DIRECTORATE OF EDUCATION
Govt. of NCT, Delhi

SUPPORT MATERIAL
(2017-2018)

Class : X
Mathematics

Under the Guidance of

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Secretary (Education)

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Govt. of N. C. T. of Delhi
Directorate of Education
Old Secretariat, Delhi-54
Tel. : 23890283

D. O. No. PD/Addl.DE/Sch/13
Dated. 14/09/2017

विषयवार सहायक सामग्री

प्रस्तावना

शिक्षा निदेशालय के अनुभवी एवं विषय विशेषज्ञ शिक्षकों द्वारा कक्षा 9वीं से 12वीं के छात्रों हेतु नवीनतम सहायक सामग्री को प्रस्तुत करतें हुए मुझे अपार हर्ष हो रहा है।

गत वर्षो से विद्यार्थियों को उपलब्ध करायी जा रही सहायक सामग्री हमारे विद्यालयों के उन छात्रों के लिए वरदान सिद्ध हो रही है जो बाज़ार से गुणात्मक विषय सामग्री खरीदने में अक्षम हैं। निदेशालय द्वारा उपलब्ध कराई जाने वाली सामग्री ऐसे छात्रों को सार्वजनिक परीक्षाओं में बेहतर प्रदर्शन करने का मौका प्रदान करती है। इस सहायक–सामग्री में निर्धारित शब्दों को स्पष्ट एवं व्यापक ढंग से प्रस्तुत किया गया है।

अध्यापकों से उम्मीद की जाती है कि वे विद्यार्थियों को इस सहायक–सामग्री का प्रर्याप्त अभ्यास करायेंगे जिससे इन छात्रों के शैक्षिक प्रदर्शन में वृद्धि हो और साथ ही छात्रों से भी यह उम्मीद की जाती है कि वे इस सहायक सामग्री का अधिकतम उपयोग कर प्रत्येक विषय को ठीक ढंग से समझ सकें।

मैं, इस सहायक सामग्री को तैयार करने वाले सभी शिक्षकों का उनके बहुमूल्य योगदान के लिए अभार प्रकट करती हूँ।

सुनीता कौशिक

डॉ. सुनीता शुक्ला कौशिक
अतिरिक्त शिक्षा निदेशक (विद्यालय एवं परीक्षा)

Saumya Gupta, IAS

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D.O. No. PS/DE/2017/304 Date : 30/08/2017

प्रिय विद्यार्थियों,

इस पुस्तक के माध्यम से आपके साथ सीधे संवाद का अवसर मिल रहा हैं । और अपने विद्यार्थियों के साथ जुड़ने के इस अवसर का मैं पूरा लाभ उठाना चाहती हूँ ।

दिल्ली में आपके विद्यालय जैसे कोई १०३० राजकीय विद्यालय हैं , जिनका संचालन 'शिक्षा निदेशालय' करता हैं । शिक्षा निदेशालय का मुख्यालय पुराना सचिवालय (ओल्ड सेक्रेटेरिएट), दिल्ली-५४ में स्थित हैं ।

इस निदेशालय में सभी अधिकारी दिन रात कार्य करते हैं तांकि हमारे स्कूल और अच्छे बन सकें; हमारे शिक्षक आपको नए-नए व बेहतर तरीकों से पढ़ा सकें; परीक्षा में हमारे सभी विद्यार्थी और अच्छे अंक ला सकें तथा उनका भविष्य सुनिश्चित हो ।

इसी क्रम में पिछले कुछ वर्षों से शिक्षा निदेशालय ने कक्षा नवीं से बारहवीं तक के अपने विद्यार्थियों के लिए विभिन्न विषयों में 'सहायक सामग्री' उपलब्ध करवाना प्रारंभ किया है।

प्यारे बच्चो, आपके हाथ में यह जो पुस्तक है, इसे कई उत्कृष्ठ अध्यापकों ने मिलकर विशेष रूप से आप ही के लिए तैयार किया है । इसे तैयार करवाने में काफी मेहनत और धन खर्च हुआ है । इसलिए अपनी मुख्य पाठ्यपुस्तक के साथ-साथ यदि आप इस सहायक सामग्री का भी अच्छे से अभ्यास करेंगे तो परीक्षा में आपकी सफलता तो सुनिश्चित होगी ही, आपको बाजार में बिकने वाली महंगी सहायक पुस्तकें भी खरीदने की जरूरत नही पड़ेगी । और हाँ, इस पुस्तक को हर साल हम CBSE के पाठ्यक्रम के अनुसार संवर्धित और परिमार्जित भी करते हैं ताकि छात्र छात्राओं की परीक्षा-तैयारी अध्यतन रहे ।

अंततः, एक बात और । अपने विद्यार्थी काल के जिस पड़ाव से आप आज गुजर रहे हैं, यह आपके शेष जीवन की नींव के निर्माण का समय है । मुझे आप पर पूरा विश्वास है कि आप इस समय का सदुपयोग करेंगे, खूब अध्ययन करेंगे तथा अपने एवं अपने देश के लिए एक सार्थक भविष्य की नींव डालेंगे ।

मेरी ढ़ेरो शुभकामनाएं । सौम्या गुप्ता

आपकी
सौम्या गुप्ता

Dr. Sunita S. Kaushik
Addl. Director of Edn. (School)/Exam

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Tel. : 23890283

D. O. No. PA/Addl.DE/Sch/38

Dated. 14/09/2017

SUBJECTWISE SUPPORT MATERIAL

FOREWORD

I take pride in presenting latest Support Material for the students of classes IX to XII developed and prepared by a team of subject experts and dedicated teachers from different schools of the Directorate of Education.

The Support Material, over the years, has proved to be a blessing for the students of our schools who are unable to purchase quality subject material from the market unlike their public school counter parts. It gives them a fair chance to do well in the public exams . The comprehensive support material presents the material contained in the prescribed texts in a lucid and comprehensible manner.

While the teachers are expected to give ample practice to the students to enhance their academic performance, the students are also expected to utilize the material to the maximum so that they have a better understanding of the concepts of each subject.

I express my sincere appreciation to all team leaders and their respective teams for their valuable contribution to this commendable task.

14/9/17

Dr. Sunita S. Kaushik
Addl D.E. (School & Exam)

DIRECTORATE OF EDUCATION
Govt. of NCT, Delhi

SUPPORT MATERIAL
(2017-2018)

Mathematics
Class : X
(English Medium)

NOT FOR SALE

PUBLISHED BY : DELHI BUREAU OF TEXTBOOKS

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Remodelled Assessment Structure
effective from the Academic Year 2017-18

(Released by the CBSE)

1. Scholastic Area

<table>
<tr><td colspan="5">Total 100 marks
(Syllabus for assessment will be only Class-X)</td></tr>
<tr><td>Subjects</td><td>80 Marks
(Board Examination)
Student has to secure 33% marks out of 80 marks in each subject</td><td></td><td>20 Marks
(Internal Assessment)
Student has to secure 33% marks out of 80 marks in each subject</td><td></td></tr>
<tr><td></td><td></td><td>Periodic test
(10 Marks)

(i)</td><td>Notebook Submission
(5 Marks)

(ii)</td><td>Subject Enrichment Activity
(5 Marks)

(iii)</td></tr>
<tr><td>Language 1</td><td rowspan="5">Board will conduct class-X Examination for 80 marks in each subject covering 100% syllabus of the subject of Class-X only. Marks and Grades both will be awarded for Individualsubjects. 9-Point grading will be same as followed by the Board in Class XII.</td><td rowspan="5">Periodic written Test, restricted to three in each subject inan Academic Year. Average of the best two tests to be taken for final marks submission</td><td rowspan="5">This will cover :
• Regularity
• Assignment Completion
• Neatness & upkeep of notebook</td><td>Speaking and listening skills</td></tr>
<tr><td>Language 2</td><td>Speaking and listening skills</td></tr>
<tr><td>Science</td><td>Practical Lab work</td></tr>
<tr><td>Mathematics</td><td>Maths Lab Practical</td></tr>
<tr><td>Social Science</td><td>Map Work andProject Work</td></tr>
<tr><td>6* Additional Subject</td><td colspan="4">Scheme of studies for 6"’ additional subject is detailed in Annexure-I
Note : In case student opts a language as 6th additional subject the modalities defined for Languages 1 and 2 shall be followed.</td></tr>
</table>

(i) Periodic lest (10 marks) :

The school should conduct three periodic written tests in the entire academic year and the average of the best two will be taken. The schools have the autonomy to make its own schedule. However, for the purpose of gradient learning, three tests may be held as one being the mid-term test and other the two being pre mid and post mid-term with portion of syllabus cumulatively covered. The gradually increasing portion of contents would prepare students acquire confidence for appearing in the Board examination with 100% syllabus. The school will take the average of the best two tests for final marks submission.

(ii) Notebook Submission (5 marks) :

Notebook submission as a part of internal assessment is aimed at enhancing seriousness of students towards preparing notes for the topics being taught in the classroom as well as assignments. This also addresses the critical aspect of regularity, punctuality, neatness and notebook upkeep.

(iii) Subject Enrichment Activities (5 marks) :

These are subject specific application activities aimed at enrichment of the understanding and skill development. These activities are to be recorded internally by respective subject teachers.

For Languages : Activities conducted for subject enrichment in languages should aim at equipping the learner to deveiop effective speaking and listening skills.

For Mathematics The listed laboratory activities and projects as given in the prescribed publication of CBSE/NCERT may be followed.

For Science : The listed practical works / activities may be carried out as prescribed by the CBSE in the curriculum.

For Social Science : Map and project work may be undertaken as prescribed by the CBSE in the curriculum.

SYLLABUS

[Released by the CBSE for Academic Year 2017-18]

Units	Unit Name	Marks
I	NUMBER SYSTEMS	06
11	ALGEBRA	20
III	COORDINATE GEOMETRY	06
IV	GEOMETRY	15
V	TRIGONOMETRY	12
VI	MENSURATION	10
VII	STATISTICS & PROBABILITY	11
	Total	**80**

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 irrationality of $\sqrt{2}, \sqrt{3}, \sqrt{5}$. Decimal representation 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 graphical method of their solution, consistency/inconsistency.

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

3. QUADRATIC EQUATIONS **(15) Periods**

Standard form of a quadratic equation $ax^2 + bx + c = 0, (a \neq 0)$. Solutions of quadratic equations (only real roots) by factorization, by completing the square and by using quadratic formula. Relationship between discriminant and nature of roots.

Situational problems based on quadratic equations related to day to day activities to be incorporated.

4. ARITHMETIC PROGRESSIONS **(8) Periods**

Motivation for studying Arithmetic Progression Derivation of the nth term and sum of the first n terms of A.P. and their application in solving daily life problems.

UNIT III : COORDINATE GEOMETRY

1. LINES (In two-dimensions) **(14) Periods**

Review: Concepts of coordinate geometry, graphs of linear equations. Distance formula. Section formula (internal division). Area of a triangle.

UNIT IV : 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 arc 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 of 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 angle.

2. CIRCLES **(8) Periods**

Tangent to a circle at, point of contact

1. (Prove) The tangent at any point'of a circle is perpendicular to the radius through the point of contact.
2. (Prove) The lengths of tangents drawn from an external point to a circle are equal.

3. CONSTRUCTIONS **(8) Periods**

1. Division of a line segment in a given ratio (internally).
2. Tangents to a circle from a point outside it.
3. Construction of a triangle similar to a given triangle.

UNIT V : 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 arc defined at 0° and 90°. Values (with proofs) of the trigonometric ratios of 30°, 45° and 60°. 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.

3. HEIGHTS AND DISTANCES: Angle of elevation, Angle of Depression **(8) Periods**

Simple problems on heights and distances. Problems should not involve more than two right triangles. Angles of elevation / depression should be only 30°. 45°, 60°.

UNIT VI: MENSURATION

1. AREAS RELATED TO CIRCLES (12) Periods

Motivate the area of a circle; area of sectors and segments of a circle. Problems based on areas and perimeter / circumference of the above said plane figures. (In calculating area of segment of a circle, problems should be restricted to central angle of 60°, 90° and 120° only. Plane figures involving triangles, simple quadrilaterals and circle should be taken.)

2. SURFACE AREAS AND VOLUMES (12) Periods

1. Surface areas and volumes of combinations of any two of the following: cubes, cuboids, spheres, hemispheres and right circular cylinders/cones. Frustum of a cone.
2. Problems involving converting one type of metallic solid into another and other mixed problems. (Problems with combination of not more than two different solids be taken).

UNIT VII : STATISTICS AND PROBABILITY

1. STATISTICS (18) Periods

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

2. PROBABILITY (10) Periods

Classical definition of probability. Simple problems on single events (not using set notation).

QUESTIONS PAPER DESIGN FOR ACADEMIC YEAR 2017-18
(Released by the CBSE)

Mathematics (Code No. 041) **Time : 3 hrs** **Marks : 80**

S.N.	Typology of Questions	Very Short Answer (VSA) (1 Mark)	Short Answer-I (SA) (2Marks)	Short Answer-11 (SA) (3 Marks)	Long Answer (LA) (4 Marks)	Total Marks	% Weightage (approx.)
1	Remembering (Knowledge based- Simple recall questions, to know specific facts, terms, concepts, principles or theories; Identify, define, or recite, information)	2	2	2	2	20	25%
2	**Understanding** (Comprehensionto be familiar with meaning and to understand conceptually, interpret, compare, contrast. explain, paraphrase, or interpret information)	2	1	1	4	23	29%
3	**Application** (Use abstract information in concrete situation, to apply knowledge to new situation; Use given content to interpret a situation, provide an example, or solve a problem)	2	2	3	1	19	24%
4	**Higher Order Thinking Skills** (Analysis & Synthesis- Classify, compare, contrast, oi differentiate between different pieces of information; Organize and/or integrate unique pieces of information from variety of sources)	-	1	4	-	14	17%
5	Evaluation (Judge, and/or justify the value or worth of a decision or outcome, or to predict outcomes based on values)	-	-	-	1	4	5%
	Total	6 × 1 = 6	6×2 = 12	10 × 3 =30	8 × 4=32	80	100%

Note: One of the LA will be to assess the values inherent in the texts.

INTERNAL ASSESSMENT **20 Marks**

- Periodical Test 10 Marks
- Note Book Submission 05 Marks
- Lab Practical (Lab activities to be done from the prescribed books) 05 Marks

Content

1

Chapter

Real Numbers

Key Points

1. **Euclid's division Lemma:**

   For given positive integers 'a' and 'b' there exist unique whole numbers 'q' and 'r' satisfying the relation a = $bq + r,\ o \leq r < b$

2. **Euclid's division algorithm:**

   HCF of any two positive integers a and b with $a > b$ is obtained as follows:

   Step 1 : Apply Euclid's division lemma to a and b to find q and r such that $a = bq + r, 0 \leq r < b$.

   Step 2 : If $r = 0$ then HCF $(a, b) = b$; if $r \neq 0$ then again apply Euclid's lemma to b and r.

   Repeat the steps till we get $r = 0$

3. **The fundamental Theorem of Arithmetic**

   Every composite number can be expressed (factorized) as a product of primes and this factorization is unique, apart from the order in which the prime factors occur.

4. Let $x=\frac{p}{q}$, $q \neq 0$ to be a rational number, such that the prime factorization of 'q' is of the form 2^m5^n, where m, n are non-negative integers. Then x has a decimal expansion which is terminating.

5. Let $x=\frac{p}{q}$, $q \neq 0$ be a rational number, such that the prime factorization of q is not of the form 2^m5^n, where m, n are non-negative integers. Then x has a decimal expansion which is non-terminating repeating.

VERY SHORT ANSWER TYPE QUESTIONS

1. Write the general form of an even integer
2. Write the form in which every odd integer can be written taking t as variable.
3. What would be the value of n for $n^2–1$ divisible by 8.

4. State whether $7 \times 11 \times 13 + 7$ is a composite number or a prime number
5. Is 5.131131113… a rational number or irrational number?
6. Find the value of m if HCF of 65 and 117 is expressible in the form $65m - 117$.
7. What can you say about the product of a non-zero rational and irrational number?
8. After how many places the decimal expansion of $\frac{13497}{1250}$ will terminate?
9. Find the least number which is divisible by all numbers from 1 to 10 (both inclusive)
10. The numbers 525 and 3000 are divisible by 3, 5, 15, 25 and 75 what is the HCF of 525 and 3000?

SHORT ANSWER TYPE-1 QUESTIONS

11. Can two numbers have 18 as their HCF and 380 as their LCM? Give reasons.
12. If $a = 4q + r$ then what are the condition for a and q ? What are the values that r can take?
13. What is the digit at unit's place of 9^n ?
14. If n is an odd integer then show that $n^2 - 1$ is divisible by 8.
15. Use Euclid's division algorithm to find the HCF of 16 and 28.
16. Show that 12^n cannot end with the digit 0 or 5 for any natural number n.
17. Without actual performing the long division, find if $\frac{395}{10500}$ will have terminating or non terminating (repeating decimal expansion.)
18. A rational no 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 of $\frac{p}{q}$? Give reasons.
19. What is the smallest number by which $\sqrt{5} - \sqrt{2}$ is to be multiplied to make it a rational number? Also find the number so obtained?
20. Find one rational and one irrational no between $\sqrt{3}$ and $\sqrt{5}$

SHORT ANSWER TYPE-11 QUESTIONS

21. Show that square of any odd integer is of the form $4m + 1$, for some integer m.
22. Show that the square of any positive integer is either of the form $4q$ or $4q + 1$ for some integer q.

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

24. Prove that $\sqrt{3}$ is an irrational number.

25. State fundamental theorem of Arithmetic and hence find the unique factorization of 120.

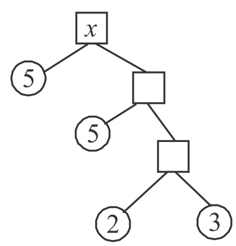
26. Prove that $\sqrt{3} + \sqrt{5}$ is irrational

27. Prove that $5 - \frac{3}{7}\sqrt{3}$ is an irrational number.

28. Prove that $\frac{1}{2 - \sqrt{5}}$ is an irrational number.

29. Find HCF and LCM of 56 and 112 by prime factorization method.

30. In factor tree find x.



LONG ANSWER TYPE QUESTIONS

31. Solve $\sqrt{45} \times \sqrt{20}$ and state what type of number is this (Rational number or irrational number).

32. Find the HCF of 56, 96, 324 by Euclid's algorithm.

33. Show that any positive odd integer is of the form $6q + 1$, $6q + 3$ or $6q + 5$, where q is some integer.

34. Prove that the square of any positive integer is of the form $5q$, $5q + 1$, $5q + 4$ for some integer, q.

35. Prove that the product of three consecutive positive integers is divisible by 6.

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

37. Show that one and only one of n, $n + 2$, $n + 4$ is divisible by 3.

38. 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,

39. Three friends Salman, Hrithik and John were very good friends. They weed to go for morning walk together once, on a morning walk, they step off together and their steps measure 40 cm, 42 cm and 45 cm, respectively.

(*a*) What is the minimum distance each should walk so that each can cover the same distance in complete steps?

(*b*) What have you learnt (values/Lesson) from above activity of three friends.

40. Aakriti decided to distribute milk in an orphanage on her birthday. The supplier brought two milk containers which contain 398 *l* and 436 *l* of milk. The milk is to be transferred to another containers so 7 *l* and 11 *l* of milk is left in both the containers respectively

(*a*) What will be the maximum capacity of the drum?

(*b*) What qualities/values were shown by Aakriti?

ANSWERS

1. $2m$
2. $2t + 1$
3. An odd integer
4. Composite
5. Irrational
6. 2
7. Irrational
8. 4
9. 2520
10. 75
11. No, HCF is not a factor of LCM
12. a and q are positive integers $0 \leq r < 4$
13. Even Power = 1 ; odd power = 9
14. —
15. 4
16. —
17. Non terminating repeating
18. Denominator is the multiple of 2's and 5's
19. $\sqrt{5} + \sqrt{2}$, 3
20. —
21. —
22. —
23. —
24. —
25. $2 \times 2 \times 2 \times 3 \times 5$
26. —
27. —
28. —
29. HCF : 56 , LCM : 112
30. 150
31. 30, Rational number
32. 4
33. —
34. —
35. —
36. —
37. —
38. —
39. (*a*) 2520 cm or 25.2m
    (*b*) Morning walk good for health
    Religion doesn't matter in friendship
40. (*a*) 17
    (*b*) Charity, concern for others etc.

Practice-Test

Real Number

MM: 20 ***Duration : 50 Minutes***

SECTION A

1. After how many decimal places the decimal expansion of $\frac{51}{150}$ will terminate. (1)

2. In Euclid's Division Lemma, when $a = bq + r$ where a, b are positive integers then what values r can take? (1)

SECTION B

3. Show that 9^n can never ends with unit digit zero. (2)

4. Without actual division find the type of decimal expansion of $\frac{935}{10500}$ (2)

SECTION C

5. Prove that $\frac{1}{3-2\sqrt{5}}$ is an irrational number. (3)

6. Find the HCF of 36, 96 and 120 by Euclid's Lemma. (3)

SECTION D

7. Show that cube of any positive integer is of the form $9m$, $9m + 1$ or $9m + 8$. (4)

8. Once a sports goods retailer organized a campaign "Run to remember" to spread awareness about benefits of walking. In that Soham and Baani participated. There was a circular path around a sports field. Soham took 12 minutes to drive one round of the field, while Baani took 18 minutes for the same. Suppose they started at the same point and at the same time and went in the same direction.

(*a*) After how many minutes have they met again at the starting point (2)

(*b*) What's your view about walking? (2)

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2

Chapter

Polynomials

Key Points

1. **Polynomial :** If x is a variable, n is a natural number and $a_0, a_1, a_2, a_3, \ldots\ldots\ldots$ a_n are real numbers, then $p(x) = a_n x^n + a_{n-1} x^{n-1} + \ldots\ldots\ldots + a_1 x + a_0$, $(a_n \neq 0)$ is called a polynomial in x.
2. Polynomials of degree 1, 2 and 3 are called linear, quadratic and cubic polynomials respectively.
3. A quadratic polynomial is an algebraic expression of the form $ax^2 + bx + c$, where a, b, c are real numbers with $a \neq 0$.
4. 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, *i.e.,* $x = a$ is a zero of polynomial $p(x)$ if $p(a) = 0$
5. A polynomial can have at most the same number of zeroes as the degree of the polynomial.
6. (*i*) If one zero of a quadratic polynomial $p(x)$ is negative of the other, then co-efficient of $x = 0$

   (*ii*) If zeroes of a quadratic polynomial $p(x)$ are reciprocal of each other, then co-efficient of x^2 = constant term.
7. Relationship between zeroes and coefficients of a polynomial

   If α And β Are zeroes of $p(x)$ $ax^2 + bx + c$ $(a \neq 0)$, them

   Sum of zeroes $= \alpha + \beta = -\dfrac{b}{a}$

   Product of zeroes $= \alpha\beta = \dfrac{c}{a}$
8. If α, β are zeroes of a quadratic polynomial $p(x)$, then

   $p(x) = k\,[x^2 -$ (sum of zeroes) $x +$ product of zeroes$]$

   $\Rightarrow\ p(x) = k\,[x^2 - (\alpha + \beta)x + \alpha\beta\ ]$; where k is any non-zero real number.
9. Graph of linear polynomial $p(x) = ax + b$ is a straight line.
10. Division Algorithm states that given any polynomials $p(x)$ and $g(x)$, there exist polynomial $q(x)$ and $r(x)$ such that:

$p(x) = g(x). q(x) + r(x)$; $g(x) \neq 0$,
[where either $r(x) = 0$ or degree $r(x) <$ degree $g(x)$]

VERY SHORT ANSWER TYPE QUESTIONS

1. What will be the number of zeroes of a linear polynomial $p(x)$ if its graph (*i*) passes through the origin. (*ii*) doesn't intersect or touch x-axis at any point?

2. Find the quadratic polynomial whose zeroes are
$\left(5+2\sqrt{3}\right)$ and $\left(5-2\sqrt{3}\right)$

3. If one zero of $p(x) = 4x^2 - (8k^2 - 40k)\,x - 9$ is negative of the other, find values of k.

4. What number should be added to the polynomial $x^2 - 5x + 4$, so that 3 is a zero of polynomial so obtained.

5. How many (*i*) maximum (*ii*) minimum number of zeroes can a quadratic polynomial have?

6. What will be the number of real zeroes of the polynomial $x^2 + 1$?

7. If α and β are zeroes of polynomial $6x^2 - 7x - 3$, then form a quadratic polynomial where zeroes are 2α and 2β

8. If α and $\frac{1}{\alpha}$ are zeroes of $4x^2 - 17x + k - 4$, find value of k.

9. What will be the number of zeroes of the polynomials whose graphs are parallel to (*i*) y-axis (ii) x-axis

10. What will be number of zeroes of the polynomials whose graphs are either touching or intersecting the axis only at the points:
(*i*) (–3, 0), (0, 2) & (3, 0) (*ii*) (0, 4), (0, 0) and (0, –4)

SHORT ANSWER TYPE (I) QUESTIONS

11. If –3 is one of the zeroes of the polynomial $(k - 1)x^2 + k\,x + 1$, find the value of k.

12. If the product of zeroes of $ax^2 - 6x - 6$ is 4, find the value of a. Hence find the sum of its zeroes.

13. If α and β are zeroes of the polynomial $x^2 - a(x + 1) - b$ such that $(\alpha + 1)(\beta + 1) = 0$, find the value of b.

14. If zeroes of $x^2 - kx + 6$ are in the ratio 3 : 2, find k.

15. If one zero of the quadratic polynomial $(k^2 + k)x^2 + 68x + 6k$ is reciprocal of the other, find k.

16. If α and β are the zeroes of the polynomial $x^2 - 5x + m$ such that $\alpha - \beta = 1$, find m.

17. If the sum of squares of zeroes of the polynomial $x^2 - 8x + k$ is 40, find the value of k.

18. If α and β are zeroes of the polynomial $t^2 - t - 4$, form a quadratic polynomial whose zeroes are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$.

SHORT ANSWER TYPE (II) QUESTIONS

19. If $(k + y)$ is a factor of each of the polynomials $y^2 + 2y - 15$ and $y^3 + a$, find values of k and a.

20. Obtain zeroes of $4\sqrt{3}\,x^2 + 5x - 2\sqrt{3}$ and verify relation between its zeroes and coefficients.

21. If $x^4 + 2x^3 + 8x^2 + 12x + 18$ is divided by $(x^2 + 5)$, remainder comes out to be $(px + q)$, find values of q and q.

22. -5 is one of the zeroes of $2x^2 + px - 15$, zeroes of $p(x^2 + x) + k$ are equal to each other. Find the value of k.

23. Find the value of k such that $3x^2 + 2kx + x - k - 5$ has the sum of zeroes as half of their product.

24. If α and β are zeroes of $y^2 + 5y + m$, find the value of m such that $(\alpha + \beta)^2 - \alpha\beta = 24$

25. If α and β are zeroes of $x^2 - x - 2$, find a polynomial whose zeroes are $(2\alpha + 1)$ and $(2\beta + 1)$

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

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

28. What must be added to $4x^4 + 2x^3 - 2x^2 + x - 1$ so that the resulting polynomial is divisible by $x^2 - 2x - 3$?

LONG ANSWER TYPE QUESTIONS

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

30. If $\sqrt{2}$ is a zero of $(6x^3 + \sqrt{2}\,x^2 - 10x - 4\sqrt{2})$, find its other zeroes.

31. If two zeroes of $x^4 - 6x^3 - 26x^2 + 138\,x - 35$ are $(2 \pm \sqrt{3})$, find other zeroes.

32. On dividing the polynomial $x^3 - 5x^2 + 6x - 4$ by a polynomial $g(x)$, quotient and remainder are $(x - 3)$ and $(-3x + 5)$ respectively. Find $g(x)$

33. If sum and product of two zeroes of the polynomial $x^3 + x^2 - 3x - 3$ are 0 and 3 respectively, find all zeroes of the polynomial.

34. If $-\frac{1}{2}$ is a zero of the polynomial $2x^3 + x^2 - 6x - 3$, find the sum and product of its other two zeroes.

35. Obtain all zeroes of the polynomial $2x^4 - 2x^3 - 7x^2 + 3x + 6$ if two factors of this polynomial are $\left(x \pm \sqrt{\frac{3}{2}}\right)$.

36. Sum and product of two zeroes of $x^4 - 4x^3 - 8x^2 + 36x - 9$ are 0 and -9 respectively. Find the sum and product of its other two zeroes.

37. A person distributes k books to some needy students. If k is a zero of the polynomial $x^2 - 100x - 20000$, then

(*i*) Find the number of books distributed

(*ii*) Which moral values depicted by the person impressed you?

38. One zero of $x^3 - 12x^2 + 47x - 60$ is 3 and the remaining two zeroes are the number of trees planted by two students.

(*i*) Find the total number of trees planted by both students.

(*ii*) Which moral value of the students is depicted here?

ANSWERS

1. (i) 1 (ii) 0

2. $x^2 - 10x + 13$

3. $k = 0, 5$

4. 2

5. (*i*) 2 (*ii*) 0

6. 0

7. $3x^2 - 7x - 6$

8. $k = 8$

9. (*i*) 1 (*ii*) 0

10. (*i*) 2 (*ii*) 1

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

12. $a = -\frac{3}{2}$, sum of zeroes = – 4

13. 1

14. – 5, 5

15. 5

16. 6

17. 12

18. $4t^2 + t - 1$

19. $k = 3, -5$ and $a = 27, -125$

20. $-\frac{2}{\sqrt{3}}, \frac{\sqrt{3}}{4}$

21. $p = 2, q = 3$

22. $\frac{7}{4}$

23. 1

24. 1

25. $x^2 - 4x - 5$

26. $a = 1$, $b = 7$

27. $14x - 10$

28. $61x - 65$

29. $\sqrt{3}, -\sqrt{3}, -\frac{1}{2}$

30. $-\frac{\sqrt{2}}{2}, -\frac{2\sqrt{2}}{3}$

31. –5, 7

32. $x^2 - 2x + 3$

33. $\sqrt{3}, -\sqrt{3}, -1$

34. 0, 3

35. $2, -1, \pm\sqrt{\frac{3}{2}}$

36. 4, 1

37. (*i*) 200 (*ii*) Love & care, humanity, …...... kindness, etc.

38. (*i*) 9 (*ii*) Love for environment, ..., eco-friendly, etc.

