CBSE EXAMINATION PAPER-2024 Mathematics (Standard) Class-10th (Solved) (Delhi & Outside Delhi Sets)

Time : 3 Hours

Max. Marks: 80

General Instructions:

Read the following instructions carefully and follow them:

- (i) This question paper contains 38 questions. All questions are compulsory.
- (ii) This question paper is divided into FIVE sections A, B, C, D and E.
- (iii) In Section A, Question numbers 1 to 18 are multiple choice questions (MCQs) and question numbers 19 and 20 are Assertion Reason based questions of 1 mark each.
- (iv) In Section B, Question numbers 21 to 25 are very short answer (VSA) type questions, carrying 2 marks each.
- (v) In Section C, Question numbers 26 to 31 are short answer (SA) type questions, carrying 3 marks each.

(vi) In Section D, Question numbers 32 to 35 are long answer (LA) type questions, carrying 5 marks each.

- (vii) In Section E, Question numbers 36 to 38 are case-study based integrated questions carrying 4 marks each. Internal choice is provided in 2 marks question in each case-study.
- (viii) 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 of 2 marks in Section *E*.
- (ix) Draw neat diagrams wherever required. Take $\pi = \frac{22}{7}$ wherever required, if not stated.

(x) Use of calculators is NOT allowed.

Delhi Set-1

SECTION – A

This section consists of 20 questions of 1 mark each.

- 1. If the sum of zeroes of the polynomial $2x^2 k\sqrt{2x} + 1$ is $\sqrt{2}$, then value of *k* is:
 - (A) $\sqrt{2}$ (B) 2

(C)
$$2\sqrt{2}$$
 (D) $\frac{1}{2}$

2. If the probability of a player winning a game is 0.79, then the probability of his losing the same game is:

(A) 1.79	(B) 0.31
(C) 0.21%	(D) 0.21

3. If the roots of equation $ax^2 + bx + c = 0$, $a \neq 0$ are real and equal, then which of the following relation is true?

(A)
$$a = \frac{b^2}{c}$$
 (B) $b^2 = ac$
(C) $ac = \frac{b^2}{4}$ (D) $c = \frac{b^2}{a}$

4. In an A.P., if the first term a = 7, *n*th term $a_n = 84$ and the sum of first *n* terms $S_n = \frac{2093}{2}$, then *n* is equal

(A) 22	(B) 24
(C) 23	(D) 26

- **5.** If two positive integers *p* and *q* can be expressed as $p = 18 a^2 b^4$ and $q = 20 a^3 b^2$, where *a* and *b* are prime numbers, then LCM(*p*, *q*) is:
 - (A) $2 a^2 b^2$ (B) $180 a^2 b^2$ (C) $12 a^2 b^2$ (D) $180 a^3 b^4$
- AD is a median of △ABC with vertices A(5, -6), B(6, 4) and C(0, 0). Length AD is equal to:
 - (A) $\sqrt{68}$ units (B) $2\sqrt{15}$ units
 - (C) $\sqrt{101}$ units (D) 10 units
- 7. If $\sec \theta \tan \theta = m$, then the value of $\sec \theta + \tan \theta$ is:

(A)
$$1 - \frac{1}{m}$$
 (B) $m^2 - 1$
(C) $\frac{1}{m}$ (D) $-m$

8. From the data 1, 4, 7, 9, 16, 21, 25 if all the even numbers are removed, then the probability of getting at random a prime number from the remaining is:

(A)	$\frac{2}{5}$	(B)	$\frac{1}{5}$

(C) $\frac{1}{7}$ (D) $\frac{2}{7}$

30/1/1

9. From some data x_1, x_2, \dots, x_n with respective frequencies f_1, f_2, \dots, f_n , the value of $\sum_{i=1}^{n} f_i(x_i - \overline{x})$ is

equal to:

(A) $n\overline{x}$	(B) 1
(C) Σf_i	(D) 0

10. The zeroes of a polynomial $x^2 + px + q$ are twice the zeroes of the polynomial $4x^2 - 5x - 6$. The value of *p* is:

(A) $-\frac{5}{2}$	(B) $\frac{5}{2}$
(C) –5	(D) 10

11. If the distance between the points (3, −5) and (*x*, −5) is 15 units, then the values of *x* are:

12. If
$$\cos(\alpha + \beta) = 0$$
, then value of $\cos\left(\frac{\alpha + \beta}{2}\right)$ is equal

to:

(A) $\frac{1}{\sqrt{2}}$	(B) $\frac{1}{2}$
(C) 0	(D) $\sqrt{2}$

13. A solid sphere is cut into two hemispheres. The ratio of the surface areas of sphere to that of two hemispheres taken together, is:

(A) 1 : 1	(B) 1:4
(C) 2:3	(D) 3 : 2

14. The middle most observation of every data arranged in order is called:

(A) mode	(B) median
(C) mean	(D) deviation

15. The volume of the largest right circular cone that can be carved out from a solid cube of edge 2 cm is:

(A)
$$\frac{4\pi}{3}$$
 cu cm
(B) $\frac{5\pi}{3}$ cu cm
(C) $\frac{8\pi}{3}$ cu cm
(D) $\frac{2\pi}{3}$ cu cm

16. Two dice are rolled together. The probability of getting sum of numbers on the two dice as 2, 3 or 5, is:

(A)	$\frac{7}{36}$	(B)	$\frac{11}{36}$
(C)	$\frac{5}{36}$	(D)	$\frac{4}{9}$

17. The centre of a circle is at (2, 0). If one end of a diameter is at (6, 0), then the other end is at:

(A) (0, 0)	(B) (4, 0)
(C) (-2, 0)	(D) (-6, 0)

18. In the given figure, graphs of two linear equations are shown. The pair of these linear equations is:



- (A) consistent with unique solution.
- (B) consistent with infinitely many solutions.
- (C) inconsistent.
- (D) inconsistent but can be made consistent by extending these lines.

Directions:

In Q. No. 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 true and Reason (R) is the correct explanation of the Assertion (A).
- (B) Both Assertion (A) and Reason (R) are true, 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): The tangents drawn at the end points of a diameter of a circle, are parallel.

Reason (R): Diameter of a circle is the longest chord.

20. Assertion (A): If the graph of a polynomial touches *x*-axis at only one point, then the polynomial cannot be a quadratic polynomial.

Reason (R): A polynomial of degree n(n > 1) can have at most *n* zeroes.

SECTION – B

This section consists of 5 questions of 2 marks each.

