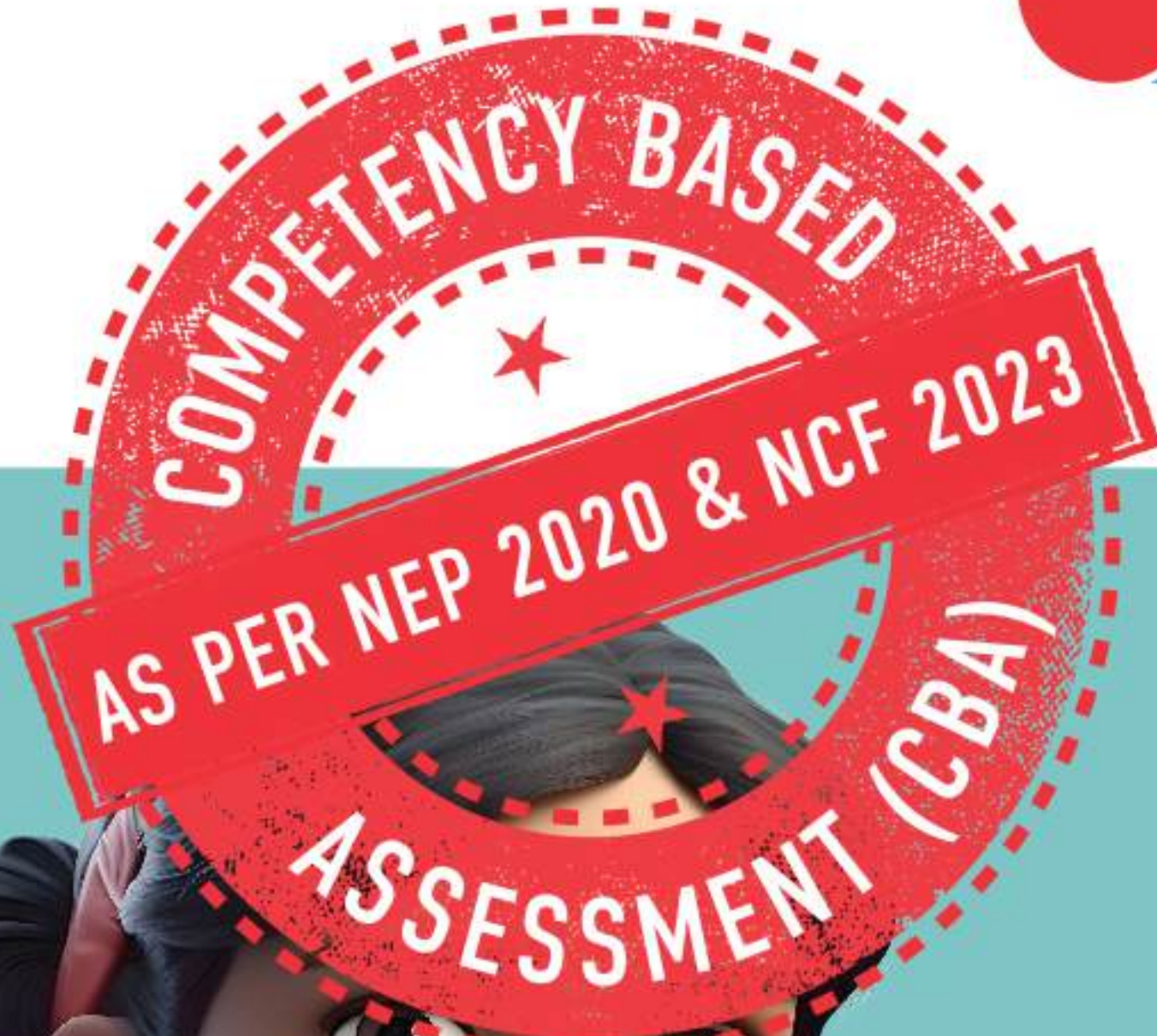


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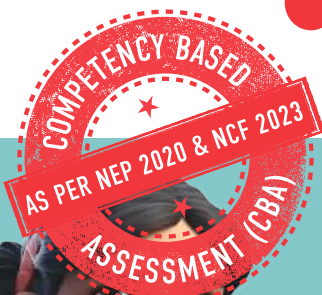
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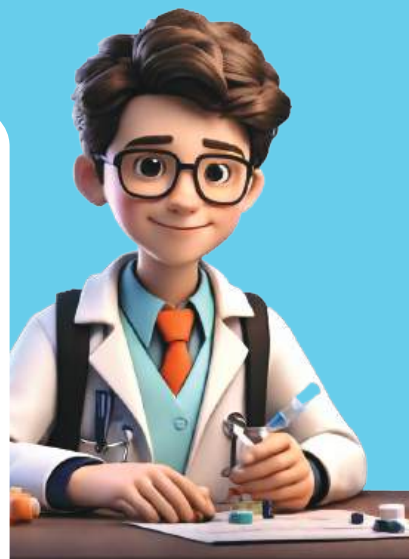
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4th EDITION

YEAR 2024-25



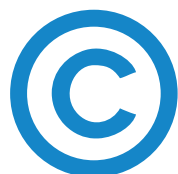
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**SYLLABUS
COVERED**

**CENTRAL BOARD OF
SECONDARY EDUCATION
DELHI**



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In each chapter, for better comprehension, questions have been categorized according to the typology issued by CBSE as follows :
R - Remembering, **U** - Understanding, **A** - Analysing, **Ap** - Applying, **C** - Creating, **E** - Evaluating.

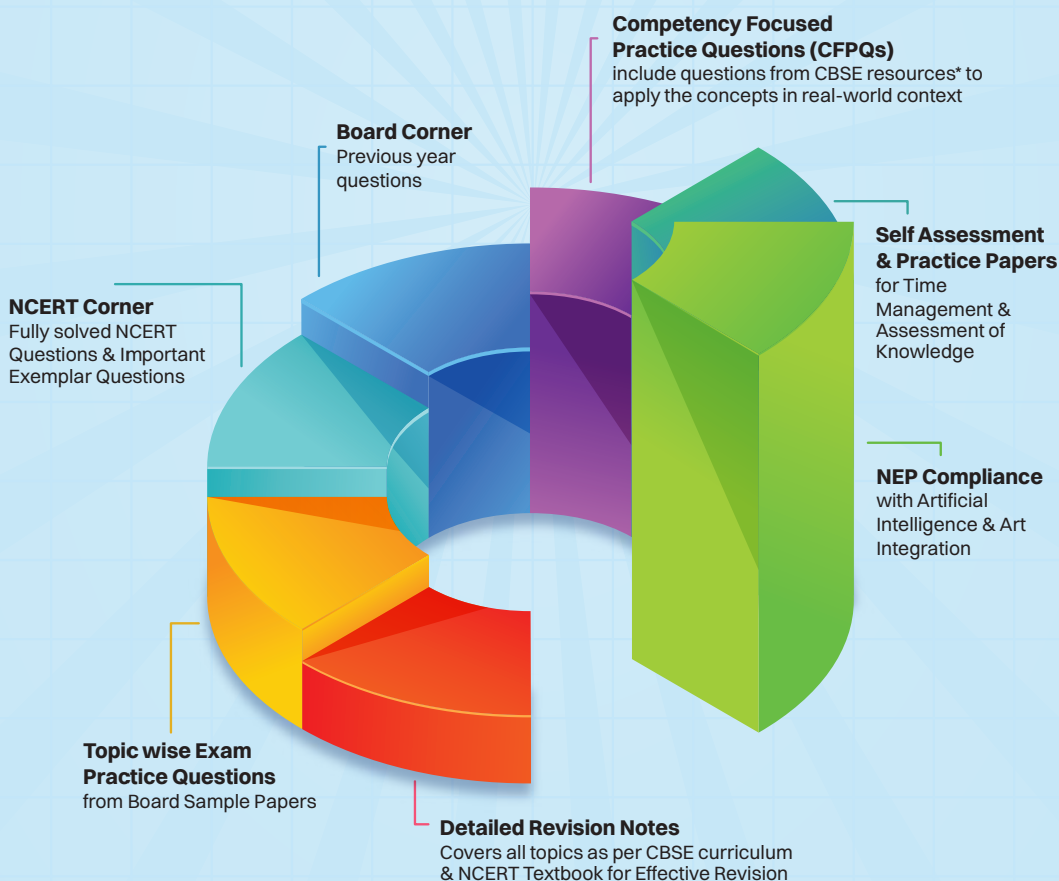
Abbreviations used - **[AI]** Academic Intelligence, **[OEB]** Oswaal Editorial Board



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*CFPQ - Competency Focused Practice Questions

SAS - Sri Aurobindo Society

Preface

Welcome to the vibrant world of CBSE One For All Class 10 – a meticulously crafted book tailored to match the pulse of the latest CBSE syllabus. Just as education constantly evolves, our commitment remains unwavering in furnishing students with the latest and most pertinent resources to thrive in their academic journey. In this edition, we present a plethora of benefits designed to empower you in your quest for academic excellence:

1. **Extensive Theory Coverage:** Comprehensive **Chapterwise Theory, Mind Maps** and **Mnemonics** simplify even the most complex concepts.
2. **Exam Readiness:** Preparedness ensured with **Previous Years' Questions, Board Marking Scheme** and latest **Typologies of Questions** specified by the Board.
3. **Valuable Exam Insights:** Fully solved **NCERT Textbook and Exemplar Questions** offer insights beyond memorization.
4. **NEP Compliance:** Foster holistic development with **Competency-Focused Practice questions (CFPQ), Artificial Intelligence & Art Integration**
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As you embark on this educational journey with us, you'll find yourself armed with all the tools necessary to not just excel in your exams but also foster a deeper understanding and appreciation for the subjects you study.

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How to use this Book?

Chapter Navigation Tools

Syllabus

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CBSE



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Chapter summary developed by
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QR Codes

For concept videos



Mind Maps & Mnemonics

For better retention of concepts



Latest Typologies of Questions

Short & Long answer type questions



Competency focused Practice Questions

MCQs/ Case based/ Source based integrated questions



Previous Years' Board Papers

To decode the paper pattern



Academically Important Questions

To look out for highly expected questions for the upcoming exams



Concept Applied

To Recall the concepts for answering the questions



NCERT Corner & Exemplar

For Valuable Exam Insights



Self Assessment & Practice Papers

For chapter-wise assessments



Commonly Made Errors & Answering Tips

To write perfect answers



Additional Practice Questions

For better practice



CBSE Circular 2024-25



केन्द्रीय माध्यमिक शिक्षा बोर्ड
(शिक्षा मंत्रालय भारत सरकार के अधीन एक स्वायत्त संगठन)

CENTRAL BOARD OF SECONDARY EDUCATION

(An Autonomous Organisation Under the Ministry of Education, Govt. of India)



CBSE/ACADEMIC/JS(SG)/2024/

3rd April, 2024

Circular No. Acad-30/2024

All the Heads of Schools affiliated to CBSE

Subject : Assessment and Evaluation Practices of the Board for the Session 2024-25.

- The Board in accordance with National Education Policy, 2020 has taken multiple steps towards implementation of Competency Based Education in schools, ranging from aligning assessment to competencies, development of exemplar resources for teachers and students as well as continuous capacity building of the teachers etc. The main emphasis of the Board was to create an educational ecosystem that would move away from rote memorization and towards learning that is focused on developing the creative, critical and systems thinking capacities of students to meet the challenges of the 21st century.
- The Board has released guidelines vide Circular No. Acad- 05/2019 dated 18.01.2019; Circular No. Acad-11/2019 dated 06.03.2019; Circular No. Acad-18/2020 dated 16.03.2020; and Circular No. Acad-57/2022 dated 20.05.2022 to progressively align assessment to the vision of the NEP by including more competency-based questions in the Classes X and XII Board examinations.
- Appropriately, the Board is continuing with aligning of the assessments and evaluation practices with NEP- 2020 for the academic session 2024-2025. Consequently, in the forthcoming session, the percentage of Competency Based Questions that assess application of concepts in real-life situations included in the question papers of the Board is given as under:

(Dr. Joseph Emmanuel)
Director (Academics)



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CBSE Circular 2024-25



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CENTRAL BOARD OF SECONDARY EDUCATION

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The changes for classes IX-XII year-end Board Examinations (2024-25)

(Classes IX-X)		
Particulars	Academic Session 2023-24	Academic Session 2024-25 (No change from previous academic session)
Composition of question paper for year-end examination/ Board Examination (Theory)	<ul style="list-style-type: none"> Competency Focused Questions in the form of MCQs/ Case Based Questions, Source-based Integrated Questions or any other type = 50% Select response type questions (MCQ) = 20% Constructed response questions (Short Answer/Long Answer Type Questions, as per existing pattern) = 30% 	<ul style="list-style-type: none"> Competency Focused Questions in the form of MCQs/Case Based Questions, Source-based Integrated Questions or any other type = 50% Select response type questions (MCQ) = 20% Constructed response questions (Short Answer/Long Answer Type Questions, as per existing pattern) = 30%
(Classes IX-XII)		
Particulars	Academic Session 2023-24	Academic Session 2024-25
Composition of question paper for year-end examination/ Board Examination (Theory)	<ul style="list-style-type: none"> Competency Focused Questions in the form of MCQs/ Case Based Questions, Source-based Integrated Questions or any other type = 40% Select response type questions (MCQ) = 20% Constructed response questions (Short Answer Questions/Long Answer type Questions, as per existing pattern) = 40% 	<ul style="list-style-type: none"> Competency Focused Questions in the form of MCQs/ Case Based Questions, Source-based Integrated Questions or any other type = 50% Select response type questions (MCQ) = 20% Constructed response questions (Short Answer Questions/Long Answer type Questions, as per existing pattern) = 30%

Curriculum document released by the Board for the Academic Session 2024-25 and the Sample Question Papers may also be referred to for details of the QP design of individual subjects. Learning frameworks for various subjects for classes IX-XII are available at the link <https://cbseacademic.nic.in> for reference.

(Dr. Joseph Emmanuel)
Director (Academics)



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F.1001/CBSE-Acad/Curriculum/2024

March 22, 2024

Cir No: Acad-29/2024

All Heads of Institutions affiliated to CBSE

Subject : Secondary and Senior School Curriculum for the session 2024-25 and new textbooks to be published by NCERT for classes III and VI.

1. CBSE provides the annual curriculum for classes IX to XII containing academic content, syllabus for examinations with learning outcomes, pedagogical practices, and assessment guidelines.
2. It is imperative for schools to ensure adherence to the curriculum directives outlined in the initial pages of the curriculum document. Subjects should be taught in accordance with the prescribed curriculum, incorporating methodologies such as Multilingualism, Art-Integrated Education, Experiential Learning, and Pedagogical Plans, wherever feasible.
3. With the adoption of the National Curriculum Framework for School Education - 2023 by CBSE, schools are advised to align their practices with the recommendations delineated in NCF-SE-2023. This includes adherence to guidelines concerning content, pedagogical strategies, assessment methodologies, and other pertinent areas as communicated by the Board from time to time.
4. The National Council of Educational Research and Training (NCERT) has informed CBSE through a letter dated 18.03.2024 that new syllabi and textbooks for Grades 3 and 6 are currently under development and will soon be released. Consequently, Schools are advised to follow these new syllabi and textbooks for classes 3 and 6 in place of textbooks published by NCERT till the year 2023. Additionally, a bridge course for class 6, and concise guidelines for class 3 are being developed by NCERT for facilitating a seamless transition for students to new pedagogical practices and areas of study aligned with NCF-SE 2023. These resources will be disseminated to all the schools online once they are received from NCERT. The Board will also organize capacity building programs for School Heads and Teachers to orient them with the new teaching learning perspectives as envisioned in NEP-2020.
5. There will be no change in the Curriculum and textbooks for other classes for the academic year 2024-25 commencing from 1st April 2024.
6. Schools are requested to share the Curriculum 2024-25 available on Boards website www.cbseacademic.nic.in with all students and teachers. CBSE Curriculum for classes IX-XII 2024-25 can be accessed at the link-Secondary & Senior Secondary School Curriculum https://cbseacademic.nic.in/curriculum_2025.html.

(Dr. Joseph Emmanuel)
Director (Academics)



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SYLLABUS 2024-25

MATHEMATICS (BASIC)-(Code No. 041)

(Issued by CBSE on 22nd March 2024)

Class-X-(Theory)

Unit No.	Unit Name	Marks
I	Number Systems	06
II	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

Fundamental Theorem of Arithmetic - statements after reviewing work done earlier and after illustrating and motivating through examples, Proofs of irrationality of $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$.

UNIT II: ALGEBRA

1. POLYNOMIALS

(8) Periods

Zeros of a polynomial. Relationship between zeros and coefficients of quadratic polynomials.

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. Simple situational problems.

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, 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

(10) Periods

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

UNIT III: COORDINATE GEOMETRY

1. COORDINATE GEOMETRY

(15) Periods

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

SYLLABUS 2024-25

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 are equal, their corresponding sides are proportional and the triangles are similar.
4. **(Motivate)** If the corresponding sides of two triangles are proportional, their corresponding angles are equal and the two triangles are similar.
5. **(Motivate)** If one angle of a triangle is equal to one angle of another triangle and the sides including these angles are proportional, the two triangles are similar.

2. CIRCLES

(10) 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.

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 are defined at 0° and 90° . Values 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.

3. HEIGHTS AND DISTANCES:

(10) Periods

Angle of Elevation, Angle of Depression.

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

UNIT VI : MENSURATION

1. AREAS RELATED TO CIRCLES

(12) Periods

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.

2. SURFACE AREAS AND VOLUMES

(12) Periods

Surface areas and volumes of combinations of any two of the following: cubes, cuboids, spheres, hemispheres and right circular cylinders/cones.

UNIT VII : STATISTICS AND PROBABILITY

1. STATISTICS

(18) Periods

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

2. PROBABILITY

(10) Periods

Classical definition of probability. Simple problems on finding the probability of an event.



SYLLABUS 2024-25

MATHEMATICS-Basic QUESTION PAPER DESIGN CLASS – X (2024-25)

Time : 3 Hours

Max. Marks : 80

S. No.	Typology of Questions	Total Marks	% Weightage (approx.)
1.	Remembering : Remembering: Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers. Understanding : Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas	60	75
2.	Applying : Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	12	15
3.	Analysing : Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations Evaluating : Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria. Creating : Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions	8	10
	Total	80	100

INTERNAL ASSESSMENT	20 Marks
● Pen Paper Test and Multiple Assessment (5+5)	10 Marks
● Portfolio	05 Marks
● Lab Practical (Lab activities to be done from the prescribed books)	05 Marks



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CBSE 20 Combined Sample Question Papers Classes 10 & 12

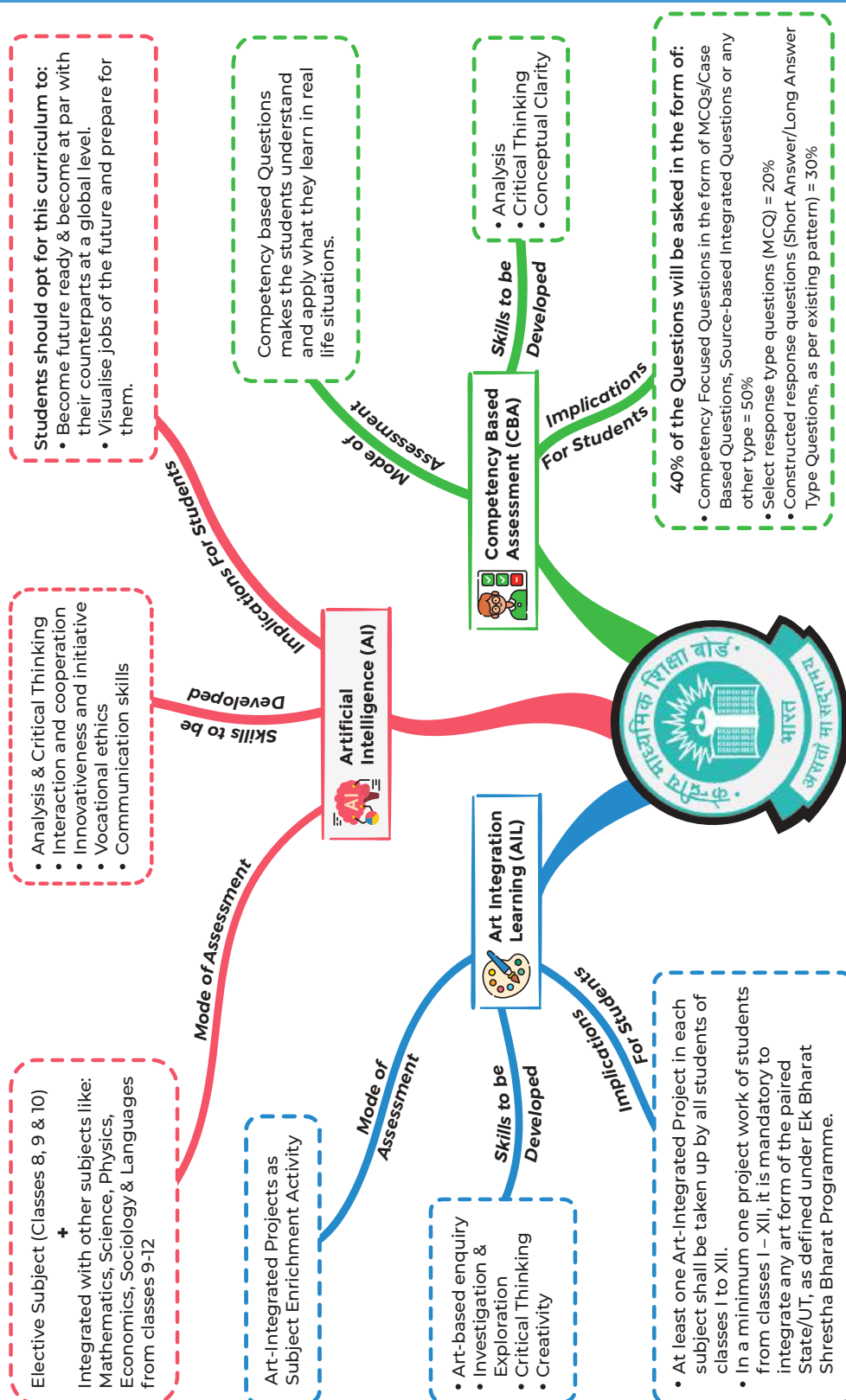
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CBSE EXAMINATION PAPER- 2024

MATHEMATICS BASIC (THEORY)

Class-10th

(Solved)

(Delhi & Outside Delhi Sets)

Maximum Marks: 80
Time allowed: Three hours

General Instructions:

Read the following instructions carefully and follow them:

1. This question paper contains 38 questions. All questions are compulsory.
2. Question paper is divided into FIVE sections - SECTION A, B, C, D and E.
3. In section A, question number 1 to 18 are multiple choice questions (MCQs) and question number 19 and 20 are Assertion - Reason based questions of 1 mark each.
4. In section B, question number 21 to 25 are very short answer (VSA) type questions of 2 marks each.
5. In section C, question number 26 to 31 are short answer (SA) type questions carrying 3 marks each.
6. In section D, question number 32 to 35 are long answer (LA) type questions carrying 5 marks each.
7. In section E, question number 36 to 38 are case-based integrated units of assessment questions carrying 4 marks each. Internal choice is provided in 2 marks question in each case study.
8. There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 2 questions in Section C, 2 questions in Section D and 3 questions in Section E.
9. Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated.
10. Use of calculators is NOT allowed.