Practice-Test

Polynomials

MM: 20 ***Duration : 50 Minutes***

SECTION- A (2 QUESTIONS OF 1 MARK EACH)

1. If α and β are zeroes of a quadratic polynomial $p(x)$, then factorize $p(x)$

2. If α and β are zeroes of $x^2 - x - 1$, find the value of $\frac{1}{\alpha} + \frac{1}{\beta}$

SECTION-B (2 QUESTIONS OF 2 MARKS EACH)

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

4. Find a quadratic polynomial one of whose zeroes is $(3 + \sqrt{2})$ and the sum of its zeroes is 6.

SECTION-C (2 QUESTIONS OF 3 MARKS EACH)

5. Find values of a and b if $(x^2 + 1)$ is a factor of the polynomial $x^4 + x^3 + 8x^2 + ax + b$.

6. If truth and lie are zeroes of the polynomial $px^2 + qx + r$, $(p \neq 0)$ and zeroes are reciprocal to each other,

(*i*) Find the relation between p and r.

(*ii*) Which value do you learn from this question?

SECTION-D (2 QUESTION OF 4 MARKS EACH)

7. On dividing the polynomial $x^3 + 2x^2 + kx + 7$ by $(x - 3)$, remainder comes out to be 25. Find quotient and the value of k. Also find the sum and product of zeroes of the quotient so obtained.

8. If β and $\frac{1}{\beta}$ are zeroes of the polynomial $(\alpha^2 + \alpha)x^2 + 61x + 6\alpha$, find values of β and α.

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3

Chapter

Pair of Linear Equations in Two Variables

Key Points

1. The 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

2. The graph of a pair of linear equations in two variables is represented by two lines.

(*i*) If the lines intersect at a point, the pair of equations is consistent. The point of intersection gives the unique solution of the equations

(*ii*) If the lines are parallel, then there is no solution the pair of linear equations is inconsistent.

(*iii*) If the lines coincide, then there are infinitely many solutions. The pair of linear equations is consistent. Each point on the line is a solution of both the equations

Algebraic Method of solutions

(i) Substitution Method   (ii) Elimination Method   (iii) Cross Multiplication Method.

3. If a pair of linear equations is given by

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

(*i*) $\dfrac{a_1}{a_2} \neq \dfrac{b_1}{b_2} \Rightarrow$ The pair of linear equations is consistent (unique solution) (*ii*) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \Rightarrow$ the pair of linear equations is inconsistent (no solution)

(*iii*) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2} \Rightarrow$ the pair of linear equations is dependent and consistent (infinitely many solutions)

VERY SHORT ANSWER TYPE QUESTIONS

1. If $x = 3m - 1$ and $y = 4$ is a solution of the equation $x + y = 6$, then find the value of m.

2. What is the point of intersection of the line represented by $3x - 2y = 6$ and the y-axis

3. For what value of p, system of equations $2x + py = 8$ and $x + y = 6$ have no solution.

4. A motor cyclist is moving along the line $x - y = 2$ and another motor cyclist is moving along the line $x - y = 4$ find out their moving direction.

5. Find the value of k for which pair of linear equations $3x + 2y = -5$ and $x - ky = 2$ has a unique solution.

6. Express y in terms of x in the expression $3x - 7y = 10$

7. If $2x + 5y = 4$, write another linear equation, so that lines represented by the pair are coincident.

8. Check whether the graph of the pair of linear equations $x + 2y - 4 = 0$ and $2x + 4y - 12 = 0$ is intersecting lines or parallel lines.

9. If the lines $3x + 2\ ky = 2$ and $2x + 5y + 1 = 0$ are parallel, then find value of k.

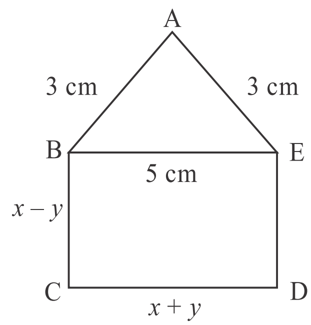
10. If we draw lines of $x = 2$ and $y = 3$ what kind of lines do we get?

SHORT ANSWER TYPE (I) QUESTIONS

11. Form a pair of linear equations for: The sum of the numerator and denominator of the fraction is 3 less than twice the denominator. If the numerator and denominator both are decreased by 1, the numerator becomes half the denominator.

12. For what value of p the pair of linear equations $(p + 2)x - (2p + 1)y = 3(2p - 1)$ and $2x - 3y = 7$ has a unique solution.

13. ABCDE is a pentagon with BE || CD and BC || DE, BC is perpendicular to CD If the perimeter of ABCDE is 21 cm, find x and y



14. Solve for x and y

$$x - \frac{y}{2} = 3 \text{ and } \frac{x}{2} - \frac{2y}{3} = \frac{2}{3}$$

15. Solve for x and y

$3x + 2y = 11$ and $2x + 3y = 4$

Also find p if $p = 8x + 5y$

16. Solve the pair of linear equations by substitution method $x - 7y + 42 = 0$ and $x - 3y - 6 = 0$

17. Ram is walking along the line joining (1, 4) and (0, 6)

Rahim is walking along the line Joining (3, 4) and (1, 0)

Represent on graph and find the point where both of them cross each other

18. Given the linear equation $2x + 3y - 12 = 0$, write another linear equation in these variables, such that.

geometrical representation of the pair so formed is

(*i*) Parallel Lines (*ii*) Coincident Lines

19. The difference of two number is 66. If one number is four times the other, find the numbers.

20. For what value of k, the following system of equations will be inconsistent

$kx + 3y = k - 3$

$12x + ky = k$

SHORT ANSWERS TYPE (II) QUESTIONS

21. Solve graphically the pair of linear equations $5x - y = 5$ and $3x - 2y = -4$ Also find the co-ordinates of the points where these lines intersect y-axis

22. Solve for x and y

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

$$\frac{15}{x+y} - \frac{5}{x-y} = -2$$

23. Solve by Cross – multiplication method

$$\frac{x}{a} + \frac{y}{b} = a + b$$

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

24. For what values of a and b the following pair of linear equations have infinite number of solutions?

$$2x + 3y = 7$$

$$a(x + y) - b(x - y) = 3a + b - 2$$

25. Solve the pair of linear equations

$$152x - 378y = -74$$

$$-378x + 152y = -604$$

26. Pinky 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 were deducted for each wrong answer, then pinky again would have scored 40 marks. How many questions were there in the test?

27. A two digit number is obtained by either multiplying sum of digits by 8 and adding 1 or by multiplying the difference of digits by 13 and adding 2. Find the number

28. Father's age is three times the sum of ages of his two children. After 5 years his age will be twice the sum of ages of two children. Find the age of the father.

29. On selling a T.V. at 5% gain and a fridge at 10% gain, a shopkeeper gain Rs. 2000. But if he sells the T.V. at 10% gain and fridge at 5% loss, he gains Rs. 1500 on the transaction. Find the actual price of the T.V. and the fridge

30. Sunita has some Rs. 50 and Rs. 100 notes amounting to a total of Rs. 15,500. If the total number of notes is 200, the find how many notes of Rs. 50 and Rs. 100 each, she has.

LONG ANSWER TYPE QUESTIONS

31. Solve graphically the pair of linear equations $3x - 4y + 3 = 0$ and $3x + 4y - 21 = 0$

Find the co-ordinates of vertices of triangular region formed by these lines and x-axis. Also calculate the area of this triangle.

32. Solve for x and y

$$\frac{1}{2(2x+3y)} + \frac{12}{7(3x-2y)} = \frac{1}{2}$$

$$\frac{7}{(2x+3y)} + \frac{4}{(3x-2y} = 2$$

for

$2x + 3y \neq 0$

$3x - 2y \neq 0$

33. Solve the pair of equations by reducing them to a pair of linear equations

$$\frac{3x+2y}{xy} = 1 \text{ and } \frac{4x-2y}{xy} = 13$$

hence find a for which $y = ax - 4$

34. A man travels 600 km to his home partly by train and partly by bus. He takes 8 hours, if he travels 120 km by train and rest by bus. Further, it takes 20 minute longer, if he travels 200 km by train and rest by bus. Find the speeds of the train and the bus.

35. A and B are two points 150 km apart on a highway. Two cars start with different speeds from A and B at same time. If they move in same direction, they meet in 15 hours. If they move in opposite direction, they meet in one hour. Find their speeds

36. A boat Covers 32 km upstream and 36 km downstream, in 7 hours. Also it Covers 40 km upstream and 48 km downstream in 9 hours. Find the speed. Of boat in still water and that of the stream.

37. The sum of the numerator and denominator of a fraction is 4 more than twice the numerator. If the numerator and denominator are increased by 3, they are in the ratio 2 : 3.

Determine the fraction

38. Raju used 2 plastic bags and 1 paper bag in a day which cost him Rs. 35. While Ramesh used 3 plastic bags and 4 paper bags per day, which cost him Rs. 65

(*i*) Find the cost of each bag.

(*ii*) Which bag has to be used and what value is reflected by using it.

39. 8 Women and 12 men can complete a work in 10 days while 6 women and 8 men can complete the same work in 14 days. Find the time taken by one woman alone and that one man alone to finish the work. What value is indicated from this action?

40. The ratio of incomes of two persons A and B is 3 : 4 and the ratio of their expenditures is 5 : 7. If their savings are Rs. 15,000 annually find their annual incomes. What value will be promoted if expenditure is under control?

ANSWERS

1. $m = 1$
2. $(0, -3)$
3. $p = 2$
4. move parallel
5. $k \neq \frac{-2}{3}$
6. $y = \frac{3x-10}{7}$
7. $4x + 10y = 8$
8. …………
9. $k = \frac{15}{4}$
10. Intersecting lines
11. $x - y = -3, 2x - y = 1$
12. $p \neq 4$
13. $x = 5, y = 0$
14. 4, 2
15. $x = 5, y = -2, p = 30$
16. 42, 12
17. (2, 2)
18. (*i*) $4x + 6y + 10 = 0$
    (*iii*) $4x + 6y - 24 = 0$
19. 88, 22
20. $k = -6$
21. (2, 5) (0, – 5) and , (0, 2)
22. (3, 2)
23. a^2, b^2
24. $a = 5, b = 1$
25. 2, 1
26. 40 questions
27. 41
28. 45 years
29. T.V. = Rs. 20,000 Fridge = Rs. 10,000
30. Rs. 50 notes = 90 Rs. 100 notes = 110
31. Solution (3, 3). Vertices (– 1, 0)
    (7, o) and (3, 3) Area = 12 square unit
32. (2, 1)
33. $x = \frac{-2}{5}, y = \frac{1}{2}, a = \frac{-45}{4}$
34. 60 km/hr, 80 km/hr
35. 80 km/hr , 70 km/hr
36. 10 km/hr, 2 km/hr
37. $\frac{5}{9}$
38. (*i*) 15, 5,
    (*ii*) Eco-friendly
39. 1 woman in 140 days,
    1 man in 280 days
    Removal of gender bias, woman
    Can work faster than man
40. Rs. 90,000, Rs. 1,20,000
    Economic value
    Saving attitude

Practice-Test

Pair of Linear Equations In Two Variables

MM: 20 ***Duration : 50 Minutes***

Section-A Comprises of 2 questions of 1 mark, each. Section-B Comprises 2 questions of 2 marks each, section-C comprises of 2 questions of 3 marks each, section-D comprises of 2 questions of 4 marks each.

SECTION-A

1. For what value of k system of equations

$x + 2y = 3$ and $5x + ky + 7 = 0$ has a unique solution

2. Does the point (2, 3) lie on line of graph of $3x - 2y = 5$

SECTION-B

3. For what values of a and b does the pair of linear equations have infinite number of solutions

$$\begin{aligned} 2x - 3y &= 7 \\ ax + 3y &= b \end{aligned}$$

4. Solve for x and y

$$\begin{aligned} 0.4x + 0.3y &= 1.7 \\ 0.7x - 0.2y &= 0.8 \end{aligned}$$

SECTION-C

5. Solve for x and y by cross multiplication method

$$\begin{aligned} x + y &= a + b \\ ax - by &= a^2 - b^2 \end{aligned}$$

6. Sum of the ages of a father and the son is 40 years. If father's age is three times that of his son, then find their ages

SECTION-D

7. Solve the following pair of equations graphically.

$3x + 5y = 12$ and $3x - 5y = -18$.

Also shade the region enclosed by these two lines and x-axis

8. The sum of a two digit number and number obtained on reversing the digits is 99. If the number obtained on reversing the digit is 9 more than the original number, find the number.

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4

Chapter

Quadratic Equations

Key Points

1. **Quadratic Equation**:- An equation of the form $ax^2 + bx + c = 0$, a $\neq 0$ is called a quadratic equation in one variable x, where a, b and c are constants.

   For example $2x^2 - 3x + 1 = 0$

2. **Roots of a Quadratic Equation**:-

   Let $ax^2 + bx + c = 0$, be a quadratic equation. If α is a root of this equation. It means $x = \alpha$ satisfies this equation *i.e.,* $a\alpha^2 + b\alpha + c = 0$

3. **Number of Roots**:- A quadratic equation has two roots,

4. Methods For Solving Quadratic Equation

   (a) By factorization

   (b) By completing the square

   (c) By Quadratic Formula

5. **Quadratic Formula** to find roots of $ax^2 + bx + c = 0$ is given by

   $$x = \frac{-b + \sqrt{b^2 - 4ac}}{2a}, \qquad x = \frac{-b - \sqrt{b^2 - 4ac}}{2a},$$

6. **Discriminant:-** For the quadratic equation $ax^2 + bx + c = 0$ the expression is called the discriminant and denoted by D. Then the roots of the quadratic equation are given by

7. **Nature of Roots**

Nature of Roots

Case 1
When D > 0
The roots are real and distinct

Case 2
When D = 0
The roots are real and equal

Case 3
When D < 0
The roots are not real i.e No real roots

VERY SHORT ANSWER TYPE QUESTIONS

1. If $\frac{-1}{2}$ is one root of quadratic equation $2x^2 + kx + 1 = 0$, find k.

2. Find the nature of the roots of $3x^2 - 4\sqrt{3x} + 4 = 0$.

3. Is $x^3 - 4x^2 - x + 1 = (x - 2)^3$ a quadratic equation?

4. Which constant should be added and subtracted to solve the quadratic equation $5x^2 - \sqrt{2x} + 3 = 0$ by the method of completing the square?

5. If $px^2 + 3x + q = 0$ has two roots $x = -1$ $x = -2$ and find $q - p$.

6. If two roots of a quadratic equation are $\sqrt{2}$ and 1 then form the quadratic equation.

7. Represent the following in the form of a quadratic equation:- "The product of two consecutive even integers is 1848".

8. Is 0.2 a root of $x^2 - 0.4 = 0$?

9. If the quadratic equation $ax^2 + bx + c = 0$ has equal roots then find c in terms of a and b.

10. If the equation $x^2 + 6x - 91 = 0$ can be written as $(x + p)(x + q) = 0$ then find p and q.

SHORT ANSWER TYPE(I) QUESTIONS

11. Solve by factorisation method:

    (a) $8x^2 - 22x - 21 = 0$ (b) $3\sqrt{5}x^2 + 25x + 10\sqrt{5} = 0$

    (c) $\sqrt{3}x^2 - 2\sqrt{2}x - 2\sqrt{3} = 0$ (d) $2x^2 + ax - a^2 = 0$

12. If roots of quadratic equation $2x^2 - kx + k = 0$ are real and equal, then find k.

13. Find k for which the given quadratic equation $9x^2 + 3kx + 4 = 0$has distinct roots.

14. Find p for which the equation $x^2 + 5px + 16 = 0$ has no real roots.

15. For what value of c, roots of quadratic equation $4x^2 - 2x + (c - 4) = 0$ are reciprocal of each other.

16. For what value of p equation $px^2 + 6x + 4p = 0$ has product of root equal to the sum of roots.
17. Two squares have sides x cm and $(x + 4)$ cm. The sum of their areas is 656 cm². Find the sides of the square.
18. Find p for which the quadratic equation $px(x - 3) + 9 = 0$ have real and equal roots.
19. Divide 16 into two parts such that twice the square of the larger part exceeds the square of the smaller part by 164.
20. For what value of k, $x^2 - 5x + 3(k - 1) = 0$ has difference of roots equal to 11.
21. The sum of squares of two consecutive natural numbers is 313, find the numbers.

SHORT ANSWER TYPE (II) QUESTIONS

22. Solve the following quadratic equation:

(a) $\dfrac{1}{a+b+x} = \dfrac{1}{a} + \dfrac{1}{b} + \dfrac{1}{x}$, $\quad a + b \neq 0$

(b) $\dfrac{1}{2a+b+x} = \dfrac{1}{2a} + \dfrac{1}{b} + \dfrac{1}{2x}$,

(c) $\dfrac{2}{x+1} + \dfrac{3}{2(x-2)} = \dfrac{23}{5x}$, $\quad x \neq -1, 2, 0$

(d) $3\left(\dfrac{7x+1}{5x-3}\right) - 4\left(\dfrac{5x-3}{7x+1}\right) = 11$ $\quad x \neq \dfrac{3}{5}, \dfrac{-1}{7}$

(e) $\dfrac{x-1}{x+2} + \dfrac{x-3}{x-4} = \dfrac{10}{3}$, $\quad x \neq -2, 4$

(f) $ax^2 + (4a^2 - 3b)x - 12ab = 0$

(g) $4x^2 - 4ax + (a^2 - b^2) = 0$

(h) $\frac{4}{x} - 3 = \frac{5}{2x+3}$, $\quad x \neq 0, \frac{-3}{2}$

23. Using quadratic formula, solve the following.

    $abx^2 + (b^2 - ac)x - bc = 0$

24. If -5 is a root of $2x^2 + px - 15 = 0$ and roots of $p(x^2 + x) + k = 0$ are equal, then find p and k.

LONG ANSWER TYPE QUESTIONS

25. Find p for which $(p + 1)x^2 - 6(p + 1)x + 3(p + q) = 0$, $q \neq -1$, has equal roots. Hence find the roots of the equation.

26. Find k for which the quadratic equation $(2k + 1)x^2 - (7k + 2)x + (7k - 3) = 0$ has equal roots. Also find the roots.

27. If the equation $(1 + m^2)x^2 + 2mcx + (c^2 - a^2) = 0$ has equal roots, then prove $c^2 = a^2(1 + m^2)$.

28. For what value of k, $(4 - k)x^2 + (2k + 4)x + (8k + 1) = 0$ is a perfect square.

29. Out of a group of swans, $\frac{7}{2}$ times the square root of the number are playing on the sea shore of a tank. The two remaining ones are playing in the water. What is the total number of swans?

30. A peacock is sitting on the top of a pillar, which is 9 m high. From a point 27 m away from the bottom of the pillar, a snake is coming to its hole at the base of the pillar. Seeing the snake, the peacock pounces on it. If their speeds are equal, at what distance from the hole is the snake caught?

31. Rs 9000 were divided equally among a certain number of persons. Had there been 20 more persons, each would have got Rs 160 less. Find the original number of persons.

32. A dealer sells a toy for Rs 24 and gains as much percent as the cost price of the toy. Find the cost price of the toy.

33. A shopkeeper buys a number of books for Rs 80. If he had bought 4 more books for the same amount, each book would cost Rs 1 less. How many books did he buy?

34. Two pipes running together can fill a cistern in $3\frac{1}{13}$ minutes. If one pipe takes 3 minutes more than the other to fill it, find the time in which each pipe would fill the cistern?

35. A chess board contains 64 equal squares and the area of each square is 6.25 cm^2. A border round the board is 2 cm wide. Find the length of the side of the chess board.

36. Sum of the areas of two squares is 400 cm^2. If the difference of their perimeters is 16 cm, find the sides of two squares.

37. The area of an isoceles triangle is 60 cm^2 and the length of each one of its equal sides is 13 cm. Find its base.

38. A girl is twice as old as her sister. Four years hence the product of their ages (in years) will be 160.Find their present age.

39. A motor boat whose speed in still water is 18 km/hr takes 1 hour more to go 24 km upstream that to return down stream to the same spot. Find the speed of the stream.

40. A fast train takes 3 hours less than a slow train for a journey of 600 km. If the speed of the slow train is 10 km/hr less than that of the fast train, find the speeds of the two trains.

41. The numerator of a fraction is 3 less than the denominator. If 2 is added to both the numerator and the denominator, then the sum of the new fraction and the original fraction is $\frac{29}{20}$. Find the original fraction.

42. The difference of two natural numbers is 3 and the difference of their reciprocals is $\frac{3}{28}$. Find the numbers.

43. Three consecutive positive integers are such that the sum of the square of the first and the product of other two is 46, find the integers.

44. A two digit number is four times the sum and three time the product of its digits. Find the numbers.

45. The hypotenuse of a grassy land in the shape of a right triangle is 1 metre more

than twice the shortest side, If the third side is 7 metres more than the shortest side, find the sides of the grassy land.

46. In a class test, the sum of the marks obtained by P in Mathematics and Science is 28. Had he got 3 marks more in Mathematics and 4 marks less in Science, the product of his marks, would have been 180. Find the marks in the two subjects.

47. APiece of cloth costs Rs 200. If the piece was 5m longer and each metre of cloth costs Rs 2 less, the cost of the piece would have remained unchanged. How long is the piece and what is the original rate per metre?

48. A plane left 30 minutes later than the schedule time and in order to reach the destination 1500 km away in time it has to increase its speed by 250 km/hr from its usual speed. Find its usual speed.

49. If the sum of first n even natural numbers is 420. Find the value of *n*.

50. While boanding an aeroplane a passenger got hurt. The pilot showing promptness and concern, made arrangements to hospitalise the injured and so the plane started late by 30 minutes to reach the destination, 1500 km away in time, the pilot increased the speed by 100 km/hr. Find the original speed /hour of the plane. What values are depicted here?

51. A takes 10 days less than the time taken by B to finish a piece of work. If both A and B together can finish the work in 12 days, find the time taken by B to finish the work alone. What are the moral values reflected in this question which are to be adopted in our life?

ANSWERS

1. k = 3

2. The roots equal

3. Yes

4. $\frac{1}{50}$ or $\frac{2}{100}$

5. 1

6. $x^2 - (\sqrt{2} + 1)x + \sqrt{2} = 0$

7. $x^2 + 2x - 1848 = 0$

8. No

9. $c = \frac{b^2}{4a}$

10. 13, –7

11. (a) $x = \frac{7}{2},\ x = \frac{-3}{4}$

(b) $x = -\sqrt{5}, x = \frac{-2\sqrt{5}}{3}$

(c) $x = \sqrt{6}, x = \frac{-\sqrt{6}}{3}$

(d) $x = \frac{a}{2},\ x = -a$

12. $k = 0, 8$

13. $k > 4, k < -4$

14. $\frac{-8}{5} < p < \frac{8}{5}$

15. $c = 8$

16. $p = \frac{-3}{2}$

17. 16 cm, 20 cm

18. $p \neq 0, p = 4$

19. $x = 10, 6$

20. $k = -7$

21. 12, 13

22. (a) $x = -a, x = -b$

(b) $x = -a, x = \frac{-b}{2}$

(c) $x = 4, x = \frac{-23}{11}$

(d) $x = 0, x = 1$

(e) $x = \frac{1 \pm \sqrt{297}}{4}$

(f) $x = \frac{3b}{a}, x = -4a$

(g) $x = \frac{a+b}{2}, x = \frac{a-b}{2}$

(h) $x = -2, x = 1$

23. $x = \frac{c}{b}, x = \frac{-b}{a}$

24. $p = 7, k = \frac{7}{4}$

25. $p = 3, x = 3, 3$

26. $k = 4, \frac{-4}{7}$

28. $k = 0, 3$

29. 16

30. 12 m

31. 25

32. Rs. 20

33. 16

34. 5 minutes, 8 minutes

35. 12, 16 cm

36. 24 cm or 10 cm

37 Length = 24 cm

38. 6 years, 12 years

39. 6 km/hr

40. 40 km/hr, 50 km/hr

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

42. 7, 4

43. 4, 5, 6

44. 24

45. 8 m, 17 m, 15 m

46. Marks in Maths = 12,
Marks in science = 16

47. length = 20 m
rate = Rs. 10/meter

48. 750 km/hr

49. $x = 20$

50. 500 km/hr, Humanity

51. 30 days, Unity

Practice Test

Quadratic Equations

Time: 50 minutse **M.M: 20**

SECTION-A

1. If the discriminant of the quadratic equation $6x^2 - bx + 2 = 0$ is 1 then find b.
2. Solve $x^2 + 5x - 300 = 0$.

SECTION-B

3. If $kx^2 - 2kx + 6 = 0$ has equal root, find k.
4. Find the value of p if the roots of $x^2 + px + 12 = 0$ are in the ratio 1:3.

SECTION-C

5. Solve the quadratic equation

   $(x - 1)^2 - 5(x - 1) - 6 = 0$
6. Find the value of k, so that the difference of roots of

   $x^2 - 5x + 3(k - 1) = 0$ is 11

SECTION-D

7. If the roots of the equation $(b - c)x^2 + (c - a)x + (a - b) = 0$ are equal then prove $2b = a + c$.
8. The sum of the squares of two natural numbers is 52. If the first number is 8 less than twice the second number, find the numbers.

5
Chapter

Arithmetic Progression

Key Points

1. **Sequence**: A set of numbers arranged in some definite order and formed according to some rules is called a sequence.
2. **Arithmetic Progression**: A sequence in which the difference of each term from its succeeding term is constant throughout, is called an arithmetic sequence or arithmetic progression (A.P.).

   In other words A.P. is squence $a_1, a_2, a_3, \ldots\ldots\ldots, a_n$ such that $a_2 - a_1 = a_3 - a_2 = a_4 - a_3$ $= \ldots\ldots\ldots\ldots\ a_n - a_{n-1} = d$ and so on.
3. **General Term**: If 'a' is the first term and 'd' is common difference in an A.P., then nth term (general term) is given by $\boldsymbol{a_n = a + (n-1)d}$.
4. **Sum of n Terms of an A.P**. : If 'a' is the first term and 'd' is the common difference of an A.P., then sum of first n terms is given by

$$S_n = \frac{n}{2}\{2a + (n-1)d\}$$

   If 'a' is the first term & 'l' is the last/nth term of a finite A.P., then the sum is given by

$$S_n = \frac{n}{2}\{a + l\}$$

5. (i) If a_n is given, then common difference $d = a_n - a_{n-1}$

(ii) If S_n is given, then nth term is given by $\boldsymbol{a_n = S_n - S_n - 1}$

(iii) If a, b, c are in A.P., then $2b = a + c$

(iv) If a sequence has n terms, its rth term from the end = $(n-r+1)^{th}$ term from the beginning.

(v) Difference of mth and n^{th} term of an A.P. = $(m - n)d$.

VERY SHORT ANSWER TYPE QUESTIONS

1. Find 5^{th} term of an A.P. whose n^{th} term is $3n - 5$.
2. Find the sum of first 10 even numbers.
3. Write the n^{th} term of odd numbers.
4. Write the sum of first n natural numbers.
5. Write the sum of first n even numbers.
6. Find the n^{th} term of the A.P. $-10, -15, -20, -25$, ...
7. Find the common difference of A.P. $4\frac{1}{9}, 4\frac{2}{9}, 4\frac{1}{3}$, ...
8. Write the common difference of an A.P. whose n^{th} term is $a_n = 3n + 7$
9. What will be the value of $a_8 - a_4$ for the following A.P.

   4, 9, 14,........, 254
10. What is value of for the A.P. $-10, -12, -14, -16$, ...
11. If $\frac{1}{x+2}, \frac{1}{x+3}$ and $\frac{1}{x+5}$ are in A.P. find the value of x.
12. For what value of p, the following terms are three consecutive terms of an A.P.

    $\frac{4}{5}, p, 2.$

SHORT ANSWER TYPE(I) QUESTIONS

13. Is 144 a term of the A.P. 3, 7, 11,...........? Justify your answer.
14. Find the 20^{th} term from the last term of the A.P. 3,8,13,........., 253
15. Which term of the A.P. 5,15,25,..........will be 130 more than its 31st term?
16. The first term, common difference and last term of an an A.P. are 12, 6 and 252 respectively, Find the sum of all terms of this A.P.
17. Find the sum of first 15 multiples of 8.
18. Is the sequence formed in the following situtions an A.P.

    (i) Number of students left in the school auditorium from the total strength of 1000 students when they leave the auditorium in batches of 25.

(ii) The amount of money in the account every year when Rs. 100 are deposited annually to accumulate at compound interest at 4% per annum.

19. Find the sum of even positive integers between 1 and 200.
20. If $4m + 8$, $2m^2 + 3m + 6$, $3m^2 + 4m + 4$ are three consecutive terms of an A.P. find m.
21. How many terms of the A.P. 22,20,18,........ should be taken so that their sum is zero.
22. If 10 times of 10th term is equal to 20 times of 20th term of an A.P. find its 30^{th} term.
23. Find the middle term of the A.P. 6, 13 , 20, ...216
24. Which term of the A.P. $20, 19\frac{1}{4}, 18\frac{1}{2}, 17\frac{3}{4}$ is the first negative term? Find the term also.

SHORT ANSWER TYPE(II) QUESTIONS

25. Find the middle terms of the A.P. 7,13,19,.......,241
26. Find the sum of integers between 10 and 500 which are divisible by 7.
27. The sum of 5th and 9th terms of an A.P. is 72 and the sum of 7^{th} and 12^{th} term is 97. Find the A.P.
28. If the m^{th} term of an A.P. be $\frac{1}{n}$ and n^{th} term be $\frac{1}{m}$, show that its $(mn)^{th}$ is 1.
29. If the p^{th} of term A.P. is q and the q^{th} term is p, prove that its n^{th} term is $(p + q - n)$.
30. If p times the p^{th} term of an A.P. is equal to q times its q^{th} term, show that the $(p + q)^{th}$ term of the A.P. is zero.
31. For what value of m are the m^{th} terms of the following two A.P.'s the same?
    (i) 1,3,5,7,........
    (ii) 4,8,12,16,.......
32. The 24^{th} term of an A.P. is twice its 10^{th} term. Show that 72^{nd} term is 4 times its 15^{th} term.
33. Find the number of natural numbers between 101 and 999 which are divisible by both 2 and 5.
34. If the seventh term of anA.P. is $\frac{1}{9}$ and ninth term is $\frac{1}{7}$, find its 63^{rd} term.

35. The sum of 5^{th} and 9^{th} terms of an A.P. is 30. If its 25^{th} term is three times its 8^{th} term, find the A.P.

36. If S_n, the sum of first n terms of an A.P. is given by $Sn = 5n^2 + 3n$, then find its n^{th} term and common difference.

LONG ANSWER TYPE QUESTIONS

37. The sum of third and seventh terms of an A.P. is 6 and their product is 8. Find the sum of first 16^{th} terms of the A.P.