- **21.** Solve the following system of linear equations 7x 2y = 5 and 8x + 7y = 15 and verify your answer.
- **22.** In a pack of 52 playing cards one card is lost. From the remaining cards, a card is drawn at random. Find the probability that the drawn card is queen of heart, if the lost card is a black card.
- **23.** (a) Evaluate : $2\sqrt{2} \cos 45^{\circ} \sin 30^{\circ} + 2\sqrt{3} \cos 30^{\circ}$

OR

- (b) If $A = 60^{\circ}$ and $B = 30^{\circ}$, verify that: sin(A + B) = sin A cos B + cos A sin B
- 24. In the given figure, ABCD is a quadrilateral. Diagonal BD bisects ∠B and ∠D both.
 Prove that:

Solved Paper - 2024



- (i) $\triangle ABD \sim \triangle CBD$
- (ii) AB = BC
- **25.** (a) Prove that $5-2\sqrt{3}$ is an irrational number. It is given that $\sqrt{3}$ is an irrational number.

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(b) Show that the number $5 \times 11 \times 17 + 3 \times 11$ is a composite number.

SECTION - C

This section consists of 6 questions of 3 marks each.

26. (a) Find the ratio in which the point
$$\left(\frac{8}{5}, y\right)$$
 divides

the line segment joining the points (1, 2) and (2, 3). Also, find the value of *y*.

OR

- (b) ABCD is a rectangle formed by the points A(-1, -1) B(-1, 6), C(3, 6) and D(3, -1). P, Q, R and S are mid-points of sides AB, BC, CD and DA respectively. Show that diagonals of the quadrilateral PQRS bisect each other.
- **27.** In a teachers' workshop, the number of teachers teaching French, Hindi and English are 48, 80 and 144 respectively. Find the minimum number of rooms required if in each room the same number of teachers are seated and all of them are of the same subject.
- **28.** Prove that : $\frac{\tan\theta}{1-\cot\theta} + \frac{\cot\theta}{1-\tan\theta} = 1 + \sec\theta.\csc\theta$
- **29.** Three years ago, Rashmi was thrice as old as Nazma. Ten years later, Rashmi will be twice as old as Nazma. How old are Rashmi and Nazma now?
- **30.** (a) In the given figure, AB is a diameter of the circle with centre O. AQ, BP and PQ are tangents to the circle. Prove that $\angle POQ = 90^{\circ}$



(b) A circle with centre O and radius 8 cm is inscribed in a quadrilateral ABCD is which P, Q, R, S are the points of contact as shown. If AD is perpendicular to DC, BC = 30 cm and BS = 24 cm, then find the length DC.



31. The difference between the outer and inner radii of a hollow right circular cylinder of length 14 cm is 1 cm. If the volume of the metal used in making the cylinder is 176 cm³, find the outer and inner radii of the cylinder.

SECTION - D

This section consists of 4 questions of 5 marks each.

- **32.** An arc of a circle of radius 21 cm subtends an angle of 60° at the centre. Find:
 - (i) the length of the arc.
 - (ii) the area of the minor segment of the circle made by the corresponding chord.
- **33. (a)** The sum of first and eight terms of an A.P. is 32 and their product is 60. Find the first term and common difference of the A.P. Hence, also find the sum of its first 20 terms

OR

- (b) In a A.P. of 40 terms, the sum of first 9 terms is 153 and the sum of last 6 terms is 687. Determine the first term and common difference of A.P. Also, find the sum of all the terms of the A.P.
- 34. (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 the other two sides are divided in the same ratio.

(b) In the given figure PA, QB and RC are each perpendicular to AC. If AP = x, BQ = y and CR



35. A pole 6 m high is fixed on the top of a tower. The angle of elevation of the top of the pole observed from a point P on the ground is 60° and the angle of depression of the point P from the top of the tower is 45°. Find the height of the tower and the distance of point P from the foot of the tower.

(use $\sqrt{3} = 1.73$)

SECTION – E

This section consists of 3 Case-Study Based Questions of 4 marks each.

36. A rectangular floor area can be completely tiled with 200 square tiles. If the side length of each tile is increased by 1 unit, it would take only 128 tiles to cover the floor.



- (i) Assuming the original length of each side of a tile be *x* units, make a quadratic equation from the above information.
- (ii) Write the corresponding quadratic equation in standard form. 1
- (iii)(a) Find the value of *x*, the length of side of a tile by factorisation. 2

OR

- (b) Solve the quadratic equation for *x*, using quadratic formula. 2
- **37.** BINGO is game of chance. The host has 75 balls numbered 1 through 75. Each player has a BINGO card with some numbers written on it. The participant cancels the number on the card when called out a number written on the ball selected at random. Whosoever cancels all the numbers on his/ her card, says BINGO and wins the game.



The table given below, shows the data of one such game where 48 balls were used before Tara said 'BINGO'.

Numbers announced	Number of times
0-15	8

Delhi Set-2

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

SECTION - A

This section consists of 20 question of 1 mark each.

4. If
$$\sin A = \frac{2}{3}$$
, then value of $\cot A$ is:

15-30	9
30-45	10
45-60	12
60-75	9

Based on the above information, answer the following:

- (i) Write the median class. 1(ii) When first ball was picked up, what was the probability of calling out an even number? 1
- (iii)(a) Find median of the given data. 2

(b) Find mode of the given data.

2

38. A backyard is in the shape of a triangle ABC with right angle at B. AB = 7 m and BC = 15 m. A circular pit was dug inside it such that it touches the walls AC, BC and AB at P, Q and R respectively such that AP = x m.





Based on the above information, answer the following questions:

(i) Find the length of AR in terms of *x*.

- 1 R. 1
- (ii) Write the type of quadrilateral BQOR.
- (iii)(a) Find the length PC in terms of *x* and hence find the value of *x*. 2 OR
 - (b) Find *x* and hence find the radius *r* of circle.2

30/1/2



7. Which of the following is not probability of an event?

(A) 0.89 (B) 52%
(C)
$$\frac{1}{13}$$
% (D) $\frac{1}{0.89}$

13. If the sum and the product of zeroes of a quadratic polynomial are $2\sqrt{3}$ and 3 respectively, then a quadratic polynomial is:

(A)
$$x^2 + 2\sqrt{3}x - 3$$
 (B) $(x - \sqrt{3})^2$
(C) $x^2 - 2\sqrt{3}x - 3$ (D) $x^2 + 2\sqrt{3}x + 3$

17. *n*th term of an A.P. is 7n + 4. The common difference is:

(A) 7/n	(B) 4
(C) 7	(D) 1

SECTION – B

This section consists of 5 questions of 2 marks each.