Delhi Set-1

430/1/1

SECTION A - 20 MARKS

Q. No. 1 to 20 are multiple Choice Questions of 1 mark each.

- | | |
|--|--|
| <p>1. For what value of k, the product of zeroes of the polynomial $kx^2 - 4x - 7$ is 2? 1</p> <p>(a) $-\frac{1}{14}$ (b) $-\frac{7}{2}$</p> <p>(c) $\frac{7}{2}$ (d) $-\frac{2}{7}$</p> <p>2. In an A.P., if $a = 8$ and $a_{10} = -19$, then value of d is: 1</p> <p>(a) 3 (b) $-\frac{11}{9}$</p> <p>(c) $-\frac{27}{10}$ (d) -3</p> <p>3. The mid-point of the line segment joining the points $(-1, 3)$ and $(8, \frac{3}{2})$ is: 1</p> <p>(a) $(\frac{7}{2}, -\frac{3}{4})$ (b) $(\frac{7}{2}, \frac{9}{2})$</p> <p>(c) $(\frac{9}{2}, -\frac{3}{4})$ (d) $(\frac{7}{2}, \frac{9}{4})$</p> <p>4. If $\sin \theta = \frac{1}{3}$, then $\sec \theta$ is equal to: 1</p> <p>(a) $\frac{2\sqrt{2}}{3}$ (b) $\frac{3}{2\sqrt{2}}$</p> | <p>(c) 3 (d) $\frac{1}{\sqrt{3}}$</p> <p>5. HCF (132, 77) is: 1</p> <p>(a) 11 (b) 77</p> <p>(c) 22 (d) 44</p> <p>6. If the roots of quadratic equation $4x^2 - 5x + k = 0$ are real and equal, then value of k is: 1</p> <p>(a) $\frac{5}{4}$ (b) $\frac{25}{16}$</p> <p>(c) $-\frac{5}{4}$ (d) $-\frac{25}{16}$</p> <p>7. If probability of winning a game is p, then probability of losing the game is: 1</p> <p>(a) $1+p$ (b) $-p$</p> <p>(c) $p-1$ (d) $1-p$</p> <p>8. The distance between the points $(2, -3)$ and $(-2, 3)$ is: 1</p> <p>(a) $2\sqrt{13}$ units (b) 5 units</p> <p>(c) $13\sqrt{2}$ units (d) 10 units</p> <p>9. For what value of θ, $\sin^2\theta + \sin\theta + \cos^2\theta$ is equal to 2? 1</p> <p>(a) 45° (b) 0°</p> <p>(c) 90° (d) 30°</p> |
|--|--|

10. A card is drawn from a well shuffled deck of 52 playing cards. The probability that drawn card is a red queen, is: 1

(a) $\frac{1}{13}$ (b) $\frac{2}{13}$
(c) $\frac{1}{52}$ (d) $\frac{1}{26}$

11. If a certain variable x divides a statistical data arranged in order into two equal parts, then the value of x is called the: 1

(a) mean of the data (b) median
(c) mode (d) range

12. The radius of a sphere is $\frac{7}{2}$ cm. The volume of the sphere is: 1

(a) $\frac{231}{3}$ cu cm (b) $\frac{539}{12}$ cu cm
(c) $\frac{539}{3}$ cu cm (d) 154 cu cm

13. The mean and median of a statistical data are 21 and 23 respectively. The mode of the data is: 1

(a) 27 (b) 22
(c) 17 (d) 23

14. The height and radius of a right circular cone are 24 cm and 7 cm respectively. The slant height of the cone is: 1

(a) 24 cm (b) 31 cm
(c) 26 cm (d) 25 cm

15. If one of the zeroes of the quadratic polynomial $(\alpha-1)x^2 + \alpha x + 1$ is -3 , then the value of α is: 1

(a) $-\frac{2}{3}$ (b) $\frac{2}{3}$
(c) $\frac{4}{3}$ (d) $\frac{3}{4}$

16. The diameter of a circle is of length 6 cm. If one end of the diameter is $(-4,0)$, the other end on x -axis is at: 1

(a) $(0,2)$ (b) $(6,0)$
(c) $(2,0)$ (d) $(4,0)$

17. The value of k for which the pair of linear equations $5x+2y-7=0$ and $2x+ky+1=0$ don't have a solution, is: 1

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

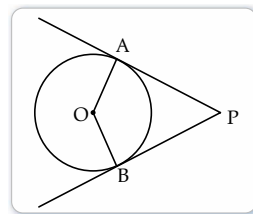
18. Two dice are rolled together. The probability of getting a double is: 1

(a) $\frac{2}{36}$ (b) $\frac{1}{36}$
(c) $\frac{1}{6}$ (d) $\frac{5}{6}$

19. Directions: In Q. No. 19 and 20, a statement of Assertion (A) is followed by a statement of Reason

(R). Select the correct option from the following options:

- (a) Both, Assertion (A) and Reason (R) are true. Reason (R) explains Assertion (A) completely.
(b) Both, Assertion (A) and Reason (R) are true. Reason (R) does not explain Assertion (A).
(c) Assertion (A) is true but Reason (R) is false.
19. (d) Assertion (A) is false but Reason (R) is true.



Assertion (A): If PA and PB are tangents drawn to a circle with centre O from an external point P, then the quadrilateral OAPB is a cyclic quadrilateral.

Reason (R): In a cyclic quadrilateral, opposite angles are equal. 1

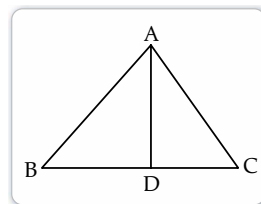
20. **Assertion (A):** Zeroes of a polynomial $p(x) = x^2 - 2x - 3$ are -1 and 3 .

Reason (R): The graph of polynomial $p(x) = x^2 - 2x - 3$ intersects x -axis at $(-1, 0)$ and $(3, 0)$. 1

SECTION B

Q. No. 21 to 25 are Very Short Answer Questions of 2 marks each.

21. D is a point on the side BC of $\triangle ABC$ such that $\angle ADC = \angle BAC$. Show that $AC^2 = BC \times DC$. 2



22. (A) Solve the following pair of linear equations for x and y algebraically: $x+2y=9$ and $y-2x=2$ 2

OR

- (B) Check whether the point $(-4, 3)$ lies on both the lines represented by the linear equations $x + y + 1 = 0$ and $x - y = 1$. 2

23. (A) Prove that $6-4\sqrt{5}$ is an irrational number, given that $\sqrt{5}$ is an irrational number. 2

OR

- (B) Show that $11 \times 19 \times 23 + 3 \times 11$ is not a prime number. 2

24. Evaluate: $\sin A \cos B + \cos A \sin B$, if $A = 30^\circ$ and $B = 45^\circ$. 2

25. A bag contains 4 red, 5 white and some yellow balls.

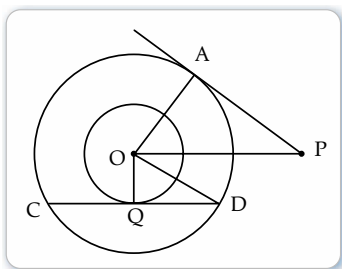
If probability of drawing a red ball at random is $\frac{1}{5}$

then find the probability of drawing a yellow ball at random. 2

SECTION C

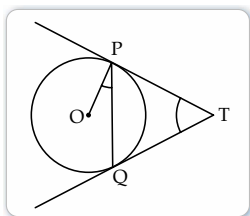
Q. No. 26 to 31 are Short Answer Questions of 3 marks each.

26. Two alarm clocks ring their alarms at regular intervals of 20 minutes and 25 minutes respectively. If they first beep together at 12 noon, at what time will they beep again together next time? 3
27. The greater of two supplementary angles exceeds the smaller by 18° . Find measures of these two angles. 3
28. Find the co-ordinates of the points of trisection of the line segment joining the points $(-2, 2)$ and $(7, -4)$. 3
29. (A) In two concentric circles, the radii are $OA = r$ cm and $OQ = 6$ cm, as shown in the figure. Chord CD of larger circle is a tangent to smaller circle at Q. PA is tangent to larger circle. If $PA = 16$ cm and $OP = 20$ cm, the length CD. 3



OR

- (B) In given figure, two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that $\angle PTQ = 2 \angle OPQ$. 3



30. (A) A solid is in the form of a cylinder with hemispherical ends of same radii. The total height of the solid is 20 cm and the diameter of the cylinder is 14 cm. Find the surface area of the solid. 3

OR

- (B) A juice glass is cylindrical in shape with hemispherical raised up portion at the bottom. The inner diameter of glass is 10 cm and its height is 14 cm. Find the capacity of the glass. (use $\pi = 3.14$) 3
31. Prove that: $(\cot \theta - \operatorname{cosec} \theta)^2 = \frac{1 - \cos \theta}{1 + \cos \theta}$. 3

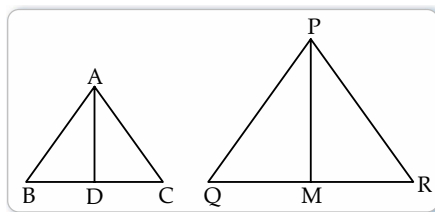
SECTION D

Q. No. 32 to 35 are Long Answer Questions of 5 marks each.

32. (A) If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then prove that other two sides are divided in the same ratio. 5

OR

- (B) Sides AB and AC and median AD of a $\triangle ABC$ are respectively proportional to sides PQ and PR and median PM of $\triangle PQR$. Show that $\triangle ABC \sim \triangle PQR$. 5



33. How many terms of the A.P. 27, 24, 21, must be taken so that their sum is 105? Which term of the A.P. is zero? 5
34. (A) The shadow of a tower standing on a level ground is found to be 40 m longer when the Sun's altitude is 30° than when it was 60° . Find the height of the tower and the length of original shadow. (use $\sqrt{3} = 1.73$) 5

OR

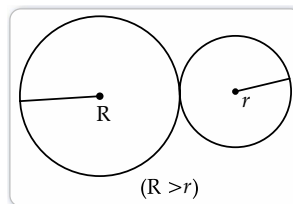
- (B) The angles of depression of the top and the bottom of an 8 m tall building from the top of a multi-storeyed building are 30° and 45° respectively. Find the height of the multi-storeyed building and the distance between the two buildings. (use $\sqrt{3} = 1.73$) 5
35. A chord of a circle of radius 14 cm subtends an angle of 90° at the centre. Find the area of the corresponding minor and major segments of the circle. 5

SECTION E

Q. No. 36 to 38 are Case-Based Questions of 4 marks each.

36. To keep the lawn green and cool, Sadhna uses water sprinklers which rotate in circular shape and cover a particular area.

The diagram below shows the circular areas covered by two sprinklers :



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

Based on above information, answer the following questions :

- (i) Obtain a quadratic equation involving R and r from above. 1
 (ii) Write a quadratic equation involving only r . 1
 (iii) (a) Find the radius r and the corresponding area irrigated. 2

OR

- (b) Find the radius R and the corresponding area irrigated. 2
 37. Gurpreet is very fond of doing research on plants. She collected some leaves from different plants and measured their lengths in mm.



The data obtained is represented in the following table:

Length (in mm):	70-80	80-90	90-100	100-110	110-120	120-130	130-140
Number of leaves:	3	5	9	12	5	4	2

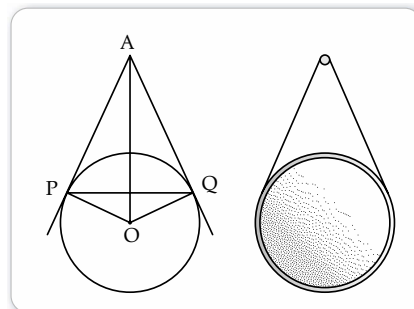
Based on the above information, answer the following questions :

- (i) Write the median class of the data. 1
 (ii) How many leaves are of length equal to or more than 10 cm? 1
 (iii) (a) Find median of the data. 2

OR

- (b) Write the modal class and find the mode of the data. 2

38. The picture given below shows a circular mirror hanging on the wall with a cord. The diagram represents the mirror as a circle with centre O . AP and AQ are tangents to the circle at P and Q respectively such that $AP = 30$ cm and $\angle PAQ = 60^\circ$.



Based on the above information, answer the questions:

- (i) Find the length PQ . 1
 (ii) Find $m\angle POQ$. 1
 (iii) (a) Find the length OA . 2

OR

- (b) Find the radius of the mirror. 2

Delhi Set-2

430/1/2

Note: Except these, all other question have been given in Delhi Set-1

SECTION A - 20 MARKS

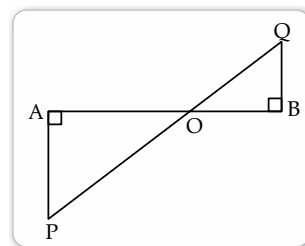
Q.No. 1 to 20 are multiple Choice Questions of 1 mark each.

1. LCM (850, 500) is: 1
 (a) 850×50 (b) 17×500
 (c) $17 \times 5^2 \times 2^2$ (d) $17 \times 5^3 \times 2$
 8. Three coins are tossed together. The probability of getting exactly one tail, is: 1
 (a) $\frac{1}{8}$ (b) $\frac{1}{4}$
 (c) $\frac{7}{8}$ (d) $\frac{3}{8}$
 10. Outer surface area of a cylindrical juice glass with radius 7 cm and height 10 cm, is: 1
 (a) 440 sq cm (b) 594 sq cm
 (c) 748 sq cm (d) 1540 sq cm
 11. On a throw of a die, if getting 6 is considered success then probability of losing the game is: 1
 (a) 0 (b) 1
 (c) $\frac{1}{6}$ (d) $\frac{5}{6}$

SECTION-B

Q. No. 21 to 25 are Very Short Answer Questions of 2 marks each.

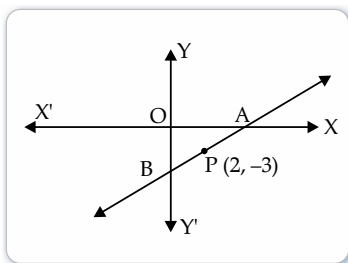
23. In a $\triangle ABC$, $\angle A = 90^\circ$. If $\tan C = \sqrt{3}$, then find the value of $\sin B + \cos C - \cos^2 B$. 2
 24. In the given figure, $AP \perp AB$ and $BQ \perp AB$. If $OA = 15$ cm, $BO = 12$ cm and $AP = 10$ cm, then find the length of BQ .

**SECTION-C**

Q. No. 26 to 31 are Short Answer Questions of 3 marks each.

26. Prove that: $\sqrt{\frac{\sec A - 1}{\sec A + 1}} + \sqrt{\frac{\sec A + 1}{\sec A - 1}} = 2 \operatorname{cosec} A$ 3

30. The line AB intersects x-axis at A and y-axis at B. The point P(2,3) lies on AB such that AP: PB = 3: 1. Find the co-ordinates of A and B. 3



SECTION D

Q. No. 32 to 35 are Long Answer Questions of 5 marks each.

Delhi Set-3

430/1/3

Note: Except these, all other question have been given in Delhi Set-1 & 2.

SECTION A - 20 MARKS

Q.No. 1 to 20 are multiple Choice Questions of 1 mark each.

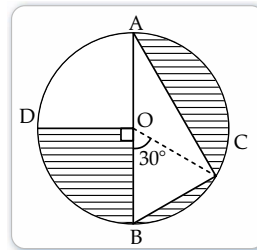
4. The curved surface area of a right circular cone of radius 7 cm is 550 sq cm. The slant height of the cone is : 1
 (a) 24 cm (b) 25 cm
 (c) 22 cm (d) 20 cm
9. If HCF (96, 404) = 4, then LCM (96, 404) is: 1
 (a) 9600 (b) 96×404
 (c) 404 (d) 9696
13. Which of the following cannot be the probability of an event? 1
 (a) 52% (b) $\frac{1}{3}\%$
 (c) 0.99 (d) $\frac{1}{0.99}$
15. Two dice are rolled together. The probability of getting at least one 6, is: 1
 (a) $\frac{1}{3}$ (b) $\frac{11}{36}$
 (c) $\frac{1}{6}$ (d) $\frac{10}{36}$

SECTION-B

Q. No. 21 to 25 are Very Short Answer Questions of 2 marks each.

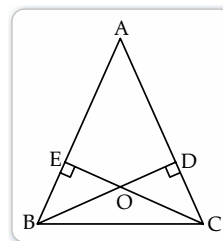
24. If $\sin A = \frac{1}{2}$ and $\cos B = \frac{1}{\sqrt{2}}$, then find the value of $\sin A \sin B + \cos A \cos B$. 2
25. In the given figure, in $\triangle ABC$, BD and CE are perpendiculars to AC and AB respectively. Prove

32. O is the centre of the circle. If AC = 28 cm, BC = 21 cm, $\angle BOD = 90^\circ$ and $\angle BOC = 30^\circ$, then find the area of the shaded region given in the figure. 5



35. In an A.P. if $S_n = 4n^2 - n$, then
 (i) find the first term and common difference. 5
 (ii) write the A.P.
 (iii) which term of the A.P. is 107?

that: $AE \times BD = AD \times CE$. 2



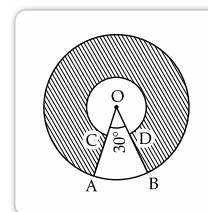
SECTION-C

Q. No. 26 to 31 are Short Answer Questions of 3 marks each.

29. Prove that: $\sin^6 \theta + \cos^6 \theta + 3 \sin^2 \theta \cos^2 \theta = 1$ 3
31. If A(2, -1), B(a, 4), C(-2, b) and D(-3, -2) are vertices of a parallelogram ABCD taken in order, then find the values of a and b. Also, find the length of the sides of the parallelogram. 3

Q. No. 32 to 35 are Long Answer Questions of 5 marks each.

32. In the given figure, two concentric circles with centre O have radii 14 cm and 7 cm. If $\angle AOB = 30^\circ$, find the area of the shaded region. 5



34. In an A.P. of 50 terms, the sum of first 10 terms is 250 and the sum of its last 15 terms is 2625. Find the A.P. so formed. 5

Outside Delhi Set-1

430/2/1

SECTION A - 20 MARKS

(Multiple Choice Questions)

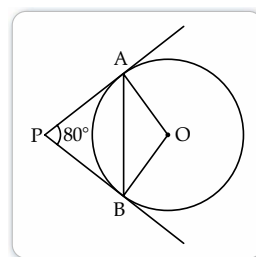
Section-A consists of 20 Multiple Choice Questions of 1 mark each.