38. If the m^{th} term of an A.P. is $\frac{1}{n}$ and the n^{th} term is $\frac{1}{m}$, show the sum of its first(mn) terms is $\frac{1}{2}(mn + 1)$.

39. If in an A.P. the sum of first m terms is equal to n and the sum of first n terms is m, prove that the sum of first $(m + n)$ terms is $-(m + n)$.

40. Determine the A.P. whase 4^{th} term is 18 and the differemce of 9^{th} trem from the 15^{th} term is 30.

41. If the sum of first k terms of an A.P. is $\frac{1}{2}(3k^2 + 7k)$, write its k^{th} term. Hence find its 20^{th} term.

42. The sum of first 9 terms of an A.P. is 162. The ratio of its 6th term to its 13th term is 1:2. Find the first and fifteenth terms of the A.P.

43. If the 10**th** term of an A.P. is 21 and the sum of its first 10 terms is 120, find its n^{th} term.

44. The sum of first 7 terms of an A.P. is 63 and the sum of its next 7 term is 161. Find the 28^{th} term of this A.P.

45. The sum of first q terms of an A.P. is $63q - 3q^2$. If p^{th} term is -60, find the value of p. Also find the 11th term of this A.P.

46. In an A.P. the first term is –2, the last term is –29 and sum of all terms is –155. Find the 11^{th} term of this A.P.

47. The sum of first 20 terms of an A.P. is one third of the sum of next 20 term. If first term is 1, find the sum of first 30 terms of this A.P.

48. The sum of first 10 terms of an A.P. is one third of the sum of next 10 terms. If first term is –5, find the sum of its first 30 terms.

49. The eighth term of an A.P. is half the second term and the eleventh term exceeds one -third of its fourth term by 1. Find its 15^{th} term.

50. The sum of first six terms of an A.P. is 42. The ratio of its 10^{th} term to its 30^{th} term is 1 : 3 calalate the first and thirteenth term of the A.P.

51. An old lady Krishna Devi deposited Rs. 120000 in a bank at 8% interest p.a. She uses the annual interest to give five scholarships to the students of a school for their overall performances each year. The amount of each

    Scholarship is Rs. 300 less than the preceding scholarship. Find the amount of each scholarship. What values of lady are depicted here?

52. Ram asks the labour to dig a well upto a depth of 10 metre. Labour charges are Rs. 150 for first metre and Rs. 50 for each subsequent metre. As labour was uneducated, he claims Rs. 550 for the whole work. What should be the actual amount to be paid to the labour? What value of Ram is depicted in the question if he pays Rs. 600 to the labourer?

ANSWERS

1.	10	2.	110
3.	$2n - 1$	4.	$\frac{n(n+1)}{2}$
5.	$n(n+1)$	6.	$-5(n+1)$
7.	$\frac{1}{9}$	8.	3
9.	20	10.	–40
11.	$x = 1$	12.	$\frac{7}{5}$

13. No Because $a = 3$ (odd number), $d = 4$ (even number), so each term of the given A.P. will be an odd number.

14.	158	15.	44^{th}
16.	5412	17.	540
18.	(i) Yes (ii) No	19.	9900
20.	$m = 0, 2$	21.	23
22.	0	23.	111
24.	$28^{th}, -\frac{1}{4}$	25.	121, 127
26.	17885	27.	6, 11, 16, 21, 26,.....
31.	No such value m exists	33.	89
34.	1	35.	3, 5, 7, 9, 11,.........
36.	$a_n = 10n - 2, d = 10$	37.	76, 20
40.	3, 8, 13,.....	41.	$a_{20} = 62, a_k = 3k + 2$
42.	6, 48	43.	$2n + 1$
44.	57	45.	$p = 21, a_{11} = 0$
46.	–32	47.	900
48.	–4500	49.	3

50. First term = 2
    13^{th} term = 26
51. Rs. 2520, Rs. 2220, Rs. 1920, Rs. 1620, Rs. 1320 Love charity etc
52. Rs. 600, Honesty, Sincerity

Practice Test

Arithmetic Progression

Time: 50 Minutes **M.M: 20**

Section-A

1. Find the sum of first 10 natural numbers.
2. What is the common difference of an A.P. $8\frac{1}{8}, 8\frac{2}{8}, 8\frac{3}{8}, \ldots\ldots\ldots$

Section-B

3. How many 2 digit number are there in between 6 and 102 which are divisible by 6.
4. The sum of n terms of an A.P. is $n^2 + 3n$. Find its 20^{th} term.

Section-C

5. Find the five terms of an A.P. whose sum is $12\frac{1}{2}$ and first and last term ratio is 2 : 3.
6. Find the middle term of an A.P. 20,16,12,.......,– 176.

Section-D

7. The digits of a three digit positive number are in A.P. and the sum of digits is 15. On subtracting 594 from the number, the digits are interchanged. Find the number.
8. The sum of three numbers in A.P. is 24 and their product is 440. Find the numbers.

6

Chapter

Similar Triangles

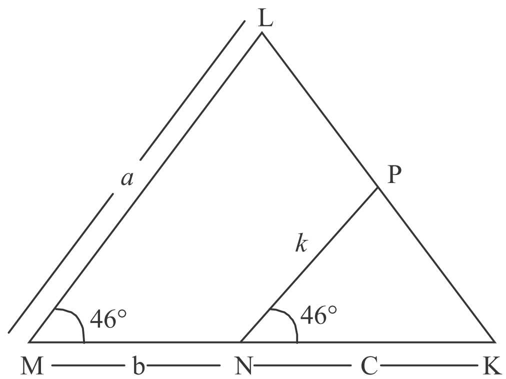
Key Points

1. **Similar Triangles :** Two triangles are said to be similar if their corresponding angles are equal and their corresponding sides are proportional.
2. **Criteria for Similarity :**
   in ΔABC and ΔDEF
   (*i*) **AAA Similarity :** $\Delta ABC \sim \Delta DEF$ when $\angle A \angle D$, $\angle B = \angle E$ and $\angle C = \angle F$
   (*ii*) SAS similarity :
   $\Delta ABC \sim \Delta DEF$ when $\frac{AB}{DE} = \frac{BC}{EF}$ and $\angle B = \angle E$
   (iii) SSS Similarty: $\Delta ABC \sim \Delta DEF$, $\frac{AB}{DE} = \frac{AC}{DF} = \frac{BC}{EF}$
3. **The proof of the following theorems can be asked in the exmination :**
   (***i***) **Basic Proportionality Theoren:** If a line is drawn parallel to one side of a triangle to intersect the other sides in distinct points, the other two sides are divided in the same ratio.
   (*ii*) The ratio of areas of two similar triangles is equal to the square of the ratio of their corresponding sides.
   (*iii*) **Pythagoras Theorm:** In a right triangles the square of the hypotenuse is equal to the sum of the squares of the other two sides.
   (*iv*) Converse of pythagoras thearem— In a triangle, if the square of one side is equal to the sum of squares of other two sides then the angle oppo site to the first side is a right angle

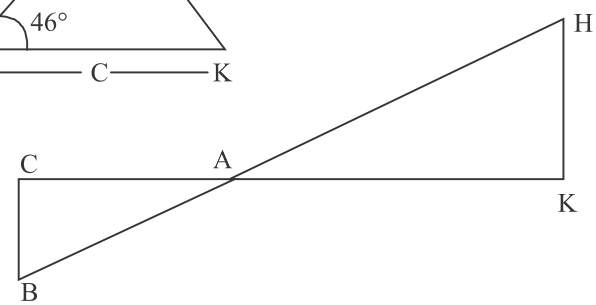
1. Is the triangle with sides 12cm, and 18 cm a right triangle? Give reason.

2. If $\Delta ABC \sim \Delta QRP$, $\frac{\text{Area }(\Delta ABC)}{\text{Area }(\Delta PQR)} = \frac{9}{4}$, AB = 18*cm*, BC = 15*cm*, then find the length of PR.

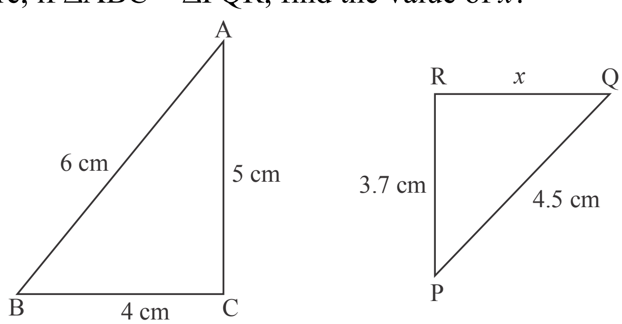
3. In the fig., LM = LN = 46°, Express x in terms of a, b and c.



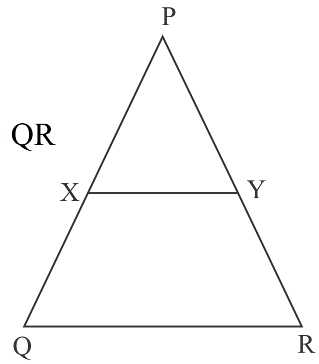
4. In fig. $\Delta AHK \sim \Delta ABC$.
If AK = 10*cm*, BC = 3.5*cm*
and HK = 7*cm*, find AC.



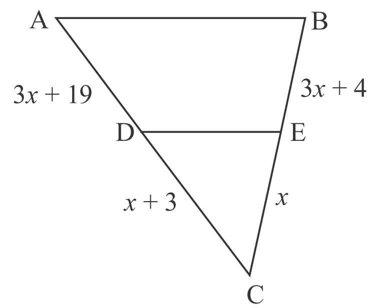
5. It is given that $\Delta DEF \sim \Delta RPQ$. Is it trne to say that $\angle D = \angle R$ and $\angle F = \angle P$?
6. If the corresponding Medians of two similar triangles are in the ratio 5 : 7, Then Find the ratio of their sides.
7. A right angled triangle has its area numerically equal to its perimeter. The length of each side is an even number and the hypotenuse is 10cm. What is the perimeter of the triangle?
8. An aeroplane leaves an airport and flies due west at a speed of 2100 km/hr. At the same time, another aeroplane leaves the same place at airport and flies due south at a speed of 2000 km/hr. How far apart will be the two planes after 1 hour?
9. The areas of two similar ΔABC and ΔDEF are 225 cm^2 and 81 cm^2 respectively. If the longest side of the larger triangle ΔABC be 30 cm, find the langest side of the smaller triangle DEF.
10. In the figure, if $\Delta ABC \sim \Delta PQR$, find the value of x?



11. In the figure, XY || QR and $\frac{PX}{XQ}=\frac{PY}{YR}=\frac{1}{2}$, find XY : QR



12. In figure, find the value of x which will make DE || AB?



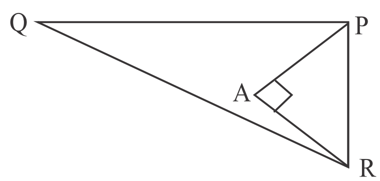
13. If ΔABC ~ ΔDEF, BC = 3EF and ar (ΔABC) = 11 7cm^2 find area (ΔDEF).

14. If ΔABC and ΔDEF are similar triangles such that ∠A = 45° and ∠F = 56°, then find ∠C.

15. If the ratio of the corresponding sides of two similar triangles is 2 : 3, then find the ratio of their corresponding attitudes.

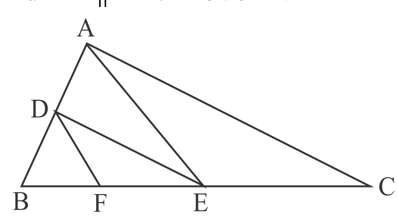
SHORT ANSWER TYPE (I) QUESTIONS

16. In the given fig. PQ = 24cm , QR = 26cm, ∠PAR = 90°, PA = 6cm and AR = 8cm, find ∠QPR.



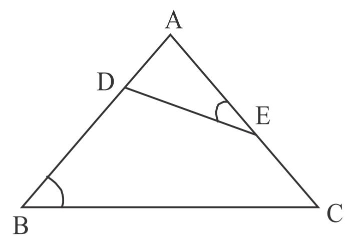
17. In the given fig., DE || AC and DF || AE. Prove that

$$\frac{FE}{BF}=\frac{EC}{BE}$$

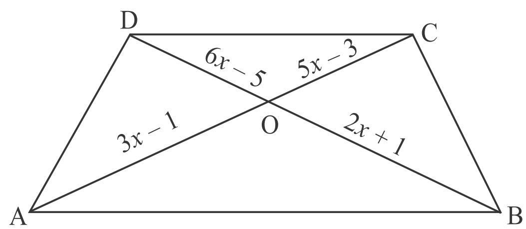


18. In ΔABC, $AD \perp BC$ Such that $AD^2 = BD \times CD$. Prove that ΔABC is right angled at A.

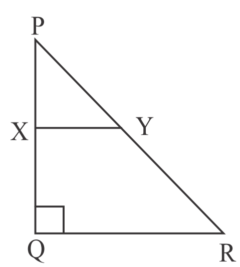
19. In the given fig, D and E are points on sides AB and CA of ΔABC such that $\angle B = \angle AED$. Show that $\Delta ABC \sim \Delta AED$.



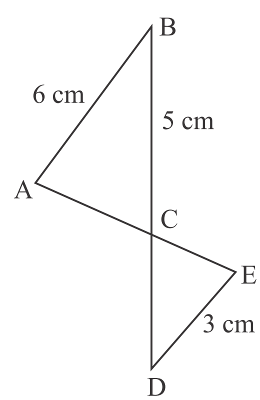
20. In the given fig., AB || DC and diagonals AC and BD intersects at O. If $OA = 3x - 1$ and $OB = 2x + 1$, $OC = 5x - 3$ and $OD = 6x - 5$, find x.



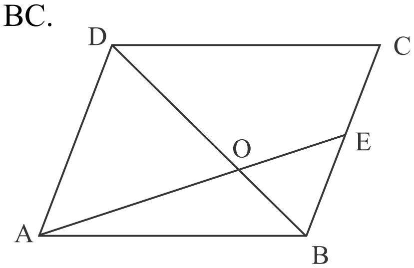
21. In the fig, PQR is a triangle, right angled at Q. If XY || QR, PQ = 6cm, PY = 4cm & PX : XQ = 1 : 2 Calculate the lengths of PR and QR.



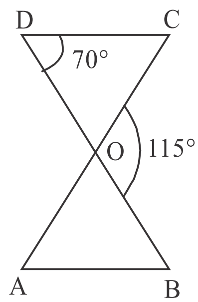
22. In the figure, AB || DE. Find the length of CD.



23. In the figure, ABCD is a parallelogram. AE divides the line segment BD in the ratio 1 : 2. If BE = 1.5cm find BC.



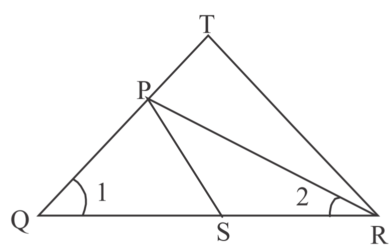
24. In the given figure, $\Delta ODC \sim \Delta OBA$, $\angle BOC = 115°$ and $\angle CDO = 70$ find, (i) $\angle DOC$, (ii) $\angle DCO$, (iii) $\angle OAB$, (iv) $\angle OBA$.



25. Perimeter of two equilateral triangles ABC and PQR are 144m and 96m, find ar (ΔABC) : ar (ΔPQR)

SHORT ANSWER TYPE (II) QUESTION

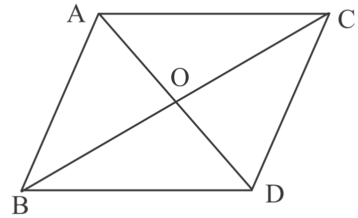
26. In the figure, $\frac{QR}{QS} = \frac{QT}{PR}$ and $\angle 1 = \angle 2$ them prove that $\Delta PQS \sim \Delta TQR$



27. In equilateral ΔABC, $AD \perp BC$. Prove that $3\ BC^2 = 4AD^2$.

28. In ΔABC, $\angle ACB = 90°$, also $CD \perp AB$, Prove that $\frac{BC^2}{AC^2} = \frac{BD}{AD}$.

29. In the adjoining figure ΔABC & ΔDBC are on the same base BC. AD & BC intersect at O. Prove that $\frac{\text{area}(\Delta ABC)}{\text{area}(\square DBC)} = \frac{AO}{DO}$



30. In ΔABC, If AD is the median, Show that $AB^2 + AC^2 = 2(AD^2 + BD^2)$

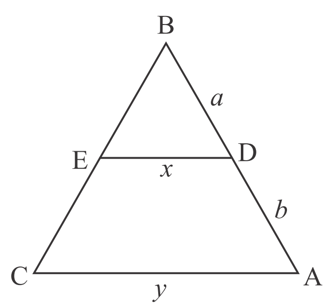
31. In ΔABC, $\angle C$ is a right angle. Points P & Q lies on the sides CA & CB respectively Prove that $AQ^2 + BP^2 = AB^2 + PQ^2$

32. If AD and PS are medians of ΔABC and ΔPQR respectively where $\Delta ABC \sim \Delta PQR$, Prove that $\frac{AB}{PQ} = \frac{AD}{PS}$.

33. In an equilateral ΔABC, $AD \perp BC$, Prove that $3AB^2 = 4AD^2$

34. In the given fig, DE || AC. which of the following is correct?

$x = \frac{a+b}{ay}$ or $x = \frac{ay}{a+b}$

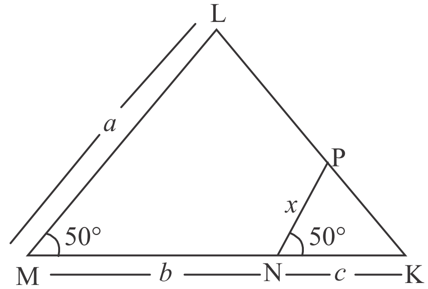


35. Prove that the sum of the square of the sides of a rhombus is equal to the sum of the squares of its diagonals;

36. 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 3*m*, find how for she is away from the base of the pole.

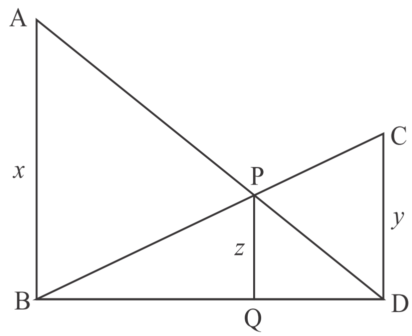
37. Two poles of height *a* metres and *b* metres are p metres apart. Prove that the height of the point of intersection of the lines joining the top of each pole to the foot of the opposite pole is gives by $\frac{ab}{a+b}$ metres.

38. In the given fig., find the value of x in terms of a, b and c

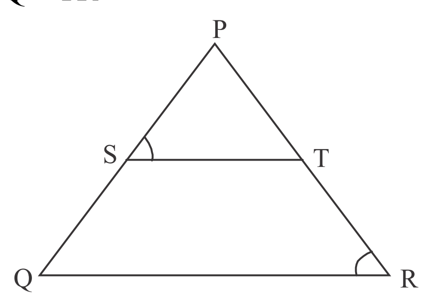


39. In fig., AB || PQ || CD, AB = x units. CD = y units and PQ = z units. Prove that

$$\frac{1}{x}+\frac{1}{y}=\frac{1}{z}$$

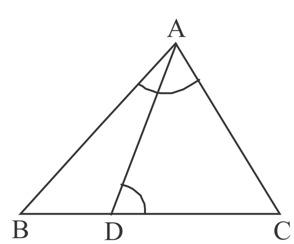


40. In the given fig., $\frac{PS}{SQ}=\frac{PT}{TR}$ and $\angle PST = \angle PRQ$. Prove that PQR is an isosceles Δ.

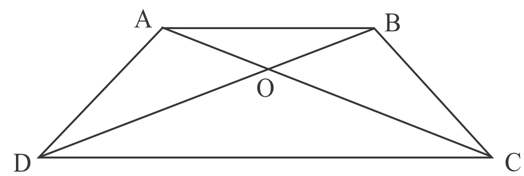


41. In the figure, D is a point on the side BC of ΔABC such that $\angle ADC = \angle BAC$

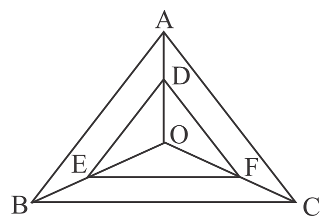
Prove that $\frac{CA}{CD}=\frac{CB}{CA}$



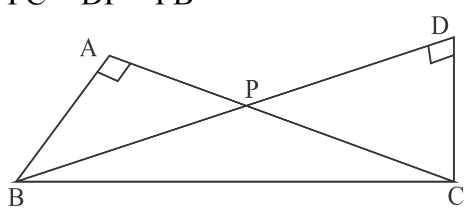
42. In the figure, ABCD is a trapezium in which AB || DC, the diagonals AC & BD intersect at O. Prove that $\frac{AO}{OC} = \frac{BO}{DO}$



43. In the figure, a point O inside ΔABC is joined to its vertices. From a point D on AO, DE is drawn parallel to AB & from E, EF is drawn parallel to BC. Prove that DF || AC.



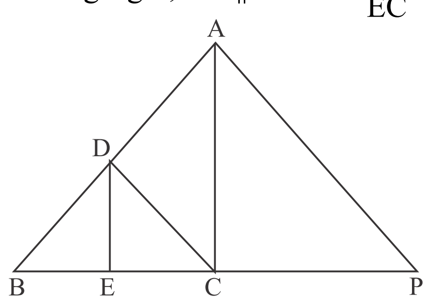
44. Two triangles BAC and BDC, right angled at A and D respectively, are drawn on the same base BC and on the same side of BC. If AC and DB intersect at P, Prove that AP × PC = DP × PB



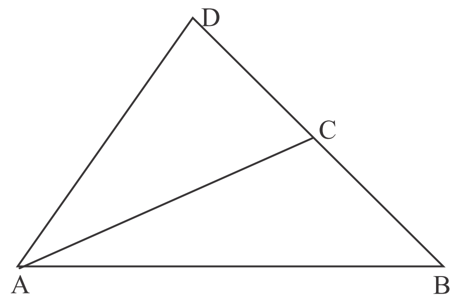
45. Hypotenuse of a right triangle is 25 cm and out of the remaining two sides, one is larger than the other by 5 cm, find the lengths of the other two sides.

LONG ANSWER TYPE QUESTIONS

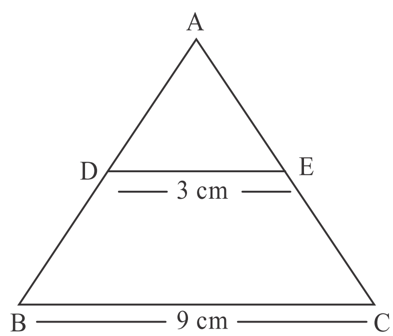
46. In the following figur, DE || AC and $\frac{BE}{EC} = \frac{BC}{CP}$. Prove that DC || AP.



47. In a quadrilateral ABCD, $\angle B = 90°$, $AD^2 = AB^2 + BC^2 + CD^2$. Prove that $\angle ACD = 90°$



48. In figure, DE || BC, DE = 3cm, BC = 9cm and ar(ΔADE) = 30cm^2. Find ar (trap. BCED).



49. State and prove Pythagoras theorem.

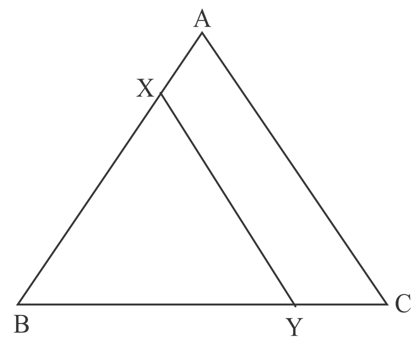
50. In an equilateral ΔABC, D is *a* point on side BC such that BD = $\frac{1}{3}$ BC. Prove that $9AD^2 = 7AB^2$.

51. IN ΔPQR, PD $\perp$ QR such that D lies on QR. If PQ = a, PR = b, QD = c and DR = d and a, b, c, d are positive units. Prove that $(a + b)(a - b) = (c + d)(c - d)$.

52. In a trapezium ABCD, AB || DC and DC = 2AB. If EF is drawn parallel to AB cuts AD in F and BC in E such that $\frac{BE}{BC} = \frac{3}{4}$. Diagonals DB intersects EF at G Prove that 7 EF = 10AB.

53. Prove that the ratio of the areas of two similar triangles is equal to the ratio of the squares of their corresponding sides.

54. In the given figure, the line segment XY is Parallel to AC of ΔABC and it divides the triangle into two parts of equal areas. Prove that $\frac{AX}{AB}=\frac{\sqrt{2}-1}{\sqrt{2}}$



55. Through the vertex D of a parallelogram ABCD, a line is drawn to intersect the sides BA and BC produced at E and F respectively. Prove that

$$\frac{DA}{AE}=\frac{FB}{BE}=\frac{FC}{CD}$$

56. Prove dthat if in a triangle, the square on one side is equal to the sum of the squares on the other two sides, then the angle opposite to the first side is a right angle.

ANSWERS

1. No

2. 10cm

3. $x = \dfrac{ac}{b+c}$

4. 5cm

5. $\angle D = \angle R$ true, $\angle F = \angle P$ false

6. 5 : 7

7. 24cm

8. 2900km

9. 18cm

10. x = 3

11. 1 : 3

12. x = 2

13. 13cm^2

14. 56°

15. 2 : 3

16. 90°

20. $x = 2$

21. PR = 12cm, QR $6\sqrt{3}$cm

22. 2.5 cm

23. 3cm

24. 65°, 45°, 45°, 70°

25. 9 : 4

34. $x = \dfrac{ay}{a+b}$

36. 9m

38. $x = \dfrac{ac}{b+c}$

45. 15cm, 20cm

48. 240 cm^2

Practice-Test

Similar Triangles

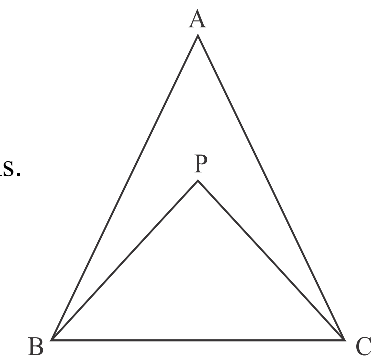
MM: 20 **Duration : 50 Minutes**

1. The lengths of the diagonals of rhombus are 16cm and 12cm. find the side of the rhombus. 1

2. In an equilateral ΔABC , $AD \perp BC$ and $\frac{AD^2}{BC^2} = x$ find the volue of x. 1

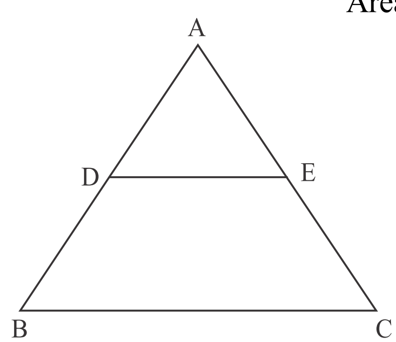
3. In ΔABC, if $DE \parallel BC$, $AD = x + 1$, $DB = x - 1$, $AE = x + 3$ and $EC = x$, then find the value of x. 2

4. In the given figure, can triangle ABC be similar to ΔPBC? If yes, give reasons. 2



5. PQR is a right angled triangle, having $\angle Q = 90°$, If QS = SR, Show that $PR^2 = 4PS^2 - 3PQ^2$. 3

6. In figure, $DE \parallel BC$ and AD : DB = 5 : 4, find $\frac{\text{Area }(\square DFE)}{\text{Area }(\square CFB)}$ 3



7. State and prove pythagoras theorem. 4

8. In as equilateral ΔLMN, the side MN is trisectedat O. prove that $\frac{LO^2}{LM^2} = \frac{7}{9}$. 4

7

Chapter

Co-ordinate Geometry

Key Points

1. Let XOX′ and YOY′ are two mutually perpendicular lines. These lines are called co-ordinate axis. XOX′ is called x-axis and YOY′ is called y-axis.
2. Point of intersection of x-axis and y-axis i.e. O is called the origin whose coordinates are (0,0).
3. x-coordinate of a point is called abscissa & y-coordinate is called the ordinate.
4. A plane is divided by the axis in four quadrants.
   (i) In first quadrant, both x and y coordinates of a point are +ve.
   (ii) In second quadrant, x-coordinate is –ve and y-coordinates is +ve.
   (iii) In third quadrant, both x and y coordinates of a point are negative.
   (iv) In fourth quadrant, x-coordinate is +ve and y-coordinate is –ve.
5. **Distance formula**

   Distance between two points **P(x_1, y_1)** and **Q(x_2, y_2) is** $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ units.
6. Point A, B, and C are collinear if they lie on the same straight line.
7. Midpoint of a line segment joining. the points **(x_1, y_1)** and **(x_2, y_2)** is given by $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$.

8. Section formula

The coordinates of a point which divides the line segment joining the points **(x_1, y_1)** and **(x_2, y_2)** in the ratio $l:m$ internally are given by $\left(\frac{lx_2 + mx_1}{l+m}, \frac{ly_2 + my_1}{l+m}\right)$.

9. The area of the triangle with vertices (x_1, y_1), (x_2, y_2) and (x_3, y_3) is given by $\frac{1}{2}[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$sq. units. If the area of triangle is zero then points are collinear.

10. Centroid of the triangle with vertices $(x_1; y_1)$, (x_2, y_2) and (x_3, y_3) is given by $\left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3}\right)$.

SECTION-A (1 MARK EACH)

1. What is the distance of points A(5,–7) from y-axis.
2. If the distance between the points (x , 2) and (3,–6) is 10 units, what is the positive value of x.
3. Find the co-ordinates of the midpoint of the line segment joining points (4,7) and (2,–3).
4. Find the co-ordinates of the point where the line $\frac{x}{2} + \frac{y}{3} = 5$ intersects y-axis.
5. If A and B are respectively the points (–6,7) and (–1,–5) then find the value of 2AB.
6. A parallel line is drawn from point P(5,3) to$y$-axis, what is the distance between the line and y-axis.
7. Find the distance between the lines $3x + 6 = 0$ and $x - 7 = 0$.
8. The midpoint of the line segmrnt AB is (4,0). If the co-ordinates of point A is (3,–2), then find the co-ordinates of point B.
9. What is the ordinate of any point on x-axis?
10. What is the abscissa of any point on y-axis?
11. What is the distance of point (3,2) from x-axis?
12. What is the distance of point (3,–4) from y-axis?
13. What is the distance of point (3,4) from the origin?
14. Find the value of y if the distance between the points A (2, – 3) & B (10, y) is 10 units.
15. Find the co-ordinates of a points on x-axis which is equidistant from the points (–2,5) and (2,–3).