21. Diagonals AC and BD of a trapezium ABCD intersect at O, where AB || DC. If $\frac{DO}{OB} = \frac{1}{2}$, then show that





Delhi Set-3

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

SECTION - A

This section consists of 20 question of 1 mark each.

2. In an A.P., if the first term (a) = -16 and the common difference (d) = -2, then the sum of first 10 terms is:

(A)
$$-200$$
(B) -70 (C) -250 (D) 250

7. One card is drawn at random from a well shuffled deck of 52 playing cards. The probability that it is a red ace card, is:

(A)
$$\frac{1}{13}$$
 (B) $\frac{1}{26}$
(C) $\frac{1}{52}$ (D) $\frac{1}{2}$

9. For $\theta = 30^\circ$, the value of $(2 \sin \theta \cos \theta)$ is:

(A) 1 (B)
$$\frac{\sqrt{3}}{2}$$

(C) $\frac{\sqrt{3}}{4}$ (D) $\frac{3}{2}$

16. If α , β are the zeroes of the polynomial $6x^2 - 5x - 4$, then $\frac{1}{\alpha} + \frac{1}{\beta}$ is equal to: **23.** Solve the following system of linear equations: 2p + 3q = 13 and 5p - 4q = -2

SECTION – C

This section consists of 6 questions of 3 marks each.

- **27.** In a chemistry lab, there is some quantity of 50% acid solution and some quantity of 25% acid solution. How much of each should be mixed to make 10 litres of 40% acid solution?
- **29.** A wooden toy is made by scooping out a hemisphere of same radius as of cylinder, from each end of a wooden solid cylinder. If the height of the cylinder is 20 cm and its base is of radius 7 cm, find the total surface area of the toy.

SECTION – D

This section consists of 4 questions of 5 marks each.

- **33.** From the top of a building 60 m high, the angles of depression of the top and bottom of the vertical lamp post are observed to be 30° and 60° respectively.
 - (i) Find the horizontal distance between the building and the lamp post.
 - (ii) Find the distance between the tops of the building and the lamp post.
- **35.** A vessel is in the form of a hollow hemisphere mounted by a hollow cylinder. The diameter of the hemisphere is 14 cm and the total height of the vessel is 13 cm. Find the inner surface area and the volume of the vessel.

30/1/3

(A)
$$\frac{5}{4}$$
 (B) $-\frac{5}{4}$
(C) $\frac{4}{5}$ (D) $\frac{5}{24}$

SECTION – B

This section consists of 5 questions of 2 marks each.

24. Solve the following system of linear equations algebraically:

$$2x + 5y = -4; 4x - 3y = 5$$

25. In \triangle ABC, altitudes AD and BE are drawn. The *AD* = 7 cm, *BE* = 9 cm and *EC* = 12 cm then, find the length of CD.



SECTION - C

This section consists of 6 questions of 3 marks each.

26. The sum of the digits of a 2-digit number is 14. The number obtained by interchanging its digits exceeds the given number by 18. Find the number.

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27. The inner and outer radii of a hollow cylinder surmounted on a hollow hemisphere of same radii are 3 cm and 4 cm respectively. If height of the cylinder is 14 cm, then find its total surface area (inner and outer).

SECTION - D

This section consists of 4 questions of 5 marks each.

- **32.** From the top of a 15 m high building, the angle of elevation of the top of a tower is found to be 30°. From the bottom of the same building, the angle of elevation of the top of the tower is found to be 60°. Find the height of the tower and the distance between tower and the building.
- **35.** In the given figure, diameters AC and BD of the circle intersect at O. If $\angle AOB = 60^{\circ}$ and OA = 10 cm, then:

Outside Delhi Set-1

SECTION A

This section consists of 20 questions of 1 mark each.

- **1.** The value of *k* for which the system of equations 3x y + 8 = 0 and 6x ky + 16 = 0 has infinitely many solutions, is
 - (A) -2 (B) 2 (C) $\frac{1}{2}$ (D) $-\frac{1}{2}$
- **2.** Point P divides the line segment joining the points A(4, –5) and B(1, 2) in the ratio 5 : 2. Co-ordinates of point P are

$(\mathbf{A})\left(\frac{5}{2},\frac{-3}{2}\right)$	$(\mathbf{B}) \ \left(\frac{11}{7}, 0\right)$
(C) $\left(\frac{13}{7},0\right)$	(D) $\left(0,\frac{13}{7}\right)$

3. The common difference of an A.P. in which $a_{15} - a_{11} = 48$, is

(A) 12	(B) 16
(C) -12	(D) –16

4. The quadratic equation $x^2 + x + 1 = 0$ hasroots.

A) real and equal	(B) irrational
C) real and distinct	(D) not-real

5. If the HCF(2520, 6600) = 40 and LCM(2520, 6600) = 252 × k, then the value of k is
 (A) 1650
 (B) 1600

()		(-)	
(C)	165	(D)	1625

6. In the given figure \triangle ABC is shown. DE is parallel to BC. If AD = 5 cm, DB = 2.5 cm and BC = 12 cm, then DE is equal to





(i) Find the length of the chord AB.

(ii) Find the area of shaded region.

(Take $\pi = 3.14$ and $\sqrt{3} = 1.73$)

30/2/1

(A) 10 cm	(B) 6 cm
(C) 8 cm	(D) 7.5 cm

7. If $\sin \theta = \cos \theta$, $(0^{\circ} < \theta < 90^{\circ})$, then value of (sec θ . $\sin \theta$) is:

(A) $\frac{1}{\sqrt{2}}$	(B) $\sqrt{2}$
(C) 1	(D) 0

8. Two dice are rolled together. The probability of getting the sum of the two numbers to be more than 10, is

(A)
$$\frac{1}{9}$$
 (B) $\frac{1}{6}$
(C) $\frac{7}{12}$ (D) $\frac{1}{12}$

9. If α and β are zeroes of the polynomial $5x^2 + 3x - 7$, the value of $\frac{1}{\alpha} + \frac{1}{\beta}$ is

(A)
$$-\frac{3}{7}$$
 (B) $\frac{3}{5}$

(C)
$$\frac{3}{7}$$
 (D) $-\frac{5}{7}$

10. The perimeters of two similar triangles ABC and PQR are 56 cm and 48 cm respectively. $\frac{PQ}{AB}$ is equal to

(A) $\frac{7}{8}$	(B) $\frac{6}{7}$
(C) $\frac{7}{6}$	(D) $\frac{8}{7}$

11. AB and CD are two chords of a circle intersecting at P. Choose the correct statement from the following:



12. If value of each observation in a data is increased by 2, then median of the new data

(A) increases by 2	(B) increases by $2n$
(C) remains same	(D) decreases by 2

13. A box contains cards numbered 6 to 55. A card is drawn at random from the box. The probability that the drawn card has a number which is a perfect square, is