- The HCF of smallest 2-digit number and the smallest composite number is: **1**
(a) 2 (b) 20
(c) 40 (d) 4
- The value of k for which the pair of linear equations $x + y - 4 = 0$ and $2x + ky - 8 = 0$ has infinitely many solutions, is **1**
(a) $k \neq 2$ (b) $k \neq -2$
(c) $k = 2$ (d) $k = -2$
- Which of the following equations has 2 as a root? **1**
(a) $x^2 - 4x + 5 = 0$ (b) $x^2 + 3x - 12 = 0$
(c) $2x^2 - 7x + 6 = 0$ (d) $3x^2 - 6x - 2 = 0$
- In an A.P., if $d = -4$ and $a_7 = 4$, then the first term 'a' is equal to **1**
(a) 6 (b) 7
(c) 20 (d) 28
- The distance of the point (5, 4) from the origin is **1**
(a) 41 (b) $\sqrt{41}$
(c) 3 (d) 9
- If $\sin A = \frac{3}{5}$, then value of $\cot A$ is: **1**
(a) $\frac{3}{4}$ (b) $\frac{4}{3}$
(c) $\frac{4}{5}$ (d) $\frac{5}{4}$
- $\frac{1 + \tan^2 A}{1 + \cot^2 A}$ is equal to **1**
(a) $\sec^2 A$ (b) -1
(c) $\cot^2 A$ (d) $\tan^2 A$
- $\frac{2 \tan 30^\circ}{1 - \tan^2 30^\circ}$ is equal to **1**
(a) $\cos 60^\circ$ (b) $\sin 60^\circ$
(c) $\tan 60^\circ$ (d) $\sin 30^\circ$
- A quadratic polynomial, the sum of whose zeroes is -5 and their product is 6, is **1**
(a) $x^2 + 5x + 6$ (b) $x^2 - 5x + 6$
(c) $x^2 - 5x - 6$ (d) $-x^2 + 5x + 6$
- The zeroes of the polynomial $3x^2 + 11x - 4$ are: **1**
(a) $\frac{1}{3}, 4$ (b) $-\frac{1}{3}, -4$
(c) $\frac{1}{3}, -4$ (d) $-\frac{1}{3}, 4$
- The annual rainfall record of a city for 66 days is given in the following table **1**

Rainfall (in cm):	0-10	10-20	20-30	30-40	40-50	50-60
Number of days :	22	10	8	15	5	6

The difference of upper limits of modal and median classes is :

- (a) 10 (b) 15
(c) 20 (d) 30
- If $P(A)$ denotes the probability of an event A , then **1**
(a) $P(A) < 0$ (b) $P(A) > 1$
(c) $0 \leq P(A) \leq 1$ (d) $-1 \leq P(A) \leq 1$
- The total surface area of a solid hemisphere of radius 7 cm is: **1**
(a) $98 \pi \text{ cm}^2$ (b) $147 \pi \text{ cm}^2$
(c) $196 \pi \text{ cm}^2$ (d) $228 \frac{2}{3} \pi \text{ cm}^2$
- The difference of the areas of a minor sector of angle 120° and its corresponding major sector of a circle of radius 21 cm, is **1**
(a) 231 cm^2 (b) 462 cm^2
(c) 346.5 cm^2 (d) 693 cm^2
- The graph of a pair of linear equations $a_1x + b_1y = c_1$, and $a_2x + b_2y = c_2$ in two variables x and y represents parallel lines, if **1**
(a) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ (b) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$
(c) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2} = \frac{c_1}{c_2}$ (d) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$
- In the given figure, tangents PA and PB from a point P to a circle with centre O are inclined to each other at an angle of 80° . $\angle ABO$ is equal to **1**



- (a) 40° (b) 80°
(c) 100° (d) 50°
- A line intersecting a circle in two distinct points is called a **1**
(a) secant (b) chord
(c) diameter (d) tangent
- If a pole 6 m high casts a shadow $2\sqrt{3}$ m long on the ground, then the sun's elevation is **1**

- (a) 30° (b) 45°
(c) 60° (d) 90°

(Assertion - Reason based questions)

Directions : In question numbers 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option :

- (a) Both Assertion (A) and Reason (R) are correct and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are correct but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.
19. **Assertion (A) :** A line drawn parallel to any one side of a triangle intersects the other two sides in the same ratio. 1
Reason (R): Parallel lines cannot be drawn to any side of a triangle.
20. **Assertion (A):** The point (0, 4) lies on y -axis. 1
Reason (R): The x -coordinate of a point, lying on y -axis, is zero.

SECTION B

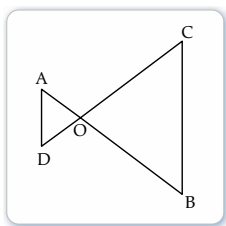
(Very Short Answer Type Questions)

Q. Nos. 21 to 25 are Very Short Answer type questions of 2 marks each.

21. Find the HCF of 84 and 144 by prime factorisation method 2
22. (a) The sum of two natural numbers is 70 and their difference is 10. Find the natural numbers. 2

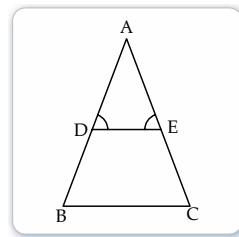
OR

- (b) Solve for x and y : 2
 $x - 3y = 7$
 $3x - 3y = 5$
23. 15 defective pens are accidentally mixed with 145 good ones. One pen is taken out at random from this lot. Determine the probability that the pen taken out is a good one. 2
24. (a) In the given figure, $OA \cdot OB = OC \cdot OD$, Prove that $\triangle AOD \sim \triangle COB$. 2



OR

- (b) In the given figure, $\angle D = \angle E$ and $\frac{AD}{DB} = \frac{AE}{EC}$. Prove that $\triangle ABC$ is isosceles.



25. Prove that the tangents drawn at the ends of a diameter of a circle are parallel to each other. 2

SECTION C

(Short Answer Type Questions)

- Q. Nos. 26 to 31 are Short Answer type questions of 3 marks each.**
26. Two dice are tossed simultaneously. Find the probability of getting 3
(a) an even number on both the dice.
(b) the sum of two numbers more than 9.
27. (a) In two concentric circles, a chord of length 24 cm of larger circle touches the smaller circle, whose radius is 5 cm. Find the radius of the larger circle. 3

OR

- (b) Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line segment joining the points of contact at the centre. 3
28. Prove that $7 - 3\sqrt{5}$ is an irrational number, given that $\sqrt{5}$ is an irrational number. 3
29. (a) Zeroes of the quadratic polynomial $x^2 - 3x + 2$ are α and β . Construct a quadratic polynomial whose zeroes are $2\alpha + 1$ and $2\beta + 1$. 3

OR

- (b) Find the zeroes of the polynomial $4x^2 - 4x + 1$ and verify their relationship between the zeroes and the coefficients. 3
30. Prove that $\frac{\tan \theta}{1 - \cot \theta} + \frac{\cot \theta}{1 - \tan \theta} = 1 + \sec \theta \operatorname{cosec} \theta$ 3
31. A car has two wipers which do not overlap. Each wiper has a blade of length 21 cm sweeping through an angle of 120° . Find the area cleaned at each sweep of the blades. 3

SECTION D

(Long Answer Type Questions)

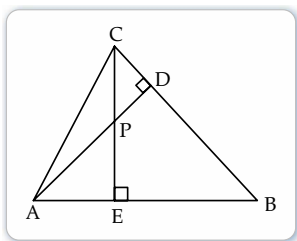
- Q. Nos. 32 to 35 are Long Answer type questions of 5 marks each.**
32. A cottage industry produces a certain number of toys in a day. The cost of production of each toy (in rupees) was found to be 55 minus the number of toys produced in a day. On a particular day, the total cost of production was ₹750. Find the total number of toys produced on that day. 5

33. A TV tower stands vertically on a bank of a canal. From a point on the other bank exactly opposite the tower, the angle of elevation of the top of the tower is 60° . From another point 20 m away from this point on the line joining this point to the foot of the tower, the angle of elevation of the top of the tower is 30° . Find the height of the tower and the width of the canal. [Use $\sqrt{3} = 1.732$]

34. (a) In the given figure, altitudes CE and AD of $\triangle ABC$ intersect each other at the point P. 1+2+2

Show that

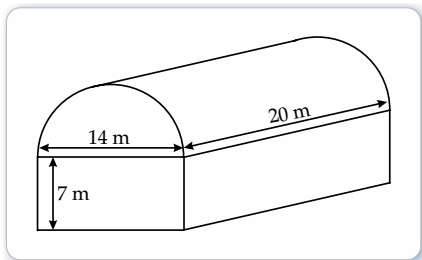
- (i) $\triangle AEP \sim \triangle CDP$
 (ii) $\triangle ABD \sim \triangle CBE$
 (iii) $\triangle AEP \sim \triangle ADB$



OR

- (b) AD and PM are medians of triangles ABC and PQR, respectively, where $\triangle ABC \sim \triangle PQR$. Prove that $\frac{AB}{PQ} = \frac{AD}{PM}$. 5

35. (a)



A textile industry runs in a shed. This shed is in the shape of a cuboid surmounted by a half cylinder. If the base of the industry is of dimensions 14 m \times 20 m and the height of the cuboidal portion is 7 m, find the volume of air that the industry can hold. Further, suppose the machinery in the industry occupies a total space of 400 m^3 . Then, how much space is left in the industry? 5

OR

- (b) From a solid cylinder of height 8 cm and radius 6 cm, a conical cavity of the same height and same radius is carved out. Find the total surface area of the remaining solid. (Take $\pi = 3.14$) 5

SECTION E

(Case Study based Questions)

Q. Nos. 36 to 38 are Case Study based Questions of 4 marks each.

36. Saving money is a good habit and it should be inculcated in children right from the beginning. Rehan's mother brought a piggy bank for Rehan and

puts one ₹5 coin of her savings in the piggy bank on the first day. She increases his savings by one ₹5 coin daily.

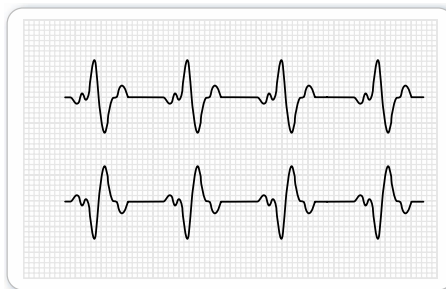


Based on the above information, answer the following questions :

- (i) How many coins were added to the piggy bank on 8th day? 1
 (ii) How much money will be there in the piggy bank after 8 days? 1
 (iii) (a) If the piggy bank can hold one hundred twenty ₹5 coins in all, find the number of days she can contribute to put ₹5 coins into it. 2

OR

- (ii) (b) Find the total money saved, when the piggy bank is full. 2
 37. **Heart Rate :** The heart rate is one of the 'vital signs' of health in the human body. It measures the number of times per minute that the heart contracts or beats. While a normal heart rate does not guarantee that a person is free of health problems, it is a useful benchmark for identifying a range of health issues.



Thirty women were examined by doctors of AIIMS and the number of heart beats per minute were recorded and summarized as follows :

Number of heart beats per minute	Number of Women
65 - 68	2
68-71	4
71-74	3
74 - 77	8
77- 80	7
80- 83	4
83-86	2

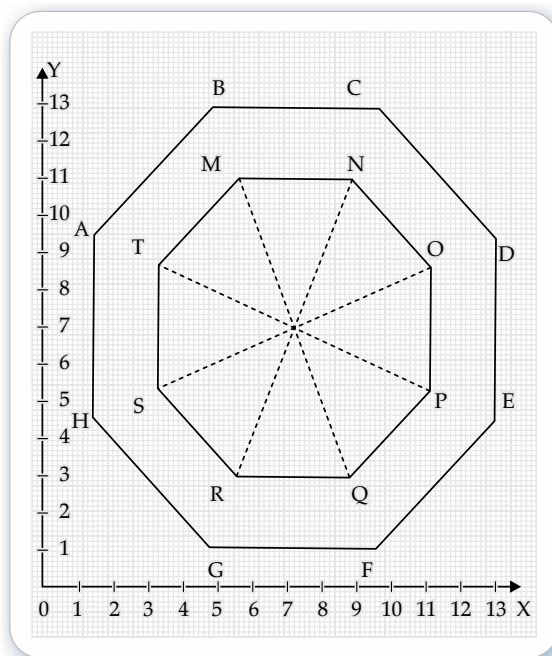
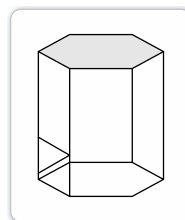
Based on the above information, answer the following questions :

- (i) How many women are having heart beat in the range 68–77 ? 1
- (ii) What is the median class of heart beats per minute for these women ? 1
- (iii) (a) Find the modal value of heart beats per minute for these women. 2

OR

- (iii) (b) Find the median value of heart beats per minute for these women. 2

38. The top of a table is hexagonal in shape.



On the basis of the information given above, answer the following questions:

- (i) Write the coordinates of A and B. 1
- (ii) Write the coordinates of the mid-point of line segment joining C and D. 1

- (iii) (a) Find the distance between M and Q. 2

OR

- (iii) (b) Find the coordinates of the point which divides the line segment joining M and N in the ratio 1:3 internally. 2

Outside Delhi Set-2

430/2/2

Note: Except these, all other question have been given in Outside Delhi Set-1

SECTION A

(Multiple Choice Questions)

Section-A consists of 20 Multiple Choice Questions of 1 mark each.

5. If $\sin^2 \theta = \frac{3}{4}$, then θ is 1
- (a) 30° (b) 45°
- (c) 60° (d) 90°
6. The zeroes of the polynomial $3x^2 - 5x - 2$, are: 1
- (a) $\frac{1}{3}, 2$ (b) $-\frac{1}{3}, 2$
- (c) $-\frac{1}{3}, -2$ (d) $\frac{1}{3}, -2$

7. A pole $7\sqrt{3}$ m high casts a shadow 21 m long on the ground, then the sun's elevation is: 1
- (a) 30° (b) 45°
- (c) 60° (d) 90°
16. Which of the following quadratic equations has -1 as a root? 1
- (a) $x^2 - 4x - 5 = 0$ (b) $-x^2 - 4x + 5 = 0$
- (c) $x^2 + 3x + 4 = 0$ (d) $x^2 - 5x + 6 = 0$
17. The distance of the point (3, 4) from the origin is 1
- (a) 25 (b) 5
- (c) 7 (d) 1
18. If the first term of an AP is -3 and common difference -2, then the seventh term is 1
- (a) -9 (b) 9
- (c) -17 (d) -15

SECTION B**(Very Short Answer Type Questions)**

- Q. Nos. 21 to 25 are Very Short Answer type questions of 2 marks each.
22. A lot consists of 165 ball pens of which 30 are defective and the others are good. Rakshita will buy a pen if it is good. The shopkeeper draws one pen at random and gives it to Rakshita. What is the probability that she will buy it? 2

SECTION C**(Short Answer Type Questions)**

- Q. Nos. 26 to 31 are Short Answer type questions of 3 marks each.
26. To warn ships for underwater rocks, a light house spreads a red coloured light over a sector of angle 80° to a distance of 16.5 km. Find the area of the sea over which the ships are warned. (Use $\pi = 3.14$) 3
27. (a) Zeroes of the quadratic polynomial $x^2 + x - 6$ are ' α ' and ' β '. Construct a quadratic polynomial whose zeroes are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$. 3

OR

- (b) Find the zeros of the polynomial $2x^2 + 3x - 2$ and verify the relationship between the zeroes and the coefficients.

SECTION D**(Long Answer Type Questions)**

- Q. Nos. 32 to 35 are Long Answer type questions of 5 marks each.
34. From the top of a 7 m high building, the angle of elevation of the top of a cable tower is 60° and the angle of depression of its foot is 45° . Determine the height of the tower. (Use $\sqrt{3} = 1.732$) 5
35. A cottage industry produces a certain number of pottery articles in a day. It was observed that on a particular day that the cost of production of each article (in rupees) was 3 more than twice the number of articles produced on that day. If the total cost of production on that day was ₹ 90, find the number of articles produced and the cost of each article. 5

Outside Delhi Set-3**430/2/3****Note:** Except these, all other question have been given in Outside Delhi Set-1 & 2**SECTION A****(Multiple Choice Questions)****Section-A consists of 20 Multiple Choice Questions of 1 mark each.**

1. The total surface area of a cube of side 20 cm is 1
 (a) 240cm^2 (b) 160cm^2
 (c) 2400cm^2 (d) 1600cm^2
9. If n is any natural number, then which of the following numbers ends with digit 0? 1
 (a) $(3 \times 2)^n$ (b) $(5 \times 2)^n$
 (c) $(6 \times 2)^n$ (d) $(4 \times 2)^n$
10. If $5 \cos A - 4 = 0$ then the value of $\tan A$ is 1
 (a) $\frac{3}{4}$ (b) $\frac{4}{3}$
 (c) $\frac{3}{5}$ (d) $\frac{4}{5}$
14. The value of ' p ' for which the pair of equations $-2x + 3y - 9 = 0$ and $4x + py + 7 = 0$ has a unique solution is 1
 (a) $p \neq 6$ (b) $p = 6$
 (c) $p = -6$ (d) $p \neq -6$
15. $\frac{\operatorname{cosec}^2 A - \cot^2 A}{1 - \sin^2 A}$ is equal to 1
 (a) $\sin^2 A$ (b) $\cos^2 A$
 (c) $\sec^2 A$ (d) $\tan^2 A$

SECTION B**(Very Short Answer Type Questions)**

- Q. Nos. 21 to 25 are Very Short Answer type questions of 2 marks each.
23. Find the LCM of 231 and 396 by prime factorisation method. 2

SECTION C**(Short Answer Type Questions)**

- Q. Nos. 26 to 31 are Short Answer type questions of 3 marks each.
28. All the kings and queens are removed from a deck of 52 playing cards. Remaining cards are well shuffled and then a card is drawn at random. Find the probability that the drawn card is 1+1+1
 (a) an ace of hearts
 (b) a black card
 (c) a jack of spades
31. Prove that $5\sqrt{2} - 3$ is an irrational number, given that $\sqrt{2}$ is an irrational number. 3

SECTION E**(Long Answer Type Questions)**

- Q. Nos. 32 to 35 are Long Answer type questions of 5 marks each.
35. The area of a rectangular plot is 528 m^2 . The length of the plot (in metres) is one more than twice the breadth. Find the length and breadth of the plot. Also, find the cost of levelling the plot at the rate of ₹80 per square metre.



ANSWERS

Delhi Set-1

430/1/1

SECTION-A

1. Option (b) is correct.

Explanation:

Given that,

Polynomial as $kx^2 - 4x - 7$

Product of zeroes = 2

We know that,

For $ax^2 + bx + c$,

Product of zeroes = $-\frac{c}{a}$

So, we have,

$$\Rightarrow 2 = \frac{-7}{k}$$

$$\Rightarrow k = \frac{-7}{2}$$

2. Option (d) is correct.

Explanation:

Given that,

$$\Rightarrow a = 8, a_{10} = -19$$

We know that,

$$\Rightarrow a_{10} = a + 9d = -19$$

$$\Rightarrow 8 + 9d = -19$$

$$\Rightarrow 9d = -19 - 8$$

$$\Rightarrow 9d = -27$$

$$\Rightarrow d = \frac{-27}{9}$$

$$\Rightarrow d = -3$$

3. Option (d) is correct.

Explanation:

The points are, $(-1, 3)$ and $(8, \frac{3}{2})$

Using midpoint formula,

$$(x, y) = \left(\frac{-1+8}{2}, \frac{3+\frac{3}{2}}{2} \right)$$

$$(x, y) = \left(\frac{7}{2}, \frac{9}{4} \right)$$

So, $\left(\frac{7}{2}, \frac{9}{4} \right)$ is the required midpoint.

