intersect each other at the point O, prove that OA . CQ = OC . AP.





69. In the above right sided Figure, if DE || BC, find the ratio of ar (ADE) and ar (DECB).

70. ABCD is a trapezium in which AB || DC and P and Q are points on AD and BC, respectively such that PQ || DC. If PD = 18 cm, BQ = 35 cm and QC = 15 cm, find AD.

71. Corresponding sides of two similar triangles are in the ratio of 2 : 3. If the area of the smaller triangle is 48 cm^2, find the area of the larger triangle.

72. In a triangle PQR, N is a point on PR such that Q N ⊥ PR . If PN. NR = QN^2, prove that ∠PQR = 90°.

73. A 15 metres high tower casts a shadow 24 metres long at a certain time and at the same time, a telephone pole casts a shadow 16 metres long. Find the height of the telephone pole.

74. Areas of two similar triangles are 36 cm^2 and 100 cm^2. If the length of a side of the larger triangle is 20 cm, find the length of the corresponding side of the smaller triangle.

75. Foot of a 10 m long ladder leaning against a vertical wall is 6 m away from the base of the wall. Find the height of the point on the wall where the top of the ladder reaches.

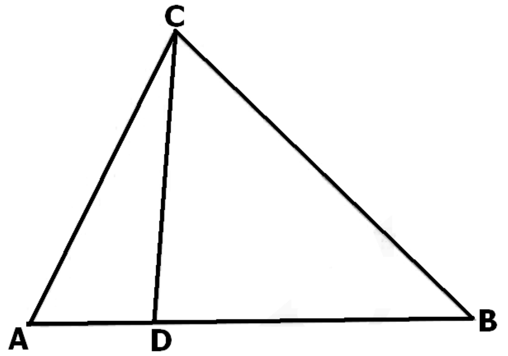
76. An aeroplane leaves an Airport and flies due North at 300 km/h. At the same time, another aeroplane leaves the same Airport and flies due West at 400 km/h. How far apart the two aeroplanes would be after $1\frac{1}{2}$ hours?

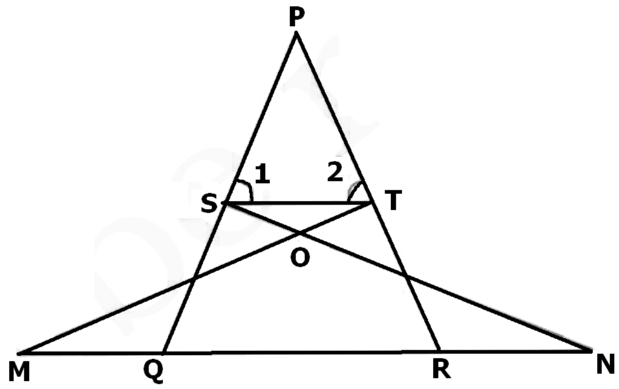
77. It is given that Δ ABC ~ Δ EDF such that AB = 5 cm, AC = 7 cm, DF= 15 cm and DE = 12 cm. Find the lengths of the remaining sides of the triangles.

78. A 5 m long ladder is placed leaning towards a vertical wall such that it reaches the wall at a point 4 m high. If the foot of the ladder is moved 1.6 m towards the wall, then find the distance by which the top of the ladder would slide upwards on the wall.

79. In a triangle PQR, PD ⊥ QR such that D lies on QR . If PQ = a, PR = b, QD = c and DR = d, prove that $(a + b)(a – b) = (c + d)(c – d)$.

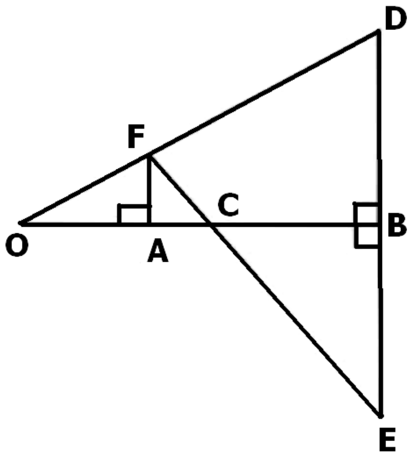
80. In the below Figure, if ∠ACB = ∠CDA, AC = 8 cm and AD = 3 cm, find BD.

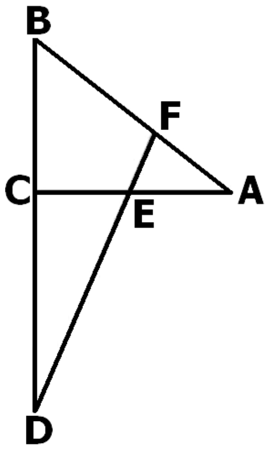




81. In the above right sided Figure, if ∠1 =∠2 and Δ NSQ ≅ Δ MTR, then prove that Δ PTS ~ Δ PRQ.

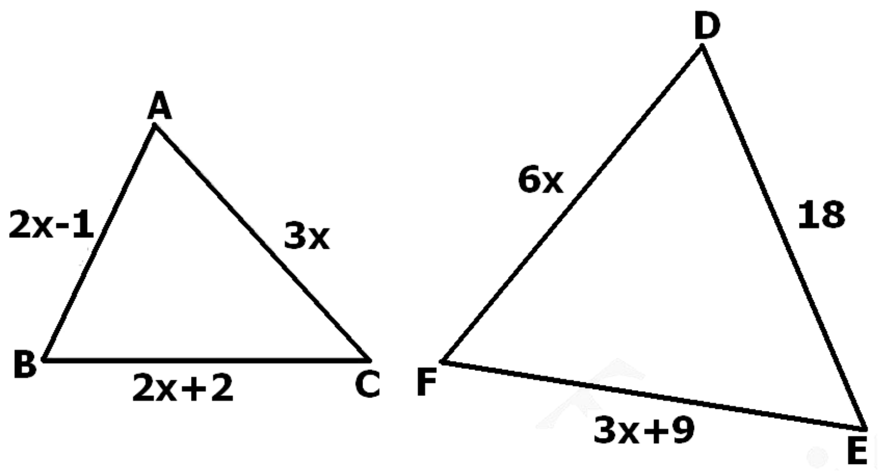
82. In the below Figure, OB is the perpendicular bisector of the line segment DE, FA ⊥ OB and F E intersects OB at the point C. Prove that $\frac{1}{OA}+\frac{1}{OB}=\frac{2}{OC}$



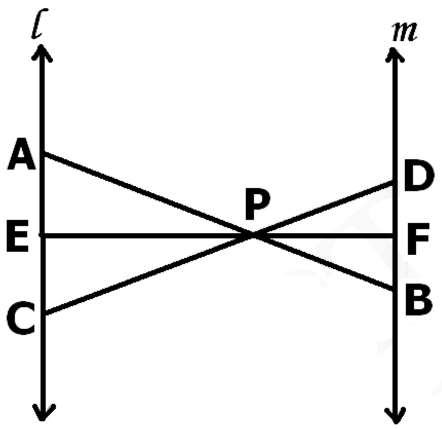


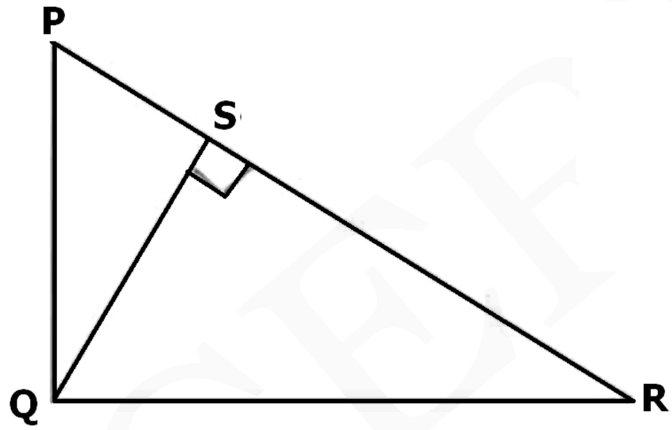
83. In the above right sided figure, line segment DF intersect the side AC of a triangle ABC at the point E such that E is the mid-point of CA and ∠AEF = ∠AFE. Prove that $\frac{BD}{CD}=\frac{BF}{CE}$.

84. In the below figure, if Δ ABC ~ Δ DEF and their sides are of lengths (in cm) as marked along them, then find the lengths of the sides of each triangle.



85. In the below figure, $l \parallel m$ and line segments AB, CD and EF are concurrent at point P. Prove that $\frac{AE}{BF} = \frac{AC}{BD} = \frac{CE}{FD}$.

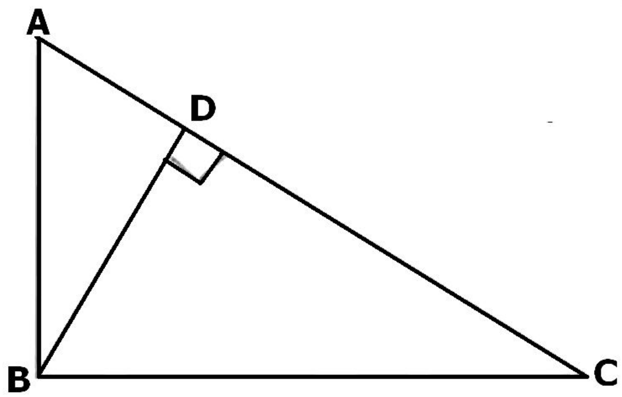


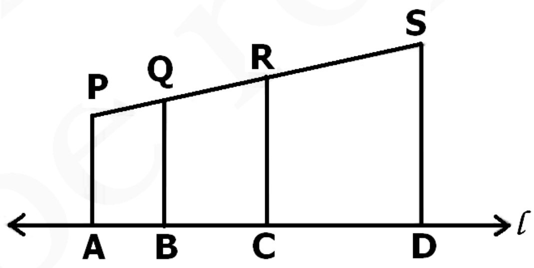


86. In the above right sided figure, PQR is a right triangle right angled at Q and $QS \perp PR$. If PQ = 6 cm and PS = 4 cm, find QS, RS and QR.

87. For going to a city B from city A, there is a route via city C such that $AC \perp CB$, AC = 2 x km and CB = 2 (x + 7) km. It is proposed to construct a 26 km highway which directly connects the two cities A and B. Find how much distance will be saved in reaching city B from city A after the construction of the highway.

88. In the below figure, ABC is a triangle right angled at B and $BD \perp AC$. If AD = 4 cm and CD = 5 cm, find BD and AB.





89. In the above right sided figure, PA, QB, RC and SD are all perpendiculars to a line l, AB = 6 cm, BC = 9 cm, CD = 12 cm and SP = 36 cm. Find PQ, QR and RS.

90. In a quadrilateral ABCD, $\angle A = \angle D = 90°$. Prove that $AC^2 + BD^2 = AD^2 + BC^2 + 2.CD.AB$

91. A flag pole 18 m high casts a shadow 9.6 m long. Find the distance of the top of the pole from the far end of the shadow.

92. A street light bulb is fixed on a pole 6 m above the level of the street. If a woman of height 1.5 m casts a shadow of 3m, find how far she is away from the base of the pole.

93. O is the point of intersection of the diagonals AC and BD of a trapezium ABCD with AB || DC. Through O, a line segment PQ is drawn parallel to AB meeting AD in P and BC in Q. Prove that PO = QO.

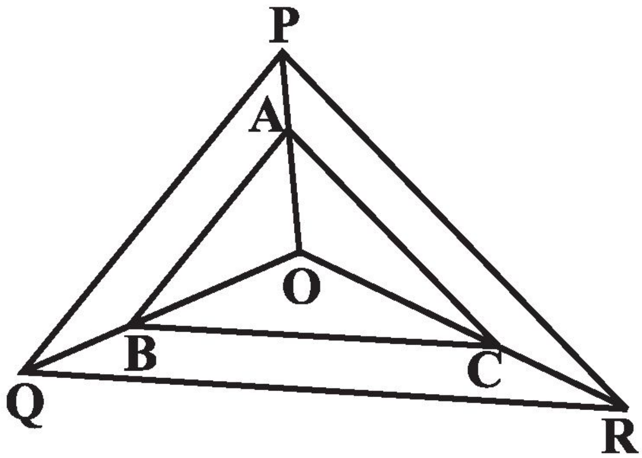
94. Prove that the internal bisector of an angle of a triangle divides the opposite side in the ratio of the sides containing the angle.

95. Prove that the area of the semicircle drawn on the hypotenuse of a right angled triangle is equal to the sum of the areas of the semicircles drawn on the other two sides of the triangle.

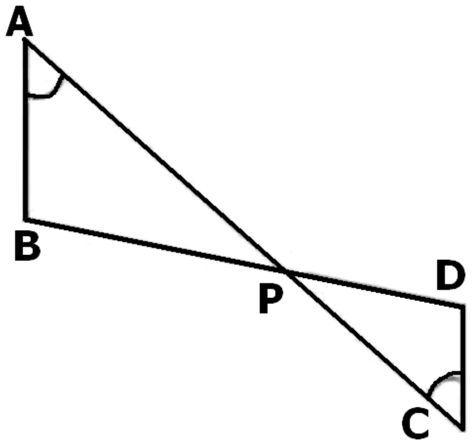
96. Using Thales theorem, prove that a line drawn through the mid-point of one side of a triangle parallel to another side bisects the third side.