(A)
$$\frac{7}{50}$$
 (B) $\frac{7}{55}$
(C) $\frac{1}{10}$ (D) $\frac{5}{49}$

14. In the given figure, tangents PA and PB to the circle centred at O, from point P are perpendicular to each other. If PA = 5 cm, then length of AB is equal to



(C) $2\sqrt{5}$ cm (D) 10 cm

15. XOYZ is a rectangle with vertices X(-3, 0), O(0, 0), Y(0, 4) and Z(x, y). The length of its each diagonal is

(A) 5 units	(B) √5	units
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(C) $x^2 + y^2$ units (D) 4 units

16. Which term of the A.P. -29, -26, -23, ..., 61 is 16?
(A) 11th
(B) 16th
(C) 10th
(D) 31st

(C) 10^{44} (D)	3.
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17. In the given figure, AT is tangent to a circle centred at O. If \angle CAT = 40°, then \angle CBA is equal to



18. After an examination, a teacher wants to know the marks obtained by maximum number of the students in her class. She requires to calculate of marks.

(A) median(B) mode(C) mean(D) range

Directions: In Question 19 and 20, Assertion (A) and Reason (R) are given. Select the correct option from the following:

- (A) Both Assertion (A) and Reason (R) are true. Reason (R) is the correct explanation of the Assertion (A).
- (B) Both Assertion (A) and Reason (R) are true. Reason (R) does not give correct explanation of Assertion (A).
- (C) Assertion (A) is true but Reason (R) is not true.
- (D) Assertion (A) is not true but Reason (R) is true.
- **19. Assertion (A):** If $\sin A = \frac{1}{3}(0^{\circ} < A < 90^{\circ})$, then the

value of $\cos A$ is $\frac{2\sqrt{2}}{3}$

Reason (R): For every angle θ , $\sin^2\theta + \cos^2\theta = 1$.

20. Assertion (A): Two cubes each of edge length 10 cm are joined together. The total surface area of newly formed cuboid is 1200 cm².

Reason (R): Area of each surface of a cube of side 10 cm is 100 cm².

SECTION - B

This section consists of 5 questions of 2 marks each.

- 21. Can the number (15)ⁿ, n being a natural number, end with the digit 0?Give reasons.
- **22.** Find the type of triangle ABC formed whose vertices are A(1, 0), B(–5, 0) and C(–2, 5).
- **23.** (a) Evaluate : $2 \sin^2 30^\circ \sec 60^\circ + \tan^2 60^\circ$.

OR

- (b) If $2 \sin(A + B) = \sqrt{3}$ and $\cos(A B) = 1$, then find the measures of angles A and B. $0 \le A$, B, $(A + B) \le 90^\circ$.
- **24.** In the given figure, AB and CD are tangents to a circle centred at O. Is $\angle BAC = \angle DCA$? Justify your answer.



25. (a) In what ratio is the line segment joining the points (3, -5) and (-1, 6) divided by the line y = x?

OR

(b) A(3, 0), B(6, 4) and C(-1, 3) are vertices of a triangle ABC. Find length of its median BE.

SECTION – C

This section consists of 6 questions of 3 marks each.

26. (a) If the sum of first *m* terms of an A.P. is same as sum of its first *n* terms $(m \neq n)$, then show that the sum of its first (m + n) terms is zero.

OR

- (b) In a A.P., the sum of the three consecutive terms is 24 and the sum of their squares is 194. Find the numbers.
- **27.** Prove that $\sqrt{5}$ is an irrational number.
- **28.** (a) In the given figure, PQ is tangent to a circle at O and $\angle BAQ = 30^\circ$, show that BP = BQ.





(b) In the given figure, AB, BC, CD and DA are tangents to the circle with centre O forming a quadrilateral ABCD.



29. Prove that $\frac{1 + \sec \theta - \tan \theta}{1 + \sec \theta + \tan \theta} = \frac{1 - \sin \theta}{\cos \theta}$.

30. In a test, the marks obtained by 100 students (out of 50) are given below:

Marks obtained:	0-10	10-20	20-30	30-40	40-50
Number of students:	12	23	34	25	6

Find the mean marks of the students.

31. In a 2-digit number, the digit at the unit's place is 5 less than the digit at the ten's place. The product of the digits is 36. Find the number.

SECTION – D

This section consists of 4 questions of 5 marks each.

32. (a) Using graphical method, solve the following system of equations:

$$3x + y + 4 = 0$$
 and $3x - y + 2 = 0$
OR

- (b) Tara scored 40 marks in a test, getting 3 marks for each right answer and losing 1 mark for each wrong answer. Had 4 marks been awarded for each correct answer and 2 marks been deducted for each wrong answer, then Tara would have scored 50 marks. Assuming that Tara attempted all question, find the total number of questions in the test.
- 33. (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 the other two sides are divided in the same ratio.

OR

- (b) Sides AB and AC and median AD to \triangle ABC are respectively proportional to sides PQ and PR and median PM of another triangle PQR. Show that \triangle ABC ~ \triangle PQR.
- **34.** From the top of a 45 m high light house, the angles of depression of two ships, on the opposite side of it, are observed to be 30° and 60°. If the line joining the ships passes through the foot of the light house, find the distance between the ships. (Use $\sqrt{3} = 1.73$)
- **35.** The perimeter of a certain sector of a circle of radius 5.6 m is 20.0 m. Find the area of the sector.

SECTION - E

This section consists of 3 Case-Study Based Questions of 4 marks each.

36. A ball is thrown in the air so that *t* seconds after it is thrown, its height *h* metre above its starting point is given by the polynomial $h = 25t - 5t^2$.





Observe the graph of the polynomial and answer the following questions:

1

1

- (i) Write zeroes of the given polynomial.
- (ii) Find the maximum height achieved by ball. 1
- (iii)(a) After throwing upward, how much time did the ball take to reach to the height of 30 m?2 OR
 - (b) Find the two different values of *t* when the height of the ball was 20 m. 2
- **37.** The word 'circus' has the same root as 'circle'. In a closed circular area, various entertainment acts including human skill and animal training are presented before the crowd.

A circus tent is cylindrical upto a height of 8 m and conical above it. The diameter of the base is 28 m and total height of tent is 18.5 m.



Based on the above, answer the following questions:

- (i) Find slant height of the conical part.
- (ii) Determine the floor area of the tent. 1
- (iii) (a) Find area of the cloth used for making tent. 2 OR
 - (b) Find total volume of air inside an empty tent. 2

Outside Delhi Set-2

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

SECTION - A

This section consists of 20 questions of 1 mark each.