4. Option (b) is correct.

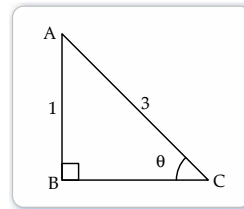
Explanation:

Given that,

$$\Rightarrow \sin \theta = \frac{1}{3}$$

We have,

In right $\triangle ABC$,



$$BC = \sqrt{9-1} = \sqrt{8} = 2\sqrt{2}$$

$$\Rightarrow \sec \theta = \frac{AC}{BC} = \frac{3}{2\sqrt{2}}$$

5. Option (a) is correct.

Explanation:

HCF of 132 and 77

$$132 = 2 \times 2 \times 3 \times 11$$

$$77 = 7 \times 11$$

$$\text{HCF}(132, 77) = 11$$

6. Option (b) is correct.

Explanation:

Given that,

Roots of quadratic equation $4x^2 - 5x + k = 0$ are real and equal

On comparing with $ax^2 + bx + c = 0$

We get, $a = 4$, $b = -5$ and $c = k$

For real and equal roots,

$$\Rightarrow b^2 - 4ac = 0$$

$$\Rightarrow (-5)^2 - 4(4)(k) = 0$$

$$\Rightarrow 16k = 25$$

$$\Rightarrow k = \frac{25}{16}$$

7. Option (d) is correct.

Explanation:

Given that,

$$P(\text{winning}) = p$$

$$\text{So, } P(\text{loosing}) = P(\text{not winning}) = 1 - p$$

8. Option (a) is correct.

Explanation:

Given the points are $(2, -3)$ and $(-2, 3)$

Using the distance formula,

$$\rightarrow \sqrt{(2 - (-2))^2 + (-3 - 3)^2}$$

$$\rightarrow \sqrt{16 + 36}$$

$$\rightarrow \sqrt{52} = 2\sqrt{13}$$

So, the distance between the points is $2\sqrt{13}$ units.

9. Option (c) is correct.

Explanation:

Given that,

$$\Rightarrow \sin^2 \theta + \sin \theta + \cos^2 \theta = 2$$

$$\Rightarrow (\sin^2 \theta + \cos^2 \theta) + \sin \theta = 2$$

$$\Rightarrow 1 + \sin \theta = 2$$

$$(As \sin^2 \theta + \cos^2 \theta = 1)$$

$$\Rightarrow \sin \theta = 1 = \sin 90^\circ$$

$$\Rightarrow \theta = 90^\circ$$

10. Option (d) is correct.*Explanation:*

We know that,

In a well shuffled deck of cards,

Total outcomes = 52

Favourable outcomes of getting red queen = 2

$$\text{So, } P(\text{red queen}) = \frac{2}{52} = \frac{1}{26}$$

11. Option (b) is correct.*Explanation:*

Median is the statistical measure that divides a statistical data arranged in order into two equal parts.

12. Option (c) is correct.*Explanation:*

Given that,

$$\text{Radius of sphere, } r = \frac{7}{2} \text{ cm}$$

We know that,

$$\text{Volume of Sphere} = \frac{4}{3} \pi r^3$$

$$\text{Volume} = \frac{4}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times \frac{7}{2}$$

$$\text{Volume} = \frac{11 \times 7 \times 7}{3} = \frac{539}{3} \text{ cm}^3$$

13. Option (a) is correct.*Explanation:*

Given that,

Mean = 21

Median = 23

Using empirical relation,

$$\text{Mode} = 3\text{Median} - 2\text{Mean}$$

$$\text{Mode} = 3 \times 23 - 2 \times 21$$

$$\text{Mode} = 69 - 42 = 27$$

14. Option (d) is correct.*Explanation:*

Given that,

Height of cone, $h = 24$ cmRadius of cone, $r = 7$ cm

Slant height of cone,

$$l = \sqrt{24^2 + 7^2}$$

$$l = \sqrt{625} = 25 \text{ cm}$$

15. Option (b) is correct.*Explanation:*

Given that,

One zero of polynomial = -3

$$P(x) = (\alpha - 1)x^2 + \alpha x + 1$$

Also, $P(-3) = 0$

$$\Rightarrow (\alpha - 1)(3)^2 + 3\alpha + 1 = 0$$

$$\Rightarrow 9\alpha - 9 + 3\alpha + 1 = 0$$

$$\Rightarrow 12\alpha = 8$$

$$\Rightarrow \alpha = \frac{8}{12} = \frac{2}{3}$$

16. Option (c) is correct.*Explanation:*

Given that,

Length of diameter of circle = 6 cm

One end of diameter = $(-4, 0)$ Other end of diameter on x -axis will be of the form $(x, 0)$

Using distance formula,

$$\rightarrow \sqrt{(x - (-4))^2 + (0 - 0)^2} = 6$$

$$\rightarrow x + 4 = 6$$

$$\rightarrow x = 2$$

So, the other end of diameter is $(2, 0)$.**17. Option (b) is correct.***Explanation:*

Given that,

Pair of linear equations as $5x + 2y - 7 = 0$ and

$$2x + ky + 1 = 0$$

For no solution,

$$\rightarrow \frac{5}{2} = \frac{2}{k} \neq \frac{-7}{1}$$

$$\rightarrow \frac{5}{2} = \frac{2}{k}$$

$$\rightarrow k = \frac{4}{5}$$

18. Option (c) is correct.*Explanation:*

We know that,

On rolling two dice,

Total number of possible outcomes = 36

Favourable outcomes are $\{(1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6)\} = 6$

$$\text{So, } P(\text{doublet}) = \frac{6}{36} = \frac{1}{6}$$

19. Option (c) is correct.*Explanation:*

In the given figure OAPB is a cyclic quadrilateral with PA and PB as tangents drawn from an external point P.

$$\text{Also, } \angle AOB + \angle APB = 180^\circ$$

As the sum of opposite angles of a cyclic quadrilateral is 180°

So, Assertion is true but reason is false.

20. Option (a) is correct.*Explanation:*

For the polynomial,

$$\Rightarrow p(x) = x^2 - 2x - 3$$

$$\Rightarrow p(x) = x^2 - 3x + x - 3$$

$$\Rightarrow p(x) = x(x - 3) + 1(x - 3)$$

$$\Rightarrow p(x) = (x - 3)(x + 1)$$

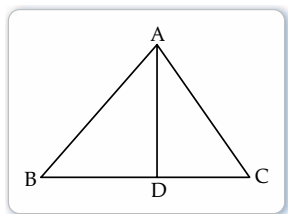
So, the zeroes are 3 and -1

Also, the graph of given polynomial intersects x -axis at points $(3, 0)$ and $(-1, 0)$

So, both assertion and reason are true and reason explains assertion completely.

SECTION-B

21. Given that,
 $\angle ADC = \angle BAC$



In $\triangle ADC$ and $\triangle BAC$, we have

$$\angle ADC = \angle BAC$$

(given)

$$\angle C = \angle C$$

(common)

By AA similarity criterion

$$\triangle ADC \sim \triangle BAC$$

$$\text{So, } \frac{AC}{BC} = \frac{DC}{AC}$$

$$\Rightarrow AC^2 = BC \times DC$$

22. (A)

Given the pair of linear equations as,

$$\Rightarrow x + 2y = 9 \quad \text{---(i)}$$

$$\Rightarrow -2x + y = 2 \quad \text{---(ii)}$$

Multiplying eqn(i) by 2 and adding to eqn (ii), we get

$$\Rightarrow (-2x + y) + (2x + 4y) = 2 + 18$$

$$\Rightarrow 5y = 20$$

$$\Rightarrow y = 4$$

Putting in eqn(i),

$$\Rightarrow x + 2(4) = 9$$

$$\Rightarrow x + 8 = 9$$

So, the required solution is $x = 1$ and $y = 4$

OR

- (B)

Given the equations of line are

$$\Rightarrow x + y = -1 \quad \text{---(i)}$$

$$\Rightarrow x - y = 1 \quad \text{---(ii)}$$

The intersection point of both the lines will be the point that lies on both the lines,

So, adding eqn (i) and (ii),

$$\Rightarrow (x + y) + (x - y) = -1 + 1$$

$$\Rightarrow 2x = 0$$

$$\Rightarrow x = 0$$

Putting in eqn (i),

$$\Rightarrow 0 + y = -1$$

$$\Rightarrow y = -1$$

So, the point will be $(x, y) = (0, -1)$

Hence, the point $(-4, 3)$ does not lie on both the lines.

- 23.

- (A)

Let us assume that $6 - 4\sqrt{5}$ be a rational number

$$\text{Let } 6 - 4\sqrt{5} = \frac{a}{b} \quad [b \neq 0; a \text{ and } b \text{ are integers}]$$

$$\Rightarrow \sqrt{5} = \frac{\left(6 - \frac{a}{b}\right)}{4}$$

We know that,

$$\left(6 - \frac{a}{b}\right)/4 \text{ is a rational number.}$$

But this contradicts the fact that $\sqrt{5}$ is an irrational number.

So, our assumption is wrong.

Therefore, $6 - 4\sqrt{5}$ is an irrational number

OR

- (B)

We have

$$11 \times 19 \times 23 + 3 \times 11$$

$$\Rightarrow 11(19 \times 23 + 3)$$

$$\Rightarrow 11(437 + 3)$$

$$\Rightarrow 11(440)$$

$$\Rightarrow 11(2 \times 2 \times 2 \times 5 \times 11)$$

$$\Rightarrow 2 \times 2 \times 2 \times 5 \times 11 \times 11$$

As it can be represented as a product of more than two primes (1 and number itself).

So, it is not a prime number.

24. Given that,

$$A = 30^\circ \text{ and } B = 45^\circ$$

$$\Rightarrow \sin A \cos B + \cos A \sin B$$

We have,

$$\Rightarrow \sin 30^\circ \times \cos 45^\circ + \cos 30^\circ \times \sin 45^\circ$$

On putting the values, we get,

$$\Rightarrow \frac{1}{2} \times \frac{1}{\sqrt{2}} + \frac{\sqrt{3}}{2} \times \frac{1}{\sqrt{2}}$$

$$\Rightarrow \frac{1}{2\sqrt{2}} + \frac{\sqrt{3}}{2\sqrt{2}}$$

$$\Rightarrow \frac{(1 + \sqrt{3})}{2\sqrt{2}}$$

Or

$$\Rightarrow \frac{(\sqrt{2} + \sqrt{6})}{4}$$

25. Given that,

Bag contains

Number of red balls = 4

Number of white balls = 5

Let the number of yellow balls be y

$$\text{Also, } P(\text{red ball}) = \frac{1}{5}$$

$$\text{Total number of balls} = 4 + 5 + y = (9 + y)$$

$$\text{So, } P(\text{red}) = \frac{4}{(9 + y)} = \frac{1}{5}$$

$$\Rightarrow \frac{1}{5} = \frac{4}{(9 + y)}$$

$$\Rightarrow 9 + y = 20$$

$$\Rightarrow y = 11$$

So, the number of yellow balls is 11.

SECTION-C

26. Given that,

Two alarms ring at regular intervals of 20 and 25 minutes, respectively.

The time they will beep together again is their LCM

So, LCM(20, 25)

$$20 = 2 \times 2 \times 5$$

$$25 = 5 \times 5$$

$$\text{LCM}(20, 25) = 2 \times 2 \times 5 \times 5 = 100$$

So, they will beep together after 100 minutes or 1 h 40 minutes

They will beep again after 12 noon at 1:40 pm.

27. Let the smaller angle be x

Greater angle = $x + 18$

As the angles are supplementary,

So, Sum of angles = 180°

$$\Rightarrow x + (x + 18)^\circ = 180^\circ$$

$$\Rightarrow 2x + 18^\circ = 180^\circ$$

$$\Rightarrow 2x = 162^\circ$$

$$\Rightarrow x = 81^\circ$$

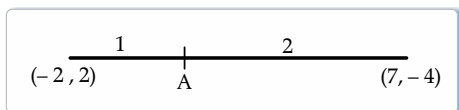
Greater angle = $(x + 18)^\circ = (81 + 18)^\circ = 99^\circ$

So, the measures of angles are 81° and 99° .

28. Given the points are $(-2, 2)$ and $(7, -4)$

Let the points of trisection be A and B

Using the section formula we have,



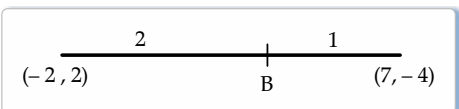
Coordinates of A are as:

$$\left[\left(\frac{1(7) + 2(-2)}{1+2} \right), \left(\frac{1(-4) + 2(2)}{1+2} \right) \right]$$

$$= \left[\left(\frac{3}{3} \right), \left(\frac{0}{3} \right) \right]$$

$$= (1, 0)$$

Now, the coordinates of B are as:



$$\left[\left(\frac{2(7) + 1(-2)}{2+1} \right), \left(\frac{2(-4) + 1(2)}{2+1} \right) \right]$$

$$= \left[\left(\frac{12}{3} \right), \left(\frac{-6}{3} \right) \right]$$

$$= (4, -2)$$

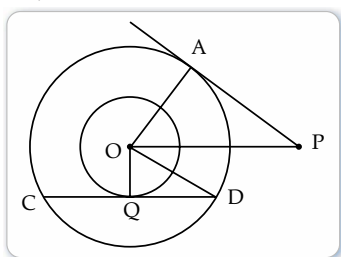
Hence, the coordinates of points of trisection are $(1, 0)$ and $(4, -2)$.

29. (A)

Given that,

OA = r cm, OQ = 6 cm,

PA = 16 cm, OP = 20 cm



In $\triangle AOP$,

We have, $\angle OAP = 90^\circ$

(Radius is perpendicular to tangent at point of contact)

$$\text{So, } OP^2 = OA^2 + AP^2$$

$$\Rightarrow (20)^2 = r^2 + (16)^2$$

$$\Rightarrow r^2 = 400 - 256 = 144$$

$$\Rightarrow r = 12 \text{ cm}$$

Also, OA = OD = 12 cm (Radius of circle)

In $\triangle QOD$,

We have, $\angle OQD = 90^\circ$ (Radius is perpendicular to tangent at point of contact)

$$\text{So, } OD^2 = OQ^2 + QD^2$$

$$\Rightarrow (12)^2 = (6)^2 + (QD)^2$$

$$\Rightarrow QD^2 = 144 - 36 = 108$$

$$\Rightarrow QD = 6\sqrt{3} \text{ cm}$$

Also, CD = 2QD (As chord is bisected at the point of contact of circle)

$$\text{So, } CD = 2 \times 6\sqrt{3} = 12\sqrt{3} \text{ cm}$$

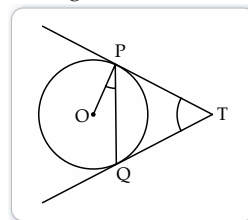
Hence, the length of CD is $12\sqrt{3}$ cm.

OR

(B)

Given that,

TP and TQ are tangents to circle



To prove: $\angle PTQ = 2\angle OPQ$

We have,

TP = TQ (Lengths of tangents from an external point to a circle are equal)

$$\angle TQP = \angle TPQ \quad \text{--- (i)}$$

(angles of equal sides are equal)

Also $\angle OPT = 90^\circ$ (Radius is perpendicular to tangent at point of contact)

$$\Rightarrow \angle OPQ + \angle QPT = 90^\circ$$

$$\Rightarrow \angle TPQ = 90^\circ - \angle OPQ \quad \text{---- (ii)}$$

In $\triangle PTQ$, we have,

$$\angle PTQ + \angle TQP + \angle TPQ = 180^\circ$$

(Sum of angles of triangle)

From (i) and (ii),

$$\Rightarrow \angle PTQ + \angle TPQ + \angle TPQ = 180^\circ$$

$$\Rightarrow \angle PTQ + 2(90^\circ - \angle OPQ) = 180^\circ$$

$$\Rightarrow \angle PTQ + 180^\circ - 2\angle OPQ = 180^\circ$$

$$\Rightarrow \angle PTQ = 2\angle OPQ$$

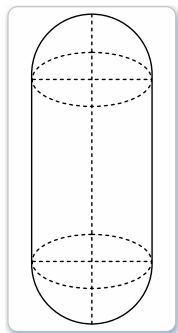
Hence, proved.

30. (A)

Given that,

Height of solid = 20 cm

Diameter of cylinder = 14 cm



We have,

Height of cylinder, $h = 20 - 7 - 7 = 6$ cm

Radius of cylindrical and hemispherical part,

$r = 7$ cm

Surface area of solid = Surface area of cylinder + 2 × Surface area of hemisphere

$$= 2\pi rh + 2 \times 2\pi r^2$$

$$= 2\pi rh + 4\pi r^2$$

$$= 2\pi r(h + 2r)$$

$$= 2 \times \frac{22}{7} \times 7 \times (6 + 14)$$

$$= 2 \times 22 \times 20$$

$$= 880 \text{ cm}^2$$

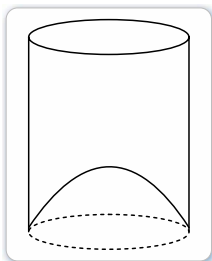
Hence, the surface area of solid is 880 cm^2 .

OR

(B) Given that,

Diameter of glass = 10 cm

Height of glass = 14 cm



Capacity of glass = Volume of cylinder – Volume of hemisphere

We have,

Radius of cylinder or hemispherical part, $r = 5$ cm

Height of cylinder, $h = 14$ cm

So,

$$\text{Capacity of glass} = \pi r^2 h - \left(\frac{2}{3}\right) \times \pi r^3$$

$$= \pi r^2 \left(h - \frac{2r}{3}\right)$$

$$= 3.14 \times (5)^2 \times \left(14 - \frac{10}{3}\right)$$

$$= 3.14 \times 25 \times \frac{32}{3}$$

$$= 837.33 \text{ cm}^3$$

So, the capacity of glass is 837.33 cm^3 .

31. Taking LHS,
($\cot \theta - \operatorname{cosec} \theta$)²

$$\Rightarrow \cot^2 \theta + \operatorname{cosec}^2 \theta - 2 \times \cot \theta \times \operatorname{cosec} \theta$$

$$\Rightarrow \frac{\cos^2 \theta}{\sin^2 \theta} + \frac{1}{\sin^2 \theta} - 2 \times \frac{\cos \theta}{\sin \theta} \times \frac{1}{\sin \theta}$$

$$\Rightarrow \frac{(1 + \cos^2 \theta)}{\sin^2 \theta} - \frac{2 \cos \theta}{\sin^2 \theta}$$

$$\Rightarrow \frac{(1 + \cos^2 \theta - 2 \cos \theta)}{\sin^2 \theta}$$

$$\Rightarrow \frac{(1 - \cos \theta)^2}{\sin^2 \theta} \quad (\text{As } \sin^2 \theta = 1 - \cos^2 \theta)$$

$$\Rightarrow \frac{(1 - \cos \theta)^2}{(1 - \cos^2 \theta)}$$

$$\Rightarrow \frac{(1 - \cos \theta)^2}{[(1 - \cos \theta)(1 + \cos \theta)]}$$

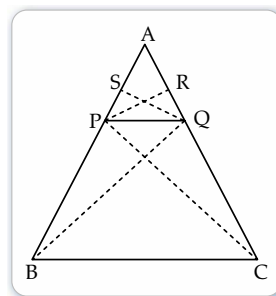
$$\Rightarrow \frac{(1 - \cos \theta)}{(1 + \cos \theta)}$$

$$\text{LHS} = \text{RHS}$$

Hence, proved.

SECTION-D

32. (A)



Given: $\triangle ABC$, where $PQ \parallel BC$

$$\text{To prove: } \frac{AP}{BP} = \frac{AQ}{CQ}$$

Construction: Join BQ, PC

Draw $PR \perp AQ$ and AC

$QS \perp AP$ and AB

Proof: $\triangle PQB$ and $\triangle PCQ$ are on the same base PQ and lie between same parallel PQ and BC.

$$\text{So, } \text{ar}(PQB) = \text{ar}(PCQ) \quad \dots(i)$$

$$\frac{\text{ar}(APQ)}{\text{ar}(PBQ)} = \frac{\frac{1}{2} \times AP \times SQ}{\frac{1}{2} \times PB \times SQ}$$

$$\frac{\text{ar}(APQ)}{\text{ar}(PBQ)} = \frac{AP}{PB} \quad \dots(ii)$$

$$\frac{\text{ar}(APQ)}{\text{ar}(PCQ)} = \frac{\frac{1}{2} \times AQ \times PR}{\frac{1}{2} \times QC \times PR}$$

$$\frac{\text{ar}(APQ)}{\text{ar}(PCQ)} = \frac{AQ}{QC} \quad \dots(iii)$$

From, (i), (ii) and (iii),

$$\Rightarrow \frac{AP}{BP} = \frac{AQ}{QC}$$

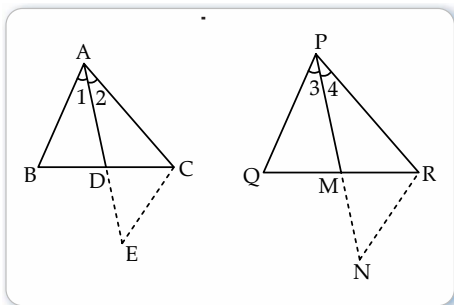
OR

(B)

Given that, AD and PM are medians of $\triangle ABC$ and $\triangle PQR$ respectively.