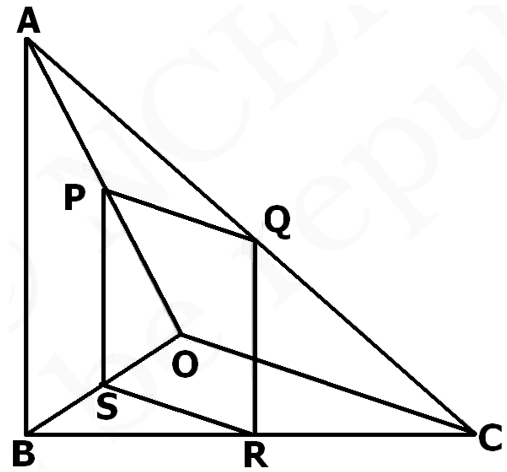
97. Using Converse of Thales theorem, prove that the line joining the mid-points of any two sides of a triangle is parallel to the third side.

98. In the below figure A, B and C are points on OP, OQ and OR respectively such that AB || PQ and AC || PR. Show that BC || QR.



99. In the below figure, if $\angle A = \angle C$, AB = 6 cm, BP = 15 cm, AP = 12 cm and CP = 4 cm, then find the lengths of PD and CD.





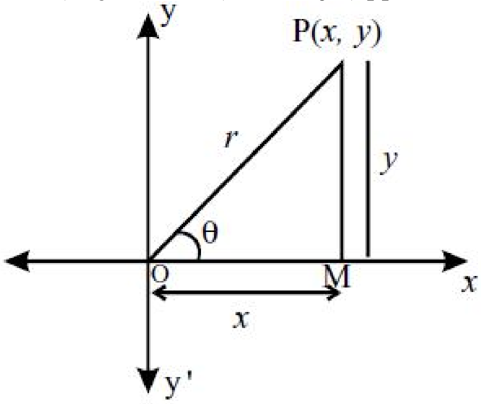
100. In the above right sided figure, if PQRS is a parallelogram, AB || PS and PQ || OC, then prove that OC || SR.

CLASS X: CHAPTER - 8
INTRODUCTION TO TRIGONOMETRY

IMPORTANT FORMULAS & CONCEPTS

The word 'trigonometry' is derived from the Greek words 'tri' (meaning three), 'gon' (meaning sides) and 'metron' (meaning measure). In fact, **trigonometry** is the study of relationships between the sides and angles of a triangle.

Trigonometric Ratios (T - Ratios) of an acute angle of a right triangle
In XOY-plane, let a revolving line OP starting from OX, trace out $\angle XOP=\theta$.
From P (x, y)draw PM $\perp$ to OX.
In right angled triangle OMP. OM = x (Adjacent side); PM = y (opposite side); OP = r (hypotenuse).



$$\sin\theta = \frac{\text{Opposite side}}{\text{Hypotenuse}} = \frac{y}{r} \qquad \cos ec\theta = \frac{\text{Hypotenuse}}{\text{Opposite side}} = \frac{r}{y}$$

$$\cos\theta = \frac{\text{Adjacent Side}}{\text{Hypotenuse}} = \frac{x}{r} \qquad \sec\theta = \frac{\text{Hypotenuse}}{\text{Adjacent Side}} = \frac{r}{x}$$

$$\tan\theta = \frac{\text{Opposite side}}{\text{Adjacent Side}} = \frac{y}{x} \qquad \cot\theta = \frac{\text{Adjacent Side}}{\text{Opposite side}} = \frac{x}{y}$$

Reciprocal Relations

$$\sin\theta = \frac{1}{\cos ec\theta} \qquad \cos ec\theta = \frac{1}{\sin\theta}$$

$$\cos\theta = \frac{1}{\sec\theta} \qquad \sec\theta = \frac{1}{\cos\theta}$$

$$\tan\theta = \frac{1}{\cot\theta} \qquad \cot\theta = \frac{1}{\tan\theta}$$

Quotient Relations

$$\tan\theta = \frac{\sin\theta}{\cos\theta} \quad \textit{and} \quad \cot\theta = \frac{\cos\theta}{\sin\theta}$$

- **Remark 1 :** sin q is read as the "sine of angle q" and it should never be interpreted as the product of 'sin' and 'q'
- **Remark 2 : Notation :** $(\sin\theta)^2$ is written as $\sin^2\theta$ (read "sin square q'') Similarly $(\sin\theta)^n$ is written as $\sin^n\theta$ (read ''sin *n*th power q''), *n* being a positive integer.
- **Note :** $(\sin\theta)^2$ should not be written as $\sin\theta^2$ or as $\sin^2\theta^2$
- **Remark 3 :** Trigonometric ratios depend only on the value of θ and are independent of the lengths of the sides of the right angled triangle.

Trigonometric ratios of Complementary angles.

$\sin(90 - \theta) = \cos\theta$	$\cos(90 - \theta) = \sin\theta$
$\tan(90 - \theta) = \cot\theta$	$\cot(90 - \theta) = \tan\theta$
$\sec(90 - \theta) = \text{cosec}\,\theta$	$\text{cosec}(90 - \theta) = \sec\theta$.

Trigonometric ratios for angle of measure.

0^0, 30^0, 45^0, 60^0 and 90^0 in tabular form.

$\angle$A	0^0	30^0	45^0	60^0	90^0
sinA	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
cosA	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
tanA	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	Not defined
cosecA	Not defined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1
secA	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	Not defined
cotA	Not defined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0

TRIGONOMETRIC IDENTITIES

An equation involving trigonometric ratios of an angle is said to be a trigonometric identity if it is satisfied for all values of θ for which the given trigonometric ratios are defined.

Identity (1) : $\sin^2\theta + \cos^2\theta = 1$

$\Rightarrow \sin^2\theta = 1 - \cos^2\theta$ and $\cos^2\theta = 1 - \sin^2\theta$.

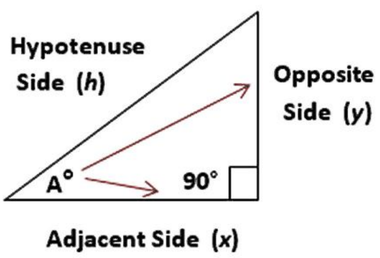
Identity (2) : $\sec^2\theta = 1 + \tan^2\theta$

$\Rightarrow \sec^2\theta - \tan^2\theta = 1$ and $\tan^2\theta = \sec^2\theta - 1$.

Identity (3) : $\text{cosec}^2\theta = 1 + \cot^2\theta$

$\Rightarrow \text{cosec}^2\theta - \cot^2\theta = 1$ and $\cot^2\theta = \text{cosec}^2\theta - 1$.

SOME TIPS

Right Triangle	SOH-CAH-TOA Method	Coordinate System Method
	SOH: $\text{sine}(A) = \sin(A) = \frac{\text{Opposite}}{\text{Hypotenuse}}$ CAH: $\text{cosine}(A) = \cos(A) = \frac{\text{Adjacent}}{\text{Hypotenuse}}$ TOA: $\text{tangent}(A) = \tan(A) = \frac{\text{Opposite}}{\text{Adjacent}}$ $\text{cosecant}(A) = \csc(A) = \frac{1}{\sin(A)} = \frac{\text{Hypotenuse}}{\text{Opposite}}$ $\text{secant}(A) = \sec(A) = \frac{1}{\cos(A)} = \frac{\text{Hypotenuse}}{\text{Adjacent}}$ $\text{cotangent}(A) = \cot(A) = \frac{1}{\tan(A)} = \frac{\text{Adjacent}}{\text{Opposite}}$	$\sin(A) = \frac{y}{h}$ $\cos(A) = \frac{x}{h}$ $\tan(A) = \frac{y}{x}$ $\csc(A) = \frac{1}{\sin(A)} = \frac{h}{y}$ $\sec(A) = \frac{1}{\cos(A)} = \frac{h}{x}$ $\cot(A) = \frac{1}{\tan(A)} = \frac{x}{y}$

Each trigonometric function in terms of the other five.

in terms of	$\sin\theta$	$\cos\theta$	$\tan\theta$	$\csc\theta$	$\sec\theta$	$\cot\theta$
$\sin\theta =$	$\sin\theta$	$\pm\sqrt{1-\cos^2\theta}$	$\pm\frac{\tan\theta}{\sqrt{1+\tan^2\theta}}$	$\frac{1}{\csc\theta}$	$\pm\frac{\sqrt{\sec^2\theta-1}}{\sec\theta}$	$\pm\frac{1}{\sqrt{1+\cot^2\theta}}$
$\cos\theta =$	$\pm\sqrt{1-\sin^2\theta}$	$\cos\theta$	$\pm\frac{1}{\sqrt{1+\tan^2\theta}}$	$\pm\frac{\sqrt{\csc^2\theta-1}}{\csc\theta}$	$\frac{1}{\sec\theta}$	$\pm\frac{\cot\theta}{\sqrt{1+\cot^2\theta}}$
$\tan\theta =$	$\pm\frac{\sin\theta}{\sqrt{1-\sin^2\theta}}$	$\pm\frac{\sqrt{1-\cos^2\theta}}{\cos\theta}$	$\tan\theta$	$\pm\frac{1}{\sqrt{\csc^2\theta-1}}$	$\pm\sqrt{\sec^2\theta-1}$	$\frac{1}{\cot\theta}$
$\csc\theta =$	$\frac{1}{\sin\theta}$	$\pm\frac{1}{\sqrt{1-\cos^2\theta}}$	$\pm\frac{\sqrt{1+\tan^2\theta}}{\tan\theta}$	$\csc\theta$	$\pm\frac{\sec\theta}{\sqrt{\sec^2\theta-1}}$	$\pm\sqrt{1+\cot^2\theta}$
$\sec\theta =$	$\pm\frac{1}{\sqrt{1-\sin^2\theta}}$	$\frac{1}{\cos\theta}$	$\pm\sqrt{1+\tan^2\theta}$	$\pm\frac{\csc\theta}{\sqrt{\csc^2\theta-1}}$	$\sec\theta$	$\pm\frac{\sqrt{1+\cot^2\theta}}{\cot\theta}$
$\cot\theta =$	$\pm\frac{\sqrt{1-\sin^2\theta}}{\sin\theta}$	$\pm\frac{\cos\theta}{\sqrt{1-\cos^2\theta}}$	$\frac{1}{\tan\theta}$	$\pm\sqrt{\csc^2\theta-1}$	$\pm\frac{1}{\sqrt{\sec^2\theta-1}}$	$\cot\theta$

Note: $\csc\theta$ **is same as** $\cos ec\theta$**.**

MCQ WORKSHEET-I

CLASS X: CHAPTER - 8
INTRODUCTION TO TRIGONOMETRY

1. In ΔOPQ, right-angled at P, OP = 7 cm and OQ – PQ = 1 cm, then the values of sin Q.
(a) $\frac{7}{25}$ (b) $\frac{24}{25}$ (c) 1 (d) none of the these

2. If sin A = $\frac{24}{25}$, then the value of cosA is
(a) $\frac{7}{25}$ (b) $\frac{24}{25}$ (c) 1 (d) none of the these

3. In ΔABC, right-angled at B, AB = 5 cm and $\angle$ACB = 30° then the length of the side BC is
(a) $5\sqrt{3}$ (b) $2\sqrt{3}$ (c) 10 cm (d) none of these

4. In ΔABC, right-angled at B, AB = 5 cm and $\angle$ACB = 30° then the length of the side AC is
(a) $5\sqrt{3}$ (b) $2\sqrt{3}$ (c) 10 cm (d) none of these

5. The value of $\frac{2\tan 30^0}{1+\tan^2 30^0}$ is
(a) sin 60° (b) cos 60° (c) tan 60° (d) sin 30°

6. The value of $\frac{1-\tan^2 45^0}{1+\tan^2 45^0}$ is
(a) tan 90° (b) 1 (c) sin 45° (d) 0

7. sin 2A = 2 sin A is true when A =
(a) 0° (b) 30° (c) 45° (d) 60°

8. The value of $\frac{2\tan 30^0}{1-\tan^2 30^0}$ is
(a) sin 60° (b) cos 60° (c) tan 60° (d) sin 30°

9. 9 $\sec^2$ A – 9 $\tan^2$ A =
(a) 1 (b) 9 (c) 8 (d) 0

10. (1 + tanA + secA) (1 + cotA – cosecA) =
(a) 0 (b) 1 (c) 2 (d) –1

11. (sec A + tan A) (1 – sin A) =
(a) sec A (b) sin A (c) cosec A (d) cos A

12. $\frac{1+\tan^2 A}{1+\cot^2 A}=$
(a) $\sec^2$ A (b) –1 (c) $\cot^2$ A (d) $\tan^2$ A

MCQ WORKSHEET-II

CLASS X: CHAPTER - 8
INTRODUCTION TO TRIGONOMETRY

1. If sin 3A = cos (A – 26°), where 3A is an acute angle, find the value of A.
(a) 29^0 (b) 30^0 (c) 26^0 (d) 36^0

2. If tan 2A = cot (A – 18°), where 2A is an acute angle, find the value of A.
(a) 29^0 (b) 30^0 (c) 26^0 (d) none of these

3. If sec 4A = cosec (A – 20°), where 4A is an acute angle, find the value of A.
(a) 22^0 (b) 25^0 (c) 26^0 (d) none of these

4. The value of tan 48° tan 23° tan 42° tan 67° is
(a) 1 (b) 9 (c) 8 (d) 0

5. If ΔABC is right angled at C, then the value of cos(A + B) is
(a) 0 (b) 1 (c) ½ (d) n.d.

6. The value of the expression $\left[\frac{\sin^2 22^0 + \sin^2 68^0}{\cos^2 22^0 + \cos^2 68^0} + \sin^2 63^0 + \cos 63^0 \sin 27^0\right]$ is
(a) 3 (b) 0 (c) 1 (d) 2

7. If cos A = $\frac{24}{25}$, then the value of sinA is
(a) $\frac{7}{25}$ (b) $\frac{24}{25}$ (c) 1 (d) none of the these

8. If ΔABC is right angled at B, then the value of cos(A + C) is
(a) 0 (b) 1 (c) ½ (d) n.d.

9. If tanA = $\frac{4}{3}$, then the value of cosA is
(a) $\frac{3}{5}$ (b) $\frac{4}{3}$ (c) 1 (d) none of the these

10. If ΔABC is right angled at C, in which AB = 29 units, BC = 21 units and ∠ABC = α. Determine the values of $\cos^2\alpha + \sin^2\alpha$ is
(a) 0 (b) 1 (c) ½ (d) n.d.