2. In the given figure, PT is tangent to a circle with centre O. Chord PQ subtends an angle of 65° at the centre. The measure of ∠QPT is:



6. If α and β are zeroes of the polynomial $2x^2 - 9x + 5$, then value of $\alpha^2 + \beta^2$ is

38. In a survey on holidays, 120 people were asked to state which type of transport they used on their last holiday. The following pie chart shows the results of the survey.



Observe the pie chart and answer the following questions:

- (i) If one person is selected at random, find the probability that he/she travelled by bus or ship. 1
- (ii) Which is most favourite mode of transport and how many people used it? 1
- (iii)(a) A person is selected at random. If the probability that he did not use train is $\frac{4}{5}$, find the number of people who used train. 2

OR OR

(b) The probability that randomly selected person used aeroplane is $\frac{7}{60}$. Find the

revenue collected by air company at the rate of ₹ 5,000 per person. 2

2	n	12	12
э	υ	14	14

(A) $\frac{1}{4}$ (B) $\frac{61}{4}$ (C) 1 (D) $\frac{71}{4}$

13. Value of *k* for which x = 2 is a solution of the equation $5x^2 - 4x + (2 + k) = 0$, is

(A) 10	(B) –10
(C) 14	(D) –14

15. The sum of first 200 natural numbers is
(A) 2010
(B) 2000
(C) 20100
(D) 21000

SECTION – B

This section consists of 5 questions of 2 marks each.

- **23.** Explain why $7 \times 11 \times 13 + 13$ and $7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 + 5$ are composite numbers.
- **24.** The vertices of a \triangle ABC are A(-2, 4), B(4, 3) and C(1, -6). Find length of the median BD.

SECTION - C

This section consists of 6 questions of 3 marks each.

- **28.** Three consecutive integers are such that sum of the square of second and product of other two is 161. Find the three integers.
- **31.** Prove that $\sin^6\theta + \cos^6\theta = 1 3\sin^2\theta\cos^2\theta$.

SECTION - D

This section consists of 4 questions of 5 marks each.

32. The angle of elevation of an aircraft from a point A on the ground is 60°. After a flight of 30 seconds,

Outside Delhi Set-3

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

SECTION – A

This section consists of 20 questions of 1 mark each.

1. The distance between the points $(a \cos \theta, -a \sin \theta)$ and $(a \sin \theta, a \cos \theta)$ is

(A) <i>a</i>	(B) $a\sqrt{2}$
(C) 0	(D) 2 <i>a</i>

- 8. The roots of the quadratic equation 4x² 5x + 4 = 0 are
 (A) irrational (B) rational and distinct
 - $(D) \quad (D) \quad (D)$
 - (C) not real (D) rational and equal
- 9. The common difference of an A.P. in which $a_{20} a_{15} = 20$, is (1) 5

(A) 4	(B) 5
(C) 4d	(D) 5a

12. If α and $\beta(\alpha > \beta)$ are the zeroes of the polynomial $-x^2 + 8x + 9$, then $(\alpha - \beta)$ is equal to

(A) –10	(B) 10
(C) ±10	(D) 8

SECTION - B

This section consists of 5 questions of 2 marks each.

23. In the given figure, a circle centred at origin O has radius 7 cm, OC is median of \triangle OAB. Find the length of median OC.



the angle of elevation changes to 30°. The aircraft is flying at a constant height of $3500\sqrt{3}$ m at a uniform

speed. Find the speed of the aircraft.

33. If the length of a rectangle is reduced by 5 cm and its breath is increased by 2 cm, then the area of the rectangle is reduced by 80 cm². However, if we increase the length by 10 cm and decrease the breadth by 5 cm, its area is increased by 50 cm². Find the length and breadth of the rectangle.

30/2/3

25. Can the number 8^{*n*}, *n* being a natural number, end with the digit 0? Give reasons.

SECTION - C

This section consists of 6 questions of 3 marks each.

- **26.** Prove that $\frac{\csc^2\theta \sec^2\theta}{\csc^2\theta + \sec^2\theta} = \frac{3}{4}$, if $\tan \theta = \frac{1}{\sqrt{7}}$
- **30.** A dealer sells an article for ₹ 75 and gains as much percent as the cost price of the article. Find the cost price of the article.

SECTION - D

This section consists of 4 questions of 5 marks each.

- **32.** A person standing on the bank of a river observes that the angle of elevation of the top of a tower on the opposite bank is 60°. When he moves 30 m away from the bank, he finds the angle of elevation to be 30°. Find the height of the tower and width of the river. (Take $\sqrt{3} = 1.732$)
- **35. (a)** Using graphical method, solve the following system of equation:
 - 3x 2y = 10 and 5x + 3y = 4OR
 - (b) If three time the greater of two numbers is divided by the smaller one, we get 4 as the quotient and 3 as the remainder. Also, if seven times the smaller number is divided by greater one, we get 5 as the quotient and 1 as the remainder. Find the numbers.

ANSWERS

Delhi Set-1

...

SECTION - A

1. Option (B) is correct. Explanation: Given polynomial is $p(x) = 2x^2 - k\sqrt{2}x + 1$ Sum of zeroes = $\frac{-(\text{coefficient of } x)}{\text{coefficient of } x^2}$ $\sqrt{2} = \frac{-(-k\sqrt{2})}{2}$ [Given, sum of zeroes = $\sqrt{2}$]

2. Option (D) is correct. Explanation: Probability of loosing the game = 1 - Probability of winning the game= 1 - 0.79 = 0.21

k = 2

3. Option (C) is correct. Explanation: If the discriminant is equal to zero, i.e., $b^2 - 4ac = 0$ where *a*, *b*, *c* are real numbers and $a \neq 0$,

then roots of the quadratic equation $ax^2 + bx + c =$ 0, are real and equal $\frac{b^2}{4}$

Thus,
$$b^2 - 4ac = 0 \text{ or } ac =$$

4. Option (C) is correct.

Explanation: Given, $a = 7, a_n = 84$ and $S_n = \frac{2093}{2}$

$$\begin{array}{cccc} & & & & & & \\ \vdots & & & & \\ a_n = a + (n-1)d \\ \Rightarrow & & & 84 = 7 + (n-1)d \\ \Rightarrow & & & 77 = (n-1)d & & \dots (i) \end{array}$$

Also,

=

=

$$\Rightarrow \qquad \frac{2093}{2} = \frac{n}{2} [2 \times 7 + (n-1)d]$$

$$\Rightarrow \qquad 2093 = n[14 + 77] \quad \text{[from eq (i)]}$$

$$\Rightarrow \qquad 2093 = 91n$$

$$\Rightarrow \qquad n = 23$$

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

5. Option (D) is correct. Explanation: Given,

$$p = 18 a^{2}b^{4} \text{ and } q = 20 a^{3}b^{2}$$

LCM(p, q) = LCM(18 a^{2}b^{4}, 20 a^{3}b^{2})
= 180a^{3}b^{4}

6. Option (A) is correct. E:

xplanation: Coordinates of
$$D(x, y)$$
.