Also,

$$\frac{AB}{PQ} = \frac{AC}{PR} = \frac{AD}{PM}$$



To prove: $\triangle ABC \sim \triangle PQR$

Construction: Produce AD to E so that AD = DE and Join CE

Similarly produce PM to N such that PM = MN, also Join RN.

Now, we have,

In $\triangle ABD$ and $\triangle CDE$,

AD = DE

[By Construction]

BD = DC

[\because AD is the median]

And, $\angle ADB = \angle CDE$

[Vertically opposite angles]

So, $\triangle ABD \cong \triangle CDE$

(By SAS Congruence criterion)

Also, AB = CE

(By CPCT) ... (i)

In $\triangle PQM$ and $\triangle MNR$,

PM = MN

[By Construction]

QM = MR

[\because AD is the median]

And, $\angle PMQ = \angle NMR$

[Vertically opposite angles]

So, $\triangle PQM \cong \triangle MNR$

(By SAS Congruence criterion)

Also, PQ = RN

(By CPCT) ... (ii)

Now,

$$\frac{AB}{PQ} = \frac{AC}{PR} = \frac{AD}{PM}$$

From (i) and (ii),

$$\frac{CE}{RN} = \frac{AC}{PR} = \frac{AD}{PM}$$

$$\frac{CE}{RN} = \frac{AC}{PR} = \frac{2AD}{2PM}$$

$$\frac{CE}{RN} = \frac{AC}{PR} = \frac{AE}{PN}$$

So, $\triangle ACE \sim \triangle PRN$

[By SSS similarity criterion]

Therefore, $\angle 2 = \angle 4$

Similarly, $\angle 1 = \angle 3$

Adding them,

$$\angle 1 + \angle 2 = \angle 3 + \angle 4$$

$$\Rightarrow \angle A = \angle P$$

...(iii)

Now, In $\triangle ABC$ and $\triangle PQR$ we have,

$$\frac{AB}{PQ} = \frac{AC}{PR}$$

(given)

\Rightarrow

$$\angle A = \angle P$$

(from (iii))

So, $\triangle ABC \sim \triangle PQR$

[By SAS Similarity criteria]

Hence proved.

33. Given that,

AP 27, 24, 21,

For the given AP,

First term, $a = 27$

Common difference, $d = 24 - 27 = -3$

Sum, $S = 105$ (given)

Let n number of terms be taken for sum to be 105

So, we have,

$$105 = \frac{n}{2} [2 \times 27 + (n-1)(-3)]$$

$$210 = n[54 - 3n + 3]$$

$$210 = n(57 - 3n)$$

$$210 = 57n - 3n^2$$

$$3n^2 - 57n + 210 = 0$$

$$n^2 - 19n + 70 = 0$$

$$\Rightarrow n^2 - 14n - 5n + 70 = 0$$

$$\Rightarrow n(n-14) - 5(n-14) = 0$$

$$\Rightarrow (n-14)(n-5) = 0$$

$$\Rightarrow n = 5, 14$$

So, 5 and 14 terms of the given AP must be taken to get sum as 105.

Now,

Let p^{th} term of the AP be zero

$$\Rightarrow a_p = 0$$

$$\Rightarrow a + (p-1)d = 0$$

$$\Rightarrow 27 + (p-1)(-3) = 0$$

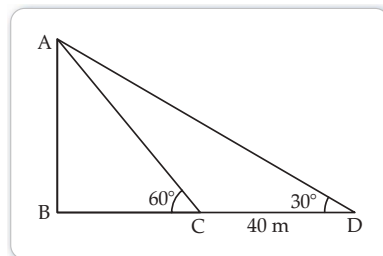
$$\Rightarrow 27 - 3p + 3 = 0$$

$$\Rightarrow 30 = 3p$$

$$\Rightarrow p = 10$$

Hence, 10th term of the given AP is zero.

34. (A)



Let AB be the tower

From the given conditions,

CD = 40 m (given)

Let BC = x m

And Height of tower AB be h m

Now,

In $\triangle ABC$,

$$\Rightarrow \tan 60^\circ = \frac{AB}{BC}$$

$$\Rightarrow \tan 60^\circ = \frac{h}{x}$$

$$\Rightarrow \sqrt{3} = \frac{h}{x}$$

$$\Rightarrow h = \sqrt{3}x$$

---(i)

In $\triangle ABD$,

$$\Rightarrow \tan 30^\circ = \frac{AB}{BD}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{(x+40)}$$

$$\Rightarrow x+40 = \sqrt{3}h$$

$$\Rightarrow x+40 = \sqrt{3}(\sqrt{3}x) \quad (\text{From (i)})$$

$$\Rightarrow x+40 = 3x$$

$$\Rightarrow 2x = 40$$

$$\Rightarrow x = 20 \text{ m}$$

$$\text{So, } h = 20\sqrt{3} \text{ m}$$

Hence,

$$\text{Height of tower} = 20\sqrt{3} \text{ m}$$

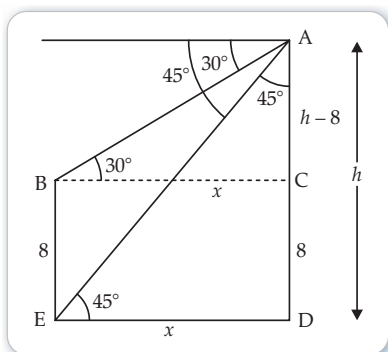
$$\text{Length of original shadow} = 20 \text{ m}$$

OR

(B)

Let AD be the multi-storied building of height h m. And angle of depression of the top and bottom are 30° and 45° .

We assume that $BE = 8$, $CD = 8$ and $BC = x$, $ED = x$ and $AC = h - 8$.



In $\triangle AED$,

$$\Rightarrow \tan 45^\circ = \frac{AD}{DE}$$

$$\Rightarrow 1 = \frac{h}{x}$$

$$\Rightarrow h = x$$

Also, In $\triangle ABC$,

$$\Rightarrow \tan 30^\circ = \frac{AC}{BC}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{(h-8)}{x}$$

$$\Rightarrow x = h\sqrt{3} - 8\sqrt{3}$$

$$\Rightarrow h = h\sqrt{3} - 8\sqrt{3} \quad (\text{As } h = x)$$

$$\Rightarrow h = \frac{8\sqrt{3}}{\sqrt{3}-1}$$

On simplifying,

$$\Rightarrow h = 4(3 + \sqrt{3}) \text{ m}$$

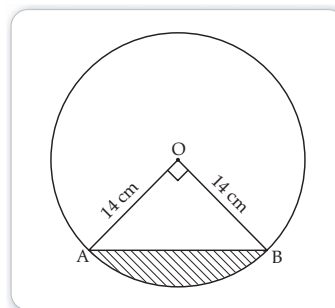
$$\text{And } x = 4(3 + \sqrt{3}) \text{ m}$$

So, the height of multi-storied building is $4(3 + \sqrt{3})$ m and the distance between two buildings is $4(3 + \sqrt{3})$ m

35. Given that,

Radius of circle, $r = 14$ cm

Angle subtended by chord, $\theta = 90^\circ$



We have,

$$\text{Area of minor sector} = \frac{\pi r^2}{360^\circ}$$

$$= \frac{22}{7} \times 14 \times 14 \times \frac{90^\circ}{360^\circ}$$

$$= 154 \text{ cm}^2$$

$$\text{Area of } \triangle AOB = \frac{1}{2} \times 14 \times 14 = 98 \text{ cm}^2$$

Now,

Area of minor segment = Area of minor sector - Area of $\triangle AOB$

$$\text{Area of minor segment} = 154 - 98 = 56 \text{ cm}^2$$

Also,

Area of major segment = Area of circle - Area of minor sector

$$\text{Area of major segment} = \pi r^2 - 56$$

$$= \frac{22}{7} \times 14 \times 14 - 56$$

$$= 616 - 56$$

$$= 560 \text{ cm}^2$$

So, the area of major segment = 560 cm^2

SECTION-E

36. (i)

We have,

$$R + r = 14 \text{ (given)}$$

Also,

$$\text{Sum of areas} = 130\pi \text{ m}^2$$

$$\Rightarrow \pi R^2 + \pi r^2 = 130\pi$$

$$\Rightarrow R^2 + r^2 = 130$$

is the required quadratic equation. ---(i)

(ii)

We have,

$$R + r = 14$$

$$R = 14 - r$$

Putting in eqn (i),

$$\Rightarrow (14 - r)^2 + r^2 = 130$$

$$\Rightarrow 196 + r^2 - 28r + r^2 = 130$$

$$\Rightarrow 2r^2 - 28r + 66 = 0$$

$$\Rightarrow r^2 - 14r + 33 = 0$$

Is the required quadratic equation in r only.

(iii)

We have,

$$\Rightarrow r^2 - 14r + 33 = 0$$

$$\Rightarrow r^2 - 11r - 3r + 33 = 0$$

$$\Rightarrow r(r - 11) - 3(r - 11) = 0$$

$$\Rightarrow (r - 11)(r - 3) = 0$$

$$\Rightarrow r = 11(\text{rejected}) \quad [\text{As } R > r]$$

$$\text{So, } r = 3 \text{ m}$$

$$\text{Corresponding Area irrigated} = \pi r^2 = 9\pi \text{ m}^2$$

OR

We have,

$$\Rightarrow r^2 - 14r + 33 = 0$$

$$\Rightarrow r^2 - 11r - 3r + 33 = 0$$

$$\Rightarrow r(r - 11) - 3(r - 11) = 0$$

$$\Rightarrow (r - 11)(r - 3) = 0$$

$$\Rightarrow r = 11(\text{rejected}) \quad [\text{As } R > r]$$

$$\text{So, } r = 3 \text{ m}$$

Now,

$$R + r = 14$$

$$\Rightarrow R + 3 = 14$$

$$\Rightarrow R = 11 \text{ m}$$

$$\text{Corresponding area irrigated} = \pi R^2 = 121\pi \text{ m}^2$$

37. For the given data we have,

Length (in mm)	Frequency (f)	Cumulative Frequency (Cf)
70-80	3	3
80-90	5	8
90-100	9	17
100-110	12	29
110-120	5	34
120-130	4	38
130-140	2	40

(i)

We have,

$$N = 40$$

$$\frac{N}{2} = 20$$

So, median class is 100 – 110.

(ii)

We know that, 10 cm = 100 mm

Number of leaves greater than 100 mm

$$= 12 + 5 + 4 + 2 = 23$$

(iii)

Median class is 100 – 110

$$\text{So, } l = 100$$

$$\Rightarrow f = 12, Cf = 17$$

$$\Rightarrow h = 10$$

$$\text{Median} = l + \frac{\left(\frac{N}{2} - Cf\right)}{f} \times h$$

$$\text{Median} = 100 + \frac{(20 - 17)}{12} \times 10$$

$$\text{Median} = 100 + 2.5$$

$$\text{Median} = 102.5$$

OR

We have,

Modal class as 100 – 110

$$\text{So, } l = 100$$

$$\Rightarrow f_1 = 12, f_0 = 9, f_2 = 5$$

$$\Rightarrow h = 10$$

We know that,

$$\text{Mode} = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$$

$$\text{Mode} = 100 + \frac{12 - 9}{24 - 9 - 5} \times 10$$

$$\text{Mode} = 100 + 3$$

$$\text{Mode} = 103$$

38. Given that,

$$AP = 30 \text{ cm}$$

$$\angle PAQ = 60^\circ$$

We have,

$$AP = AQ = 30 \text{ cm (length of tangents are equal)}$$

Also,

$$\angle PAO = \frac{1}{2} \times \angle PAQ = \frac{1}{2} \times 60^\circ = 30^\circ$$

In $\triangle APM$,

$$\Rightarrow \sin 30^\circ = \frac{PM}{AP}$$

$$\Rightarrow \frac{1}{2} = \frac{PM}{30}$$

$$\Rightarrow PM = 15 \text{ cm}$$

$$\text{Also, } PM = MQ = 15$$

cm (Chord is bisected by perpendicular from centre)

$$PQ = 2PM = 30 \text{ cm}$$

(i) Length of PQ = 30 cm

(ii) As APOQ is a cyclic quadrilateral,

$$\text{So, } \angle PAQ + \angle POQ = 180^\circ$$

$$\Rightarrow 60^\circ + \angle POQ = 180^\circ$$

$$\Rightarrow \angle POQ = 120^\circ$$

(iii)

In $\triangle AOP$,

$$\Rightarrow \cos 30^\circ = \frac{AP}{OA}$$

$$\Rightarrow \frac{\sqrt{3}}{2} = \frac{30}{OA}$$

$$\Rightarrow OA = \frac{60}{\sqrt{3}}$$

$$\Rightarrow OA = 20\sqrt{3} \text{ cm}$$

OR

In $\triangle AOP$,

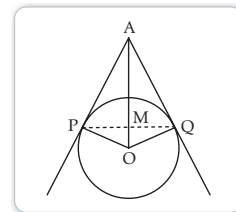
$$\Rightarrow \tan 30^\circ = \frac{OP}{AP}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{OP}{30}$$

$$\Rightarrow OP = \frac{30}{\sqrt{3}} \text{ cm}$$

$$\Rightarrow OP = 10\sqrt{3} \text{ cm}$$

$$\text{Radius of mirror} = 10\sqrt{3} \text{ cm}$$



SECTION-A

1. Option (b) is correct.

LCM of (850, 500)

2	850
5	425

2	500
2	250

5	85	5	125
17	17	5	25
	1	5	5
			1

$$850 = 17 \times 5^2 \times 2$$

$$500 = 5^3 \times 2^2$$

$$\text{LCM}(850, 500) = 17 \times 5^3 \times 2^2$$

$$= 17 \times 500$$

8. Option (d) is correct.

There are three possible outcomes where exactly one tail occurs : HHT, HTH and THH each of these outcomes has the same probability, because the coin are fair, So each outcomes has probability of $\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8}$

The "P" of getting are tail $= 3 \times \frac{1}{8} = \frac{3}{8}$

10. Option (a) is correct.

Outer surface area = lateral surface area of cylinder
 $= 2\pi rh$

$$= 2 \times \frac{22}{7} \times 7 \times 10 = 440 \text{ sq. units.}$$

11. Option (d) is correct.

Probability of not rolling a 6 (loosing the game) is $1 - \frac{1}{6}$ (probability of getting 6)

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

23.

$$\tan C = \sqrt{3}$$

$$\tan C = \tan 60^\circ$$

$$C = 60^\circ$$

$$A + B + C = 180^\circ$$

[Sum of Angle in a triangle]

$$B = 30^\circ$$

$$\text{Now, } \sin B + \cos C - \cos^2 B$$

$$\Rightarrow \sin 30^\circ + \cos 60^\circ - \cos^2 30^\circ$$

$$\Rightarrow \frac{1}{2} + \frac{1}{2} - \left(\frac{\sqrt{3}}{2}\right)^2$$

$$\Rightarrow 1 - \frac{3}{4}$$

$$\Rightarrow \frac{1}{4}$$

Ans

24. In $\triangle AOP$ and $\triangle BOQ$

$$\angle A = \angle B = 90^\circ$$

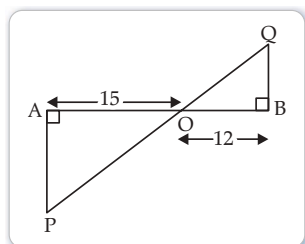
$$\angle AOP = \angle BOQ \text{ (Alt. angle)}$$

AA Similarity

$$\frac{AO}{OB} = \frac{AP}{BQ}$$

$$\frac{15}{12} = \frac{10}{BQ} \Rightarrow \frac{3}{12} = \frac{2}{BQ}$$

$$BQ = 8 \text{ cm}$$



26. L.H.S

$$\Rightarrow \sqrt{\frac{\sec A - 1}{\sec A + 1} \times \frac{\sec A - 1}{\sec A - 1}} + \sqrt{\frac{\sec A + 1}{\sec A - 1} \times \frac{\sec A + 1}{\sec A + 1}}$$

$$\Rightarrow \sqrt{\frac{(\sec A - 1)^2}{\sec^2 A + 1}} + \sqrt{\frac{(\sec A + 1)^2}{\sec^2 A - 1}}$$

$$\Rightarrow \sqrt{\frac{(\sec A - 1)^2}{\tan^2 A}} + \sqrt{\frac{(\sec^2 A + 1)^2}{\tan^2 A}}$$

$$\Rightarrow \sqrt{\left(\frac{\sec A - 1}{\tan A}\right)^2} + \sqrt{\left(\frac{\sec A + 1}{\tan A}\right)^2}$$

$$\Rightarrow \frac{\sec A - 1}{\tan A} + \frac{\sec A + 1}{\tan A}$$

$$\frac{\sec A - 1 + \sec A + 1}{\tan A} \Rightarrow \frac{2\sec A}{\tan A}$$

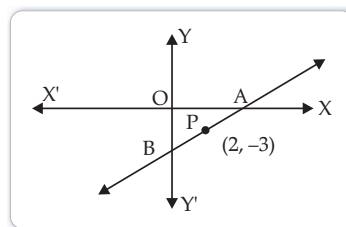
$$= \frac{2 \times \frac{1}{\cos A}}{\frac{\sin A}{\cos A}}$$

$$\left\{ \begin{array}{l} \sec A = \frac{1}{\cos A} \\ \tan A = \frac{\sin A}{\cos A} \end{array} \right.$$

$$= \frac{2}{\sin A} = 2\text{cosec} A$$

Hence Proved

30.



Given AP:PB = 3:1

Using section formula

$$X = \frac{x_1 m_2 + x_2 m_1}{m_1 + m_2}$$

$$Y = \frac{y_1 m_2 + y_2 m_1}{m_1 + m_2}$$

X, Y is a coordinate of P(2, -3)

Let coordinate of A ($x_1, 0$) and coordinate of B ($0, y_2$)

$$m_1 = 3, m_2 = 1$$

$$2 = \frac{x_1 \times 1 + 3 \times 0}{3 + 1}$$

$$8 = x_1$$

$$-3 = \frac{3 \times y_2 + 0 \times 1}{3 + 1}$$

$$-4 = y_2$$

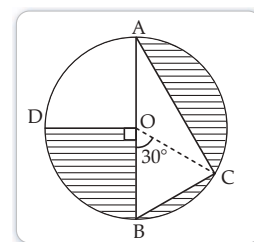
Co-ordinate of A (8, 0)

Co-ordinate of B (0, -4)

32. Given AC = 28cm.

BC = 21 cm.

$$\text{Since } AB^2 = BC^2 + AC^2$$



$$AB^2 = 28^2 + 21^2$$

$$AB^2 = 784 + 441$$

$$AB = 35$$

$$\text{Radius} = \frac{35}{2}$$

Now area of shaded region = Area of circle – area of quadrilateral (AOD) – area of $\triangle ABC$

$$= \pi r^2 - \frac{1}{4}\pi r^2 - \frac{1}{2} \times BC \times AC$$

$$= \frac{3}{4} \times \frac{22}{7} \times \frac{35}{2} \times \frac{35}{2} - \frac{1}{2} \times 28 \times 21$$

$$= 427.875 \text{ cm}^2$$

35. (i) $S_n = 4n^2 - n$

We know

$$a_1 = S_1 \Rightarrow 4(1)^2 - (1) = 3$$

$$\Rightarrow a_2 = S_2 - S_1$$

Ans

$$= 4(2)^2 - (2) - \{4(1)^2 - 1\}$$

$$= 4 \times 4 - 2 - \{4 - 1\}$$

$$= 14 - 3$$

$$a_2 = 11$$

$$d = a_2 - a_1$$

$$d = 11 - 3$$

$$d = 8$$

(ii) $a_1, a + d, a + 2d$

$$3, 3 + 8, 3 + 2 \times 8$$

$$AP = 3, 11, 19, \dots$$

(iii) $a = 3, d = 8, a_n = 107$

$$a_n = a + (n - 1)d$$

$$\Rightarrow 107 = 3 + (n - 1)8$$

$$\Rightarrow \frac{104}{8} = n - 1$$

$$= 13 + 1 = n$$

$$n = 14$$

Delhi Set-3

430/1/3

SECTION-A

4. Option (b) is correct

Explanation:

Given that, Curved Surface Area of a right circular cone

$$= 550 \text{ sq. cm}$$

Radius of a right circular cone, $r = 7 \text{ cm}$

To Find: Slant Height of a right circular cone

Curved Surface Area of a right circular cone = πrl

$$550 = \frac{22}{7} \times 7 \times l$$

$$550 = 22 \times l$$

$$l = \frac{550}{22} = 25 \text{ cm}$$

\therefore Slant Height of a right circular cone, $l = 25 \text{ cm}$

9. Option (d) is correct

Explanation:

Given that, HCF (96, 404) = 4

To Find: LCM (96, 404)

As we know that,

LCM of two numbers = Product of two numbers / their

HCF

$$= \frac{96 \times 404}{4}$$

$$= 9696$$

13. Option (d) is correct

Explanation: Probability of an event always lie between 0 and 1.