11. In a right triangle ABC, right-angled at B, if tan A = 1, then the value of 2 sin A cos A =
(a) 0 (b) 1 (c) ½ (d) n.d.

12. Given 15 cot A = 8, then sin A =
(a) $\frac{3}{5}$ (b) $\frac{4}{3}$ (c) 1 (d) none of the these

MCQ WORKSHEET-III
CLASS X: CHAPTER - 8
INTRODUCTION TO TRIGONOMETRY

1. In a triangle PQR, right-angled at Q, PR + QR = 25 cm and PQ = 5 cm, then the value of sin P is
(a) $\frac{7}{25}$ (b) $\frac{24}{25}$ (c) 1 (d) none of the these

2. In a triangle PQR, right-angled at Q, PQ = 3 cm and PR = 6 cm, then $\angle$QPR =
(a) 0° (b) 30° (c) 45° (d) 60°

3. If sin (A – B) = $\frac{1}{2}$ and cos(A + B) = $\frac{1}{2}$, then the value of A and B, respectively are
(a) 45° and 15° (b) 30° and 15° (c) 45° and 30° (d) none of these

4. If sin (A – B) = 1 and cos(A + B) = 1, then the value of A and B, respectively are
(a) 45° and 15° (b) 30° and 15° (c) 45° and 30° (d) none of these

5. If tan (A – B) = $\frac{1}{\sqrt{3}}$ and tan (A + B) = $\sqrt{3}$, then the value of A and B, respectively are
(a) 45° and 15° (b) 30° and 15° (c) 45° and 30° (d) none of these

6. If cos (A – B) = $\frac{\sqrt{3}}{2}$ and sin (A + B) = 1, then the value of A and B, respectively are
(a) 45° and 15° (b) 30° and 15° (c) 60° and 30° (d) none of these

7. The value of $2\cos^2 60^0 + 3\sin^2 45^0 - 3\sin^2 30^0 + 2\cos^2 90^0$ is
(a) 1 (b) 5 (c) 5/4 (d) none of these

8. sin 2A = 2 sin AcosA is true when A =
(a) 0° (b) 30° (c) 45° (d) any angle

9. sin A = cosA is true when A =
(a) 0° (b) 30° (c) 45° (d) any angle

10. If sinA = $\frac{1}{2}$, then the value of 3cosA – $4\cos^3$A is
(a) 0 (b) 1 (c) ½ (d) n.d.

11. If 3cotA = 4, then the value of $\cos^2$A – $\sin^2$A is
(a) $\frac{3}{4}$ (b) $\frac{7}{25}$ (c) ½ (d) $\frac{24}{25}$

12. If 3tanA = 4, then the value of $\frac{3\sin A + 2\cos A}{3\sin A - 2\cos A}$ is
(a) 1 (b) $\frac{7}{25}$ (c) 3 (d) $\frac{24}{25}$

MCQ WORKSHEET-IV
CLASS X: CHAPTER - 8
INTRODUCTION TO TRIGONOMETRY

1. Value of θ, for $\sin 2\theta = 1,\ where\ 0^0 < \theta < 90^0$ is:
(a) 30° (b) 60° (c) 45° (d) 135^0.

2. Value of $\sec^2 26^0 - \cot^2 64^0$ is:
(a) 1 (b) –1 (c) 0 (d) 2

3. Product $\tan 1^0 . \tan 2^0 . \tan 3^0 \ldots\ldots \tan 89^0$ is:
(a) 1 (b) –1 (c) 0 (d) 90

4. $\sqrt{1+\tan^2\theta}$ is equal to:
(a) $\cot\theta$ (b) $\cos\theta$ (c) $\operatorname{cosec}\theta$ (d) $\sec\theta$

5. If A + B = 90^0, cot B = $\frac{3}{4}$ then tanA is equal to;
(a) $\frac{3}{4}$ (b) $\frac{4}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{3}$

6. Maximum value of $\frac{1}{\operatorname{cosec}\theta}$, $0^0 < \theta < 90^0$ is:
(a) 1 (b) –1 (c) 2 (d) $\frac{1}{2}$

7. If $\cos\theta = \frac{1}{2}$, $\sin\phi = \frac{1}{2}$ then value of $\theta + \phi$ is
(a) 30° (b) 60° (c) 90° (d) 120^0.

8. If Sin (A + B) = 1 = cos(A – B) then
(a) A = B = 90^0 (b) A = B = 0^0 (c) A = B = 45^0 (d) A = 2B

9. The value of $\sin 60^0 \cos 30^0 - \cos 60^0 \sin 30^0$ is
(a) 1 (b) –1 (c) 0 (d) none of these

10. The value of $2\sin^2 30^0 - 3\cos^2 45^0 + \tan^2 60^0 + 3\sin^2 90^0$ is
(a) 1 (b) 5 (c) 0 (d) none of these

PRACTICE QUESTIONS
CLASS X: CHAPTER - 8
INTRODUCTION TO TRIGONOMETRY
TRIGONOMETRIC RATIOS

1. If $\tan\theta = \dfrac{1}{\sqrt{5}}$, what is the value of $\dfrac{\operatorname{cosec}^2\theta - \sec^2\theta}{\operatorname{cosec}^2\theta + \sec^2\theta}$?

2. If $\sin\theta = \dfrac{4}{5}$, find the value of $\dfrac{\sin\theta\tan\theta - 1}{2\tan^2\theta}$.

3. If cosA = $\dfrac{1}{2}$, find the value of $\dfrac{2\sec A}{1+\tan^2 A}$.

4. If $\sin\theta = \dfrac{\sqrt{3}}{2}$, find the value of all T– ratios of θ.

5. If $\cos\theta = \dfrac{7}{25}$, find the value of all T– ratios of θ.

6. If $\tan\theta = \dfrac{15}{8}$, find the value of all T– ratios of θ.

7. If $\cot\theta = 2$, find the value of all T– ratios of θ.

8. If $\operatorname{cosec}\theta = \sqrt{10}$, find the value of all T– ratios of θ.

9. If $\tan\theta = \dfrac{4}{3}$, show that $(\sin\theta + \cos\theta) = \dfrac{7}{5}$.

10. If $\sec\theta = \dfrac{5}{4}$, show that $\dfrac{(\sin\theta - 2\cos\theta)}{(\tan\theta - \cot\theta)} = \dfrac{12}{7}$.

11. If $\tan\theta = \dfrac{1}{\sqrt{7}}$, show that $\dfrac{(\operatorname{cosec}^2\theta - \sec^2\theta)}{(\operatorname{cosec}^2\theta + \sec^2\theta)} = \dfrac{3}{4}$.

12. If $\operatorname{cosec}\theta = 2$, show that $\left\{\cot\theta + \dfrac{\sin\theta}{1+\cos\theta}\right\} = 2$.

13. If $\sec\theta = \dfrac{5}{4}$, verify that $\dfrac{\tan\theta}{(1+\tan^2\theta)} = \dfrac{\sin\theta}{\sec\theta}$.

14. If $\cos\theta = 0.6$, show that $(5\sin\theta - 3\tan\theta) = 0$.

15. In a triangle ACB, right-angled at C, in which AB = 29 units, BC = 21 units and $\angle ABC = \theta$. Determine the values of (i) $\cos^2\theta + \sin^2\theta$ (ii) $\cos^2\theta - \sin^2\theta$

16. In a triangle ABC, right-angled at B, in which AB = 12 cm and BC = 5cm. Find the value of cosA, cosecA, cosC and cosecC.

17. In a triangle ABC, $\angle B = 90^0$, AB = 24 cm and BC = 7 cm. Find (i) SinA, CosA (ii) SinC, CosC.

PRACTICE QUESTIONS

CLASS X: CHAPTER - 8

INTRODUCTION TO TRIGONOMETRY

T – RATIOS OF SOME PARTICULAR ANGLES

Evaluate each of the following:

1. $\sin 60^0 \cos 30^0 + \cos 60^0 \sin 30^0$

2. $\cos 60^0 \cos 30^0 - \sin 60^0 \sin 30^0$

3. $\cos 45^0 \cos 30^0 + \sin 45^0 \sin 30^0$

4. $\sin 60^0 \sin 45^0 - \cos 60^0 \cos 45^0$

5. $\frac{\sin 30^0}{\cos 45^0} + \frac{\cot 45^0}{\sec 60^0} - \frac{\sin 60^0}{\tan 45^0} - \frac{\cos 30^0}{\sin 90^0}$

6. $\frac{\tan^2 60^0 + 4\cos^2 45^0 + 3\operatorname{cosec}^2 60^0 + 2\cos^2 90^0}{2\operatorname{cosec} 30^0 + 3\sec 60^0 - \frac{7}{3}\cot^2 30^0}$

7. $4(\sin^4 30^0 + \cos^4 60^0) - 3(\cos^2 45^0 - \sin^2 90^0) + 5\cos^2 90^0$

8. $\frac{4}{\cot^2 30^0} + \frac{1}{\sin^2 30^0} - 2\cos^2 45^0 - \sin^2 0^0$

9. $\frac{1}{\cos^2 30^0} + \frac{1}{\sin^3 30^0} - \frac{1}{2}\tan^2 45^0 - 8\sin^2 90^0$

10. $\cot^2 30^0 - 2\cos^2 30^0 - \frac{3}{4}\sec^2 45^0 + \frac{1}{4}\operatorname{cosec}^2 30^0$

11. $(\sin^2 30^0 + 4\cot^2 45^0 - \sec^2 60^0)(\operatorname{cosec}^2 45^0 \sec^2 30^0)$

12. In right triangle ABC, $\angle B = 90^0$, AB = 3cm and AC = 6cm. Find $\angle C$ and $\angle A$.

13. If A = 30^0, verify that:

(i) $\sin 2A = \frac{2\tan A}{1+\tan^2 A}$ (ii) $\cos 2A = \frac{1-\tan^2 A}{1+\tan^2 A}$ (iii) $\tan 2A = \frac{2\tan A}{1-\tan^2 A}$

14. If A = 45^0, verify that

(i) sin2A = 2sinAcosA (ii) cos2A = $2\cos^2 A - 1 = 1 - 2\sin^2 A$

15. Using the formula, $\cos A = \sqrt{\frac{1+\cos 2A}{2}}$, find the value of $\cos 30^0$, it being given that $\cos 60^0 = \frac{1}{2}$

16. Using the formula, $\sin A = \sqrt{\frac{1-\cos 2A}{2}}$, find the value of $\sin 30^0$, it being given that $\cos 60^0 = \frac{1}{2}$

17. Using the formula, $\tan 2A = \frac{2\tan A}{1-\tan^2 A}$, find the value of $\tan 60^0$, it being given that $\tan 30^0 = \frac{1}{\sqrt{3}}$.

18. If sin (A – B) = $\frac{1}{2}$ and cos(A + B) = $\frac{1}{2}$, then find the value of A and B.

19. If sin (A + B) = 1 and cos(A – B) = 1, then find the value of A and B.

20. If tan (A – B) = $\frac{1}{\sqrt{3}}$ and tan (A + B) = $\sqrt{3}$, then find the value of A and B.

21. If cos (A – B) = $\frac{\sqrt{3}}{2}$ and sin (A + B) = 1, then find the value of A and B.

22. If A and B are acute angles such that tanA = $\frac{1}{3}$, tanB = $\frac{1}{2}$ and $\tan(A+B) = \frac{\tan A + \tan B}{1-\tan A \tan B}$, show that A + B = 45^0.

23. If A = B = 45^0, verify that:

a) sin(A + B) = sinAcosB + cosAsinB
b) sin(A – B) = sinAcosB – cosAsinB
c) cos(A + B) = cosAcosB – sinAsinB
d) cos(A – B) = cosAcosB + sinAsinB
e) $\tan(A+B) = \frac{\tan A + \tan B}{1-\tan A \tan B}$
f) $\tan(A-B) = \frac{\tan A - \tan B}{1+\tan A \tan B}$

24. If A = 60^0 and B = 30^0, verify that:

a) sin(A + B) = sinAcosB + cosAsinB
b) sin(A – B) = sinAcosB – cosAsinB
c) cos(A + B) = cosAcosB – sinAsinB
d) cos(A – B) = cosAcosB + sinAsinB
e) $\tan(A+B) = \frac{\tan A + \tan B}{1-\tan A \tan B}$
f) $\tan(A-B) = \frac{\tan A - \tan B}{1+\tan A \tan B}$

25. Evaluate:

$$\frac{\sin^2 45^0 + \frac{3}{4}\cos ec^2 30^0 - \cos 60^0 + \tan^2 60^0}{\sin^2 30^0 + \cos^2 60^0 + \frac{1}{2}\sec^2 45^0}$$

PRACTICE QUESTIONS

CLASS X: CHAPTER - 8

INTRODUCTION TO TRIGONOMETRY

T – RATIOS OF COMPLEMENTARY ANGLES

1. Evaluate: $\cot\theta \tan(90^0 - \theta) - \sec(90^0 - \theta)\,\text{cosec}\theta + (\sin^2 25^0 + \sin^2 65^0) + \sqrt{3}\,(\tan 5^0 . \tan 15^0 . \tan 30^0 . \tan 75^0 . \tan 85^0)$.