Using the mid point formula, the coordinates of mid-point of BC are

Co-ordinates of
$$D(x, y) = \left(\frac{6+0}{2}, \frac{4+0}{2}\right)$$

= (3, 2)
Now, length of $AD = \sqrt{(5-3)^2 + (-6-2)^2}$
= $\sqrt{4+64} = \sqrt{68}$ units

7. Option (C) is correct.

Explanation: Given, sec θ – tan θ = *m* ...(i) $\sec^2\theta - \tan^2\theta = 1$ We know that, \Rightarrow (sec θ – tan θ)(sec θ + tan θ) = 1 $\sec \theta + \tan \theta = \frac{1}{\sec \theta - \tan \theta}$ \Rightarrow $\sec \theta + \tan \theta = \frac{1}{\cdots}$ [from (i)] \Rightarrow

8. Option (B) is correct.

Explanation: Given data : 1, 4, 7, 9, 16, 21, 25 After removing even numbers data is: 1, 7, 9, 21, 25 Prime number : 7

Thus, required probability = $\frac{1}{5}$

9. Option (D) is correct.

10. Option (A) is correct. *Explanation*: Given polynomials : $x^2 + px + q$...(i) and $4x^2 - 5x - 6$...(ii) Zero of polynomial $4x^2 - 5x - 6$ are:

$$x = 2$$
 and $x = -\frac{3}{4}$

Now, zero of polynomial $x^2 + px + q$ are 4 and $-\frac{3}{2}$

:. Sum of zeroes
$$= -\frac{p}{1}$$
 i.e., $4 - \frac{3}{2} = -\frac{p}{1}$
or, $\frac{5}{2} = -\frac{p}{1}$ or, $p = -\frac{5}{2}$

11. Option (B) is correct.

Explanation: Here,

or,

or,

or,

$$(15)^{2} = (3 - x)^{2} + (-5 + 5)^{2}$$

$$225 = 9 - 6x + x^{2}$$

or, $x^{2} - 6x - 216 = 0$
or, $x^{2} - 18x + 12x - 216 = 0$
or, $x(x - 18) + 12(x - 18) = 0$
or, $(x - 18)(x + 12) = 0$ or, $x = -12$, 18

Explanation: Given,

$$\cos(\alpha + \beta) = 0$$

 $\Rightarrow \qquad \cos(\alpha + \beta) = \cos\frac{\pi}{2} \Rightarrow \alpha + \beta = \frac{\pi}{2}$
 $\therefore \qquad \cos\left(\frac{\alpha + \beta}{2}\right) = \cos\left(\frac{\pi}{4}\right) = \frac{1}{\sqrt{2}}$

13. Option (C) is correct.

Explanation: The total surface area of a sphere = $4\pi r^2$

The surface area of one hemi-sphere = $3\pi r^2$ \therefore The total surface area of two hemi-sphere = $6\pi r^2$

Required Ratio =
$$\frac{4\pi r^2}{6\pi r^2} = \frac{4}{6} = \frac{2}{3}$$

14. Option (B) is correct.

Explanation: The middle most observation, after arranging all observations in ascending or descending order is called the median.

15. Option (D) is correct.

Explanation: Radius of cone
$$=\frac{2}{2} = 1 \text{ cm}$$

Height of cone $= 2 \text{ cm}$
Volume of cone $=\frac{1}{3}\pi r^2 h = \frac{1}{3}\pi .(1)^2 \times 2$
 $=\frac{2\pi}{3}\text{cu cm}$

16. Option (A) is correct.

Explanation: When two dice are tossed together, Total possible outcomes = $6^2 = 36$ No. of cases getting sum two : $\{(1, 1)\}$ No. of cases getting sum three : $\{(1, 2)(2, 1)\}$ No. of cases getting sum five : {(1, 4)(4, 1), (2, 3), (3, 2)} Thus total cases getting sum 2, 3 or 5 = 7

Therefore, required probability =

17. Option (C) is correct. Explanation: Here, centre C is mid-point of AB.



18. Option (D) is correct.

...

 \Rightarrow

19. Option (B) is correct. Explanation: Assertion: Two parallel tangents always lie at the end points of the diameter of the circle. Reason: Diameter is the longest chord of a circle which passes through centre joining the two points on the circumference of a circle.

20. Option (D) is correct.

Explanation: The polynomials of the form $(x + a)^2$ and $(x - a)^2$ has only equal roots and graphs of these polynomials cut x-axis at only one point. These polynomials are quadratic Thus, Assertion is true Reason is true.

SECTION - B

21. Given system of linear equations:

$$7x - 2y = 5$$
 ...(i)
 $8x + 7y = 15$...(ii)

Multiplying eq (i) by 7 and eq (ii) by 2, we get 49x - 14y = 35

$$\frac{16x + 14y = 30}{65x = 65}$$

$$\therefore \qquad x = 1$$

Substituting value of x is eq (i) we get

$$7(1) - 2y = 5$$

or,
$$7 - 2y = 5$$

or,
$$-2y = -2 \text{ or, } y = 1$$

Therefore,
$$x = 1 \text{ and } y = 1$$

22. If one black cards is lost, then remaining cards = 51Probability of drawing a queen of heart from remaining $51 \text{ cards} = \frac{1}{51}$

[As there is only one queen of heart card in a pack of 52 cards]

23. (a) We have,

$$2\sqrt{2} \cos 45^\circ \sin 30^\circ + 2\sqrt{3} \cos 30^\circ$$

$$= 2\sqrt{2} \times \frac{1}{\sqrt{2}} \times \frac{1}{2} + 2\sqrt{3} \times \frac{\sqrt{3}}{2}$$
$$= 1 + 3 = 4$$

OR

(b) LHS $\Rightarrow \sin(A + B) = \sin(60^\circ + 30^\circ) = \sin 90^\circ = 1$ $RHS \Rightarrow sin A cos B + cos A sin B$

$$= \sin 60^{\circ} \cos 30^{\circ} + \cos 60^{\circ} \sin 30^{\circ}$$
$$= \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2} + \frac{1}{2} \times \frac{1}{2} = \frac{3}{4} + \frac{1}{4} = \frac{4}{4} = 1$$

24. (i) Given: diagonal BD bisects $\angle B$ and $\angle D$



To prove: $\triangle ABD \sim \triangle CBD$ Proof: In $\triangle ABD$ and $\triangle CBD$ $\angle ABD = \angle CBD$ (BD bisects $\angle B$) $\angle ADB = \angle CDB$ (BD bisects $\angle D$) Therefore, $\triangle ABD \sim \triangle CBD$ (by AA rule) Hence Proved

(ii)	Since, ΔABI	Since, $\Delta ABD \sim \Delta CBD$			
	Therefore,	$\frac{AB}{BD} = \frac{BC}{BD}$	(by cpct)		
	.:	AB = BC	Hence Proved		

25. (a) Let assume that $5-2\sqrt{3}$ is rational.