SECTION-B (2 MARKS EACH)

16. For what value of P, the points (2,1), (p,–1) and (–1,3) are collinear?
17. Find the area of ΔPQR whose vertices are P(–5,7), Q(–4,–5) and R(4,5).
18. Find the point of trisection of the line segment joining the points (1,–2) and (–3,4).
19. The midpoints of the sides of a triangle are (3,4),(4,1) and (2,0). Find the vertices of the triangle.
20. Find the value of x if the points A (4,3) and B(x,5) lie on a circle whose centre is O(2,3).
21. Find the ratio in which x-axis divides the line segment joining the points (6,4) and (1,–7).
22. Show that the points (–2,3),(8,3) and (6,7) are the vertices of a right angle triangle.
23. Find the point on the y-axis which is equidistant from the points (5,–2) and (–3,2).
24. Find the ratio in which y-axis divides the line segment joining the points A(5,–6) and B(–1, –4).
25. Find the co-ordinates of a centroid of a triangle whose vertices are (3,–5), (–7,4) and (10,–2).

SECTION-C (3 MARKS EACH)

26. Show that the points A(2,–2), B(14,10), C(11,13) and D(–1,1) are the vertices of a rectangle.
27. Show that the points A(5,6),B(1,5),C(2,1) and D(6,2) are the vertices of a square.
28. The point R divides the line segment AB, whose A(–4,0) and B(0,6) are such that . $AR = \frac{3}{4} AB$
29. Three consecutive vertices of a parallelogram are (–2, –1), (1,0) and (4, 3). Find the coordinates of fourth vertex.
30. If the distance of P(x,y) from the points A(3,6) and B(–3,4) are equal, prov that $3x + y = 5$.
31. Two vertices of a triangle are (1,2) and (3,5). If the centroid of the triangle is at origin, find the co-ordinates of the third vertex.

32. If P(x,y) is any point on the line joining the points A(a,0) and B(0,b) then show that . $\frac{x}{a}+\frac{y}{b}=1$

33. The line segment joining the points A (2,1) and B (5,–8) is trisected at the points P and Q such that P is nearer to A. If P also lies on line give by $2x - y + k = 0$, find the value of k.

34. If (3, 3), (6, y), (x, 7) and (5, 6) are the vertices of a parallelogram taken in order, find the value of x and y.

35. It the vertices of a triangle are (1, –3),(4, p) and (–9, 7) and its area is 15 sq units, find the value of p.

SECTION-D (4 MARK EACH)

36. Find the values of a and b if the points A(–2,1), B(a,b) and C(4,–1) are collinear and $a - b = 1$.

37. If a point A(0,2) is equidistant from the points B(3,p) and C(p,5) then find value of p and the length of AB.

38. To solve a riddle a girl is asked to join the three points A(7, 5), B(2, 3) and C(6, –7) with a sketchpen. After joining these points a triangle is obtained by her. What type of triangle is it? What values are depicted in the question?

39. The coordinates of the houses of Mona and Nishi are (7, 3) and (4, –3) respectively. The coordinates of their school are (2, 2). If they both start for school at the same time in the morning and reaches at the same time, who walks fast? What values are depicted from the question?

40. A teacher asked three students to stand to form a triangle at the points P (–1, 3), Q (1,–1) and R (5, 1). Suddenly a fourth boy came and shows his interest in participating the activity. She asked him to stand at point mid way between Q and R. What is his distance from P. What values of the teacher appears when she agreed the fourth boy to participate?

41. Point P divides the line segment joining the points A (2, 1) and B (5, – 8) such that $\frac{AP}{AB}=\frac{1}{3}$. If P lies on the line $2x - y + k = 0$, Find the value of k.

ANSWERS

1. 5	2. 9
3. (3,2)	4. 15
5. 26	6. 3
7. 9	8. (5,2)
9. 0	10. 0
11. 2 units	12. 3 units
13. 5 units	14. 3 or – 9
15. (–2,0)	16. 5
17. 53 sq. units	18. $\left(\frac{-5}{3},2\right),\left(\frac{-1}{3},0\right)$
19. (1,3),(5,5),(3,–3)	20. 2
21. 4:7	23. (0,–2)
24. 5:1	25. (2,–1)
26. $\left(-1,\frac{9}{2}\right)$	28. (1,2)
31. (–4,–7)	33. $k=-8$
34. $x=8$, $y=4$	35. $p=-3$
36. $a=1$, $b=0$	37. P = 1, AB = $\sqrt{10}$ units

38. (a) Right Angled Triangle (b) Sports, Activeness, Critical thinking.
39. (a) Mona, (b) Time bound, Reality
40. 5 Units, interest in Mathematics, Friendship, Cooperation
41. –8

Practice Test

Coordinate Geometry

Time: 50 minutes **M.M: 20**

SECTION-A

1. Find the area of triangle whose vertices are (–2, 3), (8, 3) and (6, 7).

2. Find the value of m in which the points (3, 5), (m, 6) and are $\left(\frac{1}{2}, \frac{15}{2}\right)$ collinear.

3. What is the distance between the points A(c, 0) and B(0, –c)

4. For what value of p, the points (–3, 9), (2, p) and (4, –5) are collinear.

5. If the points A(8, 6) and B(x, 10) lie on the circle whose centre is (4, 6) then find the value of x.

6. Show that the points A(–3, 2), B(–5, –5), C(2, –3) and D(4, 4) are the vertices of a rhombus.

7. Find the ratio in which the point (2, y) divides the line segment joining the points A(–2, 2) and B(3, 7). Also find the value of y.

8. If the point P divides the line segment joining the points A(–2, –2) and B(2, –4) such that $\frac{AP}{AB} = \frac{3}{7}$, then find the coordinate of P.

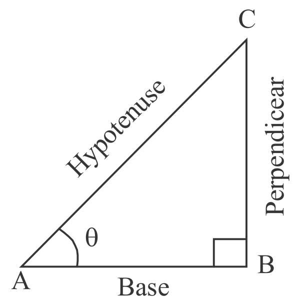
9. If A(–5, 7), B(–4, –5), C(–1, –6) and D(4, 5) are the vertices of a parallelogram taken in order then find the area.

8 Chapter

Trigonometry

Key Points

1. Trigonometric ratio : In ΔABC, $\angle B = 90°$. For $\angle A$,



$$\sin A = \frac{\text{Perpendicular}}{\text{Hypotenuse}} = \frac{\text{Opposite side}}{\text{Hypotenuse}}$$

$$\cos A = \frac{\text{Base}}{\text{Hypotenuse}} = \frac{\text{adjacent side}}{\text{Hypotenuse}}$$

$$\tan A = \frac{\text{Perpendicular}}{\text{Base}} = \frac{\text{Opposite side}}{\text{adjacent side}}$$

$$\cot A = \frac{\text{Base}}{\text{Perpendicular}} = \frac{\text{adjacent side}}{\text{opposite side}}$$

$$\sec A = \frac{\text{Hypotenuse}}{\text{Base}} = \frac{\text{Hypotenuse}}{\text{adjacent side}}$$

$$\text{cosec } A = \frac{\text{Hypotenuse}}{\text{Perpendicular}} = \frac{\text{Hypotenuse}}{\text{Opposite side}}$$

2. Opposites

$$\sin\theta = \frac{1}{\text{cosec }\theta}, \quad \text{cosec }\theta = \frac{1}{\sin\theta}$$

$$\cos\theta = \frac{1}{\sec\theta}, \quad \sec\theta = \frac{1}{\cos\theta}$$

$$\tan\theta = \frac{1}{\cot\theta}, \quad \cot\theta = \frac{1}{\tan\theta}$$

3. $$\tan\theta = \frac{\sin\theta}{\cos\theta}, \quad \cot\theta = \frac{\cos\theta}{\sin\theta}$$

4. **Identities**

$\sin^2\theta + \cos^2 = 1 \Rightarrow \sin^2\theta = 1 - \cos^2\theta$ and $\cos^2\theta = 1 - \sin^2\theta$

$1 + \tan^2\theta = \sec^2\theta \Rightarrow \tan^2\theta = \sec^2\theta - 1$ and $\sec^2\theta - \tan^2\theta = 1$

$1 + \cot^2\theta = \mathrm{cosec}^2\theta \Rightarrow \cot^2\theta = \mathrm{cosec}^2\theta - 1$ and $\mathrm{cosec}^2\theta - \cot^2\theta = 1$

5. **Trigonometric ratios of some specific angles**

$\angle A$	0°	30°	45°	60°	90°
sin A	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
cos A	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
tan A	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	Not defined
cot A	Not defined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0
sec A	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	Not defined
cosec A	Not defined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1

6. **Trigonometric ratios of complimentary angles**

$\sin(90 - \theta) = \cos\theta$

$\cos(90 - \theta) = \text{Sin}\,\theta$

$\tan(90 - \theta) = \cot\theta$

$\cot(90 - \theta) = \tan\theta$

$\sec(90 - \theta) = \mathrm{cosec}\,\theta$

$\mathrm{cosec}(90 - \theta) = \sec\theta$

VERY SHORT ANSWER TYPE QUESTIONS

1. If Sin $\theta = \cos\theta$, find the value of θ
2. If $\tan\theta = \cot(30° + \theta)$, find the value of θ
3. If Sin $\theta = \cos(\theta - 6°)$, find the value of θ

4. If $\cos A = \frac{7}{25}$, find the value of $\tan A + \cot A$

5. If $\tan \theta = \frac{4}{3}$ then find the value of $\frac{\sin \theta + \cos \theta}{\sin \theta - \cos \theta}$

6. If $3x = \operatorname{cosec} \theta$ and $\frac{3}{x} = \cot \theta$ then find $3\left(x^2 - \frac{1}{x^2}\right)$

7. If $x = a \sin \theta$ and $y = a \cos \theta$ then find the value of $x^2 + y^2$

8. Find the value of $\operatorname{cosec} 70° - \sec 20°$

9. If $5x = \sec \theta$ and $\frac{5}{x} = \tan \theta$ then find the value of $5\left(x^2 - \frac{1}{x^2}\right)$

10. Find the value of $9 \sec^2 A - 9 \tan^2 A$

11. Express $\sec \theta$ in terms of $\cot \theta$

12. Find the value of $\cos \theta \cos (90 - \theta) - \sin \theta \sin (90 - \theta)$

13. If $\sin (20 + \theta) = \cos 30°$ then find the value of θ.

14. Find the value of $\frac{1 + \tan^2 \theta}{1 + \cot^2 \theta}$

15. Find the value of $\frac{\sin \theta}{\sqrt{1 - \sin^2 \theta}}$

SHORT ANSWER TYPE (I) QUESTIONS

Prove that :

16. $\sec^4 \theta - \sec^2 \theta = \tan^4 \theta + \tan^2 \theta$

17. $\sqrt{\frac{1 + \sin \theta}{1 - \sin \theta}} = \tan \theta + \operatorname{Sec} \theta$

18. If $x = p \sec \theta + q \tan \theta$ & $y = p \tan \theta + q \sec \theta$ then prove that $x^2 - y^2 = p^2 - q^2$

19. If $7 \sin^2 \theta + 3 \cos^2 \theta = 4$ then show that $\tan \theta = \frac{1}{\sqrt{3}}$

20. If Sin (A – B) = $\frac{1}{2}$, cos (A + B) = $\frac{1}{2}$ then find the value of A and B.

21. Find the value of $\frac{\cos^2 20° + \cos^2 70°}{\sin^2 59° + \sin^2 31°}$.

22. **Prove that :** tan 1° tan 11° tan 21° tan 69° tan 79° tan 89° = 1

23. If sec 4 A = cosec (A – 20°) then find the value of A.

24. If 3 cot A = 4, find the value of $\frac{\text{Cosec}^2 A + 1}{\text{Cosec}^2 A - 1}$.

25. If tan (3x – 15) = 1 then find the value of x.

SHORT ANSWER TYPE QUESTIONS

Prove that :

26. $\frac{\tan A + \text{Sec} A - 1}{\tan A - \text{Sec} A + 1} = \frac{1 + \text{Sin } A}{\text{Cos } A}$

27. $\frac{1}{\sec x - \tan x} - \frac{1}{\cos x} = \frac{1}{\cos x} - \frac{1}{\sec x + \tan x}$

28. $\frac{\tan\theta}{1 - \cot\theta} + \frac{\cot\theta}{1 - \tan\theta} = 1 + \tan\theta + \cot\theta = \sec\theta \csc\theta + 1$

29. $(\sin\theta + \csc\theta)^2 + (\cos\theta + \sec\theta)^2 = 7 + \tan^2\theta + \cot^2\theta$

30. sec A (1 – sin A) (sec A + tan A) = 1

31. If $\cos\theta + \sin\theta = \sqrt{2}\cos\theta$ then show that $\cos\theta - \sin\theta = \sqrt{2}\sin\theta$

32. If $\tan\theta + \sin\theta = m$, $\tan\theta - \sin\theta = n$ then show that $m^2 - n^2 = 4\sqrt{mn}$.

33. If $\sec\theta = x + \frac{1}{4x}$, prove that $\sec\theta + \tan\theta = 2x$ or $\frac{1}{2x}$

34. If $\sin\theta + \sin^2\theta = 1$, prove that $\cos^2\theta + \cos^4\theta = 1$

35. Without using trigonometric table, the value of
$\cot\theta \tan(90 - \theta) - \sec(90 - \theta)\csc\theta + \sin^2 65° + \sin^2 25° + \sqrt{3}\tan 5°$
$\tan 85°$.

36. **Prove that :** $\frac{\cot(90 - \theta)}{\tan\theta} + \frac{\csc(90 - \theta)\sin\theta}{\tan(90 - \theta)} = \sec^2\theta$

37. Find the value of :

$$\frac{\cos 20° + \cos^2 70°}{\sec^2 50° - \cot^2 40} + 2 \text{ Cosec}^2 58° - 2 \text{ Cot } 58° \tan 32° - 4 \tan 13° \tan 37° \tan 77° \tan 45° \tan 53°.$$

38. If A, B, C are the angles of ΔABC then prove that $\text{cosec}^2\left(\frac{B+C}{2}\right) - \tan^2\frac{A}{2} = 1$

39. Find the value of $\sec^2 10° - \cot^2 80° + \dfrac{\sin 15 \cos 75 + \cos 15° \sin 75}{\cos\theta \sin(90-\theta) + \sin\theta \cos(90-\theta)}$.

40. Prove that : $\dfrac{\tan\theta - \cot\theta}{\sin\theta\cos\theta} = \tan^2\theta - \cot^2\theta$.

LONG ANSWER TYPE QUESTIONS

Prove That:

41. $\dfrac{\text{Sec}\,\theta + \tan\theta - 1}{\tan\theta - \text{Sec}\,\theta + 1} = \dfrac{\text{Cos}\,\theta}{1 - \text{Sin}\,\theta}$

42. $\left(1 + \dfrac{1}{\tan^2\theta}\right)\left(1 + \dfrac{1}{\text{Cot}^2\theta}\right) = \dfrac{1}{\text{Sin}^2\theta - \text{Sin}^4\theta}$

43. $2(\sin^6\theta + \cos^6\theta) - 3(\sin^4\theta + \cos^4\theta) + 1 = 0$

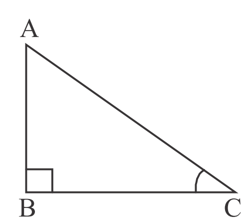
44. $(1 + \cot A + \tan A)(\sin A - \cos A) = \sin A \tan A - \cot A \cos A$

45. If $\text{Sin}\,\theta + \text{Cos}\,\theta = m$ and $\text{Sec}\,\theta + \text{Cosec}\,\theta = n$ then show that $n(m^2 - 1) = 2m$

46. find the value of :

$$\frac{\text{Cot}(90-\theta)\ \text{ten}\,\theta - \text{Cosec}(90-\theta)\text{Sec}\,\theta}{\text{Sin } 12° \text{ Cos } 15° \text{ Sec } 78° \text{ Cosec} 75°} + \frac{\text{Cos}^2(50+\theta)\tan^2(40-\theta)}{\tan 15° \tan 37° \tan 53° \tan 75°}$$

47. In given right triangle if base and perpendicular represents hardwork and success respectively and the ratio between them is 1 : 1 then find $\angle AOB$. Which mathematical concepts has been use in the question? Which values are depicted here?



48. If time bound and continuity are two measurable quantities respectively equal to A & B. If $\text{Sin}(A-B)=\frac{1}{2}$, $\cos(A+B)=\frac{1}{2}$, where $0°<A+B\leq 90°$ find the values of A and B.

49. If $x = \text{Sin}^2\,\theta$, $y = \text{Cos}^2\,\theta$ where x & y represents honesty and hardwork

(a) What will be the result after joining honesty & hardwork

(b) Which mathematical concept has been used here?

(c) Which values are depicted here?

50. Prove that :

$$\frac{1}{\text{Cosec}\,\theta+\text{Cot}\,\theta}-\frac{1}{\text{Sin}\,\theta}=\frac{1}{\text{Sin}\,\theta}-\frac{1}{\text{Cosec}\,\theta-\text{Cot}\,\theta}$$

51. If $\frac{\text{Cos}\,\alpha}{\text{Cos}\,\beta}=m$ and $\frac{\text{Cos}\,\alpha}{\text{Sin}\,\beta}=n$, then prove that $(m^2+n^2)\,\text{Cos}^2\,\beta=n^2$

52. If $\tan\theta+\text{Sin}\,\theta=m$. $\tan\theta-\sin\theta=n$, then prove that $m^2-n^2=4\sqrt{mn}$

53. **Prove that :**

$$\text{Sec}^2\,\theta-\frac{\text{Sin}^2\,\theta-2\text{Sin}^4\,\theta}{2\text{Cos}^4\,\theta-\text{Cos}^2\,\theta}=1$$

54. $\text{Cot}\,\theta\tan(90°-\theta)-\text{Sec}(90°-\theta)\,\text{Cosec}\,\theta+\sqrt{3}\tan 12°\tan 60°\tan 78°$ find its value.

55. Find the value of —

$$\frac{\text{Sec}(90°-\theta)\,\text{Cosec}\,\theta-\tan(90°-\theta)\,\text{Cot}\,\theta+\text{Cos}^2\,25°+\text{Cos}^2\,65°}{3\tan 27°\tan 63°}$$

ANSWERS

1.	45°	**2.**	30°
3.	24°	**4.**	$\frac{625}{168}$
5.	7	**6.**	$\frac{1}{3}$
7.	*a*	**8.**	0
9.	$\frac{1}{5}$	**10.**	9
11.	$\frac{\sqrt{1+\text{Cos}^2\theta}}{\text{Cot}\,\theta}$	**12.**	0°
13.	50°	**14.**	$\tan^2\theta$
15.	$\tan\theta$	**20.**	A = 45°, B = 15°
21.	1	**23.**	22°
24.	$\frac{17}{8}$	**25.**	20°
35.	$\sqrt{3}$	**37.**	– 1
39.	2	**46.**	0

47. 45° trigonometry, hardwork & success

48. A = 45°, B = 15° honesty, hardwork, Co-operation

49. (a) 1 (b) Trigonometry (c) Honesty & hardwork

54.	2	**55.**	$\frac{2}{3}$

Practice-Test

Trigonometry

MM: 20 ***Time : 1 hr***

1. If $\text{Sin } \theta = \frac{4}{5}$ what is the value of $\cos \theta$ **1**

2. Write the value of $\text{Sin }(45 + \theta) - \text{Cos }(45 - \theta)$ **1**

3. If $5 \tan \theta = 4$ then find the value of $\frac{5 \text{ Sin } \theta - 3 \text{Cos } \theta}{5 \text{ Sin } \theta + 2 \text{Cos } \theta}$ **2**

4. Find the value of tan 35 tan 40° tan 45° tan 50° tan 55° **2**

5. Prove that $\frac{\text{Sin } \theta}{1 + \text{Cos } \theta} + \frac{1 + \text{Cos } \theta}{\text{Sin } \theta} = 2 \text{ Cosec } \theta$ **3**

6. Prove that $\frac{\text{Cos A}}{1 - \tan \text{A}} - \frac{\text{Sin}^2 \text{ A}}{\text{Cos A} - \text{Sin A}} = \text{Sin A} + \text{Cos A}$ **3**

7. If $\tan (\text{A} + \text{B}) = \sqrt{3}$ and $\tan (\text{A} - \text{B}) = \frac{1}{\sqrt{3}}$ then find the value of x & y **4**

8. Prove that $\frac{\tan \theta + \text{Sec } \theta - 1}{\tan \theta - \text{Sec } \theta + 1} = \frac{\text{Cos } \theta}{1 - \text{Sin } \theta}$ **4**

❑❑❑

9

Chapter

Some Applications of Trigonometry (Heights and Distances)

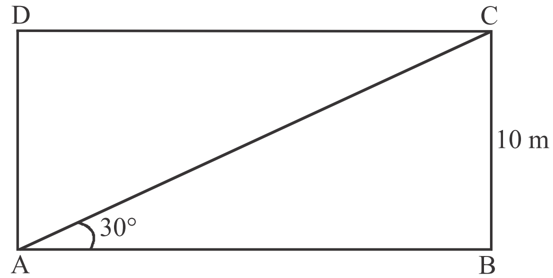
Key Points

1. **Line of Sight :** The line of sight is the line drawn from the eyes of an observer to a point in the object viewed by the observer.
2. **Angle of Elevation :** The angle of elevation is the angle formed by the line of sight with the horizontal, when it is above the horizontal level i.e. the case when we raise our head to look at the object.
3. **Angle of Depression :** The angle of depression is the angle formed by the line of sight with the horizontal when it is below the horizontal i.e. case when we lower our head to look at the object.

VERY SHORT ANSWER TYPE QUESTIONS

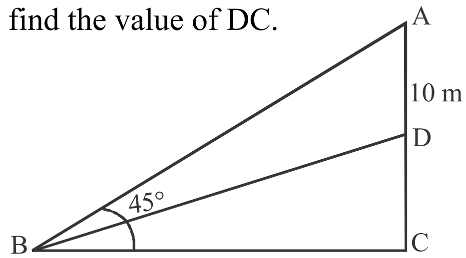
1. A tower is 50 m high. When the sun's altitude is 45° then what will be the length of its shadow?
2. The length of shadow of a pole 50 m high is $\frac{50}{\sqrt{3}}$ m. find the sun's altitude.
3. Find the angle of elevation of a point which is at a distance of 30 m from the base of a tower $10\sqrt{3}$ m high.
4. A kite is flying at a height of $50\sqrt{3}$ m from the horizontal. It is attached with a string and makes an angle 60° with the horizontal. Find the length of the string.

5. In the given figure find the perimeter of rectangle ABCD.

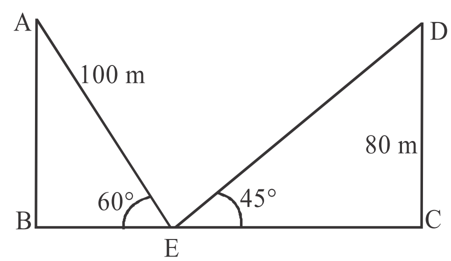


6. The length of the shadow of a pillar is $\sqrt{3}$ times its height. Find the angle of elevation of the source of light.

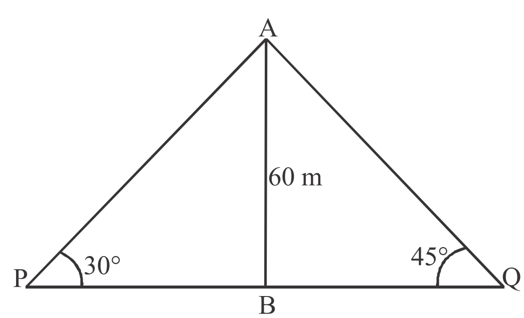
7. In the figure, find the value of DC.



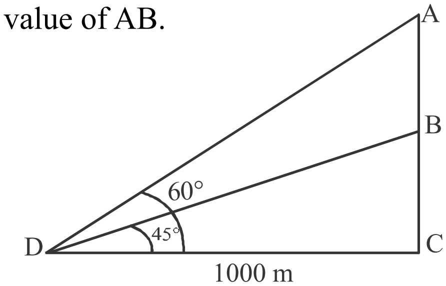
8. In the figure, find the value of BC.



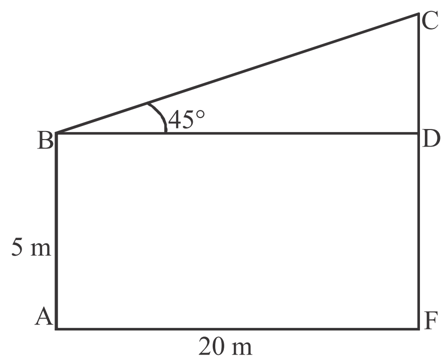
9. In the figure, two persons are standing at the opposite direction P & Q of the tower. If the height of the tower is 60 m then find the distance between the two persons.



10. In the figure, find the value of AB.



11. In the figure, find the value of CF.



12. If the horizontal distance of the boat from the bridge is 25 m and the height of the bridge is 25 m, then find the angle of depression of the boat from the bridge.

SHORT ANSWER TYPE QUESTIONS

13. From the top of a hill, the angles of depression of two consecutive kilometre stones due east are found to be 30° and 45°. Find the height of the hill.

14. The string of a kite is 150 m long and it makes an angle 60° with the horizontal. Find the height of the kite above the ground. (Assume string to be tight)

15. The shadow of a vertical tower on level ground increases by 10 m when the altitude of the sun changes from 45° to 30°. Find the height of the tower.

16. An aeroplane at an altitude of 200 m observes angles of depression of opposite points on the two banks of the river to be 45° and 60°, find the width of the river.

17. The angle of elevation of a tower at a point is 45°. After going 40 m towards the foot of the tower, the angle of elevation of the tower becomes 60°. Find the height of the tower.

18. The upper part of a tree broken over by the wind makes an angle of 30° with the ground and the distance of the root from the point where the top touches the ground is 25 m. What was the height of the tree?

19. A vertical flagstaff stands on a horizontal plane. From a point 100 m from its foot, the angle of elevation of its top is found to be 45°. Find the height of the flagstaff.

20. The length of a string between kite and a point on the ground is 90 m. If the string makes an angle with the level ground and $\sin\alpha = \frac{3}{5}$. . Find the height of the kite. There is no slack in the string.

21. An aeroplane, when 3000 m high, passes vertically above another plane at an instant when the angle of elevation of two aeroplanes from the same point on the ground are 60° and 45° respectively. Find the vertical distance between the two planes.

22. The angle of elevation of a cloud from a point 60 metres above a lake is 30° and the angle of depression of its reflection of the cloud in the lake is 60°. Find the height of the cloud.

23. A man standing on the deck of a ship, 10 m above the water level observes the angle of elevation of the top of a hill as 60° and angle of depression the bottom of a hill as 30°. Find the distance of the hill from the ship and height of the hill.

24. A 7 m long flagstaff is fixed on the top of a tower on the horizontal plane. From a point on the ground, the angle of elevation of the top and the bottom of the flagstaff are 45° and 30° respectively. Find the height of the tower.

25. From a window 60 m high above the ground of a house in a street, the angle of elevation and depression of the top and the foot of another house on the opposite side of the street are 60° and 45° respectively. Show that the height of opposite house is $60(1+\sqrt{3})$ metres.

26. The angle of elevation of an aeroplane from a point A on the ground is 60°. After a flight of 30 seconds, the angle of elevation changes to 30°. If the plane is flying at a constant height of $3600\sqrt{3}$ m, find the speed in km/hour of the plane.

27. A bird is sitting on the top of a tree, which is 80 m high. The angle of elevation of the bird, from a point on the ground is 45°. The bird flies away from the point of observation horizontally and remains at a constant height. After 2 seconds, the angle of elevation of the bird from the point of observation becomes 30°. Find the speed of flying of the bird.

28. From the top of a 7 m high building, the angle of elevation of the top of the tower is 60° and the angle of depression of the foot of the tower is 30°. Find the height of the tower.

29. The angles of elevation of the top of a tower from two points on the ground at distances 9 m and 4 m from the base of the tower are in the same straight line with it are complementary. Find the height of the tower.

30. A boy standing on a horizontal plane finds a bird flying at a distance of 100 m from him at an elevation of 30°. A girl, standing on the roof of 20 m high building, finds the angle of elevation of the same bird to be 45°. Both the boy and girl are on the opposite sides of the bird. Find the distance of bird from the girl.

31. As observed from the top of a light house, 100 m high above sea level, the angle of depression of a ship, sailing directly towards it, changes from 30° to 60°. Determine the distance travelled by the ship during the period of observation.

32. The angles of elevation and depression of the top and bottom of a light house from the top of a building 60 m high are 30° and 60° respectively. Find

    (i) The difference between the height of the light house and the building.

    (ii) distance between the light house and the building.

33. Anand is watching a circus artist climbing a 20m long rope which is tightly stretched and tied from the top of vertical pole to the ground. Find the height of the pole if the angle made by the rope with the ground level is 30°. What value is experienced by Anand?

34. A fire in a building 'B' is reported on telephone in two fire stations P an Q, 20 km apart from each other on a straight road. P observes that the fire is at an, angle of 60° to the road, and Q observes, that it is at an angle of 45° to the road. Which station should send its team and how much distance will this team has to travel? What value is depicted from the problem?

35. A 1.2m tall girl spots a balloon on the eve of Independence Day, moving with the wind in a horizontal live at a height of 88.2 m from the ground. The angle of elevation of the balloon from the of the girl at an instant is 60°. After some time, the angle of elevation reduces to 30°. Find the distance travelled by the balloon. What value is depicted here?

ANSWERS

1.	50 m	2.	60°
3.	30°	4.	100 m
5.	$20\left(\sqrt{3}+1\right)$ m	6.	30°
7.	60 m	8.	130 m
9.	$60\left(\sqrt{3}+1\right)$ m	10.	$1000\left(\sqrt{3}-1\right)$ m
11.	25 m	12.	45
13.	1.37 km.	14.	$75\sqrt{3}$ m
15.	13.65 m	16.	315.8 m
17.	94.8 m	18.	43.3 m
19.	100 m	20.	120 m
21.	1268 m	22.	120 m
23.	40 m, 17.32 m	24.	9.6 m
26.	864 km/hour	27.	29.28 m
28.	28 m	29.	6 m
30.	$30\sqrt{2}$ m	31.	115.5 m
32.	20 m, 34.64 m	33.	10 m, happiness

34. Station P, 14.64 km, logical reasoning, Thinking, Security

35. $58\sqrt{3}m$, Equality of Gender, Enjoyment

Practice Test

Heights and Distances

Time: 50 minutes **M.M: 20**

SECTION-A

1. A pole which is 6 m high cast a shadow $2\sqrt{3}$ on the ground. What is the sun's angle of elevation.
2. The height of a tower is 100 m. When the angle of elevation of sun is 30°, then what is the shadow of tower?