2. Evaluate without using tables: $\dfrac{\sec\theta\,\text{cosec}(90^0-\theta) - \tan\theta\cot(90^0-\theta) + (\sin^2 35^0 + \sin^2 55^0)}{\tan 10^0 \tan 20^0 \tan 45^0 \tan 70^0 \tan 80^0}$

3. Evaluate: $\dfrac{\sec^2 54^0 - \cot^2 36^0}{\text{cosec}^2 57^0 - \tan^2 33^0} + 2\sin^2 38^0 \sec^2 52^0 - \sin^2 45^0$.

4. Express $\sin 67^0 + \cos 75^0$ in terms of trigonometric ratios of angles between 0^0 and 45^0.

5. If $\sin 4A = \cos(A - 20^0)$, where A is an acute angle, find the value of A.

6. If A, B and C are the interior angles of triangle ABC, prove that $\tan\left(\dfrac{B+C}{2}\right) = \cot\dfrac{A}{2}$

7. If A, B, C are interior angles of a ΔABC, then show that $\cos\left(\dfrac{B+C}{2}\right) = \sin\dfrac{A}{2}$.

8. If A, B, C are interior angles of a ΔABC, then show that $\text{cosec}\left(\dfrac{A+C}{2}\right) = \sec\dfrac{B}{2}$.

9. If A, B, C are interior angles of a ΔABC, then show that $\cot\left(\dfrac{B+A}{2}\right) = \tan\dfrac{C}{2}$.

10. Without using trigonometric tables, find the value of $\dfrac{\cos 70^0}{\sin 20^0} + \cos 57^0\,\text{cosec} 33^0 - 2\cos 60^0$.

11. If $\sec 4A = \text{cosec}(A - 20^0)$, where 4A is an acute angle, find the value of A.

12. If $\tan 2A = \cot(A - 40^0)$, where 2A is an acute angle, find the value of A.

13. Evaluate $\tan 10^0 \tan 15^0 \tan 75^0 \tan 80^0$

14. Evaluate: $\left[\dfrac{\sin^2 22^0 + \sin^2 68^0}{\cos^2 22^0 + \cos^2 68^0} + \sin^2 63^0 + \cos 63^0 \sin 27^0\right]$

15. Express $\tan 60^0 + \cos 46^0$ in terms of trigonometric ratios of angles between 0^0 and 45^0.

16. Express $\sec 51^0 + \text{cosec} 25^0$ in terms of trigonometric ratios of angles between 0^0 and 45^0.

17. Express $\cot 77^0 + \sin 54^0$ in terms of trigonometric ratios of angles between 0^0 and 45^0.

18. If $\tan 3A = \cot(3A - 60^0)$, where 3A is an acute angle, find the value of A.

19. If $\sin 2A = \cos(A + 36^0)$, where 2A is an acute angle, find the value of A.

20. If $\text{cosec}A = \sec(A - 10^0)$, where A is an acute angle, find the value of A.

21. If sin5θ = cos4θ, where 5θ and 4θ are acute angles, find the value of θ.

22. If tan 2A = cot (A – 18^0), where 2A is an acute angle, find the value of A.

23. If tan2θ = cot(θ + 6^0), where 2θ and θ + 6^0 are acute angles, find the value of θ.

24. Evaluate:

$$\frac{2\sin 68^0}{\cos 22^0} - \frac{2\cot 15^0}{5\tan 75^0} - \frac{3\tan 45^0 \tan 20^0 \tan 40^0 \tan 50^0 \tan 70^0}{5}$$

25. Evaluate:

$$\frac{\cos(90^0 - \theta)\sec(90^0 - \theta)\tan\theta}{\cos ec(90^0 - \theta)\sin(90^0 - \theta)\cot(90^0 - \theta)} + \frac{\tan(90^0 - \theta)}{\cot\theta} = 2$$

26. Evaluate:

$$\frac{\sin 18^0}{\cos 72^0} + \sqrt{3}\left\{\tan 10^0 \tan 30^0 \tan 40^0 \tan 50^0 \tan 80^0\right\}$$

27. Evaluate:

$$\frac{3\cos 55^0}{7\sin 35^0} - \frac{4(\cos 70^0 \cos ec 20^0)}{7(\tan 5^0 \tan 25^0 \tan 45^0 \tan 65^0 \tan 85^0)}$$

28. Evaluate:

$$\cos(40^0 - \theta) - \sin(50^0 + \theta) + \frac{\cos^2 40^0 + \cos^2 50^0}{\sin^2 40^0 + \sin^2 50^0}$$

29. If A + B = 90^0, prove that $\sqrt{\frac{\tan A \tan B + \tan A \cot B}{\sin A \sec B} - \frac{\sin^2 B}{\cos^2 A}} = \tan A$

30. If cos2θ = sin4θ, where 2θ and 4θ are acute angles, find the value of θ.

PRACTICE QUESTIONS

CLASS X: CHAPTER - 8

INTRODUCTION TO TRIGONOMETRY

TRIGONOMETRIC IDENTITIES

1. Prove that $\frac{\cos\theta}{1-\tan\theta}+\frac{\sin\theta}{1-\cot\theta}=\sin\theta+\cos\theta$.

2. Prove that $\frac{1}{2}\left\{\frac{\sin\theta}{1+\cos\theta}+\frac{1+\cos\theta}{\sin\theta}\right\}=\frac{1}{\sin\theta}$.

3. Prove that: $\frac{\tan^3\alpha}{1+\tan^2\alpha}+\frac{\cot^3\alpha}{1+\cot^2\alpha}=\sec\alpha\cos ec\alpha-2\sin\alpha\cos\alpha$

4. Prove that: $\frac{\tan A}{1-\cot A}+\frac{\cot A}{1-\tan A}=1+\tan A+\cot A=1+\sec A\cos ecA$.

5. Prove that:. $\frac{1+\sin A-\cos A}{1+\sin A+\cos A}=\sqrt{\frac{1-\cos A}{1+\cos A}}$

6. Prove that $(\tan A + \text{cosec} B)^2 - (\cot B - \sec A)^2 = 2\tan A \cot B (\text{cosec} A + \sec B)$.

7. Prove that: $\frac{\cos A}{1+\sin A}+\frac{1+\sin A}{\cos A}=2\sec A$.

8. Prove that: $\frac{\cos A-\sin A+1}{\cos A+\sin A-1}=\cos ecA+\cot A$.

9. Prove that: $\frac{\sin A+\cos A}{\sin A-\cos A}+\frac{\sin A-\cos A}{\sin A+\cos A}=\frac{2}{\sin^2 A-\cos^2 A}=\frac{2}{2\sin^2 A-1}=\frac{2}{1-2\cos^2 A}$.

10. Prove that $\frac{\sin A}{\cot A+\cos ecA}=2+\frac{\sin A}{\cot A-\cos ecA}$.

11. Prove that $\sqrt{\frac{\sec A-1}{\sec A+1}}+\sqrt{\frac{\sec A+1}{\sec A-1}}=2\cos ecA$.

12. Prove that: $\frac{1}{\cos ecA-\cot A}-\frac{1}{\sin A}=\frac{1}{\sin A}-\frac{1}{\cos ecA+\cot A}$.

13. Prove that: $\frac{\tan\theta+\sec\theta-1}{\tan\theta-\sec\theta+1}=\sec\theta+\tan\theta=\frac{1+\sin\theta}{\cos\theta}$

14. If x = $a\sin\theta+b\cos\theta$ and y = $a\cos\theta+b\sin\theta$, prove that $x^2+y^2=a^2+b^2$.

15. If $\sec\theta+\tan\theta=m$, show that $\left(\frac{m^2-1}{m^2+1}\right)=\sin\theta$.

16. Prove that: $\frac{1+\cos\theta+\sin\theta}{1+\cos\theta-\sin\theta}=\frac{1+\sin\theta}{\cos\theta}$.

17. Prove that $\sec^4 A(1-\sin^4 A)-2\tan^2 A=1$

18. If $\cos ec\theta-\sin\theta=m$ and $\sec\theta-\cos\theta=n$, prove that $\left(m^2n\right)^{2/3}+\left(mn^2\right)^{2/3}=1$

19. If $\tan\theta+\sin\theta=m$ and $\tan\theta-\sin\theta=n$, show that $m^2-n^2=4\sqrt{mn}$

20. If $a\cos\theta-b\sin\theta=c$, prove that $\left(a\sin\theta+b\cos\theta\right)=\pm\sqrt{a^2+b^2-c^2}$

21. If $\cos\theta+\sin\theta=\sqrt{2}\cos\theta$, prove that $\cos\theta-\sin\theta=\sqrt{2}\sin\theta$

22. If $\left(\frac{x}{a}\sin\theta-\frac{y}{b}\cos\theta\right)=1$ and $\left(\frac{x}{a}\cos\theta+\frac{y}{b}\sin\theta\right)=1$, prove that $\left(\frac{x^2}{a^2}+\frac{y^2}{b^2}\right)=2$

23. If $\left(\tan\theta+\sin\theta\right)=m$ and $\left(\tan\theta-\sin\theta\right)=n$ prove that $\left(m^2-n^2\right)^2=16mn$

24. If $\cos ec\theta-\sin\theta=a^3$ and $s\,ec\theta-\cos\theta=b^3$, prove that $a^2b^2(a^2+b^2)=1$

25. If $a\cos^3\theta+3a\sin^2\theta\cos\theta=m$ and $a\sin^3\theta+3a\sin\theta\cos^2\theta=n$, prove that $\left(m+n\right)^{2/3}+(m-n)^{2/3}=2a^{2/3}$

26. Prove that $\sqrt{\sec^2\theta+\cos ec^2\theta}=\tan\theta+\cot\theta$.

27. Prove the identity: $\frac{\sin\theta-\cos\theta+1}{\sin\theta+\cos\theta-1}=\frac{1}{\sec\theta-\tan\theta}$.

28. Prove the identity: $\sec^6\theta=\tan^6\theta+3\tan^2\theta.\sec^2\theta+1$.

29. Prove the identity: $(\sin A+\text{cosec } A)^2+(\cos A+\sec A)^2=7+\tan^2 A+\cot^2 A$.

30. If $x\sin^3\theta+y\cos^3\theta=\sin\theta\cos\theta$ and $x\sin\theta=y\cos\theta$, prove that $x^2+y^2=1$.

31. If $\sec\theta=x+\frac{1}{4x}$, Prove that $\sec\theta+\tan\theta=2x$ or $\frac{1}{2x}$.

32. Prove that $\left(1+\frac{1}{\tan^2 A}\right)\left(1+\frac{1}{\cot^2 A}\right)=\frac{1}{\sin^2 A-\sin^4 A}$.

33. If $\cot\theta+\tan\theta=x$ and $\sec\theta-\cos\theta=y$, prove that $\left(x^2y\right)^{2/3}-\left(xy^2\right)^{2/3}=1$.

34. If $\frac{\cos\alpha}{\cos\beta}=m$ *and* $\frac{\cos\alpha}{\sin\beta}=n$, show that $(m^2+n^2)\cos^2\beta=n^2$.

35. If $\text{cosec}\theta-\sin\theta=a$ and $\sec\theta-\cos\theta=b$, prove that $a^2b^2(a^2+b^2+3)=1$

36. If x = rsinAcosC, y = rsinAsinC and z = rcosA, prove that $r^2 = x^2 + y^2 + z^2$.

37. If tanA = n tanB and sinA = msinB, prove that $\cos^2 A = \frac{m^2 - 1}{n^2 - 1}$.

38. If $\sin\theta + \sin^2\theta = 1$, find the value of $\cos^{12}\theta + 3\cos^{10}\theta + 3\cos^8\theta + \cos^6\theta + 2\cos^4\theta + 2\cos^2\theta - 2$..

39. Prove that: $(1 - \sin\theta + \cos\theta)^2 = 2(1 + \cos\theta)(1 - \sin\theta)$

40. If $\sin + \sin^2\theta = 1$, prove that $\cos^2\theta + \cos^4\theta = 1$.

41. If $a\sec\theta + b\tan\theta + c = 0$ and $p\sec\theta + q\tan\theta + r = 0$, prove that $(br - qc)^2 - (pc - ar)^2 = (aq - bp)^2$.

42. If $\sin\theta + \sin^2\theta + \sin^3\theta = 1$, then prove that $\cos^6\theta - 4\cos^4\theta + 8\cos^2\theta = 4$.

43. If $\tan^2\theta = 1 - a^2$, prove that $\sec\theta + \tan^3\theta\,\mathrm{cosec}\,\theta = (2 - a^2)^{3/2}$.

44. If $x = a\sec\theta + b\tan\theta$ and $y = a\tan\theta + b\sec\theta$, prove that $x^2 - y^2 = a^2 - b^2$.

45. If $3\sin\theta + 5\cos\theta = 5$, prove that $5\sin\theta - 3\cos\theta = \pm 3$.

CLASS X: CHAPTER - 14
STATISTICS

IMPORTANT FORMULAS & CONCEPTS

In many real-life situations, it is helpful to describe data by a single number that is most representative of the entire collection of numbers. Such a number is called a **measure of central tendency.** The most commonly used measures are as follows.