15. Option (b) is correct

Explanation: Probability of atleast one 6 = 1 - Probability of number 6

$$\text{Probability of not getting 6 on dice 1} = \frac{5}{6}$$

$$\text{Probability of not getting 6 on dice 2} = \frac{5}{6}$$

Probability of number 6 = Both dice doesn't get 6

$$= \frac{5}{6} \times \frac{5}{6} = \frac{25}{36}$$

$$\text{Probability of atleast one 6} = 1 - \frac{25}{36} = \frac{11}{36}$$

24. Given that

$$\sin A = \frac{1}{2} \text{ and } \cos B = \frac{1}{\sqrt{2}}$$

$$\cos A = \sqrt{1 - \sin^2 A}$$

$$= \sqrt{1 - \left(\frac{1}{2}\right)^2} = \sqrt{1 - \frac{1}{4}} = \sqrt{\frac{3}{4}} = \frac{\sqrt{3}}{2}$$

$$\sin B = \sqrt{1 - \cos^2 B}$$

$$= \sqrt{1 - \left(\frac{1}{\sqrt{2}}\right)^2} = \sqrt{1 - \frac{1}{2}} = \sqrt{\frac{1}{2}} = \frac{1}{\sqrt{2}}$$

$$\Rightarrow \sin A \sin B + \cos A \cos B$$

$$\Rightarrow \frac{1}{2} \times \frac{1}{\sqrt{2}} + \frac{\sqrt{3}}{2} \times \frac{1}{\sqrt{2}}$$

$$\Rightarrow \frac{1}{2\sqrt{2}} + \frac{\sqrt{3}}{2\sqrt{2}} = \frac{1 + \sqrt{3}}{2\sqrt{2}}$$

25. Given that : In $\triangle ABC$, BD and CE are perpendicular to AC and AB respectively.

To Prove: $AE \times BD = AD \times CE$

Proof: In $\triangle ADB$ and $\triangle AEC$

$\angle A = \angle A$ (Common)

$\angle ADB = \angle AEC$ (each 90°)

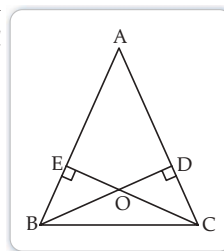
$\Rightarrow \triangle ADB \sim \triangle AEC$

When two triangles are similar,

then their corresponding sides are proportional.

$$\text{So, } \frac{BD}{CE} = \frac{AD}{AE}$$

Hence, $BD \times AE = AD \times CE$



29. We have ,

$$\begin{aligned} \text{LHS} &= \sin^6 \theta + \cos^6 \theta + 3\sin^2 \theta \cos^2 \theta \\ &\Rightarrow (\sin^2 \theta)^3 + (\cos^2 \theta)^3 + 3\sin^2 \theta \cos^2 \theta \\ &\Rightarrow (\sin^2 \theta + \cos^2 \theta)^3 - 3\sin^2 \theta \cos^2 \theta (\sin^2 \theta + \cos^2 \theta) \\ &\quad + 3\sin^2 \theta \cos^2 \theta \\ &\quad [a^3 + b^3 = (a+b)^3 - 3ab(a+b)] \\ &\Rightarrow 1 - 3\sin^2 \theta \cos^2 \theta + 3\sin^2 \theta \cos^2 \theta = 1 = \text{RHS} \end{aligned}$$

31. As we know that ,

Diagonals of a parallelogram bisect each other.
Therefore, the coordinates of mid-point of AC are same as the coordinates of mid-point of BD i.e.,
By using mid point formula

$$\begin{aligned} &\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \\ &\left(\frac{2-2}{2}, \frac{-1+b}{2} \right) = \left(\frac{a-3}{2}, \frac{4-2}{2} \right) \\ &\left(0, \frac{-1+b}{2} \right) = \left(\frac{a-3}{2}, 1 \right) \\ &0 = \frac{a-3}{2}, \frac{-1+b}{2} = 1 \end{aligned}$$

$$\Rightarrow 0 = a - 3, -1 + b = 2$$

$$\Rightarrow a = 3, b = 3$$

Also,

Length of the Sides of parallelogram

$$\Rightarrow AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$\begin{aligned} &\Rightarrow \sqrt{(3-2)^2 + (4+1)^2} \\ &= \sqrt{26} \end{aligned}$$

$$AB = CD$$

[Pair of opposite sides of parallelogram are equal]

$$\Rightarrow CD = \sqrt{26}$$

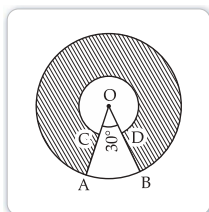
$$\begin{aligned} &\Rightarrow BC = \sqrt{(-2-3)^2 + (3-4)^2} \\ &= \sqrt{26} \end{aligned}$$

$$\therefore BC = AD$$

$$\Rightarrow AD = \sqrt{26}$$

$$\text{Hence, } AB = BC = CD = DA = \sqrt{26}$$

32. Area of Region ABCD = Area of bigger sector - Area of smaller sector



$$= \left(\frac{30}{360} \times \frac{22}{7} \times 14 \times 14 - \frac{30}{360} \times \frac{22}{7} \times 7 \times 7 \right)$$

$$\begin{aligned} &= \left(\frac{1}{12} \times 22 \times 2 \times 14 - \frac{1}{12} \times 22 \times 7 \right) \\ &= \frac{1}{12} \times 22 \times (28 - 7) \\ &= \frac{1}{12} \times 22 \times 21 \\ &= \frac{77}{2} \text{ sq.cm} \end{aligned}$$

$$\text{Area of circular ring} = \left(\frac{22}{7} \times 14 \times 14 - \frac{22}{7} \times 7 \times 7 \right)$$

$$= (22 \times 14 \times 2 - 22 \times 7 \times 1)$$

$$= 22 \times 21 = 462 \text{ sq.cm}$$

$$\begin{aligned} \text{Hence, Required shaded area} &= 462 - \frac{77}{2} \\ &= 462 - 38.5 = 423.5 \text{ sq.cm} \end{aligned}$$

34. Let a and d be the first term and the common difference of an A.P. respectively .

$$n = 50$$

Given , sum of first 10 terms = 250

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

$$250 = \frac{10}{2} [2a + 9d]$$

$$2a + 9d = 50$$

... (1)

15th term from the last = $(50 - 15 + 1)^{\text{th}} = 36^{\text{th}}$ term from the beginning.

$$a_{36} = a + 35d$$

Sum of last 15 terms = 2625

$$S_{50} - S_{35} = 2565$$

$$\frac{50}{2} [2a + (50-1)d] - \frac{35}{2} [2a + (35-1)d] = 2625$$

$$25(2a + 49d) - \frac{35}{2} (2a + 34d) = 2625$$

$$5(2a + 49d) - \frac{7}{2} (2a + 34d) = 525$$

$$10a + 245d - 7a - 119d = 525$$

$$3a + 126d = 525$$

$$a + 42d = 175$$

... (2)

From eq (1) & eq (2), we get

$$\Rightarrow \begin{aligned} 2a + 9d &= 20 \\ 2a + 84d &= 350 \\ -75d &= -300 \end{aligned}$$

$$\Rightarrow \begin{aligned} 2a + 9d &= 20 \\ 2a + 84d &= 350 \\ -75d &= -300 \end{aligned}$$

$$\Rightarrow d = \frac{300}{75} = 4$$

By putting the value of d in (1), we get

$$\Rightarrow 2a + 9 \times 4 = 50$$

$$\Rightarrow 2a = 50 - 36$$

$$\Rightarrow 2a = 14$$

$$\Rightarrow a = 7$$

\therefore Required A.P. is $a, a+d, a+2d, a+3d, \dots, a+49d$
 $= 7, 11, 15, 19, \dots, 203$

Outside Delhi Set-1

430/2/1

SECTION-A

1. Option (a) is correct.

Explanation: Smallest 2- digit number = 10

Smallest composite number = 4

Now, Prime factorization of 4 = 2×2 Prime factorization of 10 = 2×5 \therefore H.C.F of (4, 10) = 2.

2. Option (c) is correct.

Explanation: Given, $x + y - 4 = 0$ $2x + ky - 8 = 0$ Here, $a_1 = 1$ $b_1 = 1$ $c_1 = -4$ And, $a_2 = 2$ $b_2 = k$ $c_2 = -8$ For infinitely many solutions: $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ Substituting, the value we get $\frac{1}{2} = \frac{1}{k} = \frac{-4}{-8}$ Thus, $\frac{1}{2} = \frac{1}{k} \Rightarrow k = 2$ or $\frac{1}{k} = \frac{-4}{-8} \Rightarrow k = 2$ Thus, value of $k = 2$ for infinitely many solutions.

3. Option (c) is correct.

Explanation: To determine which of the equations has 2 as a root, we substitute $x = 2$ into each equation:(a) $x^2 - 4x + 5$ By substituting $x = 2$ we get,

$$2^2 - 4 \times 2 + 5$$

$$= 4 - 8 + 5$$

$$= 9 - 8 = 1$$

Therefore, 2 is not a root of this equation.

(b) $x^2 + 3x - 12$ By substituting $x = 2$ we get,

$$2^2 + 3 \times 2 - 12$$

$$4 + 6 - 12 = 10 - 12 = -2$$

Therefore, 2 is not a root of this equation.

(c) $2x^2 - 7x + 6$ By substituting $x = 2$ we get,

$$2 \times 2^2 - 7 \times 2 + 6$$

$$= 8 - 14 + 6$$

$$= 14 - 14 = 0$$

Therefore, 2 is a root of this equation

(d) $3x^2 - 6x - 2$ By substituting $x = 2$ we get,

$$3 \times 2^2 - 6 \times 2 - 2$$

$$= 12 - 12 - 2$$

$$= 12 - 14 = -2.$$

Therefore, 2 is not a root of this equation.

Hence, Equation (c) has 2 as root.

4. Option (d) is correct.

Explanation: $d = -4$, $a_7 = 4$

$$t_n = a + (n - 1)d$$

$$a_7 = a + (7 - 1) \cdot 4$$

$$4 = a + (-24)$$

$$4 + 24 = a$$

$$\Rightarrow a = 28.$$

5. Option (b) is correct.

Explanation: The distance of a point $P(x, y)$ from origin is

$$\sqrt{x^2 + y^2}$$

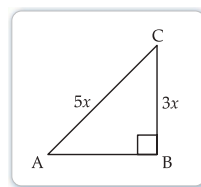
Substitute $x = 5$ and $y = 4$ we get,

$$\sqrt{5^2 + 4^2} = \sqrt{25 + 16} = \sqrt{41}$$

6. Option (b) is correct.

Explanation: We have, $\sin A = \frac{3}{5}$

$$\text{As, } \sin A = \frac{P}{h}$$

Let perpendicular = $3x$ and hypotenuse = $5x$ Also let ABC be a right angled Δ .

$$\begin{array}{cc} 5x & 3x \\ A & B \end{array}$$

$$AC = \sqrt{AB^2 + BC^2} \quad (\text{By using Pythagoras theorem})$$

$$5x = \sqrt{AB^2 + (3x)^2}$$

$$(5x)^2 = AB^2 + 9x^2$$

$$AB^2 = 25x^2 - 9x^2$$

$$AB^2 = 16x^2$$

$$\Rightarrow AB = 4x$$

Thus, Base = $4x$

$$\text{Hence, } \cot A = \frac{B}{P} = \frac{4x}{3x} = \frac{4}{3}$$

7. Option (d) is correct.

Explanation:

$$\frac{1 + \tan^2 A}{1 + \cot^2 A} = \frac{1 + \frac{\sin^2 A}{\cos^2 A}}{1 + \frac{\cos^2 A}{\sin^2 A}}$$

$$= \frac{\frac{\cos^2 A + \sin^2 A}{\cos^2 A}}{\frac{\sin^2 A + \cos^2 A}{\sin^2 A}} = \frac{\frac{1}{\cos^2 A}}{\frac{1}{\sin^2 A}}$$

$$= \frac{\sin^2 A}{\cos^2 A} = \tan^2 A$$

$$\therefore \frac{1 + \tan^2 A}{1 + \cot^2 A} = \tan^2 A.$$

8. Option (c) is correct.

$$\text{Explanation: } \frac{2 \tan 30^\circ}{1 - \tan^2 30^\circ}$$

$$\text{As, } \tan 30^\circ = \frac{1}{\sqrt{3}}$$

By substituting the value we get,

$$= \frac{2 \times \frac{1}{\sqrt{3}}}{1 - \left(\frac{1}{\sqrt{3}}\right)^2}$$

$$= \frac{2}{\frac{3-1}{3}} = \frac{3}{3-1} = \frac{3\sqrt{3}}{3} = \sqrt{3}$$

$$\text{And, } \sqrt{3} = \tan 60^\circ.$$

9. Option (a) is correct.

Explanation: Given: Sum of zeroes = -5 and product = 6

According to quadratic polynomial $ax^2 + bx + c$,

$$\text{Sum of roots} = -\frac{b}{a} = -\frac{-5}{1}$$

$$\text{Product of roots} = \frac{c}{a} = 6$$

Thus, $a = 1$, $b = 5$ and $c = 6$

By substituting value in quadratic polynomial we get,
 $1x^2 + (5)x + 6 = x^2 + 5x + 6$.

10. Option (c) is correct.

Explanation: Quadratic polynomial is in form of $ax^2 + bx + c = 0$

So, zeroes of polynomial is given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\Rightarrow x = \frac{11 \pm \sqrt{(-11)^2 - 4 \times 3 \times -4}}{2 \times 3}$$

$$= \frac{-11 \pm \sqrt{121 + 48}}{6} = \frac{-11 \pm \sqrt{169}}{6}$$

$$= \frac{-11 \pm 13}{6} = \frac{-11 + 13}{6} = \frac{2}{6} = \frac{1}{3}$$

$$= \frac{-11 - 13}{6} = \frac{-24}{6} = -4$$

$$\text{Thus, zeroes of polynomial} = \left(\frac{1}{3}, -4\right)$$

11. Option (c) is correct.

Explanation: Modal class is the one having highest frequency.

Here, highest frequency = 22 days

So modal class = 0 - 10

Now, Cumulative frequency table is:

Class - Interval	Frequency	Cumulative Frequency
0 - 10	22	22
10 - 20	10	32
20 - 30	8	40
30 - 40	15	55
40 - 50	5	60

50 - 60	6	66
---------	---	----

Since total frequency is 66.

$$\frac{N}{2} = 33$$

And cumulative frequency greater than or equal to 33 lies in class 20-30.

So, median class is 20-30.

\therefore Upper limit of median class is 30

Thus, difference between upper limits of modal and median classes is

$$= 30 - 10 = 20.$$

12. Option (c) is correct.

Explanation: As, probability of an event is always greater than equal to 0 and less than equal to 1.

It means probability lies between 0 and 1.

Therefore correct option is c.

13. Option (b) is correct.

Explanation: Total surface area of solid hemisphere = $3\pi r^2$

Given: radius = 7cm

$$\Rightarrow \text{TSA} = 3 \times \pi \times 7 \times 7$$

$$= 147\pi \text{ cm}^2$$

14. Option (b) is correct.

Explanation:

Given: radius = 21cm

Central angle $\angle AOB = 120^\circ$

$$\text{Area of minor sector} = \frac{\theta}{360^\circ} \pi r^2 = \frac{120^\circ}{360^\circ} \times \frac{22}{7} \times 21 \times 21$$

$$= 462 \text{ cm}^2$$

$$\text{Area of circle} = \pi r^2 = \frac{22}{7} \times 21 \times 21 = 1386 \text{ cm}^2$$

So, Area of major sector = $1386 - 462 = 924 \text{ cm}^2$

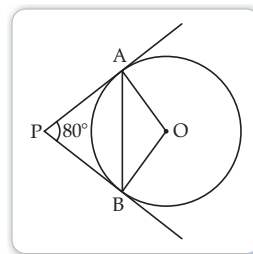
\Rightarrow Difference of the areas of a minor sector and its corresponding major sector
 $= 924 - 462 = 462 \text{ cm}^2$

15. Option (d) is correct.

Explanation: The graph of a pair of linear equations $a_1x + b_1y = c_1$ and $a_2x + b_2y = c_2$ in two variables x and y represents parallel lines, if

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$

16. Option (a) is correct.



Explanation:

In $\triangle OAB$, we have

$OA = OB$

(radii of same circle)

$\therefore \angle ABO = \angle BAO$

(Angles opposite to equal sides are equal)

As PA and PB are tangents from a point P to a circle with centre O.

So, $\angle OAP = 90^\circ$

Similarly, $\angle OBP = 90^\circ$

(\because tangents drawn from an external point to a circle are perpendicular to the circle)

Now, in quadrilateral PAOB,

$$\angle P + \angle A + \angle O + \angle B = 360^\circ$$

$$\Rightarrow \angle 80^\circ + 90^\circ + \angle O + 90^\circ = 360^\circ$$

$$\Rightarrow \angle O = 360^\circ - (90^\circ + 90^\circ + 80^\circ)$$

$$\angle O = 100^\circ$$

Again, in $\triangle OAB$,

$$\angle O + \angle ABO + \angle BAO = 180^\circ$$

(Angle sum property)

$$100^\circ + \angle ABO + \angle BAO = 180^\circ$$

($\because \angle ABO = \angle BAO$)

$$\Rightarrow 2 \angle ABO = 180^\circ - 100^\circ = 80^\circ$$

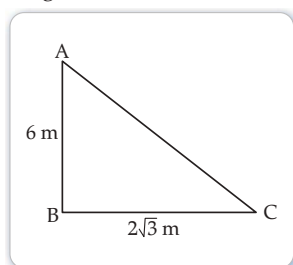
$$\Rightarrow \angle ABO = 40^\circ$$

17. Option (a) is correct.

18. Option (c) is correct.

Explanation:

In right $\triangle ABC$, $\angle B = 90^\circ$



$$\tan \theta = \frac{AB}{BC} = \frac{6}{2\sqrt{3}} = \sqrt{3} = \tan 60^\circ$$

$$\Rightarrow \theta = 60^\circ$$

19. Option (c) is correct.

Explanation: In case of Assertion:

According to Thales theorem If a line is drawn parallel to one side of a triangle intersecting the other two sides in distinct points, then the other two sides are divided in the same ratio.

So, Assertion is true.

In case of reason:

Parallel lines can be drawn along any side of the triangle.

So, reason is false.

20. Option (a) is correct.

Explanation: In case of Assertion:

The point (0,4) has an x-coordinate = 0, which means that point lies on y-axis, So, assertion is true.

In case of Reason:

The x- coordinate of a point, lying on y-axis is zero, because x- coordinate represents The distance of the point from y-axis is zero.

Therefore, both assertion and reason are true and reason is the correct explanation of assertion.