SECTION-B

3. From a point on the ground 20 m away from the foot of a tower the angle of elevation is 60°. What is the height of tower?
4. The ratio of height and shadow of a tower is $1 : \frac{1}{\sqrt{3}}$. What is the angle of elevation of the sun?

SECTION-C

5. The shadow of tower, when the angle of elevation of the sun is 45° is found to be 10 m longer than when it was 60°. Find the height of tower.
6. The angle of elevation of the top of a rock from the top and foot of a 100 m high tower are 30° and 45° respectively. Find the height of the rock.

SECTION-D

7 A man standing on the deck of a ship, 10 m above the water level observes the angle of elevation of the top of a hill as 60° and angle of depression of the base of the hill as 30°. Find the distance of the hill from the ship and height of the hill.

8. From a window 15 m high above the ground in a street, the angle of elevation and depression of the top and the foot of another house on the opposite side of the street are 30° and 45° respectively. Show that the height of opposite house is 23.66 metres.

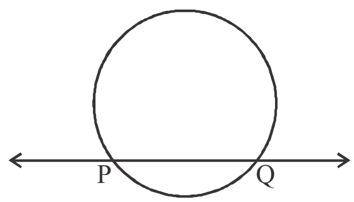
10

Chapter

Circles

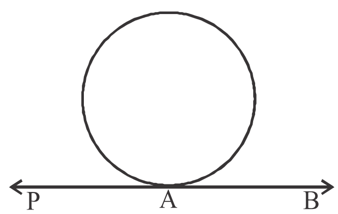
Key Points

1. A **circle** is a collection of all those points in a plane which are at a constant distance from a fixed point. The fixed point is called the**centre** and fixed distance is called the **radius**.
2. **Secant:** A line which intesects a circle in two distinct points is called a secant of the circle.



3. **Tangent**: It is a line that intersects the circle at only one point. The point where tangent touches the circle is called the point of contact.

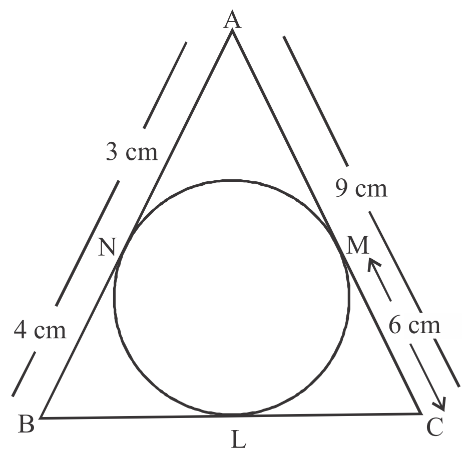
   Here A is the poin of contact.



4. **Number of Tangent**: Infinitely many tangents can be drawn on a circle.
5. **Number of Secant**: There are infinitely many secants which can be drawn on a circle.
6. The proofs of the following theorems can be asked in the examination:–
   (i) The tangent at any point of a circle is perpendicular to the radius through the point of contact.
   (ii) The lengths of tangents drawn from an external point to a circle are equal.

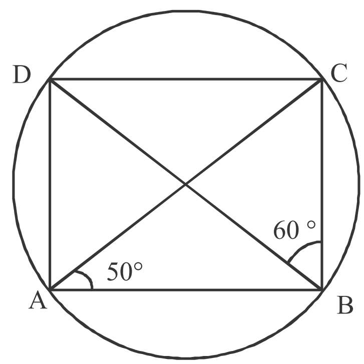
VERY SHORT ANSWER TYPE QUESTIONS

1. In fig., ΔABC is circumscribing a circle. Find the length of BC.

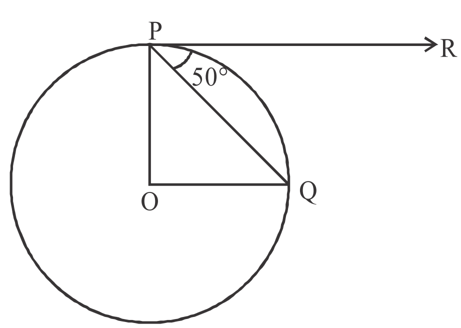


2. The length of the tangent to a circle from a point P, which is 25 cm away from the centre, is 24 cm. What is the radius of the circle.

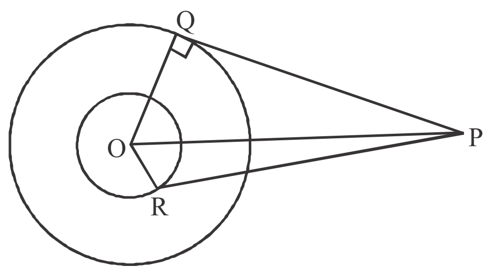
3. In fig., ABCD is a cyclic quadrilatreral. If ∠BAC = 50° and ∠DBC = 60°, then find ∠BCD.



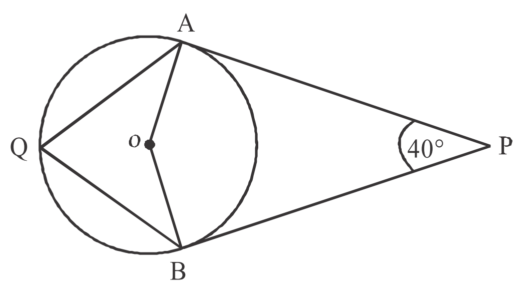
4. In figure, O is the centre of a circle, PQ is a chord and the tangent PR at P makes an angles of 50° with PQ. Find ∠POQ.



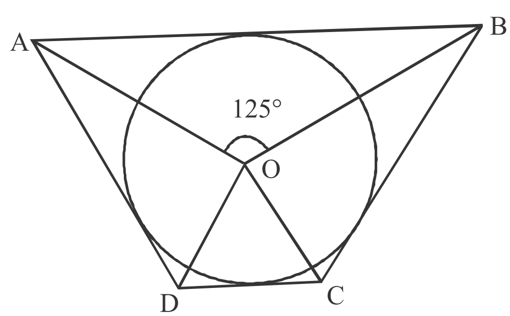
5. If two tangents inclined at an angle 60° are drawn to a circle of radius 3 cm, then find the length of each tangent.
6. If radii of two concentric circles are 4 cm and 5 cm, then find the length of each chord of one circle which is tangent to the other circle.
7. In the given figure, PQ is tangent to outer circle and PR is tangent to inner circle. If PQ = 4cm, OQ = 3 cm and QR = 2 cm then find the length of PR.



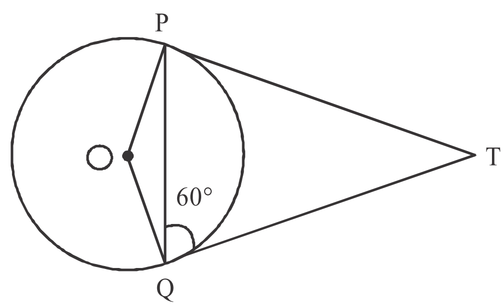
8. In the given figure, O is the centre of the circle, PA and PB are tangents to the circle then find ∠AQB.



9. In the given figure, If ∠AOB = 125° then find ∠COD.



10. If two tangent TP and TQ are drawn from an external point T such that $\angle TQP = 60°$ then find $\angle OPQ$.



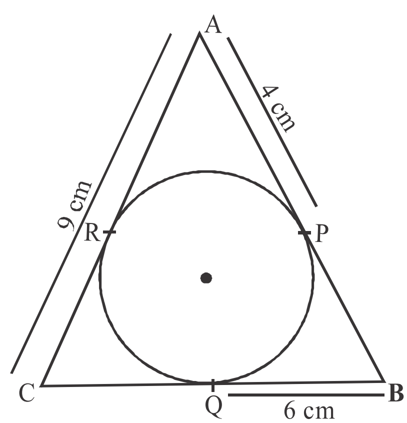
SHORT ANSWER TYPE-I QUESTIONS

11. If diameters of two concentric circle are d_1 and d_2 ($d_2 > d_1$) and and C is the length of chord of bigger circle which is tangent to the smaller circle. Show that $d_2^2 = C^2 + d_1^2$.

12. The length of tangent to a circle of radius 2.5 cm from an external point P is 6 cm. Find the distance of P from the nearest point of the circle.

13. TP and TQ are the tangents from the external point T of a circle with centre O. If $\angle OPQ = 30°$ then find the measure of $\angle TQP$.

14. In the given fig. AP = 4 cm, BQ = 6 cm and AC = 9 cm. Find the semi perimeter of ΔABC.

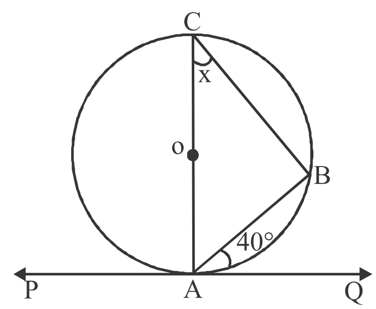


15. A circle is drawn inside a right angle triangle whose sides are a, b, c where c is the hypotenuse, which touches all the sides of the triangle. Prove $r = \dfrac{a + b - c}{2}$ where r is the radius of the circle.

16. Prove that the tangent at any point of a circle is perpendicular to the radius through the point of contact.

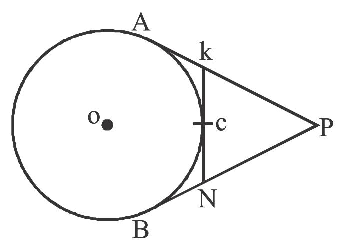
17. Prove that in two concentric circles the chord of the larger circle which is tangent to the smaller circle is bisected at the point of contact.

18. In the given Fig., AC is diameter of the circle with centre O and A is point of contact, then find x.

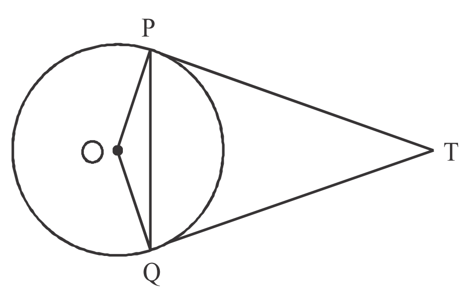


19. In the given fig. PA and PB are tangents to the circle. Prove that:

KN = AK + BN.

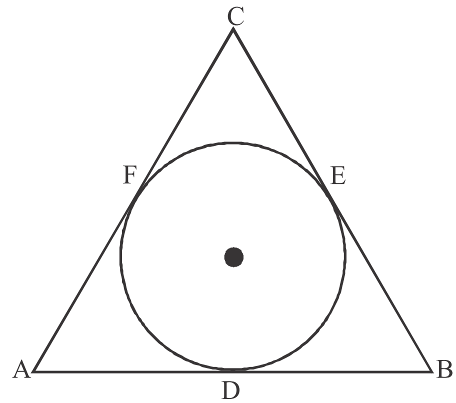


20. In the given fig. PQ is a chord of length 6 cm and the radius of the circle is 6 cm. TP and TQ are two tangents drawn from an external point T. Find $\angle PTQ$.



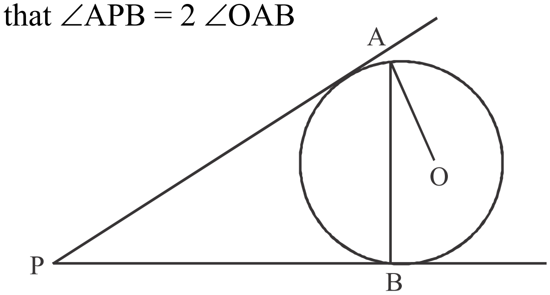
SHORT ANSWER TYPE-II QUESTIONS

21. In the given figure find AD, BE, CF where AB = 12 cm, BC = 8 cm and AC = 10 cm.



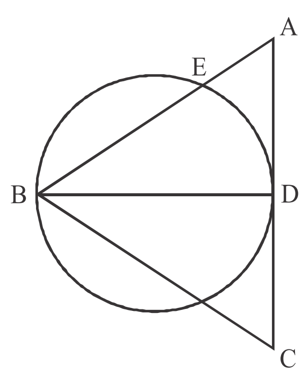
22. In a right triangle ABC a circle is drawn with AB as the diameter which interscet hypotenuse AC at point P. Prove PB = PC.

23. Two tangents PA and PB are drawn to a circle with centre O from an external point P. Prove that $\angle APB = 2\angle OAB$

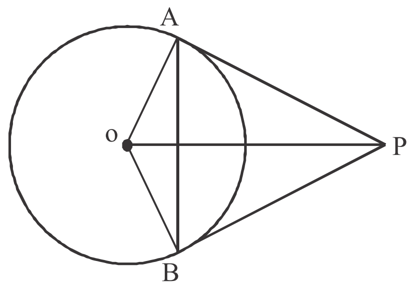


24. If an equilateral triangle ABC with sides AB = AC = 6 cm is drawn inside a circle of radius 9 cm, find area of the triangle.

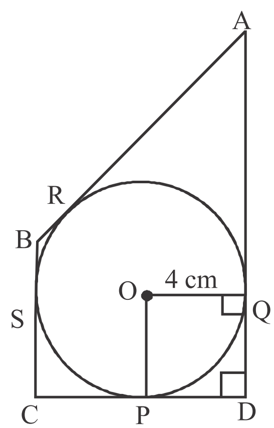
25. In the given fig. AB = AC, D is the mid point of AC, BD is the diameter of the circle, then prove $AE = \frac{1}{4} AC$



26. In the given fig. OP is equal to thediameter of the circle with centre O. Prove that ΔABP is an equilateral triangle.



27. In the given fig., Find PC.

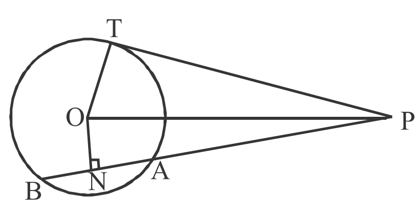


28. In the given fig. from an external point P, a tangent PT and a secant PAB is drawn to a circle with centre O. ON is perpendicular on the chord AB. Prove

(i) $PA.PB = PN^2 - AN^2$

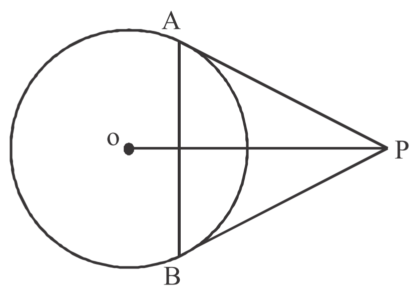
(ii) $PN^2 - AN^2 = OP^2 - PT^2$

(iii) $PA.PB = PT^2$



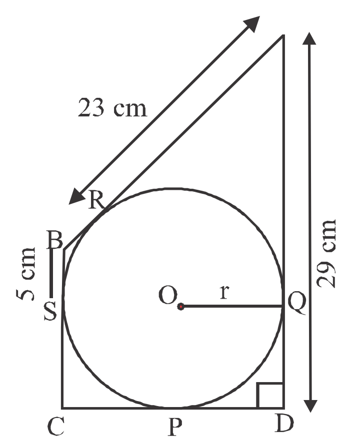
29. In a circle with centre O, AB is a diameter and AC is the chord and $\angle BAC = 30°$. A tangent AB drawn at the point C when extended meets D. Prove BC = BD.

30. In the given fig. PA and PB are tangents to the circle with centre O. Prove that OP bisects AB and is perpendicular to it.

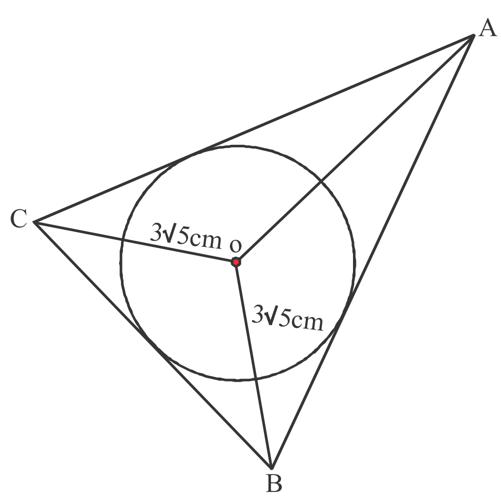


LONG ANSWER TYPE QUESTIONS

31. In the given fig. find the radius of the circle.

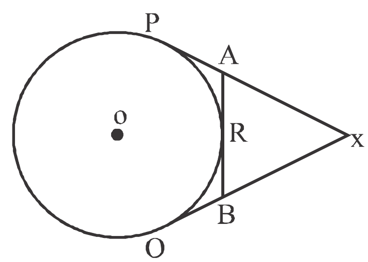


32. In the given fig. if radius of circle is 3 cm. Find the perimeter of ΔABC.

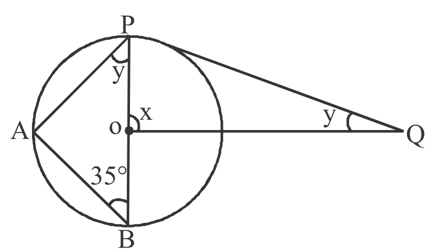


33. A circle touches the side BC of a ΔABC at P and AB and AC are extended respectively to points Q and R. Prove that AQ is half the perimeter of ΔABC.

34. In the given fig. XP and XQ are tangents from X to the circle with centre O. R is a point on the circle. Prove that XA + AR = XB + BR.



35. In the given fig. PQ is tangent and PB is diameter. Find the value of x and y.



36. The distance between villages A and B is 7 km, B and C is 5 km and C and A is 8 km. The Pradhan of village wants to build a well which is equidistant from each villages.

    (i) Find the location of well?

    (ii) What values are depicted by this action of Pradhan?

37. The villagers wants to construct a road around a circular village. The Road cannot pass through inside the village. The villagers wants that the road should be at shortest distance from the centre of the circular village.

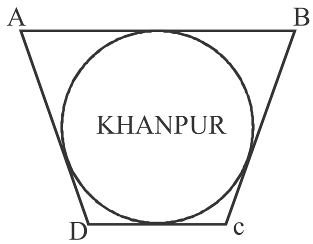
    (i) Which road will be at minimum distance from the centre of the village?

    (ii) Which values are depicted through the life of villagers?

38. In the given figure four roads touch to a circular village Khanpur of radius 1700 m. Savita got a contract for constructing road AB and CD while Vijay to construct road AD and BC.

    (i) Prove AB + CD = AD + BC

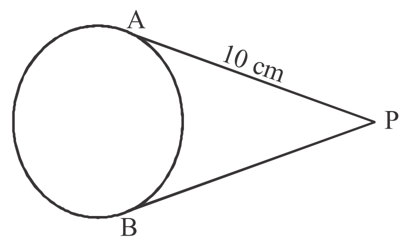
(ii) Which value is depicted in this questions?



39. Two roads starting from point P touch a circular path at A and B as shown in the Figure. Sarita walks 10 km from P to A and Ramesh goes from P to B at the same time.

    (i) If Sarita wins in this race then find the distance covered by Ramesh.

    (ii) What value is depicted here.

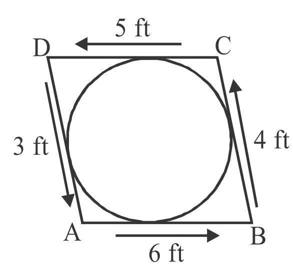


40. One day Rahim while coming to his house found a circular pit on the road. He immediately informed Municipal corporation about the pit. Municipal corporation installed wire around the pit.

    (i) Find the total length of wire.

    (ii) Which concept of mathematics is used to find the answer?

    (iii)Which values of Rahim are depicted here?



ANSWERS

1.	10 cm	2.	7 cm
3.	70°	4.	100°
5.	$3\sqrt{3}$ cm	6.	6 cm
7.	$\sqrt{21}\,cm$	8.	70°
9.	55°	10.	30°
12.	4 cm	13.	60°
14.	15 cm	18.	40°
20.	120°		
21.	AD = 7 cm, BE = 5 cm, CF = 3 cm		
24.	$8\sqrt{2}\ cm^3$	27.	5 cm
31.	11 cm	32.	32 cm
35.	$x = 35°$, $y = 55°$		

36. (i) A, B, C, are on circumference of the circle and well at the centre.
    (ii) Equality, Love & Care, Humanity
37. (i) Tangent (ii) Economic value
38. (ii) Gender equality
39. (i) 10 km (ii) Gender equality, Healthy competition
40. (i) 36 feet
    (ii) tangent are equal from the external point
    (iii)Moral and social responsibility, logical reasoning.

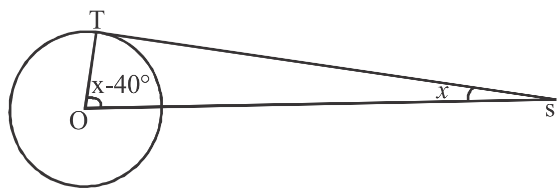
Practice Test

Circle

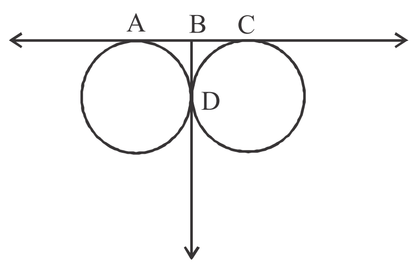
Time: 50 minutes **M.M: 20**

SECTION-A

1. In the given figure find x, where ST is the tangent.

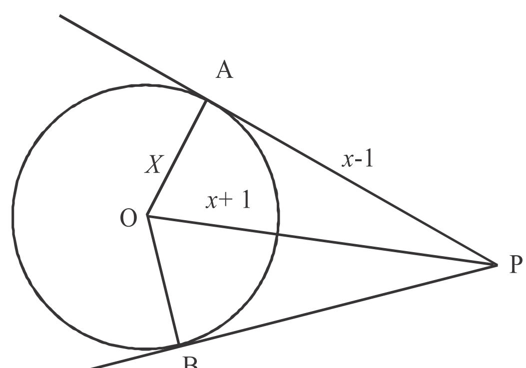


2. In the given figure if AC = 9, find BD.

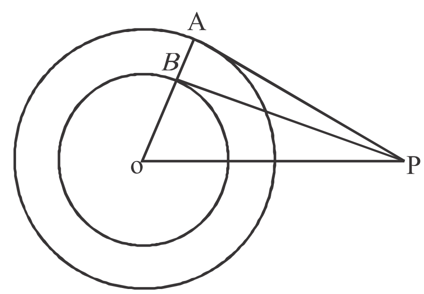


SECTION-B

3. In the following figure find x.

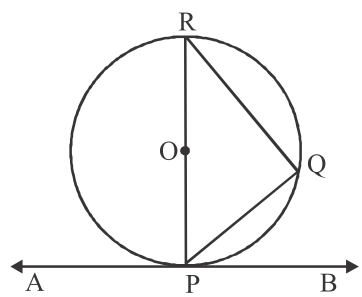


4. Two concentric circle with centre O are of radii 6 cm and 3 cm. From an external point P, tangents PA and PB are drawn to these circle as shown in the figure. If AP = 10 cm. Find BP

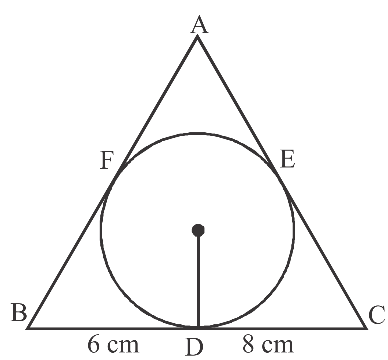


SECTION-C

5. In the given figure, AB is a tangent to a circle with centre O. Prove $\angle BPQ = \angle PRQ$.

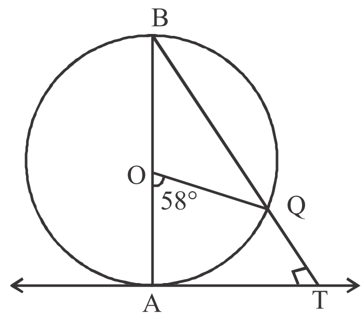


6. In the given figure ΔABC is drawn to circumscribe a circle of radius 3 cm, such that the segment BD and DC into which BC is divided by the point of contact D are of length 6 cm and 8 cm respectively, find side AB if the $ar(\Delta ABC) = 63\ cm^2$

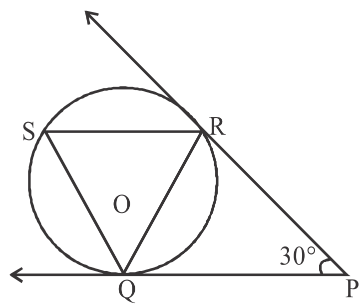


SECTION-D

7. AB is a diameter of a circle with centre O and AT is a tangent. If $\angle AOQ = 58°$ find $\angle ATQ$.



8. Tangent PQ and PR are drawn from external point P to a circle with centre O, such that $\angle RPQ = 30°$. A chord RS is drawn parallel to the tangent PQ find $\angle RQS$.



11

Chapter

Constructions

Key Points

1. Construction should be neat and clean and There should be no doubling.
2. Construction should be as per a given scale factor which may be less than 1 or greater than 1 for a triangle similar to a given triangle.
3. Step of construction should be provided only when it is mentioned in the question.
4. We makes use of compass and ruler only but in case of non-standard angles, protractor can be used.

VERY SHORT ANSWER TYPE QUESTIONS

1. To construct a triangle similar to a given ΔABC with its sides $\frac{5}{3}$ of the corresponding sides of ΔABC, a ray BX is drawn such that CBX is an acute angle and X is on the opposite side od A with respect to BC. What is the minimum no. of points to be located at equal distances on ray BX.
2. To draw a pair of tangents to a circle which are inclined to each other at an angle of 30°. What should be the angle between two radii?
3. To constract a triangle similar to a given ΔABC with its sides $\frac{2}{5}$ of the corresponding sides of ΔABC , firstly a ray BX is drawn such that CBX is an acute angle and X lies on the opposite side of A with respect to BC then points B_1, B_2, B_3, are located on BX at equal distances Which two points will be joined in the next step.
4. To divide a line segment AB in the ratio 3:7, What is the minimum number of points marked on a ray AX at equal distances?
5. How many tangents can be drawn from a point lying inside a circle?

6. To divide a line segment AB in the ratio 4:5, a ray AX is drawn first such that $\angle BAX$ is an acute angle and then points A_1, A_2, A_3, ... are located at equal distances on the ray AX which should be joined to B?

7. To divide a line segment AB in the ratio 4:5, the points A_1, A_2, A_3,....and B_1, B_2, B_3,.... are located at equal distances on the ray AX and BY respectively. Which two points should be joined to divide a line segment?

LONG ANSWER TYPE QUESTIONS

8. AB is a line segment of length 8 cm. Locate a point C on AB such that $AC = \frac{1}{3} CB$.

9. Construct a ΔABC in which AB = 6.5 cm, ∠B = 60° and BC = 5.5 cm. Also construct a triangle AB'C' similar to ΔABC, whose each side is $\frac{3}{2}$ times the corresponding sides of ΔABC.

10. Construct a ΔABC in which BC = 5 cm, CA = 6 cm and AB = 7. Construct a ΔA'BC' similar to ΔABC, each of whose side are times $\frac{7}{5}$ the corresponding sides of ΔABC.

11. Construct a triangle with side 4 cm, 5 cm, 7 cm. Then construct a triangle similar to it whose sides are $\frac{2}{3}$ of the corresponding sides of the given triangle.

12. Construct a right triangle in which sides (other than hypotenuse) are of lengths 8 cm and 6 cm. Then construct another triangle similar to this triangle whose sides are times the corresponding sides of the first triangle.

13. Construct a DABC in which BC = 8 cm, ∠B = 45° cm and ∠C = 30°. Construct another triangle similar to DABC such that each side are $\frac{3}{4}$ of the corresponding sides of DABC

14. A triangle ABC is given such that AB = 15 cm, BC = 27 cm andΔBAC = 50°. Draw another triangle A'BC' similar to ΔABC with sides BA' and BC' equal to 25 cm and 45 cm respectively. Find the scale factor.

15. Draw a pair of tangents to a circle of radius 6 cm which are inclined to each other at an angle of 60°. Also justify the construction.

16. Construct a triangle ABC in which AB = 5 cm, $\angle B = 60°$ and attitude CD = 3 cm. Construct a $\Delta AQR \sim \Delta ABC$ such that each sides is 1.5 times that of the corresponding sides of ΔABC.

17. Draw an isosceles tntABC with AB=AC and base BC=7cm, vertical angle is 120°. Construct $\Delta AB'C' \sim \Delta ABC$ with its sides $1\frac{1}{3}$ times of the corresponding sides of ΔABC.

18. Draw a circle of radius 3 cm. From a point 5 cm from the centre of the circle, draw two tangents to the circle. Measure the length of each tangent.

19. Draw a circle of radius 4 cm with centre O. Draw a diameter POQ. Through P or Q draw a tangent to the circle.

20. Draw two circle of radius 5 cm and 3 cm with their centres 9 cm apart. From the centre of each circle, draw tangents to other circles.

21. Draw two circles of radii 6 cm and 4 cm. From a point on the outer circle, draw a tangent to the inner circle and measure its length.

22. Draw a circle of radius 3 cm. Take two points P and Q on one of its extended diameter each at a distance of 7 cm from its centre. Draw tangents to the circle from these two points.

23. Draw a line segment PQ = 10 cm. Take a points A on PQ such that $\frac{PA}{PQ} = \frac{2}{5}$ Measure the length of PA and AQ

24. Draw an equilateral triangle f'PQR with side 5cm. Now construct $\Delta PQ'R'$ such that $\frac{PQ}{PQ'} = \frac{1}{2}$.

25. Draw a line segment of length 8 cm and divided it in the ratio 5:8. Meeasure the two parts.

26. Students of a school staged a rally for cleanliness campaign. They walked through the lanes AB, BC and CA which form a triangle. Construct a triangle ABC with sides AB = 7 cm, BC = 7.5 cm abd CA = 6.5 cm. Construct a Δ similar to ΔABC whose sides are of the corresponding sides of ΔABC. What value represents here?

27. Amit has a triangu;ar piece of land ABC with base BC = 4.2 m, $\angle A = 45°$ and altitude through A is 2.5 cm. He wants to purchase another piece of land similar to the earlier triangle with scale factor $\frac{1}{2}$ and donate this to vridhashram. Construct triangle using above dimensions. What value represents here? What qualities of Gandhiji would you like to construct within you?

28. Draw a line segment of length 8 cm divided it in the ratio 3:4. Dividing joint families into nuclear families is good or bad. Give reson in support of your answer.

29. Draw a circle of radius 5 cm. Draw tangents from the end points of its diameter. What do you you observe?

    If each tangent represents the quality of a human being, Find out the qualites that should be adopted for a better human being.