1. The **mean,** or **average,** of 'n' numbers is the sum of the numbers divided by n.
2. The **median** of 'n' numbers is the middle number when the numbers are written in order. If n is even, the median is the average of the two middle numbers.
3. The **mode** of 'n' numbers is the number that occurs most frequently. If two numbers tie for most frequent occurrence, the collection has two modes and is called **bimodal.**

MEAN OF GROUPED DATA

Direct method

Mean, $\bar{x} = \dfrac{\sum f_i x_i}{\sum f_i}$

Assume mean method or Short-cut method

Mean, $\bar{x} = A + \dfrac{\sum f_i d_i}{\sum f_i}$ where $d_i = x_i - A$

Step Deviation method

Mean, $\bar{x} = A + \dfrac{\sum f_i u_i}{\sum f_i} \times h$ where $u = \dfrac{x_i - A}{h}$

MODE OF GROUPED DATA

$$Mode = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) \times h$$

where l = lower limit of the modal class,
h = size of the class interval (assuming all class sizes to be equal),
f_1 = frequency of the modal class,
f_0 = frequency of the class preceding the modal class,
f_2 = frequency of the class succeeding the modal class.

- **Cumulative Frequency:** The cumulative frequency of a class is the frequency obtained by adding the frequencies of all the classes preceeding the given class.

MEDIAN OF GROUPED DATA

$$Median = l + \left(\frac{\frac{n}{2} - cf}{f} \right) \times h$$

where l = lower limit of median class,
n = number of observations,
cf = cumulative frequency of class preceding the median class,
f = frequency of median class,
h = class size (assuming class size to be equal).

EMPIRICAL FORMULA
3Median = Mode + 2 Mean

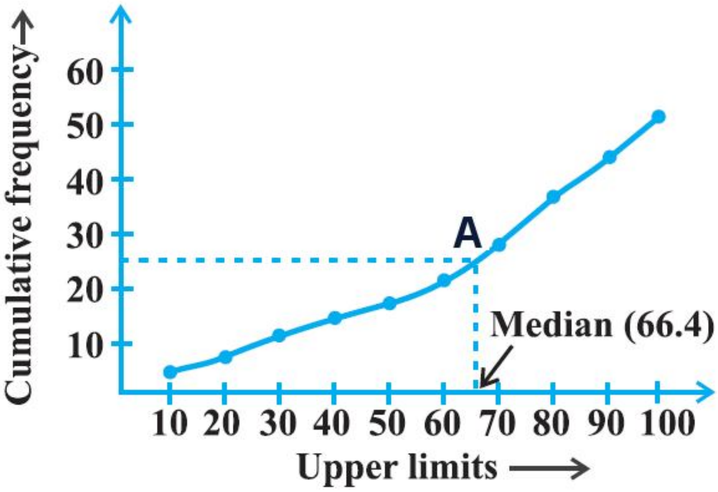
❖ Cumulative frequency curve is also known as 'Ogive'.

There are three methods of drawing ogive:

1. LESS THAN METHOD

Steps involved in calculating median using less than Ogive approach-

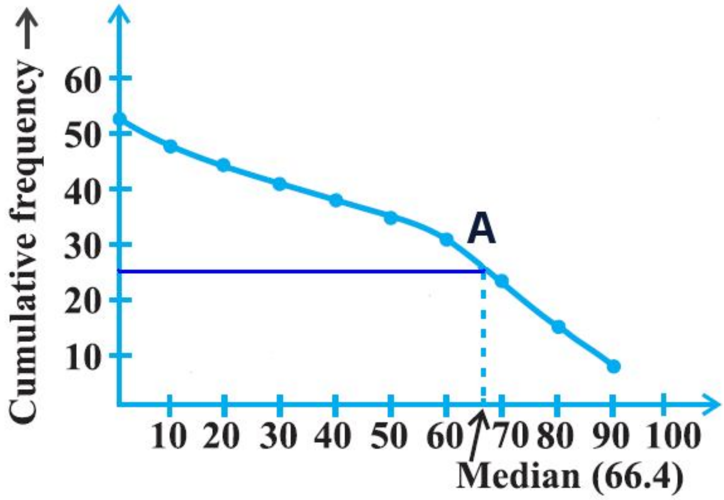
- Convert the series into a 'less than ' cumulative frequency distribution.
- Let N be the total number of students who's data is given. N will also be the cumulative frequency of the last interval. Find the $(N/2)^{th}$ itemand mark it on the y-axis.
- Draw a perpendicular from that point to the right to cut the Ogive curve at point A.
- From point A where the Ogive curve is cut, draw a perpendicular on the x-axis. The point at which it touches the x-axis will be the median value of the series as shown in the graph.



2. MORE THAN METHOD

Steps involved in calculating median using more than Ogive approach-

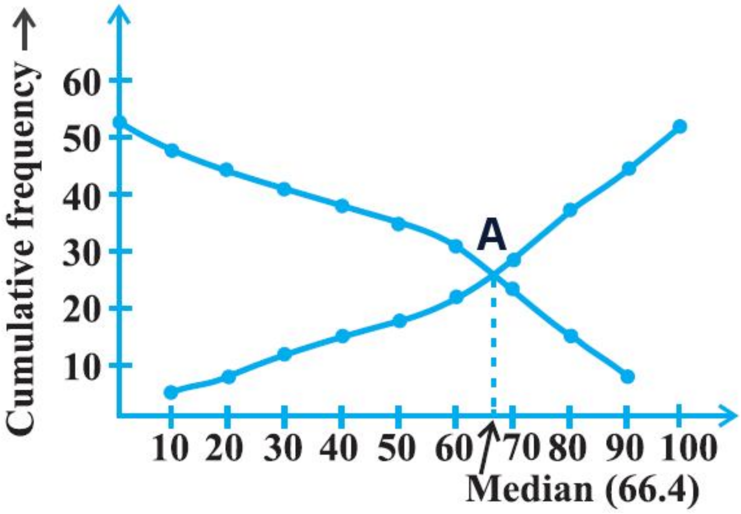
- Convert the series into a 'more than ' cumulative frequency distribution.
- Let N be the total number of students who's data is given. N will also be the cumulative frequency of the last interval. Find the $(N/2)^{th}$ item and mark it on the y-axis.
- Draw a perpendicular from that point to the right to cut the Ogive curve at point A.
- From point A where the Ogive curve is cut, draw a perpendicular on the x-axis. The point at which it touches the x-axis will be the median value of the series as shown in the graph.



3. LESS THAN AND MORE THAN OGIVE METHOD

Another way of graphical determination of median is through simultaneous graphic presentation of both the less than and more than Ogives.

- Mark the point A where the Ogive curves cut each other.
- Draw a perpendicular from A on the x-axis. The corresponding value on the x-axis would be the median value.



- The median of grouped data can be obtained graphically as the *x*-coordinate of the point of intersection of the two ogives for this data.

MCQ WORKSHEET-I

CLASS X: CHAPTER - 14

STATISTICS

1. For a frequency distribution, mean, median and mode are connected by the relation
(a) mode = 3mean – 2median (b) mode = 2median – 3mean
(c) mode = 3median – 2mean (d) mode = 3median + 2mean

2. Which measure of central tendency is given by the x – coordinate of the point of intersection of the more than ogive and less than ogive?
(a) mode (b) median (c) mean (d) all the above three measures

3. The class mark of a class interval is
(a) upper limit +lower limit (b) upper limit – lower limit
(c) $\frac{1}{2}$(upper limit + lower limit) (d) $\frac{1}{2}$(upper limit – lower limit)

4. Construction of cumulative frequency table is useful in determining the
(a) mode (b) median (c) mean (d) all the above three measures

5. For the following distribution

Marks	Number of students
Below 10	3
Below 20	12
Below 30	27
Below 40	57
Below 50	75
Below 60	80

the modal class is
(a) 10 – 20 (b) 20 – 30 (c) 30 – 40 (d) 40 – 50

6. For the following distribution

Marks	Number of students
Below 10	3
Below 20	12
Below 30	27
Below 40	57
Below 50	75
Below 60	80

the median class is
(a) 10 – 20 (b) 20 – 30 (c) 30 – 40 (d) 40 – 50

7. In a continuous frequency distribution, the median of the data is 24. If each item is increased by 2, then the new median will be
(a) 24 (b) 26 (c) 12 (d) 48

8. In a grouped frequency distribution, the mid values of the classes are used to measure which of the following central tendency?
(a) mode (b) median (c) mean (d) all the above three measures

9. Which of the following is not a measure of central tendency of a statistical data?
(a) mode (b) median (c) mean (d) range

10. Weights of 40 eggs were recorded as given below:

Weights(in gms)	85 – 89	90 – 94	95 – 99	100 – 104	105- 109
No. of eggs	10	12	12	4	2

The lower limit of the median class is
(a) 90 (b) 95 (c) 94.5 (d) 89.5

MCQ WORKSHEET-II
CLASS X: CHAPTER - 14
STATISTICS

1. The median class of the following distribution is

C.I	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
F	8	10	12	22	30	18

(a) 10 – 20 (b) 20 – 30 (c) 30 – 40 (d) 40 – 50

2. Weights of 40 eggs were recorded as given below:

Weights(in gms)	85 – 89	90 – 94	95 – 99	100 – 104	105- 109
No. of eggs	10	12	15	4	2

The lower limit of the modal class is

(a) 90 (b) 95 (c) 94.5 (d) 89.5

3. The arithmetic mean of 12 observations is 7.5. If the arithmetic mean of 7 of these observations is 6.5, the mean of the remaining observations is

(a) 5.5 (b) 8.5 (c) 8.9 (d) 9.2

4. In a continuous frequency distribution, the mean of the data is 25. If each item is increased by 5, then the new median will be

(a) 25 (b) 30 (c) 20 (d) none of these

5. In a continuous frequency distribution with usual notations, if $l = 32.5$, $f_1 = 15$, $f_0 = 12$, $f_2 = 8$ and $h = 8$, then the mode of the data is

(a) 32.5 (b) 33.5 (c) 33.9 (d) 34.9

6. The arithmetic mean of the following frequency distribution is 25, then the value of p is

C.I	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
F	5	18	15	p	6

(a) 12 (b) 16 (c) 18 (d) 20

7. If the mean of the following frequency distribution is 54, then the value of p is

C.I	0 – 20	20 – 40	40 – 60	60 – 80	80 –100
F	7	p	10	9	13

(a) 12 (b) 16 (c) 18 (d) 11

8. The mean of the following frequency distribution is

C.I	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
F	12	16	6	7	9

(a) 12 (b) 16 (c) 22 (d) 20

9. The mean of the following frequency distribution is

C.I	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
F	7	8	12	13	10

(a) 12.2 (b) 16.2 (c) 22.2 (d) 27.2

10. The median of the following frequency distribution is

C.I	100 – 150	150 – 200	200 – 250	250 – 300	300 – 350
F	6	3	5	20	10

(a) 120 (b) 160 (c) 220 (d) 270

MCQ WORKSHEET-III
CLASS X: CHAPTER - 14
STATISTICS

1. The range of the data 14, 27, 29, 61, 45, 15, 9, 18 is
(a) 61 (b) 52 (c) 47 (d) 53

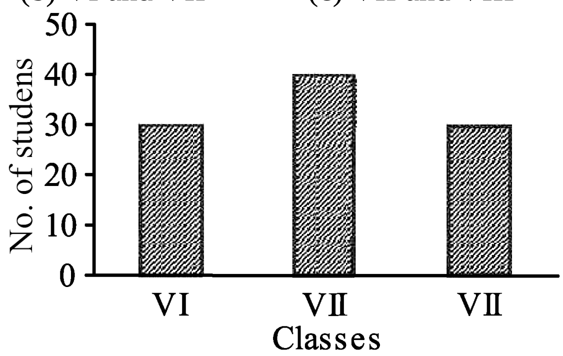
2. The class mark of the class 120 – 150 is
(a) 120 (b) 130 (c) 135 (d) 150

3. The class mark of a class is 10 and its class width is 6. The lower limit of the class is
(a) 5 (b) 7 (c) 8 (d) 10

4. In a frequency distribution, the class width is 4 and the lower limit of first class is 10. If there are six classes, the upper limit of last class is
(a) 22 (b) 26 (c) 30 (d) 34

5. The class marks of a distribution are 15, 20, 25,…….45. The class corresponding to 45 is
(a) 12.5 – 17.5 (b) 22.5 – 27.5 (c) 42.5 – 47.5 (d) none of these

6. The number of students in which two classes are equal.
(a) VI and VIII (b) VI and VII (c) VII and VIII (d) none of these



7. The mean of first five prime numbers is
(a) 5.0 (b) 4.5 (c) 5.6 (d) 6.5

8. The mean of first ten multiples of 7 is
(a) 35.0 (b) 36.5 (c) 38.5 (d) 39.2

9. The mean of x + 3, x – 2, x + 5, x + 7 and x + 72 is
(a) x + 5 (b) x + 2 (c) x + 3 (d) x + 7

10. If the mean of n observations $x_1, x_2, x_3,\ldots\ldots x_n$ is $\bar{x}$ then $\sum_{i=1}^{n} x_i - \bar{x}$ is
(a) 1 (b) –1 (c) 0 (d) cannot be found

11. The mean of 10 observations is 42. If each observation in the data is decreased by 12, the new mean of the data is
(a) 12 (b) 15 (c) 30 (d) 54

12. The median of 10, 12, 14, 16, 18, 20 is
(a) 12 (b) 14 (c) 15 (d) 16

13. If the median of 12, 13, 16, x + 2, x + 4, 28, 30, 32 is 23, when x + 2, x + 4 lie between 16 and 30, then the value of x is
(a) 18 (b) 19 (c) 20 (d) 22

14. If the mode of 12, 16, 19, 16, x, 12, 16, 19, 12 is 16, then the value of x is
(a) 12 (b) 16 (c) 19 (d) 18

15. The mean of the following data is

x	5	10	15	20	25
f	3	5	8	3	1

(a) 12 (b) 13 (c) 13.5 (d) 13.6

16. The mean of 10 numbers is 15 and that of another 20 number is 24 then the mean of all 30 observations is
(a) 20 (b) 15 (c) 21 (d) 24

MCQ WORKSHEET-IV
CLASS X: CHAPTER - 14
STATISTICS

1. Construction of cumulative frequency table is useful in determining the
(a) mean (b) median (c) mode (d) all three

2. In the formula $\bar{x} = a + \frac{\sum f_i d_i}{\sum f_i}$, finding the mean of the grouped data, d_i's are deviations from assumed mean 'a' of
(a) lower limits of classes (b) upper limits of classes
(c) class marks (d) frequencies of the classes.