Therefore it can be expressed in the form of $\frac{p}{q}$

where *p* and *q* are integers and $q \neq 0$

Therefore, we write
$$5-2\sqrt{3} = \frac{p}{q}$$

or, $2\sqrt{3} = 5-\frac{p}{q}$ or, $\sqrt{3} = \frac{5q-p}{2q}$

But $\frac{5q-p}{2q}$ is a rational number as p and q are

integers. This contradicts the fact that $\sqrt{3}$ is irrational, so our assumption is wrong. Hence $5 - 2\sqrt{3}$ is an irrational number.

OR

- (b) The numbers are prime numbers and composite numbers. Prime numbers can be divided by 1 and itself. A composite number has factors other than 1 and itself. $(5 \times 11 \times 17) + (3 \times 11)$ $= (85 \times 11) + (3 \times 11)$
 - $= 11 \times (85 + 3)$
 - $= 11 \times 88 = 11 \times 11 \times 8$
 - $= 2 \times 2 \times 2 \times 11 \times 11$

The given expression has 2 and 11 as its factors. Therefore it is a composite number.

SECTION - C

26. (a) Let P divides the line segment AB in the ratio *k* : 1



Then by section formula, $= \frac{2k+1}{k+1}$ $\frac{8}{5}$

...(i)

...(ii)

and

from (i), we get

$$8k + 8 = 10k + 5$$
$$2k = 3 \Longrightarrow k = \frac{3}{2}$$

 $y = \frac{3k+2}{k+1}$

from (ii), we get

$$y = \frac{3\left(\frac{3}{2}\right) + 2}{\frac{3}{2} + 1} = \frac{9 + 4}{5} = \frac{13}{5}$$

Therefore, required ratio is 3:2

value of
$$y = \frac{13}{5}$$

OR

(b) Given ABCD is a rectangle and P, Q, R and S are mid-points of sides AB, BC, CD and DA.



coordinates of
$$P = \left(\frac{-1-1}{2}, \frac{-1+6}{2}\right)$$

 $= \left(-1, \frac{5}{2}\right)$
coordinates of $Q = \left(\frac{-1+3}{2}, \frac{6+6}{2}\right)$
 $= (1, 6)$
coordinates of $R = \left(\frac{3+3}{2}, \frac{6-1}{2}\right)$
 $= \left(3, \frac{5}{2}\right)$
coordinates of $S = \left(\frac{3-1}{2}, \frac{-1-1}{2}\right)$
 $= (1, -1)$

Now, we shall find the mid points of *PR* & *SQ*. Mid points of *P* & *R* which is point *O*,

$$x = \frac{-1+3}{2} = 1$$
$$y = \frac{\frac{5}{2} + \frac{5}{2}}{2} = \frac{5}{2}$$
$$O(x, y) = \left(1, \frac{5}{2}\right)$$

Similarly, the midpoint of *S* and *Q*

 \Rightarrow

$$\Rightarrow \qquad x = \frac{1+1}{2} = 1$$
$$y = \frac{6-1}{2} = \frac{5}{2} \Rightarrow O(x, y) = \left(1, \frac{5}{2}\right)$$

Since, the midpoints of PR & QS both have the same coordinate $\left(1, \frac{5}{2}\right)$. Hence, diagonals *PR* and *SQ* bisect to each other. Hence Proved.

27. The no. of rooms will be minimum if each room accommodates maximum no. of teachers. Since in each room the same number of teachers are to be seated and all of them must be of the same subject. Therefore no. of teachers in each room must be HCF

of 48, 80 and 144. The prime factorization of 48, 80 and 144 are as

 $48 = 2^4 \times 3^1$ under

$$80 = 2^4 \times 5^1$$
$$144 = 2^4 \times 3^2$$

: HCF of 48, 80 and 144 is
$$2^4 = 16$$

Therefore in each room 16 teachers can be seated.

$$\therefore \text{ No. of room required} = \frac{\text{Total no. of teachers}}{16}$$
$$- \frac{48 + 80 + 144}{16}$$

$$=\frac{16}{16}$$

= $\frac{272}{16}$ = 17

2

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

$$= \frac{\tan \theta}{1 - \frac{1}{\tan \theta}} + \frac{\frac{1}{\tan \theta}}{1 - \tan \theta}$$

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

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

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

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

$$[Using a^3 - b^3 = (a - b)(a^2 + \tan \theta + 1)]$$

$$= \frac{\tan^2 \theta + \tan \theta + 1}{\tan \theta}$$

$$= \frac{\sec^2 \theta + \tan \theta}{\tan \theta}$$

$$= \frac{\sec^2 \theta + \tan \theta}{\tan \theta}$$

$$= \frac{\sec^2 \theta}{\tan \theta} + 1$$

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

$$= \sec \theta \cdot \csc \theta + 1$$

$$= 1 + \sec \theta \cdot \csc \theta + 1$$

$$= 1 + \sec \theta \cdot \csc \theta$$
29. Let the age of Rashmi = x years
and the age of Nazma = y years
Three years ago,
Rashmi's age = (x - 3)years
Nazma's age = (y - 3)years
According to question,
(x - 3) = 3(y - 3)
$$\Rightarrow x - 3 = 3(y - 3)$$

$$\Rightarrow x - 3 = 3y - 6 \dots (i)$$
Ten years later,
Rashmi's age = x + 10
Nazma's age = y + 10
According to question,
(x + 10) = 2(y + 10)
$$x + 10 = 2(y + 10)$$

$$x + 10 = 2(y + 10)$$

$$x + 10 = 2(y + 10)$$

$$x = 3y - 6 = 48 - 6 = 42$$
Thus, the age of Rashmi is 42 years and age of Nazma is 16 years.

30. (a) In the given figure, Join OR.