ANSWERS

1. 5

2. 150

3. B_5 to C

4. 10

5. 0

6. A_9

7. A_4 & B_5

Practice Test

Constructions

Time: 50 minutes **M.M: 20**

SECTION-A

1. Draw a perpendicular bisector of line segment AB = 8cm
2. Draw a line parallel to a given line.

SECTION-B

3. Draw an angle bisectorof 75°.
4. Draw a line segment of 5.6cm. Divide it in the ratio 2:3.

SECTION-C

5. Draw two tangents to a circle of radius 3.5cm from a point P at a distance of 5.5cm from its centre. Measure its length.
6. Draw a circle of radius 3.5cm. Draw two tangents to the circle such that they include an angle of 120°.

SECTION-D

7. Construct a ΔABC of sides AB = 4cm, BC = 5cm and AC = 7 cm.Construct another triangle similar to ΔABC such that each of its sides is $\frac{5}{7}$ of the corresponding sides of ΔABC.
8. Draw a right triangle ABC in which AB = 6cm, BC = 8cm and $\angle B = 90°$. Draw $BD \perp AC$ and draw a circle passing through the points B, C and D, Construct tangents from A to this circle.

12

Chapter

Areas Related to Circles

Key Points

1. **Circle:** A circle is the locus of a point which moves in a plane in such a way that its distance from a fixed point always remains the same. The fixed point is called the centre and the given constant distance is known as the radius of the circle.

   If r is radius of a circle, then

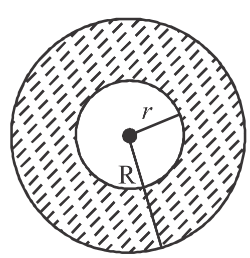
   (i) Circumference = $2\pi r$ or πd where $d = 2r$ is the diameter of the circle

   (ii) Area = πr^2 or $\frac{\pi d^2}{4}$

   (iii) Area of semi circle = $\frac{\pi r^2}{2}$

   (iv) Area of quadrant of a circle = $\frac{\pi r^2}{4}$

   Area enclosed by two concentric circles: If R and r are radii of two concentric circles, then area enclosed by the two circles = $\pi R^2 - \pi r^2$



$$= \pi (R^2 - r^2)$$

$$= \pi (R + r)(R - r)$$

(i) If two circles touch internally, then the distance between their centres is equal to the difference of their radii.

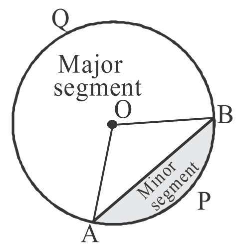
(ii) If two circles touch externally, then distance between their centres is equal to the sum of their radii.

(iii) Distance moved by rotating wheel in one revolution is equal to the circumference of the wheel.

(iv) The number of revolutions completed by a rotating wheel in

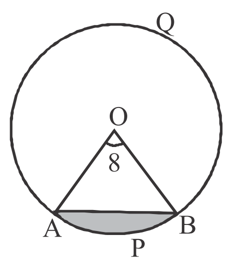
$$\text{one minute} = \frac{\textit{Distance moved in one minute}}{\textit{Circumference of the wheel}}$$

Segment of a Circle: The portion (or part) of a circular region enclosed between a chord and the corresponding arc is called a segment of the circle. In fig. adjacent APB is minor segment and AQB is major segment.



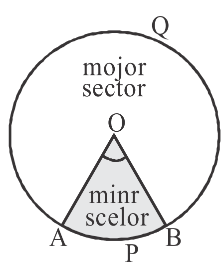
Area of segment APB = Area of the sector OAPB – Area of ΔOAB

$$= \frac{\theta}{360°} \times \pi r^2 - \frac{1}{2} r^2 \sin\theta$$



Sector of a circle: The portion (or part) of the circular region enclosed by the two radii and the corresponding arc is called a sector of the circle.

In figure adjacent OAPB is minor sector and OAQB is the major sector.



Area of the sector of angle $\theta = \frac{\theta}{360°} \times 2\pi r^2$

$$= \frac{1}{2} \times \textit{length of arc} \times \textit{radius} = \frac{1}{2}\, lr$$

Length of an arc of a sector of angle $\theta = \frac{\theta}{360} \times 2\pi r$

(i) The sum of the arcs of major and minor sectors of a circle is equal to the circumference of the circle.

(ii) The sum of the areas of major and minor sectors of a circle is equal to the area of the circle.

(a) Angle described by minute hand in 60 minutes = 360°

Angle described by minute hand in one minute $= \frac{360°}{60°} = 6°$

Thus minute hand rotates through an angle of 6° in one minute

(b) Angle described by hour hand in 12 hours = 360°

Angle described by hour hand in one hour $= \frac{360°}{12°} = 30°$

Angle described by hour hand in one minute $= \frac{30°}{60°} = \frac{1°}{2}$

Thus, hour hand rotates through an angle of $\frac{1°}{2}$ in one minute.

VERY SHORT ANSWER QUESTIONS

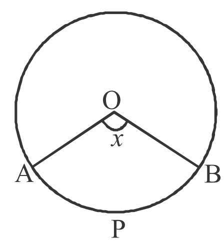
1. If the diameter of a semi circular protactor is 14 cm, then find its perimeter.
2. If circumference and the area of a circle are numerically equal, find the diameter of the circle.
3. Find the area of the circle 'inscribed' in a square of side *a* cm.
4. Find the area of a sector of a circle whose radius is *r* and length of the arc is *l*.
5. The radius of a wheel is 0.25 m. Find the number of revolutions it will make to travel a distance of 11 kms.

6. If the area of circle is 616 cm^2, then what is its circumference?
7. What is the area of the circle that can be inscribe in a square of side 6 cm?
8. What is the diameter of a circle whose area is equal to the sum of the areas of two circles of radii 24 cm and 7 cm?
9. A wire can be bent in the form of a circle of radius 35 cm. If it is bent in the form of a square, then what will be its area?
10. What is the angle subtended at the centre of a circle of radius 6 cm by an arc of length 3π cm?
11. Write the formula for the area of sector of angle θ (in degrees) of a circle of radius r.
12. If the circumference of two circles are in the ratio 2:3, what is the ratio of their areas?
13. If the difference between the circumference and radius of a circle is 37 cm, then find the circumference of the circle. (Use $\pi = \frac{22}{7}$)
14. If diameter of a circle is increased by 40%, find by how much percentage its area increases?
15. The hour hand of a clock is 6 cm long. Find the area swept by it between 11:20 am and 11:55 am.

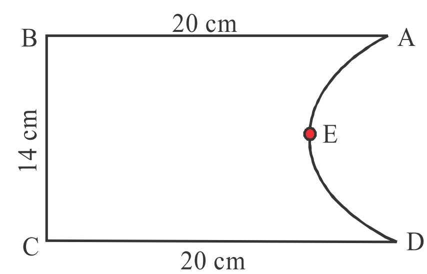
SHORT ANSWER TYPE I QUESTIONS

16. Find the area of a quadrant of a circle whose circumference is 22 cm.
17. What is the angle subtended at the centre of a circle of radius 10 cm by an arc of length 5π cm?
18. If a square is inscribed in a circle, what is the ratio of the area of the circle and the square?
19. Find the radius of semicircle if its perimeter is 18 cm.
20. If the perimeter of a circle is equal to that of square, then find the ratio of their areas.
21. What is the ratio of the areas of a circle and an equilateral triangle whose diameter and a side are respectively equal?

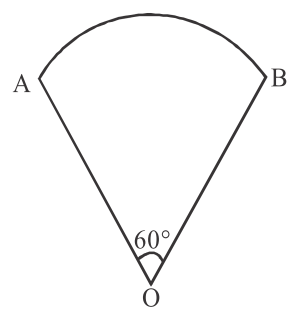
22. In fig., O is the centre of a circle. The area of sector OAPB is $\frac{5}{18}$ of the area of the circle. Find x.



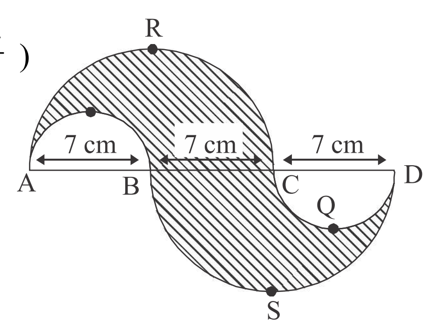
23. Find the perimeter of a given fig, where AED is a semicircle and ABCD is a rectangle.



24. In fig, is a sector of a circle of radius 10.5 cm. Find the perimeter of the sector.



25. In the given fig, APB and CQD are semi circles of diameter 7 cm each, while ARC and BSD are semicircles of diameter 14 cm each. Find the perimeter of the shaded region. (Use $\pi = \frac{22}{7}$)

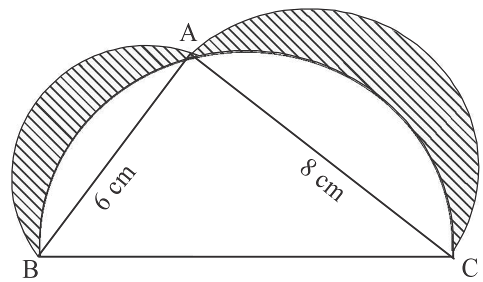


SHORT ANSWER TYPE II QUESTIONS

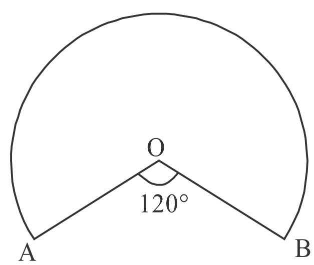
26. Area of a sector of a circle of radius 36 cm is $54\pi \text{ cm}^2$. Find the length of the corresponding arc of the sector.

27. The length of the minute hand of a clock is 5 cm. Find the area swept by the minute hand during the time period 6:05 am to 6:40 am.

28. In fig, ABC is a triangle right angled at A. Semi circles are drawn on AB, AC and BC as diameters. Find the area of the shaded region.



29. In fig, OAPB is a sector of a circle of radius 3.5 cm with the centre at O and $\angle AOB = 120°$. Find the length of OAPBO.



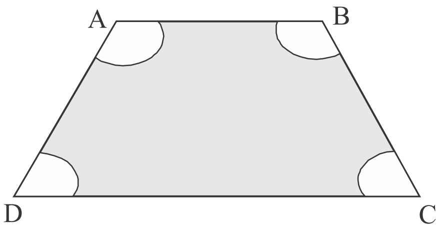
30. Circular footpath of width 2 m is constructed at the rate of Rs 20 per square meter, around a circular park of radius 1500 m. Find the total cost of construction of the foot path. (Take $\pi = 3.14$)

31. A boy is cycling such that the wheels of the cycle are making 140 revolutions per minute. If the diameter of the wheel is 60 cm. Calculate the speed of cycle.

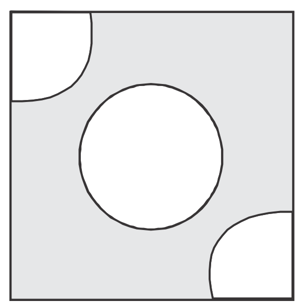
32. In a circle with centre O and radius 5 cm, AB is a chord of length $5\sqrt{3}$ cm. Find the area of sector AOB.

33. The area of an equilateral triangle is $49\sqrt{3} \text{ cm}^2$. Taking each angular point as centre, a circle is described with radius equal to half the length of the side of the triangle. Find the area of the triangle not included in the circle.

34. ABCD is a trapezium with AB||DC, AB= 18 cm, DC= 32 cm and the distance between AB and DC is 14 cm. Circles of equal radii 7 cm with centres A, B, C and D have been drawn, Then, find the area of the shaded region of the figure. $(\pi = \frac{22}{7})$

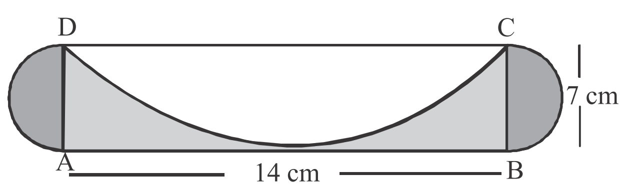


35. From each of the two opposite corners of a square of side 8 cm, a quadrant of a circle of radius 1.4 cm is cut. Another circle of radius 4.2 cm is also cut from the centre as shown in fig. Find the area of the shaded portion. (Use $\pi = \frac{22}{7}$)



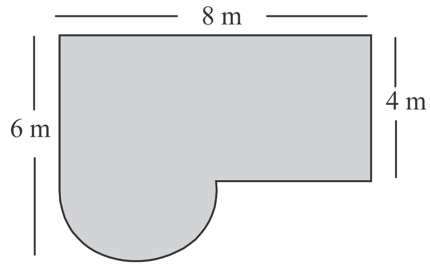
36. A sector of 100° cut off from a circle contains 70.65 cm². Find the radius of the circle. ($\pi = 3.14$)

37. In fig. ABCD is a rectangle with AB= 14 cm and BC= 7 cm. Taking DC, BC and AD as diameter, three semicircles are drawn. Find the area of the shaded portion.



38. A square water tank has its each side equal to 40 m. There are four semi circular grassy plots all around it. Find the cost of turfing the plot at Rs 1.25 per sq. m. (Use $\pi = 3.14$)

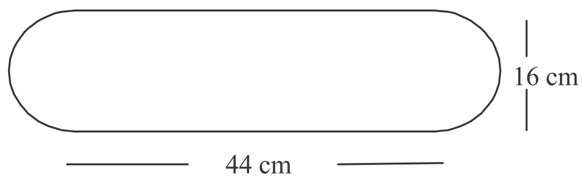
39. Find the area of the shaded region shown in the fig.



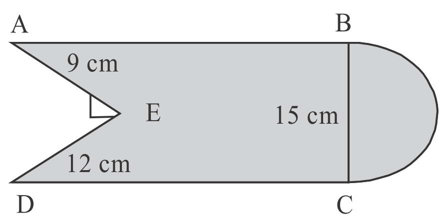
40. Find the area of the minor segment of a circle of radius28 cm, when the angle of the corresponding sector is 45°.

41. A piece of wire 11 cm long is bent into the form of an arc of a circle subtending an angle of 45° at its centre. Find the radius of the circle.

42. Find the area of the flower bed (with semicircular ends).

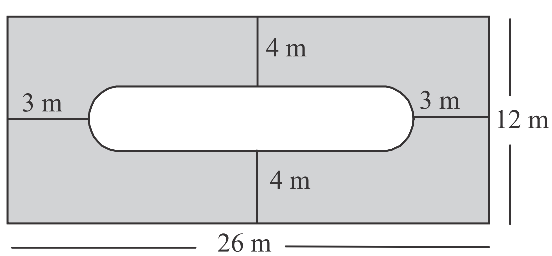


43. In fig. from a rectangular region ABCD with AB= 20 cm, a right triangle AED with AE= 9 cm and DE= 12 cm, is cut off. On the other end, taking BC as diameter, a semi circle is added on outside the region. Find the area of the shaded region.



44. The circumference of a circle exceeds the diameter by 16.8 cm. Find the radius of the circle.

45. Find the area of the shaded region.



LONG ANSWER TYPE QUESTIONS

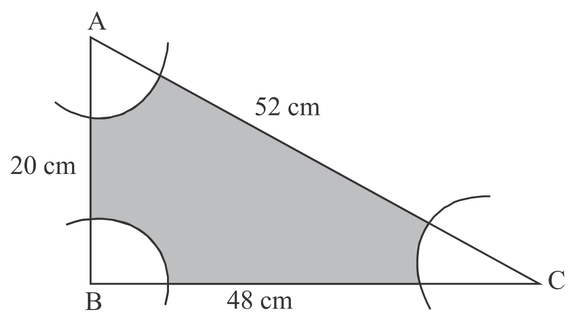
46. Two circles touch externally. The sum of their areas is 130π sq. cm and the distance between their centres is 14 cm. Find the radii of the circles.

47. Three circles each of radius 7 cm are drawn in such a way that each of their touches the other two. Find the area enclosed between the circles.

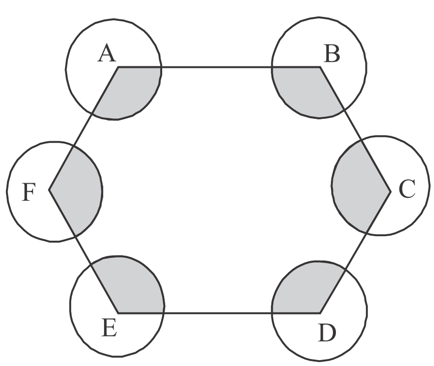
48. Find the number of revolutions made by a circular wheel of area 6.16 m^2 in rolling a distance of 572 m.

49. All the vertices of a rhombus lie on a circle. Find the area of the rhombus, if area of the circle is 2464 cm^2.

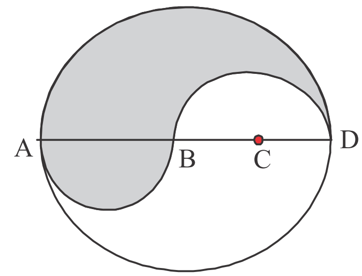
50. With vertices A, B and C of a triangle ABC as centres, arcs are drawn with radii 6 cm each in fig. If AB= 20 cm, BC= 48 cm and CA= 52 cm, then find the area of the shaded region. (Use π = 3.14)



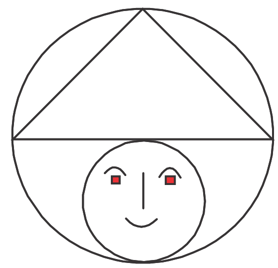
51. ABCDEF is a regular hexagon. With vertices A, B, C, D, E and F as the centres, circles of same radius 'r' are drawn. Find the area of the shaded portion shown in the given figure.



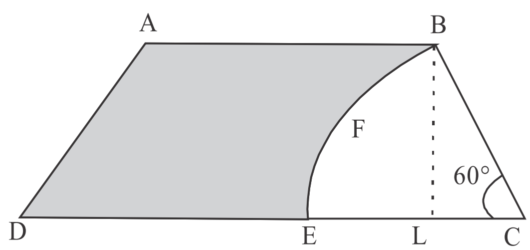
52. ABCD is a diameter of a circle of radius 6 cm. The lengths AB, BC and CD are equal. Semicircles are drawn on AB and BD as diameter as shown in the fig. Find the perimeter and area of the shaded region.



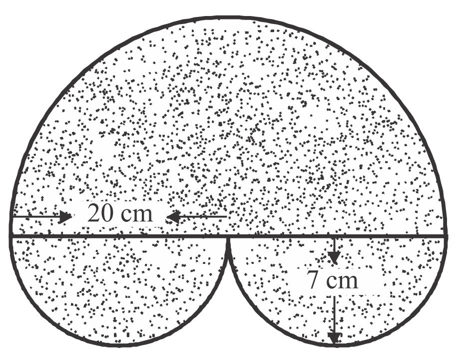
53. A poor artist on the street makes funny cartoons for children and earns his living. Once he made a comic face by drawing a circle within a circle, the radius of the bigger circle being 30 cm and that of smaller being 20 cm as shown in the figure. What is the area of the cap givn in this figure? What qualities of this artist are being reflected here?



54. In the given fig., ABCD is a trapezium with AB||CD and , $\angle BCD = 60°$, If BFEC is a sector of a circle with centre C and AB = BC = 7 cm and DE = 4 cm, then find the area of the shaded region. (Use $\pi = \frac{22}{7}$, $\sqrt{3} = 1.732$)



55. Find the area of the shaded region in the given figure.



ANSWERS

1. 36 cm	2. 4 units
3. $\frac{\pi a^2}{4}$ cm²	4. $\frac{1}{2}$ *lr* sq. units
5. 7000	6. 88 cm
7. 9π cm²	8. 50 cm
9. 3025 cm²	10. 90°
11. $\frac{8}{360} \times \pi r^2$	12. 4:9
13. 44 cm	14. 96%
15. 5.5 cm²	16. 9.625 cm²
17. 90°	18. $\pi : 2$ or 11 : 7
19. 3.5 cm	20. $4 : \pi$
21. $\pi : \sqrt{3}$	22. 100
23. 76 cm	24. 32 cm
25. 66 cm	26. 3π cm
27. $45\frac{5}{6}$ cm²	28. 24 cm²
29. 21.67 cm	30. Rs. 377051.2
31. 15.84 km/h	32. $\frac{25}{3}\pi$ cm²
33. 7.77 cm²	34. 196 cm²
35. 5.48 cm²	36. 9 cm
37. 59.5 cm²	38. Rs. 5140
39. $(32 + 2\pi)$ cm²	40. $(308 - 196\sqrt{2})$ cm²
41. 14 cm	42. $(704 + 64\pi)$ cm²
43. 334.31 cm²	44. 3.92 cm

45. $(248 - 4\pi)cm^2$

46. 11 cm and 3 cm

47. $7.87\ cm^2$

48. 65

49. $1568\ cm^2$

50. $423.48\ cm^2$

51. $2\pi r^2$

52. P = 37.71 cm
    A = $37.71\ cm^2$

53. $400\sqrt{2}$, Kind hearted, sensitive

54. $28.89\ cm^2$

55. $462\ cm^2$

Practice Test

Areas Related to Circles

Time: 50 minutes **M.M: 20**

SECTION-A

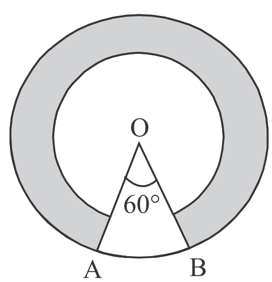
1. If the circumference of two circles are equal, then what is the ratio between their areas?
2. If the diameter of a protactor is 21 cm, then find its perimeter.

SECTION-B

3. Find the area of a circle whose circumference is 22 cm.
4. Find the area of a quadrant of a circle whose circumference is 44 cm.

SECTION-C

5. A horse is tied to a pole with 28 cm long string. Find the area where the horse can graze.
6. In fig. two concentric circles with centre O, have radii 21 cm and 42 cm. If $\angle AOB = 60°$ find the area of the shaded region. (Use $\pi = \frac{22}{7}$)



SECTION-D

7. A chord AB of a circle of radius 10 cm makes a right angle at the centre of the circle. Find the area of the minor and major segments.

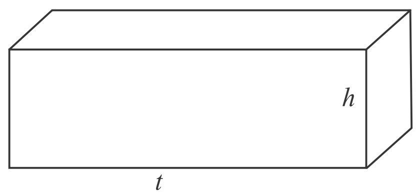
13

Chapter

Surface Areas and Volumes

Key Points

1. **Cuboid:** 3-D shapes like a book, a metch box , an almirah, a room etc. are called Cuboid.



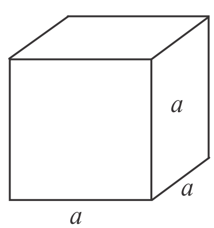
For cuboid = l, breadth = b, height = h

Volume = l × b × h

Lateral surface area = $2h(l + b)$

Total surface area = $2(lb + bh + hl)$

2. **Cube:** 3-D shapes like ice-cubes, dice atc. are called cube.



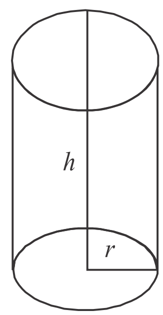
In cube, length = breadth = height = a

Volume = a^3

Lateral surface area = $4a^2$

Total surface area = $6a^2$

3. **Cylinder**: 3-D shapes like jars, circular pillars, circular pipes, rood rollers etc. are called cylinder.



(a) For right circular cylinder solid, base radius = $\boldsymbol{r}$, height = $\boldsymbol{h}$

Volume = $\boldsymbol{\pi r^2 h}$

Lateral surface area = $\boldsymbol{2\pi r h}$

Total surface area = $\boldsymbol{2\pi r (r + h)}$

(b) For right circular cylinder (Hollow)

external radius = R

internal radius = r

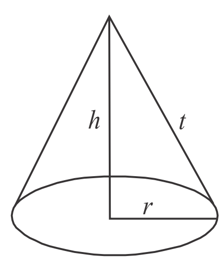
height = h

Volume = $\boldsymbol{\pi(R^2 - r^2)h}$

Curved surface area = $2\pi(\boldsymbol{R + r})\boldsymbol{h}$

Total surface area = $\boldsymbol{2\pi(R + r)\, h} + 2\pi(\boldsymbol{R^2} - \boldsymbol{r^2})$

4. Cone: 3-D shapes like conical tents, ice-cream cone are called Cone.



For right circular cone,

base radius = $\boldsymbol{r}$

height = $\boldsymbol{h}$

slant height = $\boldsymbol{l}$

$\boldsymbol{l} = \sqrt{h^2 + r^2}$

Volume = $\frac{1}{3}$ $\boldsymbol{\pi r^2 h}$

Curved surface area = $\boldsymbol{\pi r l}$

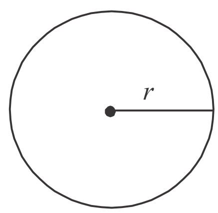
Total surface area = $\boldsymbol{\pi r (r + l)}$

It may be noted that

3 × volume of a cone = volume of right circular cylinder

$$\begin{bmatrix} \text{radius of cone and eylinder should be same} \\ \text{height of cone and cylinder should be same} \end{bmatrix}$$

5. **Sphere**: 3-D shapes like cricket balls, footballs etc. are called sphere.

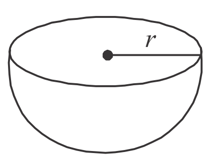


(a) For sphere : Radius = $\boldsymbol{r}$

Volume = $\frac{4}{3}\pi r^3$

surface area = $\boldsymbol{4\pi r^2}$

(b) For Hemisphere (solid): Radius = $\boldsymbol{r}$

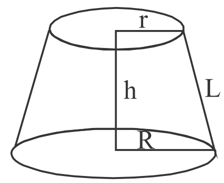


Volume = $\frac{2}{3}\pi r^3$

curved surface = $\boldsymbol{2\pi r^2}$

Total surface area = $\boldsymbol{3\pi r^2}$

6. **Frustum**: When a cone is cut by a plane parallel to the base of the cone, then the portion between the plane and the base is called the frustum of the cone.



Example = Turkish Cap

For a frustum of cone:

Base radius = R

Top radius = r

Height = h

slant height = l

$l = \sqrt{h^2 + (R-r)^2}$

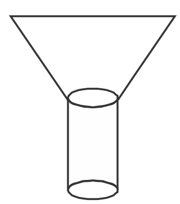
volume = $\frac{1}{3}\pi h(r^2 + R^2 + Rr)$

Curved surface area (solid frustum) = $\pi l(R + r)$

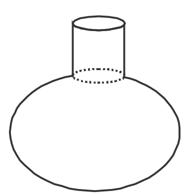
Total surface area (solid frustum) = $\pi l(R + r) + \pi(R^2 + r^2)$

VERY SHORT ANSWER TYPE QUESTIONS

1. What geometrical shapes is a "FUNNEL" combination of?

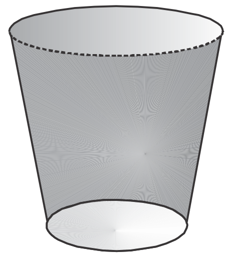


2. What geometrical shapes is a "SURAHI" combination of?

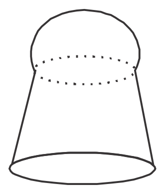


3. What geometrical shapes is a cylindrical "PENCIL" sharped at one edge combination of?

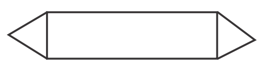
4. What geometrical shapes is a "GLASS (tumbler)"?



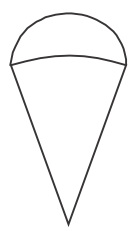
5. What geometrical shapes is a "SHUTTLE COCK" combination of?



6. What geometrical shapes is a "GILLI" in gilli-danda game combination of?



7. What geometrical shapes is a "PLUMBLINE" (SAHUL) use by masons combination of?



8. A solid shape is converted from one form ot another. What is the change in its volume?
9. What cross-section is made by a cone when it is cut parallel to its base?

   [Hint : Cross sectional area of top of frustum]
10. Find total surface area of a solid hemi-sphere of radius 7cm.
11. Volume of two spheres is in the ratio 64 : 125. Find the ratio of their surface areas.

12. A right circular cylinder of radius r cm and height h cm ($h > 2r$) just encloses a sphere. Find diameter of the sphere.
13. A cylinder and a cone are of same base radius and of same height. Find the ratio of the volumes of cylinder to that of the cone.
14. A solid sphere of radius r is melted and recast into the shape of a solid cone of height *r.* Find radius of the base of the cone.
15. Find the total surface area of a solid hemi-sphere of radius *r*.
16. If the volume and the surface area of a sphere are numerically equal, then find the radius of the sphere.
17. A cylinder, a cone and a hemisphere are of same base and have the same height. What is the ratio of their volumes?
18. If two solid hemi-spheres of same base radius *r* are joined together along their base, then find the total surface area of this new solid.
19. If the volume of a cube is 1331 cm^3, then find the length of its edge.
20. What does the "CAPACITY" for a hollow cylinder means?

SHORT ANSWER TYPE QUESTION (TYPE-I)

21. How many cubes of side 2 cm can be cut from a cuboid measuring ($16cm \times 12cm \times 10cm$).
22. Find the height of largest right circular cone that can be cut out of a cube whose volume is 729 cm^3.
23. Two identical cubes each of volume 64 cm^3 are joined together end to end. What is the surface area of the resulting cuboid?
24. Twelve solid spheres of the same sizes are made by melting a solid metallic cylinder of base diameter 2 cm and height 16cm. Find the radius of each sphere.
25. The diameters of the two circular ends of the bucket are 44 cm and 24 cm. The height of the bucket is 35cm. Find the volume of the bucket.

SHORT ANSWER TYPE QUESTION (TYPE-II)

26. Find the length of the longest rod that can be put in a room of $10m \times 10m \times 5m$ dimensions.
27. Find surface area of a cube whose volume is 1000 cm^3.

28. The volume of two hemi-sphere are in the ratio 8:27. Find the ratio of their radii.

29. Find the curved surface area and the total surface area of a solid cone whose height is 28 cm and radius is 21 cm.

30. A bucket is in the form of a frustum of a cone and holda 28.490 litres of water. The radii of the top and bottom are 28 cm and 21 cm respectively. Find the height of the bucket.

31. Three cubes of a metal whose edge are in the ratio 3:4:5 are melted and converted into a single cube whose diagonal is $12\sqrt{3}$ cm. Find the edge of three cubes.

32. Find the depth of a cylindrical tank of radius 10.5 cm, if its capacity is equal to that of a rectangular tank of size 15 cm × 11 cm × 10.5 cm.