3. If x_i's are the midpoints of the class intervals of grouped data, f_i's are the corresponding frequencies and x is the mean, then $\sum f_i (x_i - \bar{x})$ is equal to
(a) 0 (b) –1 (c) 1 (d) 2

4. In the formula $\bar{x} = a + \left(\frac{\sum f_i u_i}{\sum f_i} \times h \right)$, finding the mean of the grouped data, u_i =
(a) $\frac{x_i + a}{h}$ (b) $\frac{x_i - a}{h}$ (c) $\frac{a - x_i}{h}$ (d) $h(x_i - a)$

5. For the following distribution:

Class	0-5	5-10	10-15	15-20	20-25
Frequency	10	15	12	20	9

The sum of lower limits of the median class and the modal class is
(a) 15 (b) 25 (c) 30 (d) 35

6. Consider the following frequency distribution:

Class	0-9	10-19	20-29	30-39	40-49
Frequency	13	10	15	8	11

The upper limit of the median class is
(a) 29 (b) 29.5 (c) 30 (d) 19.5

7. The abscissa of the point of intersection of the less than type and of the more than type ogives gives its
(a) mean (b) median (c) mode (d) all three

8. For the following distribution: the modal class is

Marks	Below 10	Below 20	Below 30	Below 40	Below 50
No. of Students	8	17	32	62	80

(a) 10 – 20 (b) 20 – 30 (c) 30 – 40 (d) 40 – 50

9. From the following data of the marks obtained by students of class X

Marks	0-10	10-20	20-30	30-40	40-50	50-60
No. of Students	8	12	20	30	10	10

How many students, secured less than 40 marks?
(a) 70 (b) 40 (c) 80 (d) 30

10. The times in seconds taken by 150 athletics to run a 100m hurdle race are given as under:

Class	12.7-13	13-13.3	13.3-13.6	13.6-13.9	13.9-13.12
Frequency	5	6	10	55	41

The number of athletes who completed the race in less than 13.9 sec is

(a) 21 (b) 55 (c) 41 (d) 76

11. Consider the data:

Class	25-45	45-65	65-85	85-105	105-125	125-145
Frequency	4	5	12	20	14	11

The difference of the upper limit of the median class and the lower limit of the modal class is

(a) 0 (b) 19 (c) 20 (d) 38

12. Consider the following distribution:

Marks	Above 0	Above 10	Above 20	Above 30	Above 40	Above 50
No. of Students	63	58	55	51	48	42

The frequency of the class 30 – 40 is

(a) 3 (b) 4 (c) 48 (d) 41

PRACTICE QUESTIONS
CLASS X: CHAPTER - 14
STATISTICS
MEAN BASED QUESTIONS

1. Is it true to say that the mean, mode and median of grouped data will always be different. Justify your answer.

2. The mean of ungrouped data and the mean calculated when the same data is grouped are always the same. Do you agree with this statement? Give reason for your answer.

3. Find the mean of the distribution:

Class	1-3	3-5	5-7	7-9
Frequency	9	22	27	17

4. Daily wages of 110 workers, obtained in a survey, are tabulated below:

Daily wages (in Rs.)	100 - 120	120 - 140	140 - 160	160 - 180	180 - 200	200 - 220
No. of workers	15	18	25	22	18	12

Determine the mean wages of workers.

5. Calculate the mean of the scores of 20 students in a mathematics test :

Marks	0-10	10-20	20-30	30-40	40-50
No. of Students	2	4	7	6	1

6. Calculate the mean of the following data :

Class	4-7	8-11	12-15	16-19
Frequency	5	4	9	10

7. The following table gives the number of pages written by Sarika for completing her own book for 30 days :

No. of pages written per day	16-18	19-21	22-24	25-27	28-30
No. of days	1	3	4	9	13

Find the mean number of pages written per day.

8. The daily income of a sample of 50 employees are tabulated as follows :

Income(in Rs.)	1-200	201-400	401-600	601-800
No. of employees	14	15	14	7

9. The weights (in kg) of 50 wrestlers are recorded in the following table :

Weight(in kg)	100-110	110-120	120-130	130-140	140-150
No. of wrestlers	4	14	21	8	3

Find the mean weight of the wrestlers.

10. An aircraft has 120 passenger seats. The number of seats occupied during 100 flights is given below:

No. of seats	100-104	104-108	108-112	112-116	116-120
Frequency	15	20	32	18	15

Determine the mean number of seats occupied over the flights

11. The mileage (km per litre) of 50 cars of the same model was tested by a manufacturer and details are tabulated as given below :

Mileage(km/l)	10-12	12-14	14-16	16-18
No. of cars	7	12	18	13

Find the mean mileage. The manufacturer claimed that the mileage of the model was 16 km/litre. Do you agree with this claim?

12. The following table shows the cumulative frequency distribution of marks of 800 students in an examination:

Marks	Below 10	Below 20	Below 30	Below 40	Below 50	Below 60	Below 70	Below 80	Below 90	Below 100
No. of Students	8	17	32	62	80	80	80	80	80	80

Find the mean marks.

13. The following is the cumulative frequency distribution (of less than type) of 1000 persons each of age 20 years and above. Determine the mean age.

Age Below(in years)	30	40	50	60	70	80
No. of persons	100	220	350	750	950	1000

14. Find the mean marks of students for the following distribution :

Marks Above	0	10	20	30	40	50	60	70	80	90	100
No. of Students	80	77	72	65	55	43	28	16	10	8	0

15. Determine the mean of the following distribution :

Marks Below	10	20	30	40	50	60	70	80	90	100
No. of Students	5	9	17	29	45	60	70	78	83	85

16. Find the mean age of 100 residents of a town from the following data :

Age equal and above(in years)	0	10	20	30	40	50	60	70
No. of Persons	100	90	75	50	25	15	5	0

17. Find the mean weights of tea in 70 packets shown in the following table :

Weight(in gm)	200-201	201-202	202-203	203-204	204-205	205-206
No. of packets	13	27	18	10	1	1

18. Find the mean of the following distribution :

Class	0-20	20-40	40-60	60-80	80-100	100-120	120-140
Frequency	12	18	15	25	26	15	9

19. Find the mean age from the following distribution :

Age(in years)	25-29	30-34	35-39	40-44	45-49	50-54	55-59
No. of persons	4	14	22	16	6	5	3

20. Find the mean age of the patients from the following distribution :

Age(in years)	5-14	15-24	25-34	35-44	45-54	55-64
No. of patients	6	11	21	23	14	5

PRACTICE QUESTIONS
CLASS X: CHAPTER - 14
STATISTICS
MEDIAN BASED QUESTIONS

1. The median of an ungrouped data and the median calculated when the same data is grouped are always the same. Do you think that this is a correct statement? Give Reason.

2. The percentage of marks obtained by 100 students in an examination are given below:

Marks	30-35	35-40	40-45	45-50	50-55	55-60	60-65
No. of Students	14	16	18	23	18	8	3

Determine the median percentage of marks.

3. Weekly income of 600 families is as under:

Income(in Rs.)	0-1000	1000-2000	2000-3000	3000-4000	4000-5000	5000-6000
No. of Families	250	190	100	40	15	5

Compute the median income.

4. Find the median of the following frequency distribution:

Marks	0 – 5	5 – 10	10 – 15	15 – 20	20 – 25	25 – 30	30 – 35	35 – 40
Number of students	8	12	20	12	18	13	10	7

5. The following table gives the distribution of the life time of 500 neon lamps:

Life time (in hrs)	1500 – 2000	2000 – 2500	2500 – 3000	3000 – 3500	3500 – 4000	4000 – 4500	4500 – 5000
Number of Lamps	24	86	90	115	95	72	18

Find the median life time of a lamp.

6. The lengths of 40 leaves of a plant are measured correct to the nearest millimetre, and the data obtained is represented in the following table. Find the median length of the leaves.

Length(in mm)	118-126	127-135	136-144	145-153	154-162	163-171	172-180
No. of leaves	3	5	9	12	5	4	2

7. Find the median of the following frequency distribution:

Class	75-84	85-94	95-104	105-114	115-124	125-134	135-144
Frequency	8	11	26	31	18	4	2

8. Find the median marks from the following data:

Marks	Below 10	Below 20	Below 30	Below 40	Below 50
Number of students	15	45	90	102	120

9. The following is the cumulative frequency distribution (of less than type) of 1000 persons each of age 20 years and above. Determine the median age.

Age Below(in years)	30	40	50	60	70	80
No. of persons	100	220	350	750	950	1000

10. Find the median age from the following distribution :

Age(in years)	25-29	30-34	35-39	40-44	45-49	50-54	55-59
No. of persons	4	14	22	16	6	5	3

11. Find the median marks for the following distribution:

Marks	Below 10	Below 20	Below 30	Below 40	Below 50	Below 60
No. of Students	6	15	29	41	60	70

12. Find the median marks for the following distribution:

Marks below	10	20	30	40	50	60	70	80
No. of Students	12	32	57	80	92	116	164	200

13. Find the median wages for the following frequency distribution:

Wages per day	61-70	71-80	81-90	91-100	101-110	111-120
No. of workers	5	15	20	30	10	8

14. Find the median marks for the following distribution:

Marks	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
No. of Students	2	3	6	7	14	12	4	2

15. Find the median age of the patients from the following distribution :

Age(in years)	5-14	15-24	25-34	35-44	45-54	55-64
No. of patients	6	11	21	23	14	5

PRACTICE QUESTIONS
CLASS X: CHAPTER - 14
STATISTICS
MODE BASED QUESTIONS

1. Will the median class and modal class of grouped data always be different? Justify your answer.

2. The frequency distribution table of agriculture holdings in a village is given below:

Area of land(in ha)	1-3	3-5	5-7	79	9-11	11-13
No. of families	20	45	80	55	40	12

Find the modal agriculture holdings of the village.

3. The weight of coffee in 70 packets is shown below:

Weight (in gm):	200-201	201-202	202-203	203-204	204-205	205-206
No. of packets:	12	26	20	9	2	1

Determine the modal weight.

4. Find the mode marks from the following data:

Marks	Below 10	Below 20	Below 30	Below 40	Below 50
Number of students	15	45	90	102	120

5. Find the mode of the following frequency distribution:

Marks	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
Number of students	15	30	45	12	18

6. Find the mode of the following frequency distribution:

Marks	Less than 20	Less than 40	Less than 60	Less than 80	Less than 100
Number of students	4	10	28	36	50

7. The following table show the marks of 85 students of a class X in a school. Find the modal marks of the distribution:

Marks(Below)	10	20	30	40	50	60	70	80	90	100
Number of Students	5	9	17	29	45	60	70	78	83	85

8. Find the mode of the following frequency distribution:

Class	25-30	30-35	35-40	40-45	45-50	50-55
Frequency	25	34	50	42	38	14

9. Find the average height of maximum number of students from the following distribution:

Height(in cm)	160-162	163-165	166-168	169-171	172-174
No. of students	15	118	142	127	18

10. Compare the modal ages of two groups of students appearing for an entrance examination:

Age(in years)	16-18	18-20	20-22	22-24	24-26
Group A	50	78	46	28	23
Group B	54	89	40	25	17

11. Find the mode age of the patients from the following distribution :

Age(in years)	6-15	16-25	26-35	36-45	46-55	56-65
No. of patients	6	11	21	23	14	5

12. 100 surnames were randomly picked up from a local telephone directory and the frequency distribution of the number of letters in the English alphabets in the surnames was obtained as follows:

Number of letters	1 - 4	4 - 7	7 - 10	10 - 13	13 - 16	16 - 19
Number of surnames	6	30	40	16	4	4

Determine the median number of letters in the surnames. Find the mean number of letters in the surnames? Also, find the modal size of the surnames.

13. Find the mean, mode and median for the following frequency distribution.

Class	0-10	10-20	20-30	30-40	40-50	Total
Frequency	8	16	36	34	6	100

14. A survey regarding the heights (in cms) of 50 girls of a class was conducted and the following data was obtained.

Height(in cm)	120-130	130-140	140-150	150-160	160-170	**Total**
No. of girls	2	8	12	20	8	**50**

Find the mean, median and mode of the above data.

15. Find the mean, mode and median marks for the following frequency distribution.

Marks	Less than 10	Less than 20	Less than 30	Less than 40	Less than 50	Less than 60
No. of Students	2	3	6	7	14	20

16. Find the mean, mode and median for the following frequency distribution.

Class	25-29	30-34	35-39	40-44	45-49	50-54	55-59
Frequency	14	22	16	6	5	3	4

17. Find the mean, mode and median for the following frequency distribution.

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	5	10	18	30	20	12	5

18. Find the mean, mode and median for the following frequency distribution.

Class	15-19	20-24	25-29	30-34	35-39	40-44	45-49
Frequency	3	13	21	15	5	4	2

19. Find the mean, mode and median for the following frequency distribution.

Class	500-520	520-540	540-560	560-580	580-600	600-620
Frequency	14	9	5	4	3	5

20. Find the mean, mode and median age in years for the following frequency distribution.

Age in years	10 – 19	20 – 29	30 – 39	40 – 49	50 – 59	60 – 69
No. of persons	8	8	10	14	28	32

PRACTICE QUESTIONS
CLASS X: CHAPTER - 14
STATISTICS
MISSING FREQUENCY BASED QUESTIONS

1. The mean of the following distribution is 18. The frequency *f* in the class interval 19-21 is missing. Determine *f*.