SECTION-B

21. Prime Factorisation of

$$84 = 2 \times 2 \times 3 \times 7$$

$$144 = 2 \times 2 \times 2 \times 2 \times 3 \times 3$$

$$\text{So, HCF of } 84 \text{ and } 144 = 2 \times 2 \times 3 = 12$$

22. (a) Let two natural numbers = x and y

$$\text{Given sum } \Rightarrow x + y = 70$$

....(i)

$$\text{Difference} = x - y = 10$$

....(ii)

By solving Equation Simultaneously we get,

$$x + y = 70$$

$$x - y = 10$$

$$\begin{array}{r} - \quad + \quad - \\ \hline 2y = 60 \\ \hline y = 30 \end{array}$$

Substituting value of y in equation (i) is we get,

$$x + 30 = 70$$

$$x = 40$$

Thus, Natural Numbers = 40 and 30

OR

(b) Given:- $x - 3y = 7$... (i)

$$3x - 3y = 5 \quad \dots \text{ (ii)}$$

Solving equations and (i) and (ii) simultaneously we get,

$$x - 3y = 7$$

$$3x - 3y = 5$$

$$\begin{array}{r} - \quad + \quad - \\ \hline -2x = (2) \\ \hline x = (-1) \end{array}$$

Now, substitute value of x in equation (i) we get

$$-1 - 3y = 7$$

$$\Rightarrow -3y = 7 + 1$$

$$\Rightarrow -3y = 8$$

$$\therefore y = \frac{-8}{3}$$

$$\text{Hence, } x = -1 \text{ and } y = \frac{-8}{3}$$

23. Numbers of defective Pens = 15

Number of Good Pens = 145

$$\text{Total Number of Pens} = 15 + 145 = 160$$

Probability that pen taken out is good one

$$= \frac{\text{Number of Possible outcomes}}{\text{Total Number of favourable outcomes}}$$

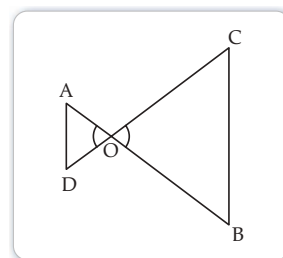
$$\Rightarrow \frac{145}{160} = \frac{29}{32}$$

$$\text{Thus, Probability of good pen} = \frac{29}{32}$$

24. (a)

Given:- $OA \times OB = OC \times OD$

To Prove:- $\triangle AOD \sim \triangle COB$



Proof:- $OA \times OB = OC \times OD$

$$\Rightarrow \frac{OA}{OC} = \frac{OD}{OB} \quad \dots \text{ (i)}$$

Now, In $\triangle AOD$ and $\triangle COB$

$$\frac{OA}{OC} = \frac{OD}{OB} \quad \text{(From (i))}$$

$$\angle AOD = \angle COB \quad \text{(vertically opposite } \angle \text{s)}$$

$\therefore \triangle AOD \sim \triangle BOC$ (SAS similarity)

OR

(b) Given:- $\angle D = \angle E$

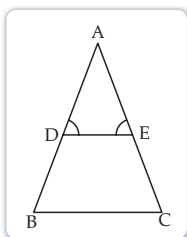
$$\frac{AD}{BD} = \frac{AE}{EC}$$

To Prove: $\triangle ABC$ is isosceles

Proof: In $\triangle ADE$

$$\angle D = \angle E$$

... (i)



And, $\frac{AD}{BD} = \frac{AE}{EC}$ (given)

$\therefore \frac{DE}{BC}$ (By converse of B.P.T)

In $\triangle ABC$

$$\angle D = \angle B$$

[Corresponding's are equal]

$$\angle E = \angle C$$

Thus $\angle B = \angle C$ (from (i))

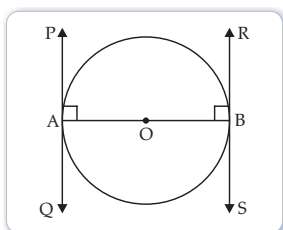
$\therefore AB = AC$ (sides opposite to equal angles) are equal

Hence, $\triangle ABC$ is isosceles.

25. Given:- PQ and RS are tangents. AB is diameter

To Prove:- $PQ \parallel RS$

Proof: $OA \perp PQ$



$OB \perp RS$ (As, tangents are perpendicular to radius)

$$\therefore \angle OAP = 90^\circ, \angle OBR = 90^\circ$$

$$\Rightarrow \angle OAP + \angle OBR = 90^\circ + 90^\circ = 180^\circ$$

If, Co-interior angles are supplementary lines are parallel to each other.

$PQ \parallel RS$

Hence Proved.

SECTION-C

26. Total Outcomes $6^2 = 36$.

(a) An even number on both the dice

Possible outcome $\Rightarrow (2,2) (2,4) (2,6)$

$(4,2) (4,4) (4,6)$

$(6,2) (6,4) (6,6)$

$\Rightarrow 9$

$$\therefore P(E_1) \Rightarrow \frac{9}{36} = \frac{1}{4}$$

(b) The sum of two numbers more than 9

Possible Outcome $\Rightarrow (4,6) (5,5) (5,6)$

$(6,4) (6,5) (6,6)$

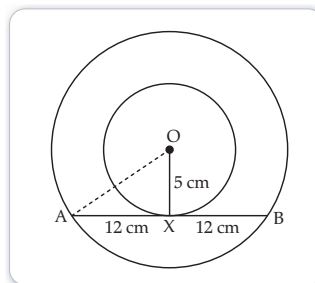
$= 6$

$$\therefore P(E_2) = \frac{6}{36} = \frac{1}{6}$$

27. (a) Given:- $OX = 5$ cm

$AB = 24$ cm

To find:- OA (Radius of Larger Circle)



Solution:- $OX \perp AB$ (\because Radius drawn from the centre of a circle is \perp to the Chord) ... (i)

And, X is mid point of AB

(\because Perpendicular drawn from the centre of a circle to the chord bisects the chord) ... (ii)

From (i) and (ii)

$\triangle OAX$ is a right angled triangle

$$\angle OXA = 90^\circ$$

$$AX = 12$$
 cm

By Using Pythagoras theorem.

$$OA^2 = OX^2 + AX^2$$

$$= 5^2 + 12^2$$

$$= 25 + 144$$

$$= 169$$

$$OA = 13$$
 cm.

OR

(b) Given: - PA and PB are tangents

To Prove:- $\angle AOB + \angle APB = 180^\circ$

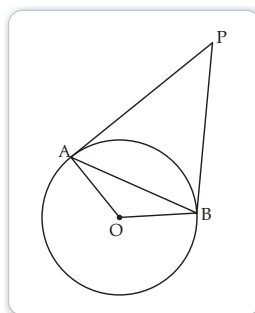
Proof:- $OA \perp PA$

$BO \perp PB$

[Radius of the circle is \perp to the tangent.]

$$\therefore \angle OAP = 90^\circ \text{ and } \angle OBP = 90^\circ$$

In Quadrilateral POAB,



$$\angle AOB + \angle OAP + \angle OBP + \angle APB = 360^\circ$$

(sum of all \angle s of a quadrilateral = 180°)

$$\Rightarrow \angle AOB + 90^\circ + 90^\circ + \angle APB = 360^\circ$$

$$\Rightarrow \angle AOB + \angle APB = 360^\circ - 180^\circ$$

$$\Rightarrow \angle AOB + \angle APB = 180^\circ$$

Hence Proved.

28. Let us assume, to the contrary that $7 - 3\sqrt{5}$ is rational

$$\Rightarrow 7 - 3\sqrt{5} = \frac{p}{q} \text{ where } p \text{ and } q \text{ are co-primes and } q \neq 0$$

$$\Rightarrow \sqrt{5} = \frac{p - 7q}{-3q}$$

$$\Rightarrow \sqrt{5} = \frac{7q - p}{3q}$$

Since p and q are integers

$$\therefore \frac{7q - p}{3q} \text{ is a rational number}$$

$\therefore \sqrt{5}$ is a rational number which is contradiction as $\sqrt{5}$ is an irrational number.

Hence, our assumption is wrong and hence $7 - 3\sqrt{5}$ is an irrational number.

29. (a) Given that α and β are zeroes of the Quadratic Polynomial $x^2 - 3x + 2$

$$\therefore \text{Sum of roots } (\alpha + \beta) = \frac{-b}{a} = \frac{-(-3)}{1} = 3$$

$$\& \text{Product of roots } (\alpha\beta) = \frac{c}{a} = \frac{2}{1} = 2$$

Quadratic Polynomial whose zeroes are $2\alpha + 1$ and $2\beta + 1$ is:

$$\begin{aligned} \text{Sum of roots} &= 2\alpha + 1 + 2\beta + 1 = 2\alpha + 2\beta + 2 \\ &= 2(\alpha + \beta + 1) \\ &= 2(3 + 1) \end{aligned}$$

$$[\because \alpha + \beta = 3]$$

$$\begin{aligned} \text{Product of roots} &= (2\alpha + 1)(2\beta + 1) \\ &= 4\alpha\beta + 2\alpha + 2\beta + 1 \\ &= 4\alpha\beta + 2(\alpha + \beta) + 1 \\ &= 4 \times 2 + 2(3) + 1 \\ &= 8 + 6 + 1 \\ &= 15 \end{aligned}$$

$$\Rightarrow \therefore \alpha\beta = 2 \& \alpha + \beta = 3 \text{ from above}$$

$$\therefore \text{Quadratic Polynomial} \Rightarrow x^2 - (\text{Sum of the roots } x + \text{Product}) = 0$$

$$\Rightarrow x^2 - 8x + 15 = 0.$$

OR

- (b) Given, Polynomial is $4x^2 - 4x + 1$

$$\Rightarrow 4x^2 - 2x - 2x + 1$$

$$\Rightarrow 2x(2x - 1) - 1(2x - 1)$$

$$\Rightarrow (2x - 1)(2x - 1)$$

$$\Rightarrow x = \frac{1}{2}$$

$$\text{Hence, zeroes of given Polynomial is } x = \frac{1}{2}$$

On comparing equation (i) with $ax^2 + bx + c = 0$, we get $a = 4$, $b = -4$ and $c = 1$

$$\text{Now, sum of zeroes} = \frac{-b}{a} = \frac{-(-4)}{4} = 1$$

$$\text{Product of zeroes} = \frac{c}{a} = \frac{1}{4}$$

which Matches with:

$$\text{Sum of the zero} = \frac{1}{2} + \frac{1}{2} = \frac{2}{2} = 1$$

$$\text{Product of the zero} = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$$

Hence verified

30. Given :- $\frac{\tan \theta}{1 - \cot \theta} + \frac{\cot \theta}{1 - \tan \theta} = 1 + \sec \theta \operatorname{cosec} \theta$

$$\text{LHS} \Rightarrow \frac{\tan \theta}{1 - \frac{1}{\tan \theta}} + \frac{\frac{1}{\tan \theta}}{1 - \tan \theta}$$

$$\Rightarrow \frac{\tan^2 \theta}{\tan \theta - 1} - \frac{1}{\tan \theta(\tan \theta - 1)}$$

$$\Rightarrow \frac{\tan^3 \theta - 1}{\tan \theta (\tan \theta - 1)}$$

$$\Rightarrow \frac{(\tan \theta - 1)(\tan^2 \theta + \tan \theta + 1)}{\tan \theta (\tan \theta - 1)}$$

$$\Rightarrow \frac{\tan^2 \theta + \tan \theta + 1}{\tan \theta}$$

$$\Rightarrow \tan \theta + 1 + \frac{1}{\tan \theta}$$

$$\Rightarrow \tan \theta + 1 + \cot \theta$$

$$\Rightarrow \frac{\sin \theta}{\cos \theta} + \frac{\cos \theta}{\sin \theta} + 1$$

$$\Rightarrow \frac{\sin^2 \theta + \cos^2 \theta}{\cos \theta \sin \theta} + 1$$

$$\Rightarrow \frac{1}{\cos \theta \sin \theta} + 1$$

$$\Rightarrow 1 + \sec \theta \operatorname{cosec} \theta$$

$$\left(\begin{aligned} \because \tan \theta &= \frac{\sin \theta}{\cos \theta} \\ \& \cot \theta &= \frac{\cos \theta}{\sin \theta} \end{aligned} \right)$$

$$(\because \sin^2 \theta + \cos^2 \theta = 1)$$

$$\left(\begin{aligned} \because \frac{1}{\cos \theta} &= \sec \theta \\ \& \frac{1}{\sin \theta} &= \operatorname{cosec} \theta \end{aligned} \right)$$

Hence Proved.

31. \Rightarrow Given:

Radius of Blades = 21cm

Centre Angle (θ) = 120°

$$\text{Area of sector cleaned by blade} = r^2 \frac{\theta \times \pi}{360^\circ}$$

Total area cleaned by two wipers

$$= 2 \times \frac{\theta}{360^\circ} \times \pi r^2$$

$$= 2 \times \frac{120^\circ}{360^\circ} \times \frac{22}{7} \times 21 \times 21$$

$$= 924 \text{ cm}^2.$$

$$\therefore \text{Area cleaned by both wipers is } 924 \text{ cm}^2.$$

SECTION-D

32. Let Number of toys produced = x
Cost of Production of each toy = ₹(55 - x)

Total Cost of Production = ₹750

$$\Rightarrow x(55 - x) = 750$$

$$\Rightarrow 55x - x^2 = 750$$

$$\Rightarrow x^2 - 55x + 750 = 0$$

$$\Rightarrow x^2 - 25x - 30x + 750 = 0$$

$$\Rightarrow x(x - 25) - 30(x - 25) = 0$$

$$(x - 25)(x - 30) = 0$$

$$\text{So, } x = 25 \text{ and } 30$$

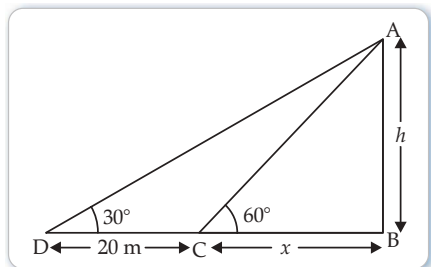
Hence, the number of toys will be either 25 or 30.

33. According to the figure.

In Right $\triangle ABD$

$$\tan 30^\circ = \frac{AB}{BC + CD}$$

$$\frac{1}{\sqrt{3}} = \frac{h}{x + 20}$$



Now, In right $\triangle ABC$

$$\tan 60^\circ = \frac{AB}{BC}$$

$$\sqrt{3} = \frac{h}{x}$$

....(i)

$$x\sqrt{3} = h$$

.... (ii)

Substitute value of 'h' in equation (i)

$$x + 20 = h\sqrt{3}$$

$$\Rightarrow x + 20 = x\sqrt{3} \times \sqrt{3}$$

$$\Rightarrow x + 20 = 3x$$

$$\Rightarrow 2x = 20$$

$$\Rightarrow x = 10$$

Substitute value of x in equation (ii)

$$10\sqrt{3} = h$$

Hence, height of tower = $10\sqrt{3}$ m

And, width of Canal = 10 m.

(1)

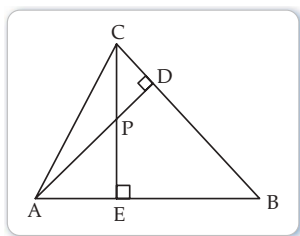
34. Given: $CE \perp AB$

$AD \perp BC$

To Prove: $\triangle AEP \sim \triangle CDP$

(ii) $\triangle ABD \sim \triangle CBE$

(iii) $\triangle AEP \sim \triangle ADB$



Proof: In $\triangle AEP$ and $\triangle CDP$

$\angle APE = \angle CPD$ (vertically opposite \angle s are equal)

And, $\angle AEP = \angle PDC = 90^\circ$ (given)

$\therefore \triangle AEP \sim \triangle CDP$ (By A.A criterion)

(ii) In $\triangle ABD$ and $\triangle CBE$

$\angle B = \angle B$ (Common)

$\angle ADB = \angle CEB = 90^\circ$ (Given)

$\therefore \triangle ABD \sim \triangle CBE$ (By AA criterion)

(iii) In $\triangle AEP$ and $\triangle ADB$

$\angle A = \angle A$ (Common)

$\angle AEP = \angle ADB = 90^\circ$ (Given)

$\therefore \triangle AEP \sim \triangle ADB$ (By AA criterion)

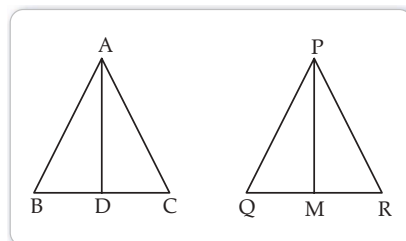
OR

(b) Given: $\triangle ABC \sim \triangle PQR$

To Prove:- $\frac{AB}{PQ} = \frac{AD}{PM}$

Proof:- $\triangle ABC \sim \triangle PQR$ (Given)

$$\therefore \frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}$$



(\because If two triangles are similar, then their Corresponding sides are in same ratio)

$\Rightarrow \angle A = \angle P, \angle B = \angle Q$ and $\angle C = \angle R$

Now, since P and M are mid points of BC and QR respectively.

$\therefore BC = 2BD$ and $QR = 2QM$

$$\Rightarrow \frac{AB}{PQ} = \frac{2BD}{2QM} = \frac{AC}{PR}$$

$$\Rightarrow \frac{AB}{PQ} = \frac{BD}{QM} = \frac{AC}{PR}$$

... (i)

In $\triangle ABD$ and $\triangle PQM$

$$\frac{AB}{PQ} = \frac{BD}{QM} \text{ (from i)}$$

$\angle B = \angle Q$ (Proved above)

$\therefore \triangle ABD \sim \triangle PQM$ (By SAS criterion)

$$\text{Thus, } \frac{AB}{PQ} = \frac{AD}{PM}$$

Hence, Proved.

35. (a) Given:-

Height of cuboid = 7 m

Length of cuboid = 20 m

Width of cuboid = 14 m.

$$\text{Radius of cylinder} = \frac{14}{2} = 7 \text{ m.}$$

Height of cylinder = 20 m

volume of air inside the industry = volume of cuboid + volume of half Cylinder.

$$\text{Volume of cuboid} = 7 \times 14 \times 20 = 1960 \text{ m}^3$$

$$\text{volume of cylinder} = \frac{1}{2} \times \frac{22}{7} \times 7 \times 7 \times 20 = 1540 \text{ m}^3$$

Thus, volume of air inside the industry

$$= 1960 + 1540$$

$$= 3500 \text{ m}^3$$

Total space occupied by machinery = 400 m^3

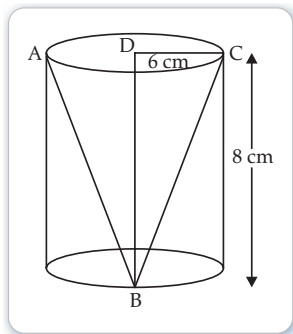
$$\therefore \text{Space left in the industry} = 3500 - 400 = 3100 \text{ m}^3$$

OR

(b) Given:- For Cylinder and cone

Height = 8 cm

Radius = 6 cm



Slant height of cane

$$\Rightarrow BC^2 = BD^2 + DC^2$$

$$= 8^2 + 6^2$$

$$= 64 + 36$$

$$BC^2 = 100$$

$$BC = 10 \text{ cm.}$$

(2)

Total surface area of remaining solid

= CSA of cylinder + area of base + CSA of cone

$$= 2\pi rh + \pi r^2 + \pi rl$$

$$= 2 \times \pi \times 6 \times 8 + \pi \times 6 \times 6 + \pi \times 6 \times 10$$

$$= 96\pi + 36\pi + 60\pi$$

$$= 192\pi$$

$$= 192 \times 3.14$$

$$= 602.88 \text{ cm}^2$$

SECTION-E

36. Given:-

Saving is increased by one ₹5 coin daily

So, Rehan's mother input = 5, 10, 15...

Number of coins on each day = 1, 2, 3, 4...

Here AP is formed

So, $a = 1, d = 1$

(i) As number of coins are increasing by One daily.

So number of coins added on 8th day = 8.

(ii) As one ₹5 coin is added daily money after

$$8 \text{ days} \Rightarrow S_8 = \frac{n}{2} [2a + (n-1)d]$$

$$= \frac{8}{2} [2 \times 1 + (8-1)1]$$

$$= 4[2 + 7]$$

$$= 36$$

Total money in 8 days = 36×5

$$= ₹ 180$$

(iii) (a) Number of coins Piggy bank can hold

$$= 120$$

$$\therefore S_n \leq 120$$

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

$$\Rightarrow S_n = \frac{n}{2} [2 \times 1 + (n-1)1]$$

$$\Rightarrow \frac{n}{2} [2 + (n-1)] = 120$$

$$\Rightarrow \frac{n}{2} [2 + n - 1] = 120$$

$$= \frac{n}{2} [1 + n] = 120$$

$$= \frac{n}{2} + \frac{n^2}{2} = 120$$

$$= n^2 + n = 240$$

$$= n^2 + n - 240 = 0$$

$$= n^2 + 16n - 15n - 240 = 0$$

$$= n(n+16) - 15(n+16) = 0$$

$$= (n+16)(n-15) = 0$$

$$\Rightarrow n = -16 \text{ and } n = 15$$

Therefore, she can put coins for 15 days.

OR

For Amount 5, 10, 15...

AP = 5, 10, 15 ...

$$\Rightarrow a = 5 \text{ and } d = 5, n = 15.$$

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

$$S_n = \frac{15}{2} [2 \times 5 + (15-1)5]$$

$$= \frac{15}{2} [10 + 70]$$

$$= \frac{15}{2} \times 80$$

$$= ₹600$$

(2)

$$\therefore \text{Total money solved} = ₹600$$

37.