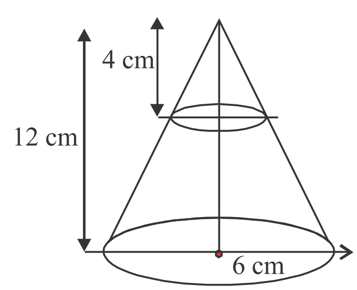
33. A cone of radius 8cm and height 12cm is divided into two parts by a plane through the mid-point of its axis parallel to its base. Find the ratio of the volumes of the two parts.

34. A petrol tank is a cylinder of base diameter 28cm and length 24cm filted with conical ends each of axis length 9cm. Determine the capacity of the tank.

LONG ANSWER TYPE QUESTIONS

35. In the given figure, from the top of a solid cone of height 12cm and base radius 6cm, a cone of height 4 cm is removed by a plane parallel to the base. Find the total surface area of the remaining solid.

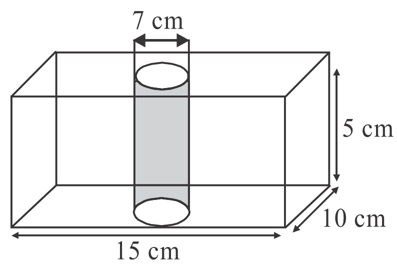
(Use $\pi = \dfrac{22}{7}$ and $\sqrt{5} = 2.236$)



36. A solid wooden toy is in the form of a hemi-sphere surmounted by a cone of same radius. The radius of hemi-sphere is 3.5cm and the total wood used in the making of toy is $166\frac{5}{6}$ cm^3. Find the height of the toy. Also, find the cast of painting the hemi-spherical part of the toy at the rate of Rs. 10 per cm^2.

(use $\pi = \frac{22}{7}$).

37. In the given figure, from a cuboidal solid metalic block of dimensions 15 cm × 10 cm × 5 cm a cylindrical hole of diameter 7cm is drilled out. Find the surface area of the remaining block. (Use $\pi = \frac{22}{7}$).



38. Water is flowing at the rate of 2.52 km/hr. through a cylindrical pipe into a cylindrical tank, the radius of whose base is 40 cm. If the increase in the level of water in the tank, in half an hour is 3.15m, find internal diameter of the pipe.

39. A solid toy is the form of a right circular cylinder with a hemispherical shape at one end and a cone at the other end. Their coameter is 4.2 cm and the heights of the cylindrical and conical portions are 12 cm and 7 cm respectively. Find the voluem of the toy.

40. A tent is in the shape of a right circular cylinder upto a height of 3m and conical above it. The total height of the tent is 13.5 m and radius of base is 14 m. Find the cost of cloth required to make the tent at the rate of ₹ 80 per sq. m.

41. The rain water from a roof 22m × 20m drains into a cylindrical vessel having diometer of base 2m and height 3.5m. If the vessel is just full, find the rainfall in cm.

42. A container, shaped like a right circular cylinder, having diameter 12cm and height 15 cm is full of ice-cream. this ice-cream is to be filled into cones of height 12 cm and diameter 6 cm, having a hemispherical shape on the top. Find the number of such cones which can be filled with ice-cream.

43. The difference between outer and inner clowed surface areas ofa hollow right circular cylinder, 14 cm long is $88cm^2$. If the volume of the metal used in making the cylinder is $176cm^3$. Find the outer and inner diameters of the cylinder.

44. A toy is in the shape of a right circular cylinder with a hemisphere on one end and a cone on the other. The radius and height of the cylindrical part are 5 cm and 13 cm respectively. The radii of hemispherical and parts are the same as that of the cylindrical part. Find the surface area of the toy if the total height of the toy is 30 cm.

45. A hollow cone is cut by a plane parallel to the base and the upper portion is removed. If the curved surface of the remainder is $\frac{8}{9}$th of the curved surface of the whole cone, find the ratio of the line segmens into which the altitude of the cone is divided by the plane.

ANSWERS

1.	Cylinder, Frustum	2.	Cylinder, Sphere
3.	Cylinder, Cone	4.	Frustum
5.	Hemi-sphere, Frustum	6.	Cylinder with Conical ends
7.	Hemi-sphere, Cone	8.	Remains Uncharged
9.	Circle	10.	462 cm^2
11.	16:25	12.	$2r$
13.	3:1	14.	$2r$
15.	$3\pi r^2$	16.	3 units
17.	3:1:2	18.	$4\pi r^2$
19.	11 cm^2	20.	Volume
21.	240	22.	9 cm
23.	160 cm^2	24.	1 cm
25.	32706.6 cm^3	26.	15 m
27.	600 cm^2	28.	2:3
29.	C.S.A = 2310 cm^2 T.S.A = 3696 cm^2	30.	15 cm
31.	6 cm, 8 cm, 10 cm	32.	5 cm
33.	1:7 or 7:1	34.	18480 cm^3
35.	350.592 cm^2	36.	h = 6 cm, Rs. 770
37.	583 cm^2	38.	4 cm
39.	218.064 cm^3	40.	Rs. 82720
41.	2.5 cm	42.	10
43.	5 cm, 3 cm	44.	770 cm^2
45.	1 : 2		

Practice Test

Surface Areas and Volumes

Time: 50 minutes **M.M: 20**

SECTION-A

1. What is the formula for total surface area of a solid hemi-sphere?
2. What geometrical shapes is a "FUNNEL" combination of?
3. A clyindrical boiler is 2 m high and has 3.5m radius. Find its volume.
4. What is the formula for total surface area of a bucket?

   [Hint: bucket is in shape of frustum]
5. What will be the volume of the largest right circular cone that can be cut from a cube of edge 4.2 cm.
6. Find the volume of a frustum of a cone whose height is 4 m and radii of the ends are 7 m amd 4 m.
7. Show that the ratio of the volumes of a cylinder, a cone and a hemi-sphere of same base and same height is 3:1:2.
8. Two solid metallic cubes of sides 40cm and 30cm are melted together recast into 5824 equal solid cubical dice. Determine the side of the cubical dice.

14

Chapter

Statistics

Basic Concepts

1. The Mean for grouped data can be found by:

(i) The direct method $\overline{X} = \frac{\Sigma f_i x_i}{\Sigma f_i}$

(ii) The assumed mean method

$$\overline{X} = a + \frac{\Sigma f_i d_i}{\Sigma f_i} \text{ where } d_i = x_i - a$$

(iii) The Step deviation method

$$\overline{X} = a + \frac{\Sigma f_i d_i}{\Sigma f_i} \times h \text{ where } u_i = \frac{x_i - a}{h}$$

2. The mode for the grouped data can be found by using the formule

$$\text{Mode} = l + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right] \times h$$

l = Lower limit of the modal class

f_1 = frequency of the modal class.

f_0 = frequency of the preceding class of the modal class

f_2 = frequency of the succeeding class of the modal class

h = Size of the class interval

Modal class - class interval with highest frequency

3. The median for the grouped data can be found by using the formula

$$\text{median} = l + \left(\frac{\frac{n}{2} - cf}{f}\right) \times h$$

l = lower limit of the median class

n = number of observations

cf = cumulative frequency of class interval preceed the median class

f = frequency of median class

h = class size

VERY SHORT ANSWER TYPE QUESTIONS

1. What is the mean of first 12 prime numbers?

2. The mean of 20 numbers is 18. If 2 is added to each number, what is the new mean?

3. the mean of 5 observations 3, 5, 7, x and 11 is 7, find the value of x.

4. What is the median of first 10 natural numbers?

5. What is the value of x, if the median of the following data is 27.5?
24, 25, 26, $x + 2$, $x + 3$, 30, 33, 37

6. what is the mode of the observations 5, 7, 8, 5, 7, 6, 9, 5, 10, 6.

7. Write the relation between mean, median and mode.

8. What measure of the central tendency is represented by the abscissa of the point whers 'less than' and 'more than' intersect?

9. Which measure of the central tendency cannot be determined graphically.

10. The arithmetic mean and mode of a data are 24 and 12 respectively. Find the median

11. Write the class mark of the class 19.5 – 29.5.

12. The mean of 5 numbers is 18. If one number is excluded then their mean is 16. Find the excluded number.

13. The mean of 11 observation is 50. If the mean of first Six observations is 49 and that of last six observation is 52, then find sixth observation.

14. Find the mean of following distribution

x	12	16	20	24	28	32
f	5	7	8	5	3	2

15. Find the median of the following distribution

x	10	12	14	16	18	20
f	3	5	6	4	4	3

16. Find the mode of the following frequency distribution.

Class	0–5	5–10	10 –15	15–20	20–25	25–30
Frequency	2	7	18	10	8	5

17. Draw a 'less than' ogive of the following data

Marks	No. of students
Less than 20	0
Less than 30	4
Less than 40	16
Less than 50	30
Less than 60	46
Less than 70	66
Less than 80	82
Less than 90	92
Less than 100	100

18. Write the following data into less than cummulative frequency distribution table.

Marks	0–10	10–20	20–30	30–40	40–50
No. of students	7	9	6	8	10

SHORT ANSWER TYPE QUESTIONS (II)

19. Find the mean of the following data

C. I	0–10	10–20	20–30	30–40	40–50
f	8	12	10	11	9

20. If the mean of the following distribution is 54, find the value of P.

Class	0–20	20–40	40–60	60–80	80–100
Frequency	7	p	10	9	13

21. Find the median of the following frequency distribution.

C.I.	0–10	10–20	20–30	30–40	40–50	50–60
f	5	3	10	6	4	2

22. The median of following frequency distribution is 24. Find the missing frequency x.

Age (In years)	0–10	10–20	20–30	30–40	40–50
No. of persons	5	25	x	18	7

23. Find the median of the following data.

Marks	Below 10	Below 20	Below 30	Below 40	below 50	Below 60
No. of student	0	12	20	28	33	40

24. Draw *a* 'more than type' 0 give of the following data

Weight (In kg.)	30–35	35–40	40–45	45–50	50–55	55–60
No. of Students	2	4	10	15	6	3

25. Find the mode of the following data.

Height (In cm)	Above 30	Above 40	Above 50	Above 60	Above 70	Above 80
No. of plants	34	30	27	19	8	2

LONG ANSWER TYPE QUESTIONS

26. The mean of the following data is 53, Find the values of f_1 and f_2.

C.I	0–20	20–40	40–60	60–80	80–100	Total
f	15	f_1	21	f_2	17	100

27. The mean of the following distribution is 57.6 and the sum of its frequencies is 50, find the missing frequencies 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

28. 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	8	x	15	y	5	60

29. The median of the following distribution is 35, find the values of a and b.

C.I	0–10	10–20	20–30	30–40	40–50	50–60	60–70	Total
f	10	20	a	40	b	25	15	170

30. Find the mean, median and mode of the following data

C.I	45–55	55–65	65–75	75–85	85–95	95–105	105–115
f	7	12	17	30	32	6	10

31. Find the mean, median and mode of the following data

C.I	1–15	16–20	21–25	26–30	31–35	36–40	41–45	46–50
f	2	3	6	7	14	12	4	2

32. The rainfall recorded in a city for 60 days is given in the following table.

Raifall (In cm)	0–10	10–20	20–30	30–40	40–50	50–60
No. of Days	16	10	8	15	5	6

Calulate the median rainfall using a more than type ogive. Why is water conseruation recessary?

33. Find the mean of the following distribution by step- deviation method

Daily Exponditure	100–150	150–200	200–250	250–300	300–350
No. of Households	4	5	12	2	2

34. The distribution given below show the marks of 100 students of a class.

Marks	**No. of students**
0–5	4
5–10	6
10–15	10
15–20	10
20–25	25
25–30	22
30–35	18
35–40	5

Draw a less than type and a more than type ogive from the given data. Hence obtain the median marks from the graph.

35. The annual profit earned by 30 factories in an industrial area is given below. Draw both ogives for the data and hence find the median.

Profit (Rs. in lakh)	No. of Factories
More than or equal to 5	30
More than or equal to 10	28
More than or equal to 15	16
More than or equal to 20	14
More than or equal to 25	10
More than or equal to 30	7
More than or equal to 35	3
More than or equal to 40	0

ANSWERS

1. 16.4	**2.** 20
3. 9	**4.** 3
5. $x = 25$	**6.** 5
7. Mode = 3 median – 2 mean	**8.** Median
9. Mean	**10.** Median = 20
11. 24.5	**12.** 26
13. 56	**14.** 20
15. 14	**16.** 12.89

17.

Marks	**No. of students**
less than 10	7
less than 20	16
less than 30	22
less than 40	30
less than 50	40

19. 25.2	**20.** 11
21. 27	**22.** 25
23. 20	**25.** 63.75
26. $f_i = 18, f_2 = 29$	**27.** $f_i = 8, f_2 = 10$
28. $x = 20, y = 7$	**29.** $a = 35, b = 25$

30. mean = 81.05, median = 82, mode = 85.71

31. Mean = 32, median = 33, mode = 34.38

32. Median = 25	**33.** Mean = 211
34. Median = 24	**35.** Median = 17.5

Practice-Test

Statistus

MM: 20 ***Time : 1 hr***

1. What is the class mark of a class $a - b$ **1**

2. Find the mean of all the even numbers between 11 and 21. **1**

3. The mean of 50 observations is 20. If each observation is multiplied by 3, then what will be the new mean? **2**

4. The mean of 10 observations is 15.3. If two observations 6 and 9 are replaced by 8 and 14 respectively. Find the new mean. **2**

5. Find the mode: **3**

Marks	less than 20	less than 40	less than 60	less than 80	less than 100
No. of Students	4	10	28	36	50

6. Find the missing frequency, if the mode is given to be 58. **3**

Age (in yers)	20–30	30–40	40–50	50–60	60–70	70–80
No. of patients	5	13	x	20	18	19

7. The mean of the following frequency distribution is 57.6 and the number of observations is 50. Find the missing frequencies f_1 & f_2. **4**

Class	0–20	20–40	40–60	60–80	80–100	100–120
frequency	7	f_1	12	f_2	8	5

8. Following is the age distribution of cardiac patients admitted during a month in a hospital: **4**

Age (in yers)	20–30	30–40	40–50	50–60	60–70	70–80
No. of patents	2	8	15	12	10	5

Draw a 'less than type' and 'more than type' ogives and from the curves, find the median. **4**

❑❑❑

15

Chapter

Probability

Key Points

1. The Theoretical probability of an event E written as P(E), is defined as.

   $$P(E) = \frac{\text{Number of outcomes favourable to E}}{\text{Number of all possible outcomes of the experiment}}$$

   Where the outcomes of the experiment are equally likely.
2. The sum of the probability of all the elementary events of an experiment is 1.
3. The probability of a sure event is 1 and probability of an impossible event is 0
4. $P(E) + P(\overline{E}) = 1$
5. The probability of an event E is a number P(E) such that .
6. A pack of cards consists of 52 cards which are divided into 4 suits of 13 cards each spades ♠, hearts ♥, diamonds ♦ and clubs ♣. Clubs and spades are of black colour, while hearts and diamonds are of red colour.
7. The cards in each suit are ace, king, queen, jack, 10, 9, 8, 7, 6, 5, 4, 3 and 2.
8. Kings, queens and jacks are called face cards. Thus there are 12 face cards in a deck of cards.

VERY SHORT ANSWER QUESTIONS

1. Find the probability of getting one head if a coin is thrown twice.
2. One card is drawn at random from a pack of cards. Find the pobability of getting jack.
3. One card is drawn at random from a pack of cards. Find the pobability of getting a diamond card.
4. A die is thrown once. What is the probability of getting an even prime number?
5. A die is thrown twice. What is the probability that the same number will come up either time.

6. In a leap year what is the probability of 53 Sundays.
7. One card is drawn from the well shuffled pack of 52 cards. Find the probability of getting a black face card.
8. If P(E) = 27% then what is the probability of not occurrence of even P?
9. Usha and Aastha are two friends. What is the probability that their birthday falls on the same day 14 November 2015?
10. One alphabet is chosen out of the alphabets of the word "BHARTIYA". What will be the probability of getting a vowel?
11. Two friends were born in the year 2000. What is the probability that they both have the same birthday.
12. A die is thrown once. What is the probability of getting a prime number?
13. A bag contains 6 red and 5 blue balls. One ball is drawn at random from the bag. Find the probability that the ball drawn is blue.
14. A pair of dice is thrown once. What is the probability of getting the sum on both the die as 11.
15. In a non - leap year, what is the probability of 53 Mondays?

VERY SHORT ANSWER QUESTIONS

16. A card is drawn at random from a pack of 52 playing cards. Find the probability that the card drawn is neither an ace nor a king.
17. Out of 250 bulbs in a box, 35 bulbs are defective. One bulb is taken out at random from the box. Find the probability that the drawn bulb is not defective.
18. Non Occurance of any event is 3:4. What is the probability of Occurance of this event?
19. If 29 is removed from (1, 4, 9, 16, 25, 29) then find the probability of getting a prime number.
20. A card is drawn at random from a deck of playing cards. Find the probability of getting a face card.
21. In 1000 lottery tickets there are 5 prize winning tickets. Find the probability of winning a prize if a person buys one ticket.
22. One card is drawn at random from a pack of cards. Find the probability that it is a black card.

23. A die is thrown once. Find the probability of getting a perfect square.

24. Two dice are rolled simultaneously. Find the probability that the sum of the two numbers appearing on the top is more than and equal to 10.

25. Find the probability of multiples of 7 in 1, 2, 3, ...,33, 34, 35.

Long Answer Type Questions

26. Cards marked with numbers 3, 4, 5, ...,50 are placed in a box and and mixed thoroughly. One card is drawn at random from the box, find the probability that the number on thedrawn card is

    (i) divisible by 7 (ii) a number, which is a perfect sqaure

27. A bag contains 5 white balls, 7 red balls, 4 black balls and 2 blue balls. One ball is drawn at random from the bag. Find the probability that the balls drawn is

    (i) White or blue (ii) red or black

    (iii) not white (iv) neither white nor black

28. The king, queen and jack of diamonds are removed from a pack of 52 playing cards and the pack is well shuffled. A card is drawn from the remaining cards.

    Find the probability of getting a card of

    (i) diamond (ii) a jack

29. The probability of winning a game is $\frac{x}{12}$. The probabilty of losing it is $\frac{1}{3}$. Find the value of x.

30. In a lottery, there are 10 prizes and 25 are empty. Find the probability of getting a prize. Also verify that. $P(E) + P(\bar{E}) = 1$ for this event

31. The probability of a defective egg in a lot of 400 eggs is 0.035. Calculate the number of defective eggs in the lot. Also calculate the probability of taking out a non defective egg from the lot.

32. In a fair at a game stall, slips marked with numbers 3,3,5,7,7,7,9,9,9,11 are placed in a box. A person wins if the mean of numbers are written on the slip. What is the probabilty of his losing the game?

33. A box contains 90 discs which are numbered from 1 to 90. If one disc is drawn at random from the box, find the probability that it bears

    (i) a two digit number (ii) a perfect square number

    (iii) a number divisible by 5.

34. A card is drawn at randown from a well shuffled deck of playing cards. Find the probability that the card drawn is

(i) a card of spade or an ace (ii) a red king

(iii) neither a king nor a queen (iv) either a king or a queen

35. A card is drawn from a well shuffled deck of playing cards. Find the probability that the card drawn is

(i) a face card

(ii) red colour face card

(iii) black colour face card

36. In a class discussion, Himanshu says that probability of an event cannot be 1.3. which value is depicted here?

37. $P(E) + P(\bar{E}) = 1$ which value is depicted by this statement?

38. Ramesh got Rs. 24000 as Bonus. He donated Rs. 5000 to temple. He gave Rs. 12000 to his wife, Rs. 2000 to his servant and gave rest of the amount to his daughter. Calculate the probability of

(i) wife's share

(ii) Servant's Share

(iii)daughter's share.

(iv)Which values are depicted by Ramesh?

39. 240 students reside in a hostel. Out of which 50% go for the yoga classes early in the morning, 25% go for the Gym club and 15% of them go for the morning walk. Rest of the students have joined the laughing club. What is the probability of students who have joined laughing club? Which value is depicted by the students?

ANSWERS

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

2. $\frac{1}{13}$

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

4. $\frac{1}{6}$

5. $\frac{1}{6}$

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

7. $\frac{3}{26}$

8. $\frac{73}{100}$

9. $\frac{1}{365}$

10. $\frac{3}{8}$

11. $\frac{1}{366}$

12. $\frac{1}{2}$

13. $\frac{5}{11}$

14. $\frac{1}{18}$

15. $\frac{1}{7}$

16. $\frac{11}{13}$

17. $\frac{43}{50}$

18. $\frac{4}{7}$

19. 0

20. $\frac{3}{13}$

21. 0.005

22. $\frac{1}{2}$

23. $\frac{1}{3}$

24. $\frac{1}{6}$

25. $\frac{1}{7}$

26. $\frac{7}{16}, \frac{1}{4}$

27. $\frac{7}{18}, \frac{11}{18}, \frac{13}{18}, \frac{1}{2}$

28. $\frac{10}{49}, \frac{3}{49}$

29. 8

30. $\frac{2}{7}$

31. 14, 0.965

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

33. $\frac{9}{10}, \frac{1}{10}, \frac{1}{5}$

34. (*i*) $\frac{4}{13}$ (*ii*) $\frac{1}{26}$ (*iii*) $\frac{11}{13}$ (*iv*) $\frac{2}{13}$

35. (*i*) $\frac{3}{13}$ (*ii*) $\frac{3}{26}$ (*iii*) $\frac{3}{26}$

36. Logical value

37. Understanding, logical reasoning

38. (*i*) $\frac{1}{2}$ (*ii*) $\frac{1}{12}$ (*iii*) $\frac{5}{24}$ Social value, Religious value

39. $\frac{1}{10}$, Physical fitness

Practice-Test

Probability

Time: 50 minutes **M.M: 20**

SECTION-A

1. A die is thrown once. find the probability of getting an odd number.
2. A bag contains 4 red and 6 black balls. one ball is drawn from the bag at random. Find the probability of getting a black ball.

SECTION-B

3. Find the probability of having 53 friday in a year.
4. One card is drawn at random from the well shuffled pack of 52 cards. Find the probability of getting a black face card or a red face card.

SECTION-C

5. A box contains 5 Red, 4 green and 7 white marbles. One marbles is drawn at random from the box. What is the probability that marble is

   (i) not white (ii) neither red nor white
6. A die is thrown once. find the probability that the number.

   (i) is an even prime number (ii) is a perfect square

SECTION-D

7. A box contains cards numbered 1,3,5,........,35. Find the probability that tha card drawn is

   (i) a prime number less than 15 (ii) divisible by both 3 and 15
8. From a deck of 52 playing cadrs, king, queen and jack of a club are removed and a card is drawn from the remaining cards. Find the probabiliy that the card drawn is

   (i) a spade (ii) a queen (iii) a club

GENERAL VALUES FOR VALUE BASED QUESTIONS

1. Honesty
2. Punctuality, Dscripline
3. Humanity
4. Gender Equality
5. Eco friendly / Environment loving
6. Hard work
7. Logical Reasoning
8. Knowledge
9. Love and Care
10. Sportsmanship
11. Healthy Competition / Team Spirit
12. Ambition
13. Courage
14. Equality
15. Economic Value / Habit of Saving
16. Social Value
17. Religious Value
18. Co-operation
19. Unity
20. Health Awareness

❑❑❑

Sample Paper-I

Tentative Paper, Marking Scheme may change as per guidelines of CBSE)

Time : 3 hours **Max , Marks : 80**

General Instructions

(*i*) All questions are compulsory.

(*ii*) The question paper consists of 30 questions, divided into four sections—A, B, C & D

(*iii*) Section A contains 6 questions of 1 mark each, section B contains 6 questions of 2 marks each, Section C contains 10 questions of 3 marks each and Section D contains 8 questions of 4 marks each.

(*iv*) Use of calculator is not permitted.

SECTION-A

1. If one zero of quadratic polynomial $x^2 - x - (2 + 2k)$ is -4, find the value of K.

2. If $\Delta ABC \sim \Delta RQP$, $\angle A = 80°$ & $\angle B = 60°$ what is the value of $\angle P$?

3. A ladder 15m long just reaches the top of a vertical wall. If the ladder makes an angle of 60° with the wall. Find the height of the wall.

4. Total surface area of a cube is 216 cm^2. what will be its volume?

5. If the probability of winning a game is 0.995 then what will be the probability of losing a game?

6. What is the ordinate of a point on x axis?

SECTION-B

7. Find the sum of first 23 terms of an A.P. 7, $10\frac{1}{2}$, 14 ....

8. A card is drawn at random from a well shuffled deck of 52 cards, find the probability that card drawn is neither a red card nor a queen.

9. If the points A(4, 3) & B(x, 5) are on the circle with the center 0(2, 3), find the value of x.

10. Simplify $(\text{Sec}\ \theta + \tan\theta)(1 - \text{Sin}\ \theta)$

11. Prove that $\text{Sec}^2\,\theta + \text{Cot}^2\,(90 - \theta) = 2\,\text{Cosec}^2\,(90 - \theta) - 1$

12. If H.C.F. (306, 144) = 18, find the LCM.

SECTION-C

13. Prove that $\dfrac{2\sqrt{3}}{5}$ is an irrational number.

14. If polynomial $f(x) = x^4 - 3x^3 - x^2 + 9x - 6$ has two zeroes as $-\sqrt{3}, \sqrt{3}$ find all zeroes of the polynomial

Or

If one zero of $2x^2 + px - 15$ is -5 and zeroes of $p(x^2 + x) + k$ are equal to each other, find the value of p & k.

15. For what value of a & b, the following pair of linear equation represents the coincident lines

$2x + 3y = 7$

$a(x + y) - b\,(x - y) = 3a + b - 2$

16. Find the value of P such that the quadratic equation $(p - 12)x^2 - 2(p - 12)x + 2 = 0$ has equal roots.

Or

Solve the equation for x :

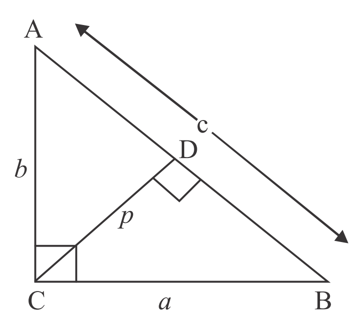
$$\frac{x+3}{x-2} - \frac{(1-x)}{x} = \frac{17}{x}$$

17. Find the sum of all 3 digit nos. which leaves the same remainder 2 when divided by 5.

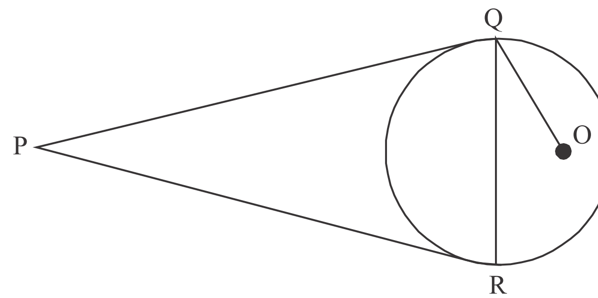
18. In the given figure, ΔABC is right angled at C If BC = a, CA = b, AB = C & P is the length of perpendicular drawn from C to AB then prove that—

(i) $cp = ab$

(ii) $\dfrac{1}{p^2} = \dfrac{1}{a^2} + \dfrac{1}{b^2}$



19. In the given figure, two tangents PQ & PR are drawn to a circle with centre O from an external point P. Prove that $\angle QPR = 2\angle OQR$



20. The length of a rope by which a cow is tethered to one end, of a corner of rectangle increased from 16m to 23m. How much additional area can the cow graze now? $\left[\text{Use } \pi = \frac{22}{7}\right]$

21. A solid wooden toy is in the form of a cone mounted on a hemisphere. If the radii of hemisphere and base of cone are 4.2 cm each and the total height of toy is 10.2 cm, find the volume of wood used in the toy. Also, find the total surface area of toy.

22. The mean of following distribution is 50, find the values of f_1, f_2—

Class interval	0–20	20–40	40–60	60–80	80–100	Total
Frequency	17	f_1	32	f_2	19	120

SECTION-D

23. From a window, 60m high above the ground of a house in a street, the angles of elevation & depression of the top & foot of another house on the opposite side of the street are 60° & 45° respectively. Show that the height of the opposite house is $60(1+\sqrt{3})$ metres.

Or

Prove that $\dfrac{1}{\sec\theta - \tan\theta} - \dfrac{1}{\cos\theta} = \dfrac{1}{\cos\theta} - \dfrac{1}{\sec\theta + \tan\theta}$.

24. The taxi charges in a city comprise of a fixed charge together with the charge for the distance covered. For a journey of 10 km, the charges paid are Rs. 75 and for a journey of 15 km, the charges paid are Rs. 110. What will a person have to pay for travelling a distance of 25 km?

Or

If two pipes functions simultaneously, a reservoir will be filled in 12 hours. First pipe fills the reservoir 10 hours faster than the second pipe. How many hours will the second pipe take to fill the reservoir.

25. Construct ΔABC in which AB = 5 cm, $\angle B$ 60° & the altitude CD = 3 cm then construct another Δ whose sides are $\frac{4}{5}$ times the corresponding sides of ΔABC.

26. A bucket is in the form of a frustrum of a cone of height is 30 cm with radii of its lower and upper ends as 10 cm and 20 cm respectively. Find the capacity of the bucket. Also, find the cost of milk which can completely fill the container, at the rate of Rs. 25 per liter (Take $\pi = 3.14$)

27. A jar contains 24 marbles, some are green and others are blue. If a marble is drawn at random from the jar, the probability that it is green is 2/3. Find the number of blue marbles.

28. State and prove pythagoras theorem

Or

Prove that the tangent at any point of acircle is perpendicular to the radius through the point of contact.

29. The distribution given below shows the marks of 100 students of a class—

Marks	*No. of Students*
0–5	4
5–10	6
10–15	10
15–20	10
20–25	25
25–30	22
30–35	18
35–40	5

Drow a less than type and a more than type ogive from the given data. Hence obtain the median marks from the graph.

30. Find the area of triangle formed by joining the midpoints of the sides of the triangle whose vertices (0, + 1) (2, 1) & (0, 3), find the ratio of this area to the area of given triangle.