Class	11-13	13-15	15-17	17-19	19-21	21-23	23-25
Frequency	3	6	9	13	f	5	4

2. The mean of the following distribution is 24. Find the value of p.

Marks	0-10	10-20	20-30	30-40	40-50	50-60
No. of Students	15	20	35	P	10	42

3. Find the missing frequencies f_1 and f_2 in table given below; it is being given that the mean of the given frequency distribution is 50.

Class	0-20	20-40	40-60	60-80	80-100	Total
Frequency	17	f_1	32	f_2	19	120

4. Find the missing frequencies f_1 and f_2 in table given below; it is being given that the mean of the given frequency distribution is 145.

Class	100-120	120-140	140-160	160-180	180-200	**Total**
Frequency	10	f_1	f_2	15	5	**80**

5. The mean of the following frequency distribution is 57.6 and the sum of the observations is 50. Find f_1 and f_2.

Class	0-20	20-40	40-60	60-80	80-100	100-120
Frequency	7	f_1	12	f_2	8	5

6. The mean of the following frequency distribution is 28 and the sum of the observations is 100. Find f_1 and f_2.

Marks	0-10	10-20	20-30	30-40	40-50	50-60
No. of Students	12	18	f_1	20	f_2	6

7. The mean of the following frequency distribution is 53. But the frequencies a and b in the classes 20-40 and 60-80 are missing. Find the missing frequencies.

Age (in years)	0 - 20	20 - 40	40 - 60	60 - 80	80 - 100	Total
Number of people	15	a	21	b	17	100

8. Compute the missing frequencies x and y in the following data if the mean is $166\frac{9}{26}$ and the sum of the frequencies is 52:

Class Interval	140 – 150	150 – 160	160 – 170	170 – 180	180 – 190	190 – 200
Frequency	5	x	20	y	6	2

9. If the median of the distribution given below is 28.5, find the values of *x* and *y*.

C. I.	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60
F	5	x	20	15	y	5

10. The median of the following data is 525. Find the values of *x* and *y*, if the total frequency is 100.

C.I	0-100	100-200	200-300	300-400	400-500	500-600	600-700	700-800	800-900	900-1000
F	2	5	x	12	17	20	y	9	7	4

11. The median of the following data is 28. Find the values of *x* and *y*, if the total frequency is 50.

Marks	0-7	7-14	14-21	21-28	28-35	35-42	42-49
No. of Students	3	x	7	11	y	16	9

12. Find the missing frequencies in the following frequency distribution table, if the total frequency is 100 and median is 32.

Marks	0-10	10-20	20-30	30-40	40-50	50-60
No. of Students	10	x	25	30	y	10

13. Find the missing frequencies in the following frequency distribution table, if the total frequency is 70 and median is 35.

Marks	0-10	10-20	20-30	30-40	40-50	50-60
No. of Students	6	9	x	y	19	10

14. The median of the following data is 167. Find the values of *x*.

Height(in cm)	160-162	163-165	166-168	169-171	172-174
Frequency	15	117	x	118	14

15. The mode of the following data is 36. Find the values of *x*.

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	8	10	x	16	12	6	7

16. Find the missing frequencies in the following frequency distribution table, if the total frequency is 100 and mode is $46\frac{2}{3}$.

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	5	8	7	x	28	20	10	y

PRACTICE QUESTIONS
CLASS X: CHAPTER - 14
STATISTICS
OGIVE BASED QUESTIONS

1. Is it correct to say that an ogive is a graphical representation of a frequency distribution? Give reason.

2. Which measure of central tendency is given by the x – coordinate of the point of intersection of the more than ogive ad less than ogive?

3. The following is the distribution of weights (in kg) of 40 persons:

Weight(in kg)	40-45	45-50	50-55	55-60	60-65	65-70	70-75	75-80
No. of persons	4	4	13	5	6	5	2	1

Construct a cumulative frequency distribution (of less than type) table for the data above.

4. Find the unknown entries a, b, c, d, e, f in the following distribution of heights of students in a class:

Height(in cm)	150-155	155-160	160-165	165-170	170-175	175-180
Frequency	12	b	10	d	e	2
Cumulative Frequency	a	25	c	43	48	f

5. Following is the age distribution of a group of students. Draw the cumulative frequency curve less than type and hence obtain the median from the graph.

Age(in years)	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16
No. of students	36	42	52	60	68	84	96	82	66	48	50	16

6. For the following distribution, draw the cumulative frequency curve more than type and hence obtain the median from the graph.

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	5	15	20	23	17	11	9

7. Draw less than ogive for the following frequency distribution:

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
Number of students	5	8	6	10	6	6

Also find the median from the graph and verify that by using the formula.

8. The table given below shows the frequency distribution of the cores obtained by 200 candidates in a BCA examination.

Score	200-250	250-300	300-350	350-400	400-450	450-500	500-550	550-600
No. of students	30	15	45	20	25	40	10	15

Draw cumulative frequency curves by using (i) less than type and (ii) more than type. Hence find median

9. Draw less than and more than ogive for the following frequency distribution:

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
Number of students	8	5	10	6	6	6

Also find the median from the graph and verify that by using the formula.

10. The following table gives production yield per hectare of wheat of 100 farms of a village.

production yield (in kg/ha)	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80
Number of farms	2	8	12	24	38	16

Change the distribution to a more than type distribution, and draw its ogive.

11. The following table gives the heights (in meters) of 360 trees:

Height (in m)	Less than 7	Less than 14	Less than 21	Less than 28	Less than 35	Less than 42	Less than 49	Less than 56
No. of trees	25	45	95	140	235	275	320	360

From the above data, draw an ogive and find the median

12. From the following data, draw the two types of cumulative frequency curves and determine the median from the graph.

Height(in cm)	Frequency
140-144	3
144-148	9
148-152	24
152-156	31
156-160	42
160-164	64
164-168	75
168-172	82
172-176	86
176-180	34

13. For the following distribution, draw the cumulative frequency curve more than type and hence obtain the median from the graph.

Marks	Below 10	Below 20	Below 30	Below 40	Below 50	Below 60
No. of Students	6	15	29	41	60	70

14. For the following distribution, draw the cumulative frequency curve less than type and hence obtain the median from the graph.

Age equal and above(in years)	0	10	20	30	40	50	60	70
No. of Persons	100	90	75	50	25	15	5	0

15. During the medical check-up of 35 students of a class, their weights were recorded as follows: Draw a less than type ogive for the given data. Hence obtain the median weight from the graph and verify the result by using the formula.

Weight (in kg)	Less than 38	Less than 40	Less than 42	Less than 44	Less than 46	Less than 48	Less than 50	Less than 52
No. of students	0	3	5	9	14	28	32	35

BLUE PRINT : SA-I (X) : MATHEMATICS

Unit/Topic	MCQ (1 mark)	Short answer (2 marks)	Short answer (3 marks)	Long answer (4 marks)	Total
Number System Real numbers	1(1)	2(1)	--	8(2)	**11(4)**
Algebra Polynomials, Pair of Linear Equations in two variables	2(2)	4(2)	9(3)	8(2)	**23(9)**
Geometry Triangles	1(1)	2(1)	6(2)	8(2)	**17(6)**
Trigonometry	--	4(2)	6(2)	12(3)	**22(7)**
Statistics	--	--	9(3)	8(2)	**17(5)**
Total	4(4)	12(6)	30(10)	44(11)	**90(31)**

SAMPLE PAPER – I

Class – X **Max. Marks: 90**
Subject: Mathematics **Time Allowed: 3 hrs**

General Instruction:

(i) All questions are compulsory.
(ii) The question paper consists of 31 questions divided into four sections A, B. C and D.
(iii) Section A contains 4 multiple-choice questions of 1 mark each. Section B contains 6 questions of 2 marks each. Section C contains 10 questions of 3 marks each. Section D contains 11 questions of 4 marks each.
(iv) Use of calculator is not permitted.

SECTION – A

1. If the sum of the zeroes of the polynomial f(x) = $2x^3 - 3kx^2 + 4x - 5$ is 6, then value of k is
(a) 2 (b) 4 (c) –2 (d) – 4

2. Euclid's division lemma state that for any positive integers a and b, there exist unique integers q and r such that a = bq + r where r must satisfy
(a) $1 < r < b$ (b) $0 < r \le b$ (c) $0 \le r < b$ (d) $0 < r < b$

3. The value of k for which the system of equations x – 2y = 3 and 3x + ky = 1 has a unique solution is
(a) k = – 6 (b) k ≠ – 6 (c) k = 0 (d) no value

4. If $\Delta ABC \sim \Delta PQR$, BC = 8 cm and QR = 6 cm, the ratio of the areas of ΔABC and ΔPQR is
(a) 8 : 6 (b) 6 : 8 (c) 64 : 36 (d) 9 : 16

SECTION – B

5. Using Euclid's division algorithm, find the HCF of 2160 and 3520.

6. If secA + tanA = m and secA – tanA = n, find the value of $\sqrt{mn}$.

7. If A and B are angles of right angled triangle ABC, right angled at C, prove that
$\text{Sin}^2A + \text{Sin}^2B = 1$

8. Two poles of heights 6 m and 11 m stand on a plane ground. If the distance between the feet of the poles is 12 m, find the distance between their tops.

9. If one zero of the polynomial $(a^2 + 9)x^2 + 13x + 6a$ is reciprocal of the other. Find the value of a.

10. The larger of the two supplementary angles exceeds the smaller by 18 degrees. Find the angles.

SECTION – C

11. If α, β are the zeroes of the polynomials f(x) = $4x^2 + 3x + 7$, then find the value of $\frac{1}{\alpha} + \frac{1}{\beta}$

12. Find the quotient and remainder when $4x^3 + 2x^2 + 5x - 6$ is divided by $2x^2 + 3x + 1$.

13. Yash scored 40 marks in a test, getting 3 marks for each right answer and losing 1 mark for each wrong answer. Had 4 marks been awarded for each correct answer and 2 marks have been deducted for each incorrect answer, then Yash would have scored 50 marks. How many questions were there in the test?

14. Prove that: $\frac{1}{\cos ecA-\cot A}-\frac{1}{\sin A}=\frac{1}{\sin A}-\frac{1}{\cos ecA+\cot A}$.

15. If $a^2\sec^2\theta-b^2\tan^2\theta=c^2$, prove that $\sin^2\theta=\frac{c^2-a^2}{c^2-b^2}$

16. If a line intersects sides AB and AC of a ΔABC at D and E respectively and is parallel to BC, prove that $\frac{AD}{AB}=\frac{AE}{AC}$

17. Find the mean marks by step deviation method from the following data:

Marks	Below 10	Below 20	Below 30	Below 40	Below 50
Number of students	15	45	90	102	120

18. Prove that the area of an equilateral triangle described on one side of a square is equal to half the area of the equilateral triangle described on one of its diagonals.

19. The median of the following data is 167. Find the values of *x*.

Height(in cm)	160-162	163-165	166-168	169-171	172-174
Frequency	15	117	x	118	14

20. Find the mode of the following frequency distribution:

Marks	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
Number of students	15	30	45	12	18

SECTION – D

21. Prove that "The ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides."

22. Show that the square of an odd positive integer can be of the form 6*q* + 1 or 6*q* + 3 for some integer *q*.

23. If a and b are two odd positive integers such that a > b, then prove that one of the two numbers $\frac{a+b}{2}$ and $\frac{a-b}{2}$ is odd and the other is even.

24. If $a\cos^3\theta+3a\sin^2\theta\cos\theta=m$ and $a\sin^3\theta+3a\sin\theta\cos^2\theta=n$, prove that $(m+n)^{2/3}+(m-n)^{2/3}=2a^{2/3}$

25. If the median of the distribution given below is 28.5, find the values of *x* and *y*.

C. I.	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	Total
F	5	x	20	15	y	5	100

26. If two zeroes of the polynomial $x^4+3x^3-20x^2-6x+36$ are $\sqrt{2}$ and $-\sqrt{2}$, find the other zeroes of the polynomial.

27. Draw more than ogive for the following frequency distribution:

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
Number of students	5	8	6	10	6	6

Also find the median from the graph and verify that by using the formula.

28. Draw the graphs of the equations $x - y + 1 = 0$ and $3x + 2y - 12 = 0$. Determine the coordinates of the vertices of the triangle formed by these lines and the x-axis, and shade the triangular region.