Number of heart beats per minute	Number of women (f)	Cumulative frequency
65-68	2	2
68-71	4	6
71-74	3	9
74-77	8	17
77-80	7	24
80-83	4	28
83-86	2	30
	$\Sigma(f) = 30$	

Number of women having heart beat in range 68-77

$$\Rightarrow 4 + 3 + 8$$

$$= 15$$

...(i)

(ii) Total Freq. = 30

$$\frac{N}{2} = \frac{30}{2} = 15$$

Since Cumulative Frequency greater than or equal to 15 lies in class Interval 74-77

 \therefore Median class of heart beats = 74-77.

$$\text{(iii) (a) Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) \times h$$

where,

Modal class having highest frequency = 74-77

$$l = 74$$

$$h = 3$$

$$f_1 = 8$$

$$f_0 = 3$$

$$f_2 = 7$$

$$\begin{aligned}
 \text{Thus, Mode} &= 74 + \left(\frac{8-3}{2 \times 8-3-7} \right) \times 3 \\
 &= 74 + \frac{5}{6} \times 3 \\
 &= 74 + \frac{5}{2} = \frac{148+5}{2} \\
 &= \frac{153}{2} = 76.5
 \end{aligned}$$

OR

(b) Here $N = \Sigma f = 30$.

$$\therefore \frac{N}{2} = \frac{30}{2} = 15$$

So, median class is 74-77.

lower limit of median class, $l = 74$ Class size $h = 3$ Cumulative frequency Preceding class, $Cf = 9$ Frequency of median class = $f = 8$

$$\begin{aligned}
 \text{Median} &= l + \frac{\left(\frac{N}{2} - Cf \right)}{f} \times h \\
 &= 74 + \frac{\left(\frac{30}{2} - 9 \right)}{8} \times 3 \\
 &= 74 + \frac{(15-9)}{8} \times 3 \\
 &= 74 + \frac{6}{8} \times 3 \\
 &= 74 + \frac{18}{8} \\
 &= 74 + 2.25 \\
 &= 76.25.
 \end{aligned}$$

38. As per given figure

(i) Co-ordinates of A = (1, 9)

Co-ordinates of B = (5, 13)

$$(ii) \text{ Mid-point of line segment} = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Coordinates of C = (9, 13)

Coordinates of D = (13, 9)

$$\begin{aligned}
 \text{Thus, mid point} &= \left[\left(\frac{9+13}{2} \right), \left(\frac{13+9}{2} \right) \right] \\
 &= \left(\frac{22}{2}, \frac{22}{2} \right) \\
 &= (11, 11)
 \end{aligned}$$

(iii) (a) Distance between two points

$$= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Here Coordinates of M (5, 11)

Coordinates of Q (9, 3)

Distance between M and Q

$$\begin{aligned}
 d &= \sqrt{(9-5)^2 + (3-11)^2} \\
 &= \sqrt{(4)^2 + (-8)^2} \\
 &= \sqrt{16 + 64} \\
 &= \sqrt{80} \\
 &= 4\sqrt{5}
 \end{aligned}$$

OR

(iii) (b) Coordinates of point which divides the line segment joining M and N in the ratio 1: 3 internally.

$$x = \left(\frac{mx_2 + nx_1}{m+n} \right), y = \left(\frac{my_2 + ny_1}{m+n} \right)$$

Co-ordinates of M = (5, 11)

Coordinates of N = (9, 11)

$$\begin{aligned}
 x &= \left(\frac{1 \times 9 + 3 \times 5}{1+3} \right) \\
 &= \frac{9+15}{4} = \frac{24}{4} = 6 \\
 y &= \left(\frac{1 \times 11 + 3 \times 11}{1+3} \right) = \left(\frac{11+33}{4} \right) \\
 &= \frac{44}{4} = 11.
 \end{aligned}$$

Thus Coordinates of point = (6, 11)

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SECTION-A

5. Option (c) is correct

$$\text{Given, } \sin^2 \theta = \frac{3}{4}$$

$$\Rightarrow \sin \theta = \pm \frac{\sqrt{3}}{2}$$

$$\Rightarrow \sin \theta = \frac{\sqrt{3}}{2} \text{ or } \sin \theta = -\frac{\sqrt{3}}{2}$$

$$\sin \theta = \sin 60^\circ \text{ (Since } \sin 60^\circ = \frac{\sqrt{3}}{2})$$

$$\Rightarrow \theta = 60^\circ$$

(Case $\sin \theta = -\frac{\sqrt{3}}{2}$ is not included in our solutionbecause in this case $\theta > 90^\circ$ and as per the syllabus we will restrict our discussion to acute angle and right angle only.)

6. Option (b) is correct

The given polynomial is $3x^2 - 5x - 2$

To find the zeroes of the given polynomial let,

$$3x^2 - 5x - 2 = 0$$

$$\Rightarrow 3x^2 - 6x + x - 2 = 0$$

$$\Rightarrow 3x(x-2) + 1(x-2) = 0$$

$$\Rightarrow (x-2)(3x+1) = 0$$

$$\Rightarrow x-2 = 0 \text{ or } 3x+1 = 0$$

$$\Rightarrow x = 2 \text{ or } x = -\frac{1}{3}$$

Therefore, the zeroes of the given polynomial are $-\frac{1}{3}$ and 2.

7. Option (a) is correct

Let the height of the pole be BC which casts a shadow AC on the ground.

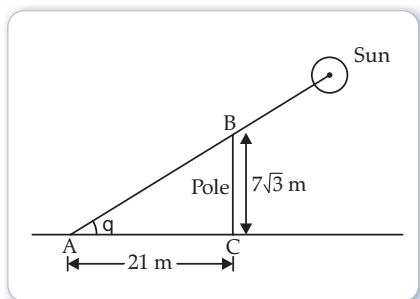
Therefore, according to question $AC = 21$ m and $BC = 7\sqrt{3}$.

Let Sun's angle of elevation is θ .

Then according to diagram,

$$\begin{aligned}\tan \theta &= \frac{BC}{AC} \\ \Rightarrow \tan \theta &= \frac{7\sqrt{3}}{21} = \frac{1}{\sqrt{3}} \\ \Rightarrow \tan \theta &= \tan 30^\circ \quad \left(\text{Since } \tan 30^\circ = \frac{1}{\sqrt{3}}\right) \\ \Rightarrow \theta &= 30^\circ\end{aligned}$$

Therefore, the Sun's elevation is 30° .

**16. Option (a) is correct.**

We know that if the root of a quadratic equation is -1 then the quadratic equation will be satisfied by -1 . Since $(-1)^2 - 4(-1) - 5 = 1 + 4 - 5 = 0$ therefore -1 is a root of $x^2 - 4x - 5 = 0$.

Since $-(-1)^2 - 4(-1) + 5 = -1 + 4 + 5 = 8 \neq 0$ therefore -1 is not a root of $-x^2 - 4x + 5 = 0$.

Since $(-1)^2 + 3(-1) + 4 = 1 - 3 + 4 = 2 \neq 0$ therefore -1 is not a root of $x^2 + 3x + 4 = 0$.

Since $(-1)^2 - 5(-1) + 6 = 1 + 5 + 6 = 12 \neq 0$ therefore -1 is not a root of $x^2 - 5x + 6 = 0$.

17. Option (b) is correct

Let d be the distance of the point $(3, 4)$ from the origin $(0, 0)$.

$$\therefore d = \sqrt{(3-0)^2 + (4-0)^2} = \sqrt{9+16} = \sqrt{25} = 5$$

18. Option (d) is correct

Given, $a = -3$ and $d = -2$

We have to find the seventh term i.e., a_7

$$\begin{aligned}\therefore a_7 &= a + (7-1)d \\ &= (-3) + 6(-2) \\ &= -3 - 12 = -15\end{aligned}$$

22. Let E be the event "Rasmita will buy a pen if it is good."

Now according to question, the number of all possible outcomes of the experiment = 165

Number of outcomes favourable to $E = 165 - 30 = 135$

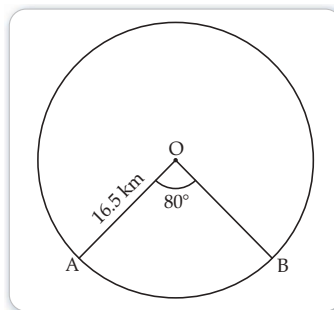
$$\therefore P(E) = \frac{135}{165} = \frac{9}{11}$$

26. Distance over which light spread i.e., radius $r = 16.5$ km

Angle made by the sector $r = \theta = 80^\circ$.

\therefore The area of the sea over which the ships are warned

$$\begin{aligned}&= \frac{\theta}{360} \times \pi r^2 \\ &= \frac{80}{360} \times 3.14 \times (16.5)^2 = \frac{2}{9} \times 3.14 \times (16.5)^2 = 189.97 \text{ km}^2\end{aligned}$$

**27.(a) The given quadratic polynomial is $x^2 + x - 6$.**

To find the zeros of the given polynomial

$$\text{let } x^2 + x - 6 = 0$$

$$\Rightarrow x^2 + 3x - 2x - 6 = 0$$

$$\Rightarrow x(x+3) - 2(x+3) = 0$$

$$\Rightarrow (x+3)(x-2) = 0$$

$$\Rightarrow x+3 = 0 \text{ or } x-2 = 0$$

$$\Rightarrow x = -3, 2$$

According to question let $\alpha = -3$ and $\beta = 2$.

We have to construct a quadratic polynomial whose

zeros are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$.

Now the quadratic equation whose zeros are $\frac{1}{\alpha}$ and

$$\frac{1}{\beta} \text{ is } \left(x - \frac{1}{\alpha}\right)\left(x - \frac{1}{\beta}\right) = 0$$

$$\Rightarrow \left(x + \frac{1}{3}\right)\left(x - \frac{1}{2}\right) = 0$$

$$\Rightarrow x^2 - \frac{1}{6}x - \frac{1}{6} = 0$$

$$\Rightarrow 6x^2 - x - 1 = 0$$

Therefore, the required quadratic polynomial is.

$$6x^2 - x - 1.$$

Alternative method: The quadratic equation is $x^2 + x - 6 = 0$

We know that for reciprocal roots, we only need to replace x by $\frac{1}{x}$ in the given equation.

Therefore, the quadratic equation whose roots are reciprocal roots of $x^2 + x - 6 = 0$ is,

$$\frac{1}{x^2} + \frac{1}{x} - 6 = 0$$

$$\Rightarrow 1 + x - 6x^2 = 0$$

$$\Rightarrow 6x^2 - x - 1 = 0$$

Therefore, the required quadratic polynomial is $6x^2 - x - 1$

OR

(b) The given polynomial is $2x^2 + 3x - 2$.

To find the zeros of the given polynomial let

$$2x^2 + 3x - 2 = 0$$

$$\Rightarrow 2x^2 + 4x - x - 2 = 0$$

$$\Rightarrow 2x(x+2) - 1(x+2) = 0$$

$$\Rightarrow (x+2)(2x-1) = 0$$

$$\Rightarrow x = -2, \frac{1}{2}$$

The zeros of the given polynomial are -2 and $\frac{1}{2}$.

$$\text{Now, } -2 + \frac{1}{2} = \frac{-3}{2} = -\frac{\text{coefficient of } x}{\text{coefficient of } x^2}$$

$$\text{and } -2 \times \frac{1}{2} = -1 = \frac{\text{constant term}}{\text{coefficient of } x^2}$$

34. Let the height of the tower be CE and the height of the building be AB . Draw $AD \parallel BC$. Let $DE = x$ m. The angle of elevation from the top E of the tower to the top A of the building is 60° and the angle of depression from the bottom C of the tower to the top A of the building is 45° .

Now according to question, $AB = 7$ m and $EC = (7 + x)$ m.

$$\angle DAC = \angle ACB = 45^\circ \text{ (Alternate interior angles)}$$

$$\text{In } \triangle ABC, \tan 45^\circ = \frac{AB}{BC}$$

$$\Rightarrow \frac{AB}{BC} = 1$$

$$\Rightarrow BC = AB = 7 \text{ m}$$

Now $ABCD$ is a rectangle,

Therefore, $AD = BC = 7$ m

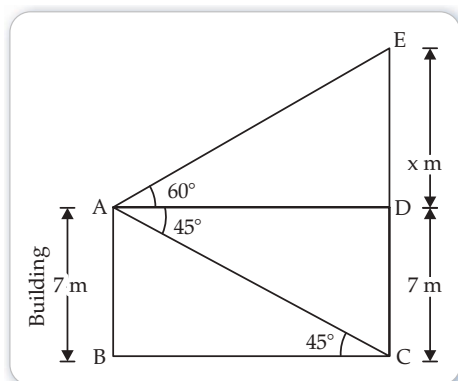
In $\triangle ADE$,

$$\tan 60^\circ = \frac{DE}{AD} = \frac{x}{7}$$

$$\Rightarrow \sqrt{3} = \frac{x}{7}$$

$$\Rightarrow x = 7\sqrt{3}$$

$$\therefore \text{Height of the tower } EC = 7 + 7\sqrt{3} = 7(1 + \sqrt{3}) \\ = 7(1 + 1.732) = 7 \times 2.732 = 19.124 \text{ m}$$



35. Let the number of articles produced be x . Now according to question, the cost of production of each article is $2x + 3$.

The total cost of production on that day = $x(2x + 3)$

But we have, the total cost of production on that day was ₹90.

$$\therefore x(2x + 3) = 90$$

$$\Rightarrow 2x^2 + 3x - 90 = 0$$

$$\Rightarrow 2x^2 + 15x - 12x - 90 = 0$$

$$\Rightarrow x(2x + 15) - 6(2x + 15) = 0$$

$$\Rightarrow (2x + 15)(x - 6) = 0$$

$$\Rightarrow x = 6, \frac{-15}{2}$$

Since the number cannot be negative therefore, $x = 6$.

So, the number of articles = 6 and the cost of each article = ₹ $\{(2 \times 6) + 3\}$ = ₹15.

Outside Delhi Set-3

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SECTION-A

1. Option (c) is correct

Explanation:

$$\begin{aligned} \text{Total surface area of a cube} &= 6 \times (\text{side})^2 \\ &= 6 \times (20)^2 \\ &= 6 \times 400^2 \\ &= 2400 \text{ cm}^2 \end{aligned}$$

9. Option (b) is correct.

Explanation: Any number that ends with zero, must have factors 2 and 5.

Therefore, Answer is $(5 \times 2)^n$

10. Option (a) is correct.

Explanation: $5 \cos A - 4 = 0$

$$\cos A = \frac{4}{5} \quad \text{Since: } \sin^2 A = 1 - \cos^2 A = 1 - \left(\frac{4}{5}\right)^2 = \frac{3}{5}$$

$$\tan A = \frac{3}{4}$$

14. Option (d) is correct.

Explanation: Given that $-2x + 3y - 9 = 0$, $4x + py + 7 = 0$

$$\begin{aligned} \text{For unique solution: } \frac{a_1}{a_2} &\neq \frac{b_1}{b_2} \\ \frac{-2}{4} &\neq \frac{3}{p} \\ -2p &\neq 4 \times 3 \\ p &\neq -6 \end{aligned}$$

15. Option (c) is correct.

$$\text{Explanation: } \frac{\operatorname{cosec}^2 A - \cot^2 A}{1 - \sin^2 A} = \frac{1}{\cos^2 A} = \sec^2 A$$

$$\begin{aligned} \text{23. Explanation: } 231 &= 3 \times 7 \times 11 \\ 396 &= 2^2 \times 3^2 \times 11 \\ \text{L.C.M} &= 2^2 \times 3^2 \times 7 \times 11 \\ &= 2772 \end{aligned}$$

28. **Explanation:** Sample Space = $n(S) = 44$ (excluding queen and king cards)

$$(a) \quad n(E) = \text{Ace of Heart} = 1$$

$$P(E) = \frac{n(E)}{n(S)} = \frac{1}{44}$$

(b) $n(F) = \text{Black cards} = 22$

$$P(F) = \frac{n(F)}{n(S)} = \frac{22}{44} = \frac{1}{2}$$

(c) $n(G) = \text{jack of spade} = 1$

$$P(G) = \frac{n(G)}{n(S)} = \frac{1}{44}$$

31. Explanation: Let us assume that $5\sqrt{2} - 3$ is an irrational number.

Then we can find integers a and $b(b \neq 0)$ such that

$$5\sqrt{2} - 3 = \frac{a}{b}$$

$$5\sqrt{2} = \frac{a}{b} + 3$$

$$5\sqrt{2} = \frac{a + 3b}{b}$$

$$\sqrt{2} = \frac{a + 3b}{5b}$$

This is a contradiction because the right-hand side is a rational number while given that $\sqrt{2}$ is an irrational. So, Our assumption that $5\sqrt{2} - 3$ is rational is wrong. Hence, $5\sqrt{2} - 3$ is an irrational number.

35. Explanation: Let Breadth = b

$$\text{Length} = 2b + 1$$

Area of Rectangular plot = length \times breadth

$$528 \text{ m}^2 = (2b + 1) \times b$$

$$528 \text{ m}^2 = 2b^2 + b$$

$$2b^2 + b - 528 = 0$$

$$2b^2 + 33b - 32b - 528 = 0$$

$$b(2b + 33) - 16(2b + 33) = 0$$

$$(b - 16)(2b + 33) = 0$$

$$\text{Therefore, } b - 16 = 0 \quad 2b + 33 = 0$$

$$b = 16 \quad b = \frac{-33}{2} \text{ (not possible)}$$

So, breadth = $b = 16$ m

$$\text{Length} = 2b + 1 = 2 \times 16 + 1 = 33 \text{ m}$$

Length = 33 m, Breadth = 16 m

□□□

REAL NUMBERS



REVISION NOTES

➤ Theorem 1.1 : (Fundamental Theorem of Arithmetic) :

Fundamental theorem of Arithmetic states that "Every composite number can be expressed as a product of prime numbers and this factorisation is unique, apart from the order in which the prime factors occur". It is also known as a **Unique Factorisation Theorem**.
i.e., Composite number = Product of prime numbers

Scan to know more about this topic



Fundamental theorem of arithmetic

OR

Any integer greater than 1 can either be a prime number or can be written as a unique product of prime numbers.

For example,

(i) $2 \times 11 = 22$ is same as $11 \times 2 = 22$

(ii) 6 can be written as 2×3 or 3×2 , where 2 and 3 are prime numbers.

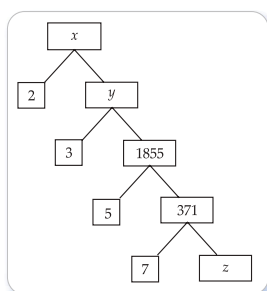
(iii) 15 can be written as 3×5 or 5×3 , where 3 and 5 are prime numbers.

☑ **Note:** The prime factorisation of a natural number is unique, except to the order of its factors.

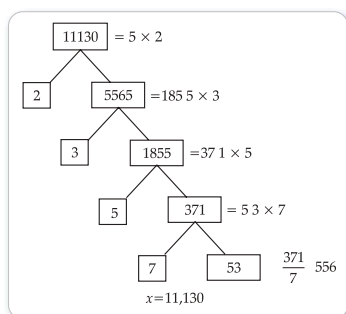
For example, 12 obtained by multiplying the prime numbers 2, 2 and 3 together, $12 = 2 \times 2 \times 3$

We would probably write it as $12 = 2^2 \times 3$

➤ Example 1: Complete the following factor tree and find the composite number x :



Sol.



$$x = 11130$$

➤ Example 2: Explain whether $3 \times 12 \times 101 + 4$ is a prime number or a composite number.

$$\begin{aligned} \text{Sol. } 3 \times 12 \times 101 + 4 &= 4(3 \times 3 \times 101 + 1) \\ &= 4(909 + 1) \\ &= 4(910) \\ &= 2 \times 2 \times 2 \times 5 \times 7 \times 13 \end{aligned}$$

As it can be expressed as a product of primes so by fundamental theorem of Arithmetic it is Composite number.

➤ Example 3: Find the smallest natural number by which 1200 should be multiplied so that the square root of the product is a rational number.

$$\begin{aligned} \text{Sol. Since, } 1200 &= 4 \times 3 \times (2 \times 5)^2 \\ &= 2^4 \times 3 \times 5^2 \end{aligned}$$

Hence, the required smallest natural number is 3.

➤ Prime factorisation method to find HCF and LCM :

By using Fundamental Theorem of Arithmetic, we shall find the HCF and LCM of given numbers (two or more). This method is known as prime factorisation method. The steps to find LCM and HCF of two given numbers by prime factorisation method are given below :

Step 1. Find all the prime factors of given numbers.

Step 2. HCF of two or more numbers = Product of the smallest power of each common prime factor, involved in the numbers.

Step 3. LCM of two or more numbers = Product of the greatest power of each prime factor, involved in the numbers.

➤ Relation between HCF and LCM :

For two positive integers a and b , we have

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

or

$$\text{HCF}(a, b) = \frac{a \times b}{\text{LCM}(a, b)}$$

and

$$\text{LCM}(a, b) = \frac{a \times b}{\text{HCF}(a, b)}$$

➤ Example 4: If two positive integers p and q are written as $p = a^2b^3$ and $q = a^3b$, where a and b are prime numbers then verify $\text{LCM}(p, q) \times \text{HCF}(p, q) = pq$.

$$\begin{aligned} \text{Sol. Since, } \text{LCM}(p, q) &= a^3b^3 \\ \text{and } \text{HCF}(p, q) &= a^2b \\ \text{Hence, } \text{LCM}(p, q) \times \text{HCF}(p, q) &= a^3b^3 \times a^2b \\ &= a^5b^4 \\ &= a^2b^3 \times a^3b \\ &= pq \end{aligned}$$

➤ Example 5: Can two numbers have 15 as their HCF and 175 as their LCM ? Give reasons.

Sol. Since, 15 does not divide 175 and LCM of two numbers should be exactly divisible by their HCF.