SOLUTION TO SAMPLE QUESTION PAPER-1

SECTION-A

1. One zero of

$x^2 - x - (2 + 2k)$ is -4

$\therefore \ (-4)^2 - (-4) - (2 + 2k) = 0$

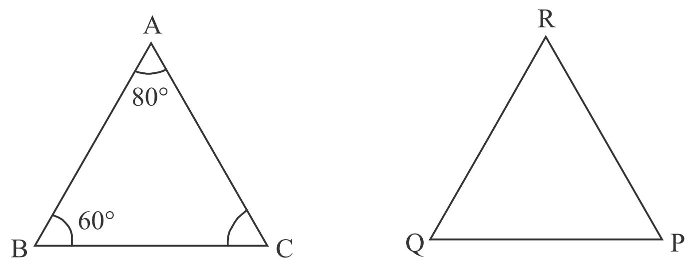
$\Rightarrow \ 16 + 4 - 2 - 2k = 0$

$\Rightarrow \ 18 - 2k = 0$

$\Rightarrow \ -2k = -18$

$\Rightarrow \ k = 9$

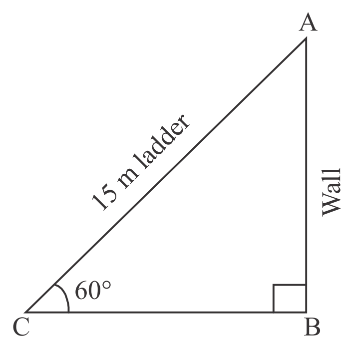
2.



$\therefore \ \Delta ABC \sim \Delta RQP$

$$\begin{aligned}\Rightarrow \ \angle P = \angle C &= 180 - (\angle A + \angle B)\\ &= 180 - (80° + 60°)\\ &= 180 - 140\\ &= 40°\end{aligned}$$

3. In ΔABC,



$$\text{Sin } 60° = \frac{h}{15}$$

$$\Rightarrow \quad \frac{\sqrt{3}}{2} = \frac{h}{15}$$

$$\Rightarrow \quad 2h = 15\sqrt{3}$$

$$\Rightarrow \quad h = \frac{15\sqrt{3}}{2}$$

$\therefore$ Height of the wall $= \dfrac{15\sqrt{3}}{2}$ m

4. Total surface area of cube = 216 cm^2

$$\Rightarrow \quad 6a^2 = 216$$

$$\Rightarrow \quad a^2 = \frac{216}{2} = 36$$

$$\Rightarrow \quad a = \sqrt{36} = 6\text{cm}$$

Volume of cube = $a^3 = 6^3 = 216$ cm^3

5.

$$\begin{aligned} P(E) &= 0.995 \\ P(E) &= 1 - P(E) \\ &= 1 - 0.995 \\ &= 0.005 \end{aligned}$$

6. The ordinate of a point on x-axis is 0.

SECTION-B

7. A.P. is 7, $10\frac{1}{2}$, 14, ...

$$\begin{aligned} a &= 7, d = \frac{21}{2} - 7 = \frac{7}{2} \\ S_n &= \frac{n}{2}[2a + (n-1)d] \\ S_{23} &= \frac{23}{2}\left[14 + \cancel{22}^{11} \times \frac{7}{\cancel{2}}\right] \\ &= \frac{23}{2}[14 + 77] \\ &= \frac{23}{2} \times 91 \\ &= \frac{2093}{2} \end{aligned}$$

8. n(s) = 52

Red Cards = 26

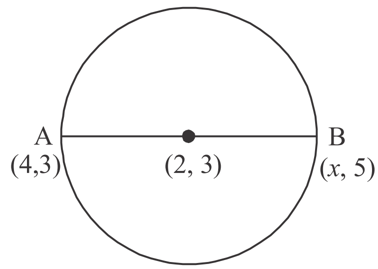
Black Queens = 02

Let A denotes the no. of cards neither Red nor black card queens

$\therefore \; n(A) = 52 - 26 - 02 = 24$

$$p(A) = \frac{\cancel{24}^{6}}{\cancel{52}^{13}} = \frac{6}{13}$$

9. $\therefore$ 0 is the midpt. of AB



$$\therefore \; 2 = \frac{x+4}{2}$$

$\Rightarrow x + 4 = 4$

$\Rightarrow x = 4 - 4$

$\Rightarrow x = 0$

10. (Sec θ + tan θ) (1 – Sin θ)

$$= \left(\frac{1}{\text{Cos}\,\theta} + \frac{\text{Sin}\,\theta}{\text{Cos}\,\theta}\right)(1 - \text{Sin}\,\theta)$$

$$= \left(\frac{1 + \text{Sin}\,\theta}{Cos\,\theta}\right)(1 - \text{Sin}\,\theta)$$

$$= \frac{1^2 - \text{Sin}^2\,\theta}{\text{Cos}\,\theta}$$

$$= \frac{1 - \text{Sin}^2\,\theta}{\text{Cos}\,\theta}$$

$$= \frac{\text{Cos}^2\,\theta}{\text{Cos}\,\theta} = \text{Cos}\,\theta$$

11. L.H.S. $\text{Sec}^2\,\theta + \text{Cot}^2\,(90 - \theta)$

$= \sec^2\theta + \tan^2\theta$

$= 1 + \tan^2\theta + \tan^2\theta$

$= 1 + 2\tan^2\theta$

RHS $2\,\text{Cosec}^2\,(90 - \theta) - 1$

$= 2\,\text{Sec}^2\,\theta - 1$

$= 2(1 + \tan^2 \theta) - 1$

$= 2 + 2 \tan^2 \theta - 1$

$= 1 + 2 \tan^2 \theta$

LHS = RHS

12. $N_1 = 306, N_2 = 144$

$$\text{HCF} = 18$$

$$\text{LCM} = \frac{N_1 \times N_2}{\text{HCF}}$$

$$= \frac{306 \times \cancel{144}^{8}}{\cancel{18}}$$

$$= 2448$$

13. To Prove $\frac{2\sqrt{3}}{5}$ is an irrational number we will first prove $\sqrt{3}$ is an irrational number.

Let if possible, $\sqrt{3}$ is a rational number

$\therefore \quad \sqrt{3} = \frac{p}{q}$, $q \neq 0$, p & q are coprime integers.

$\Rightarrow$ Squaring both sides

$$3 = \frac{p^2}{q^2}$$

$$3q^2 = p^2 \qquad \text{....(1)}$$

$\Rightarrow$ p^2 is divisible by 3

$\Rightarrow$ p is divisible by 3

$\therefore$ If a prime number divides a^2 then it also divides a ...(A)

$\Rightarrow$ p = 3m ....(2)

Substituting (2) in (1)

$$3q^2 = (3m)^2$$

$$3q^2 = 9m^2$$

$$q^2 = 3m^2$$

$\Rightarrow$ 3 divides q^2

$\Rightarrow$ 3 divides q using A

$\Rightarrow$ $q = 3n$ ...(3)

2 & 3 $\Rightarrow$ 3 divides both p and q which contradicts the fact that p and q are coprime

$\therefore$ Our anumption is false $\Rightarrow \sqrt{3}$ is an irrational number.

$\Rightarrow$ $\dfrac{2\sqrt{3}}{5}$ is an irrational number as product of rational & irrational number is an irrational number.

14. $f(x) = x^4 - 3x^3 - x^2 + 9x - 6$

$\therefore$ $-\sqrt{3}$, $\sqrt{3}$ are two zeroes of $f(x)$

$\therefore$ $(x + \sqrt{3})(x - \sqrt{3})$ will divide $f(x)$

$\therefore$ $x^2 - 3$ is a factor of $f(x)$

$$
\begin{array}{r|l|l}
x^2-3 & x^4 - 3x^3 - x^2 + 9x - 6 & x^2 - 3x + 2 \\
 & x^4 \quad\quad\; - 3x^2 & \\
 & - \quad\quad\;\; + & \\
\hline
 & -3x^3 + 2x^2 + 9x - 6 & \\
 & \cancel{-3x^3} \quad\quad\; \cancel{+9x} & \\
 & + \quad\quad\quad\quad - & \\
\hline
 & 2x^2 \quad - 6 & \\
 & 2x^2 \quad - 6 & \\
\hline
 & \times & \\
\end{array}
$$

$$
\begin{aligned}
f(x) &= (x^2 - 3)(x^2 - 3x + 2) \\
&= \left[x^2 - \left(\sqrt{3}\right)^2\right]\left[x^2 - 2x - x + 2\right] \\
&= \left(x + \sqrt{3}\right)\left(x - \sqrt{3}\right)\left(x\,(x-2) - 1\,(x-2)\right) \\
&= \left(x + \sqrt{3}\right)\left(x - \sqrt{3}\right)(x-2)(x-1)
\end{aligned}
$$

$\therefore$ Zeroes of $f(x) = -\sqrt{3}, \sqrt{3}, 2, 1$

Or

One zero of $2x^2 + px - 15$ is -5

$\therefore$ $2(-5)^2 + p(-5) - 15 = 0$

$50 - 5p - 15 = 0$
$-5p = -35$
$p = 7$

$\therefore \quad p(x^2 + x) + k$

$= 7(x^2 + x) + k$

$= 7x^2 + 7x + k$

$\lambda + \beta = -\frac{7}{7} = -1$

$\lambda + \beta = -1 \quad (\because \square = \square)$

$2\lambda = -1$

$\lambda = -\frac{1}{2}$

$\lambda . \beta = \frac{k}{7}$

$\left(-\frac{1}{2}\right)\left(-\frac{1}{2}\right) = \frac{k}{7}$

$\frac{1}{4} = \frac{k}{7}$

$4k = 7$

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

15. $2x + 3y = 7$ ...(1)

$a(x + y) - b(x - y) = 3a + b - 2$

or $x(a - b) + y(a + b) = 3a + b - 1$ ...(2)

for coincident lines

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

$$\Rightarrow \quad \frac{2}{a-b} = \frac{3}{a+b} = \frac{7}{3a+b-2}$$

If $\quad \frac{2}{a-b} = \frac{7}{3a+b-2}$

$\Rightarrow \quad 7a - 7b = 6a + 2b - 4$

$\Rightarrow \quad a - 9b = -4$ ...(3)

If $\quad \frac{3}{a+b} = \frac{7}{3a+b-2}$

$\Rightarrow \quad 7a + 7b = 9a + 3b - 6$

$\Rightarrow \quad -2a + 4b = -6$

$\Rightarrow \quad a - 2b = 3 \qquad$ —4

$$a - 9b = -4$$
$$a - 2b = 3$$
$$\underline{- \quad + \quad -}$$
$$\cancel{-}7b = \cancel{-}7$$
$$b = 1$$

Putting in —3

$a - 9 \times 1 = -4$

$\Rightarrow \quad a = 4 + 9$

$\Rightarrow \quad a = 5$

16. $(p - 12)x^2 - 2(p - 12)x + 2 = 0$

$\Rightarrow \; a = p - 12, b = -2(p - 12), c = 2$

for equal roots

$D = 0$

$\Rightarrow \quad b^2 - 4ac = 0$

$\Rightarrow \quad [-2(p-12)]^2 - 4(p-12)\times 2 = 0$

$\Rightarrow \quad 4(p - 12)^2 - 8(p - 12) = 0$

$\Rightarrow \quad (p - 12)^2 - 2(p - 12) = 0$

$\Rightarrow \quad (p - 12)(p - 12 - 2) = 0$

$\Rightarrow \quad (p - 12)(p - 14) = 0$

$\Rightarrow \quad p = 12, 14$

Or

$$\frac{x+3}{x-2} - \frac{1-x}{x} = \frac{17}{x}$$

$$\Rightarrow \quad \frac{x^2+3x-(x-x^2-2+2x)}{\cancel{x}(x-2)} = \frac{17}{\cancel{6}}$$

$$\Rightarrow \quad \frac{x^2+3x-3x+x^2+2}{x-2} = \frac{17}{1}$$

$$\Rightarrow \quad \frac{2x^2+2}{x-2} = \frac{17}{1}$$

$\Rightarrow\ 2x^2 + 2 = 17x - 34$

$\Rightarrow\ 2x^2 - 17x + 36 = 0$

$\Rightarrow\ 2x^2 - 9x - 8x + 36 = 0$

$x(2x - 9) - 4\,(2x - 9) = 0$

$\Rightarrow\ (2x - 9)\,(x - 4) = 0$

$\Rightarrow\ x = \dfrac{9}{2}, 4$

17. Three digit nos. divisible by 5 leaving remainder 2 in each case are—

102, 107, ..., 997

$a_n = 997,\ a = 102,\ d = 107 - 102 = 5$

$102 + (n - 1)\,5 = 997$

$\Rightarrow\ 102 + 5n - 5 = 997$

$\Rightarrow\ 5n + 97 = 997$

$\Rightarrow\ 5n = 997 - 97$

$\Rightarrow\ 5n = 900$

$\Rightarrow\ n = \dfrac{900}{5} = 180$

$S_n = \dfrac{n}{2}[a + an]$

$= \dfrac{180}{2}[102 + 997]$

$= 90 \times 1099$

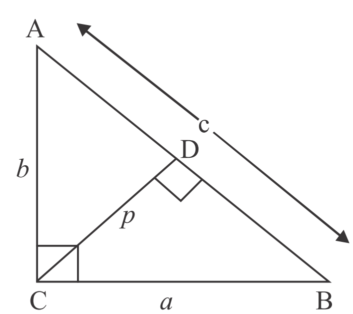
$= 98910$

18. (*i*) ar $(\Delta ACB) = \dfrac{1}{2} \times a \times b$

$= \dfrac{1}{2}ab$ ...(1)

Also ar $(\Delta ACB) = \dfrac{1}{2} \times c \times p$

$= \dfrac{1}{2}cp$ ...(2)



from 1 & 2

$$\frac{1}{\cancel{2}}cp = \frac{1}{\cancel{2}}ab$$

$$\Rightarrow \quad cp = ab$$

(*ii*) $$p^2 = \frac{a^2 b^2}{c^2}$$

$$\Rightarrow \quad \frac{1}{p^2} = \frac{6^2}{a^2 b^2}$$

$$\Rightarrow \quad \frac{1}{p^2} = \frac{a^2+b^2}{a^2 b^2} \qquad \begin{bmatrix} \because \text{In } \square \text{ ACB} \\ \text{C}^2 = \text{a}^2+\text{b}^2 \end{bmatrix}$$

$$\Rightarrow \quad \frac{1}{p^2} = \frac{1}{b^2}+\frac{1}{a^2}$$

19. Let ∠QPR = Q

We know that PQ = PR $\quad \begin{pmatrix} \text{The length of the tangents drawn} \\ \text{from an external point are equal} \end{pmatrix}$

∴ PQR is an isosceles triangle

$$\Rightarrow \angle PQR = \angle PRQ = \frac{1}{2}(180 - Q)$$

$$\Rightarrow \angle PQR = \angle PRQ = 90 - Q/2$$

$$\therefore \angle OQP = 90^\circ \ (\because OQ \perp PQ)$$

$$\therefore \angle OQR = \angle OQP = \angle PQR$$

$$\therefore \angle OQR = \angle OQP - \angle PQR$$

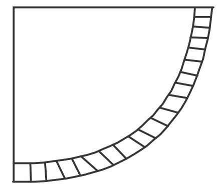
$$\Rightarrow \angle OQR = 90 - (90 - \frac{1}{2}Q)$$

$$\Rightarrow \angle OQR = \frac{1}{2}Q$$

$$\Rightarrow \angle OQR = \frac{1}{2}\angle QPR$$

$$\Rightarrow \angle QPR = 2\angle OQR$$

20. Additional area grazed = $\frac{\pi\theta}{360}\left(R^2 - r^2\right)$



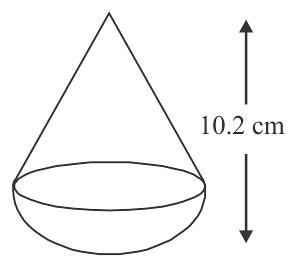
$$= \frac{\cancel{90}}{\underset{\underset{2}{\cancel{4}}}{\cancel{360}}} \times \frac{\overset{11}{\cancel{22}}}{7}(23^2 - 16^2)$$

$$= \frac{11}{14} \times (23+16)\,(23-16)$$

$$= \frac{11}{\underset{2}{\cancel{14}}} \times 39 \times \cancel{7}$$

$$= \frac{429}{2} = 214.5\ m^2$$

21. $r = 4.2$ cm



height of cone $= 10.2 - 4.2$

$= 6$ cm

$$l = \sqrt{6^2 + 4.2^2}$$

$$= \sqrt{36 + 17.14} = \sqrt{53.64}$$

$$= 7.32 \text{ cm}$$

Volume of wood $= \frac{1}{3}\pi r^2 h + \frac{2}{3}\pi r^3$

$$= \frac{1}{3}\pi r2\,(h + 2r)$$

$$= \frac{1}{\cancel{3}} \times \frac{22}{\cancel{7}} \times \overset{\cancel{0.6}\ 0.2}{\cancel{4.2}} \times 4.2\,(6 + 2 \times 4.2)$$

$= 4.4 \times 4.2 \times 14.4$

$= 266.112$ cm3

Total Surface area of toy $= \pi rl + 2\,\pi r^2$

$$= \frac{22}{7}\times 4.2\times 7.3\times 2\times \frac{22}{7}(4.2)^2$$

$= 96.36 + 110.88$

$= 207.24\ cm^2$

22.

Class interval	x	f	fx
0–20	10	17	170
20–40	30	f1	30f1
40–60	50	32	1600
60–80	70	f2	70f2
80–100	90	19	1710
		120	$3480 + 30f_1 + 70f_2$

Mean = 50

$$\Rightarrow \frac{3480+30f_1+70f_2}{120} = 50$$

$\Rightarrow \quad 3480 + 30f_1 + 70f_2 = 6000$

$\Rightarrow \quad 348 + 3f_1 + 7f_2 = 600$

$\Rightarrow \quad 3f_1 + 7f_2 = 252 \quad ...(1)$

Also $\quad 17 + f_1 + 32 + f_2 + 19 = 120$

$f_1 + f_2 = 52 \quad ...(2)$

Multiplying equation 1 by 1 & 2 by 3

$$\cancel{3f_1} + 7f_2 = 252$$
$$\cancel{3f_1} + 3f_2 = 156$$
$$- \quad - \qquad -$$

$4f2 = 96$

$$f2 = \frac{96}{4} = 24$$

$f_1 + 24 = 52$

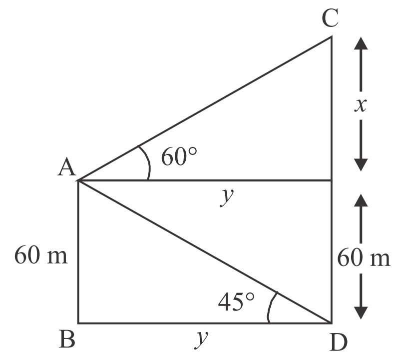
$f_1 = 52 - 24 = 28$

23. In ΔABC

$$\tan 45° = \frac{60}{y}$$

$$\Rightarrow \; 1 = \frac{60}{y}$$

$$\Rightarrow \; y = 60$$



In Δ ACE

$$\tan 60° = \frac{x}{y}$$

$$\Rightarrow \quad \frac{\sqrt{3}}{1} = \frac{x}{60}$$

$$\Rightarrow \quad x = 60\sqrt{3}$$

Height of wall $= 60$

$= 60 + 60\sqrt{3}$

$= 60(1+\sqrt{3})\, m$

Or

LHS $\quad \dfrac{1}{\text{Sec}\,\theta - \tan\theta} - \dfrac{1}{\text{Cos}\,\theta}$

$$= \frac{\text{Sec}\,\theta + \tan\theta}{(\text{Sec}\,\theta - \tan\theta)(\sec\theta + \tan\theta)} - \text{Sec}\,\theta$$

$$= \frac{\text{Sec}\,\theta + \tan\theta}{\text{Sec}^2\theta - \tan^2\theta} - \text{Sec}\,\theta$$

$$= \frac{\text{Sec}\,\theta + \tan\theta}{1} - \text{Sec}\,\theta$$

$$= \text{Sec}\,\theta + \tan\theta - \text{Sec}\,\theta$$

$$= \tan\theta$$

RHS $\quad \dfrac{1}{\text{Cos}\,\theta} - \dfrac{1}{\text{Sec}\,\theta + \tan\theta}$

$$= \quad \text{Sec}\,\theta - \frac{\text{Sec}\,\theta - \tan\theta}{\text{Sec}^2\theta - \tan^2\theta}$$

$$= \quad \text{Sec}\,\theta - \frac{\text{Sec}\,\theta - \tan\theta}{1}$$

$$= \quad \cancel{\text{Sec}\,\theta} - \cancel{\sec\theta} + \tan\theta$$

$$= \quad \tan\theta$$

CHS = RHS

24. Let fixed fare = RS. x

fare per km = Rs. y

$x + 10y = 75$ ...(1)

$x + 15y = 110$ ...(2)

$- \quad - \qquad -$

$-5y = -35$

$\Rightarrow \quad y = 7$

Put y = 7m – q^n D

$x + 10 \times 7 = 75$

$x = 75 - 70$

$x = 5$

Fixed fare = x = Rs. 5

Fare for 1 km = y = Rs. 7

Fare for 25 km = $x + 25y$

= 5 + 25 × 7

= Rs.180

Or

Let time taken by small llameher pipe = n *hr*

time taken by b_1 q llameler pipe = (n – 10) *hr* and

$$\frac{1}{n} + \frac{1}{n-10} = \frac{1}{12}$$

$$\frac{n-10+n}{n(n-10)} = \frac{1}{12}$$

$$\frac{2n-10}{n^2-10n} = \frac{1}{12}$$

$$n^2 - 10n = 24n - 120$$
$$n^2 - 34n + 120 = 0$$
$$n^2 - 30n - 4n + 120 = 0$$
$$n(n - 30) - 4(n - 30) = 0$$
$$(n - 30)(n - 4) = 0$$
$$n = 30, \quad n = 4$$

time taken by smalldiameter pipe = 30 *hrs*

time taken by diameter pipe = 20 *hrs*

25. Full marks for correct construction.

260. $h = 30$ cm, $r = 10$ cm, R = 20 cm

vol of by neat $= \frac{1}{3}\pi h(R^2 + r^2 + Rr)$

$$= \frac{1}{3} \times \frac{22}{7} \times 30(20^2 + 10^2 + 20 \times 10)$$

$$= \frac{1}{3} \times \frac{22}{7} \times 30(400 + 100 + 200)$$

$$= \frac{1}{\cancel{3}} \times \frac{22}{\cancel{7}} \times \overset{10}{\cancel{30}} \times \overset{100}{\cancel{700}}$$

$$= 22000 \text{ cm}^3 = \frac{22000}{1000} = 220$$

Cost of milk = 25 × 22 = ... 550

27. Total marbles = 24

Let green marbles = x

blue marbles = $24 - x$

p (green marbles) = $\frac{2}{3}$

$$\frac{x}{24} = \frac{2}{3}$$

$$\Rightarrow \quad x = \frac{24 \times 2}{3} = 16$$

$\therefore$ blue marbles = 24 – 16 = 8

28. Statement – 1 mark

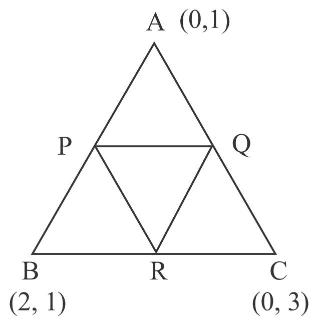
For Given, To prove, Construction – $\frac{1}{2}$ mark for each Proof – $1\frac{1}{2}$ marks

29.

Less than type		**More than type**	
Mark	**No of students**	**Marks**	**No. of students**
Less than 5	4	More than 0	100
Less than 10	10	More than 5	96
Less than 15	20	More than 10	90
Less than 20	30	More than 15	80
Less than 25	55	More than 25	70
Less than 30	77	More than 30	45
Less than 35	95	More than 30	23
Less than 40	100	More than 35	5

Draw ogive of both types & find the median.

30.



$$P = \left(\frac{0+2}{2}, \frac{1+1}{2}\right) = (1, 1)$$

$$Q = \left(\frac{0+0}{2}, \frac{1+3}{2}\right) = (0, 2)$$

$$R = \left(\frac{2+0}{2}, \frac{1+3}{2}\right) = (1, 2)$$

$$A_1 = \text{ar}\,(\Delta PQR) = \left[1\,(2-2) + 0\,(2-1) + 1\,(-2)\right]$$

$$= \frac{1}{2}\left[0 + 0 - 1\right]$$

$$= -\frac{1}{2} = \frac{1}{2} \text{ sq units}$$

$$A_2 = \text{ar}\,(\Delta ABC) = \frac{1}{2}\left[0\,(1-3) + 2\,(3-1) + 0\,(1-1)\right]$$

$$= \frac{1}{2}\left[0 + 4 + 0\right]$$

$$= 2 \text{ sq. units}$$

$$\frac{A_1}{A_2} = \frac{\frac{1}{2}}{2} = \frac{1}{4}$$

$$= 1 : 4$$

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Sample Paper-II

Tentative Paper, Marking Scheme may change as per guidelines of CBSE)

Time : 3 hours	*Max , Marks : 80*

General Instructions

(*i*) All questions are compulsory.

(*ii*) The question paper consists of 30 questions, divided into four sections—A, B, C & D

(*iii*) Section A contains 6 questions of 1 mark each, section B contains 6 questions of 2 marks each, Section C contains 10 questions of 3 marks each and Section D contains 8 questions of 4 marks each.

(*iv*) Use of calculator is not permitted.

SECTION-A

1. Write maximum number of zeroes for $p(x) = x^3 + 3x^2 - 3x + 1$

2. If $\Delta ABC \sim \Delta PQR$ ar $(\Delta ABC) = 16$ cm^2 and ar (PQR) = 81 cm^2, AB = 2 cm find PQ.

3. The ratio of the height of a tower and the length of its shadow on the ground is $\sqrt{3}:1$. What is the angle of the sun?

4. Volume and surface area of a solid hemisphere are numerically equal. What is the diameter of hemisphere.

5. A number is chosen at random from the numbers –3, –2, –1, 0, 1, 2, 3. What will be the probability that square of this number is less than or equal to 1?

6. If the distance between the points $(4, k)$ and $(1, 0)$ is 5, then what can be the possible values of k?

SECTION-B

7. Find the sum of all 2 digit positive numbers divisible by 3.

8. A dice is thrown once. Find the probability of getting *a*) aprime number *b*) a number divisible by 2.

9. Find the ratio in which the line segment joining the points A (3, –6) and B (5, 3) is divided by x axis.

10. If 3 cot A = 4 then find the value of $\frac{\text{Cosec}^2\text{A} + 1}{\text{Cosec}^2\text{A} - 1}$

11. Prove $\frac{\text{Sin}\,\theta}{\text{Sin}\,(90–\theta)} + \frac{\text{Cos}\,\theta}{\text{Cos}\,(90–\theta)} = \text{Sec}\,\theta\ \text{cosce}\,\theta$

12. Find HCF of 455 and 84 by Endils division lemma.

SECTION-C

13. Prove that $5-\sqrt{3}$ is an imational number

14. Find all the zeroes of polynomial,
$p(x) = x^4 - 5x^3 + 2x^2 + 10x - 8$ if its two zeroes are $\sqrt{2}$ and $-\sqrt{2}$

Or

Find zeroes of $3\sqrt{2}\,x^2 + 13x + 6\sqrt{2}$ and verify the relation between the zeroes and the coefficients.

15. Solve for x and y

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

16. Find the value of k for which the equation $x^2 + k(2x + k - 1) + 2 = 0$ has real and equal roots

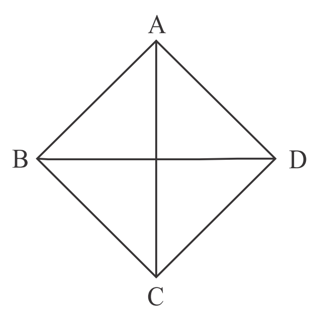
Or

Solve the following equation for x—

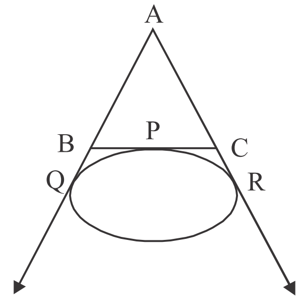
$$\frac{1}{a} + \frac{1}{b} + \frac{1}{x} = \frac{1}{a+b+x}$$

17. If sum of first n teims of an A.P is $5n^2 - 3$n find the A.P and also find its sixteenth term.

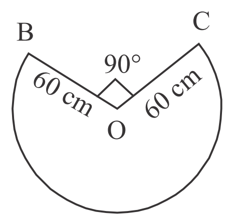
18. In the given figure ABCD is a rhombus than prove that 4 AB^2 = AC^2 + BD^2



19. In the given figure, a circle touches the side BC ofΔABC at P and tonches AB and AC produced at Q and R respectindy. If AQ = 5 cm, find the perimeter of ΔABC.



20. In the given figure the shape of the top of a table in a restaurant is that of a sector of circle with centre 0 and $\angle$BOD = 90°, If OB = OD = 60 cm find the perimeter of the table top [use π = 3.14]



21. A solid cylinder of nadius r and height h is placed over other cylinder of same height and radius. Find the total surface Area of the shape so formed.

22. If median of the following distribution is 35 find the value of x & y

C.I	0–10	10–20	20–30	30–40	40–50	50–60	60–70	Total
f	10	20	x	40	y	25	15	170

SECTION-D

23. $\sec\theta = x + \dfrac{1}{4x}$ then prove that

$\sec\theta + \tan\theta = 2x$ or $\dfrac{1}{2x}$.

Or

The angle of elevation of a jet plane from a point A an the ground is 60°. After a flight of 15 seconds the angle of elevation changes to 30°. If the jet plane is flying at a constant height of $1500\sqrt{3}\ m$ find the speed of the jet plane.

24. A Shopkeeper buys a number of books for Rs. 1200. If he had bought 10 more books for the same amount, each book would have cost Rs 20less. How many books did he buy?

Or

A boat travels 24 km upstream and 28 km downstream in 6 hours. If it travel 30 km upstream and 21 km down stream in 6 hours and 30 minutes. Find the speed of boat in still water.

25. Construct a pair of tangents to a circle of radius 4 cm inclined at an angle of 45°

26. A cone of radius 10 cm is divided into two parts by a plane parallel to its base through the mid point of its height. Compare the volumes of the two parts.

27. Peter throws two different dice together and finds the product of the two numbers obtained. Rina throws a die and squares the number obtained. Who has the better chance to get the number 25?

28. State and prove Basic Proportionality theorem.

Or

Prove that the lengths of tangents drawn from an external point to a circle are equal.

29. The following distribution gives annual profit of 30 shops

Profit (In lakhs)	0–5	5–10	10–15	15–20	20–25
No. of Shops	3	14	5	6	2

Draw less than ogive and more than ogive of above distribution and also find the median from the graph.

30. The points A (2, 9), B (a, 5), C (5, 5) are the vertices of a ΔABC, right angled at B. find the value of a and hence find the area of ΔABC.

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