29. Prove that "If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio".

30. Evaluate without using tables: $\dfrac{\sec\theta \operatorname{cosec}(90^0 - \theta) - \tan\theta \cot(90^0 - \theta) + (\sin^2 35^0 + \sin^2 55^0)}{\tan 10^0 \tan 20^0 \tan 45^0 \tan 70^0 \tan 80^0}$

31. Prove that: $\dfrac{\cos A - \sin A + 1}{\cos A + \sin A - 1} = \operatorname{cosec} A + \cot A$.

BLUE PRINT : SA-I (X) : MATHEMATICS

Unit/Topic	MCQ (1 mark)	Short answer (2 marks)	Short answer (3 marks)	Long answer (4 marks)	Total
Number System Real numbers	--	4(2)	3(1)	4(1)	**11(4)**
Algebra Polynomials, Pair of Linear Equations in two variables	1(1)	4(2)	6(2)	12(3)	**23(8)**
Geometry Triangles	1(1)	2(1)	6(2)	8(2)	**17(6)**
Trigonometry	1(1)	--	9(3)	12(3)	**22(7)**
Statistics	1(1)	2(1)	6(2)	8(2)	**17(6)**
Total	4(4)	12(6)	30(10)	44(11)	**90(31)**

SAMPLE PAPER – II

Class – X **Max. Marks: 90**
Subject: Mathematics **Time Allowed: 3 hrs**

General Instruction:
(i) All questions are compulsory.
(ii) The question paper consists of 31 questions divided into four sections A, B. C and D.
(iii) Section A contains 4 multiple-choice questions of 1 mark each. Section B contains 6 questions of 2 marks each. Section C contains 10 questions of 3 marks each. Section D contains 11 questions of 4 marks each.
(iv) Use of calculator is not permitted.

SECTION – A

1. If one of the zero of the quadratic polynomial $x^2 + 3x + k$ is 2, then the value of k is
(a) 10 (b) –10 (c) 5 (d) –5

2. If $\tan 9\theta = \cot\theta$ and $9\theta < 90^0$, then the value of $\text{cosec} 5\theta$ is
(a) 1 (b) $\frac{2}{\sqrt{3}}$ (c) 2 (d) $\sqrt{2}$

3. Weights of 40 eggs were recorded as given below:

Weights (in gms)	85 – 89	90 – 94	95 – 99	100 – 104	105- 109
No. of eggs	10	12	15	4	2

The lower limit of the modal class is
(a) 90 (b) 95 (c) 94.5 (d) 89.5

4. $\Delta ABC \sim \Delta DEF$ and their areas be, respectively, 64 cm^2 and 121 cm^2. If EF = 15.4 cm, find BC.
(a) 10.2 cm (b) 11.2 cm (c) 13.2 cm (d) none of the above

SECTION – B

5. Use Euclid's division algorithm to show that any positive odd integer is of the form 4q + 1 or 4q + 3, where q is some integer.

6. Show that 12^n cannot end with the digit 0 or 5 for any natural number *n*.

7. In ΔPQR, S is any point on QR such that $\angle RSP = \angle RPQ$. Prove that RS x RQ = RP^2.

8. Mean of the following data is 21.5. Find the missing value of k.

x	5	15	25	35	45
f	6	4	3	k	2

9. If –1 is one of the zeroes of the polynomial $p(x) = 3x^3 - 5x^2 - 11x - 3$, find the other two zeroes.

10. Three angles of a triangle are x, y and 40^0. The difference between the two angles x and y is 30^0. Find x and y.

SECTION – C

11. Prove that $5 - \sqrt{3}$ is an irrational number.

12. If α, β are the zeroes of the polynomials f(x) = $x^2 - 2x + 5$, then find the quadratic polynomial whose zeroes are $\alpha + \beta$ and $\frac{1}{\alpha}+\frac{1}{\beta}$

13. The taxi charges in a city consist of a fixed charge together with the charge for the distance covered. For a distance of 10 km, the charge paid is Rs 105 and for a journey of 15 km, the charge paid is Rs 155. What are the fixed charges and the charge per km? How much does a person have to pay for travelling a distance of 25 km?

14. Prove that $\frac{\sin A}{\cot A + \cos ecA} = 2 + \frac{\sin A}{\cot A - \cos ecA}$.

15. If $(\tan\theta + \sin\theta) = m$ and $(\tan\theta - \sin\theta) = n$ prove that $(m^2 - n^2)^2 = 16mn$

16. Find the mean marks by step deviation method from the following data:

Marks	Below 10	Below 20	Below 30	Below 40	Below 50	Below 60
No. of students	4	10	18	28	40	70

17. Find the mode of the following frequency distribution:

Marks	Less than 20	Less than 40	Less than 60	Less than 80	Less than 100
Number of students	4	10	28	36	50

18. If $\sec\theta + \tan\theta = m$, show that $\left(\frac{m^2-1}{m^2+1}\right) = \sin\theta$

19. Diagonals of a trapezium ABCD with AB || CD intersects at O. If AB = 2CD, find the ratio of areas of triangles AOB and COD.

20. Prove that the area of an equilateral triangle described on the hypotenuse of a right angled triangle is equal to the sum of the areas of the equilateral triangles drawn on the other two sides of the triangle.

SECTION – D

21. State and prove converse of Basic Proportionality theorem..

22. If $\cos ec\theta - \sin\theta = m$ and $\sec\theta - \cos\theta = n$, prove that $(m^2n)^{2/3} + (mn^2)^{2/3} = 1$

23. If d is the HCF of 56 and 72, find x, y satisfying d = 56x + 72y. Also show that x and y are not unique.

24. If the median of the distribution given below is 14.4, find the values of *x* and *y*.

C. I.	0 – 6	6 – 12	12 – 18	18 –24	24 – 30	Total
F	4	x	5	y	1	20

25. If two zeroes of the polynomial $3x^4 + 6x^3 - 2x^2 - 10x - 5$ are $\sqrt{\frac{5}{3}}$ and $-\sqrt{\frac{5}{3}}$, find the other zeroes of the polynomial.

26. Draw the graphs of the equations $4x-y-8=0; 2x-3y+6=0$. Also determine the vertices of the triangle formed by the lines and x-axis.

27. If the polynomial $x^4 - 6x^3 + 16x^2 - 25x + 10$ is divided by another polynomial $x^2 - 2x + k$, the remainder comes out to be $x + a$, find k and a.

28. Prove that “In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

29. Prove that: $\dfrac{\cos A-\sin A+1}{\cos A+\sin A-1}=\text{s}\,ecA+\tan A$.

30. Draw more than ogive for the following frequency distribution:

Heights (in cms)	145-150	150-155	155-160	160-165	165-170	170-175
Number of persons	8	10	9	15	10	8

Also find the median from the graph..

31. Evaluate: $$\frac{\sin^2 45^0+\frac{3}{4}\cos ec^2 30^0-\cos 60^0+\tan^2 60^0}{\sin^2 30^0+\cos^2 60^0+\frac{1}{2}\sec^2 45^0}$$

BLUE PRINT : SA-I (X) : MATHEMATICS

Unit/Topic	MCQ (1 mark)	Short answer (2 marks)	Short answer (2 marks)	Long answer (2 marks)	Total
Number System Real numbers	1(1)	4(2)	6(2)	--	**11(5)**
Algebra Polynomials, Pair of Linear Equations in two variables	1(1)	--	6(2)	16(4)	**23(7)**
Geometry Triangles	1(1)	2(1)	6(2)	8(2)	**17(6)**
Trigonometry	--	4(2)	6(2)	12(3)	**22(7)**
Statistics	1(1)	2(1)	6(2)	8(2)	**17(6)**
Total	4(4)	12(6)	30(10)	44(11)	**90(31)**

SAMPLE PAPER – III

Class – X **Max. Marks: 90**
Subject: Mathematics **Time Allowed: 3 hrs**

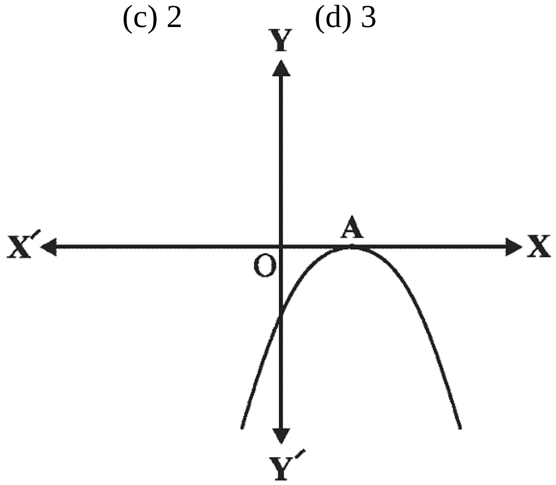
General Instruction:

(i) All questions are compulsory.
(ii) The question paper consists of 31 questions divided into four sections A, B. C and D.
(iii) Section A contains 4 multiple-choice questions of 1 mark each. Section B contains 6 questions of 2 marks each. Section C contains 10 questions of 3 marks each. Section D contains 11 questions of 4 marks each.
(iv) Use of calculator is not permitted.

SECTION – A

1. Euclid's division lemma state that for any positive integers a and b,
there exist unique integers q and r such that a = bq + r where r must satisfy
(a) $1 < r < b$ (b) $0 < r \le b$ (c) $0 \le r < b$ (d) $0 < r < b$

2. The number of zeroes of the polynomial from the graph is
(a) 0 (b) 1 (c) 2 (d) 3



3. A girl walks 200 towards East and the she walks 150m towards North. The distance of the girl from the starting point is
(a) 350m (b) 250m (c) 300m (d) 225m

4. Which measure of central tendency is given by the x – coordinate of the point of intersection of the more than ogive ad less than ogive?
(a) mode (b) median (c) mean (d) all the above three measures

SECTION – B

5. Given that HCF (306, 657) = 9, find the LCM(306, 657).

6. If $\cot\theta = \frac{15}{8}$, evaluate $\frac{(2+2\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(2-2\cos\theta)}$.

7. $\Delta ABC \sim \Delta DEF$ and their areas be, respectively, 64 cm^2 and 121 cm^2. If EF = 15.4 cm, find the value of BC

8. Show that 6^n cannot end with the digit 0 or 5 for any natural number *n*.

9. The following is the distribution of weights (in kg) of 40 persons:

Weight(in kg)	40-45	45-50	50-55	55-60	60-65	65-70	70-75	75-80
No. of persons	4	4	13	5	6	5	2	1

Construct a cumulative frequency distribution (of less than type) table for the data above.

10. If $\cos\alpha = \frac{1}{2}$ and $\tan\beta = \frac{1}{\sqrt{3}}$. Find $\sin(\alpha+\beta)$ where α and β are both acute angles.

SECTION – C

11. Prove that $5-\sqrt{2}$ is an irrational number.

12. If α, β are the zeroes of the polynomials f(x) = x^2 – 3x + 6, then find the value of $\frac{1}{\alpha}+\frac{1}{\beta}+\alpha^2+\beta^2-2\alpha\beta$

13. Find the quotient and remainder when $4x^3 + 2x^2 + 5x - 6$ is divided by $2x^2 + 3x + 1$.

14. A two-digit number is 4 more than 6 times the sum of its digit. If 18 is subtracted from the number, the digits are reversed. Find the number.

15. Prove that $\frac{\sin A}{\cot A+\operatorname{cosec} A} = 2+\frac{\sin A}{\cot A-\operatorname{cosec} A}$.

16. If $\cos\theta+\sin\theta=\sqrt{2}\cos\theta$, prove that $\cos\theta-\sin\theta=\sqrt{2}\sin\theta$

17. Diagonals of a trapezium PQRS intersect each other at the point O, PQ || RS and PQ = 3 RS. Find the ratio of the areas of triangles POQ and ROS.

18. Find the average height of maximum number of students from the following distribution:

Height(in cm)	160-162	163-165	166-168	169-171	172-174
No. of students	15	118	142	127	18

19. Find the median wages for the following frequency distribution:

Wages per day	61-70	71-80	81-90	91-100	101-110	111-120
No. of workers	5	15	20	30	10	8

20. If AD and PM are medians of triangles ABC and PQR, respectively where ΔABC ~ ΔPQR, prove that $\frac{AB}{PQ}=\frac{AD}{PM}$

SECTION – D

21. Prove that “The ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides.”

22. Find all the zeroes of the polynomial $2x^4+7x^3-19x^2-14x+30$, if two of its zeroes are $\sqrt{2}$ and $-\sqrt{2}$.

23. Solve for x and y: $\frac{1}{2(2x+3y)}+\frac{12}{7(3x-2y)}=\frac{1}{2}$; $\quad \frac{7}{(2x+3y)}+\frac{4}{(3x-2y)}=2$.

24. If $\operatorname{cosec}\theta-\sin\theta=a^3$ and $\sec\theta-\cos\theta=b^3$, prove that $a^2b^2(a^2+b^2)=1$

25. If $\sec\theta$ = x + $\frac{1}{4x}$, Prove that $\sec\theta$ + tan θ = 2x or $\frac{1}{2x}$.

26. If the median of the distribution given below is 28.5, find the values of *x* and *y*.

C. I.	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	Total
F	5	x	20	15	y	5	100

27. Solve the following system of linear equations graphically: $2x-5y+4=0$; $2x+y-8=0$. Find the points where these lines meet the y-axis and shade the triangular region formed by these lines and x – axis.

28. In the below Figure, OB is the perpendicular bisector of the line segment DE, FA $\perp$ OB and F E intersects OB at the point C. Prove that $\frac{1}{OA}+\frac{1}{OB}=\frac{2}{OC}$

29. For the following distribution, draw the cumulative frequency curve more than type and hence obtain the median from the graph.

Marks	Below 10	Below 20	Below 30	Below 40	Below 50	Below 60
No. of Students	6	15	29	41	60	70

30. Places A and B are 100 km apart on a highway. One car starts from A and another from B at the same time. If the cars travel in the same direction at different speeds, they meet in 5 hours. If they travel towards each other, they meet in 1 hour. What are the speeds of the two cars?

31. Evaluate without using tables: $\frac{\sec\theta\operatorname{cosec}(90^0-\theta)-\tan\theta\cot(90^0-\theta)+(\sin^2 35^0+\sin^2 55^0)}{\tan 10^0\tan 20^0\tan 60^0\tan 70^0\tan 80^0}$