(i) Given,

$$r = 21 \text{ cm}, \theta = 60^{\circ}$$
length of the arc $APB = \frac{\theta}{360^{\circ}} \times 2\pi r$

$$= \frac{60^{\circ}}{360^{\circ}} \times 2 \times \frac{22}{7} \times 21$$

$$= \frac{1}{6} \times 2 \times 22 \times 3$$

$$= 22 \text{ cm}$$
(ii) Area of the minor segment = Area of sector
 $OAPB$ – Area of triangle of OAB
Now, Area of sector $APB = \frac{\theta}{360^{\circ}} \times \pi r^{2}$
33. (a)

 \Rightarrow \Rightarrow \Rightarrow

Also,

 \Rightarrow \Rightarrow

 \Rightarrow

 $a.a_8 = 60$ a.[a + (8 - 1)d] = 60 a(a + 7d) = 60

a(32-a) = 60

(given)

[from eq (i)]

 $\angle POQ = 90^{\circ}$ *i.e.*, *OPDQ* is a regular

DP = DQ i.e., OPDQ is a square

DC = DQ + QC = 8 + 6 = 14 cm

radius = OP = DQ = 8 cm

31. Let *r* and R be the radii of inner and outer surface of

 $R^2 - r^2 = \frac{176 \times 7}{22 \times 14} = 4$

 $R = \frac{5}{2}$ cm = 2.5 cm

 $r = \frac{5}{2} - 1 = \frac{3}{2} = 1.5 \text{ cm}$

R - r = 1 cm

 $V = 176 \text{ cm}^2$ $\pi (R^2 - r^2)h = 176$

Given, height of cylinder (h) = 14 cm

Volume of cylinder (V) = 176 cm³

 $\frac{22}{7}(R^2 - r^2) \times 14 = 176$

(R - r)(R + r) = 4 1(R + r) = 4

On solving eqs (i) & (ii), we get

R + r = 4

2R = 5

r = R - 1

SECTION - D

B

2

polygon

[from eqs (i) & (ii)]

...(ii)

...(i)

...(ii)

:..

Further

Hence,

Now,

a cylinder.

and

÷

 \Rightarrow \Rightarrow

 \Rightarrow

32.

From (i),

(i) Given,

Now, Area of sector
$$APB = \frac{\theta}{360^\circ} \times \pi r^2$$

$$= \frac{60^\circ}{360^\circ} \times \frac{22}{7} \times (21)^2$$
$$= \frac{1}{6} \times \frac{22}{7} \times 21 \times 21$$
$$= 231 \text{ cm}^2$$

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$$\Rightarrow 32a - a^{2} = 60
\Rightarrow a^{2} - 32a + 60 = 0
\Rightarrow a^{2} - 30a - 2a + 60 = 0
\Rightarrow a(a - 30)(a - 2) = 0
\Rightarrow a = 2, 30
For a = 2, from eq (i)
2 + 7d = 32 - 2
7d = 28
d = 4
For a = 30, from eq (i)
30 + 7d = 32 - 30
7d = -28
d = -4
for (a, d) = (2, 4)
a_{8} = 2 + 7 × 4 = 30
∴ a + a_{8} = 32 and a.a_{8} = 60
for (a, d) = (30, -4)
a_{8} = 30 + 7 (-4) = 2
∴ a + a_{8} = 32 and a.a_{8} = 60
Taking (a, d) = (2, 4)
S_{20} = \frac{20}{2} [2 × 2 + (20 - 1) × 4]
[$\because S_{n} = \frac{n}{2} [2a + (n - 1)d]$
 $= 10[4 + 19 × 4]$
 $= 10 × 80 = 800 (a, d)$
Taking $= (30, -4)$
 $S_{20} = \frac{20}{2} [30 × 2 + (20 - 1)(-4)]$
 $= 10[60 + 19(-4)]$
 $= 10[60 + 19(-4)]$
 $= 10(60 - 76)$
 $= 10 × (-16) = -160$
OR$$

(b) Let the first term and common difference of A.P. be *a* and *d*.

∴ Sum of *n* terms of A.P.,
$$S_n = \frac{n}{2}[2a + (n-1)d]$$

$$S_9 = \frac{9}{2}[2a + (9-1)d]$$

$$= \frac{9}{2}[2a + 8d]$$

$$= 9(a + 4d)$$

$$\Rightarrow 153 = 9(a + 4d)$$
[∴ Given, $S_9 = 153$]

$$\Rightarrow 17 = a + 4d$$
or $a + 4d = 17$...(i)
Similarly, sum of 6 terms,
 $S_6 = \frac{6}{2}[2a + (6-1)d]$

$$\Rightarrow 687 = 3(2a + 5d)$$

$$\Rightarrow 229 = 2a + 5d$$
or $2a + 5d = 229$...(ii)
On solving eqs (i) & (ii), we get
 $3d = -195$

$$\Rightarrow d = -65$$
Substituting value of *d* in eq (i), we get
 $a + 4(-65) = 17$
 $a = 17 + 260$

a = 277Thus, first term of given A.P. is 277 and common difference is -65. Now, Sum of all terms i.e., $S_{40} = \frac{40}{2} [2 \times 277 + (40 - 1)(-65)]$ $= 20[554 + 39(-65)] \\= 20(554 - 2535)$ $= 20 \times (-1981) = -39,620$ 34. (a) Given,: DE || BC А D Е В ECBD To prove: = AE AD Proof: In $\triangle AED$ and $\triangle ACB$ $\angle AED = \angle ACB$ (Corresponding angles) $\angle ADE = \angle ABC$ (Corresponding angles) ∠EAD is common to both triangles $\Delta AED \sim \Delta ACB$ (by AAA similarity) \Rightarrow $\frac{AC}{AE} = \frac{AB}{AD}$ *.*.. $\Rightarrow \frac{AE + EC}{AE} = \frac{AD + BD}{AD} \Rightarrow 1 + \frac{EC}{AE} = 1 + \frac{BD}{AD}$ $\frac{EC}{AE} = \frac{BD}{AD}$ \Rightarrow Hence Proved OR (b) In \triangle CAP and \triangle CBQ $\angle CAP = \angle CBQ = 90^{\circ}$ $\angle PCA = \angle QCB$ (common angle) R \boldsymbol{z} Ο х y С В А So, $\triangle CAP \sim \triangle CBQ$ (By AA similarly Rule) $\frac{BQ}{AP} = \frac{BC}{AC}$ Hence, $\frac{y}{x} = \frac{BC}{AC}$ \Rightarrow ...(i)

Now, in $\triangle ACR$ and $\triangle ABQ$ $\angle ACR = \angle ABQ = 90^{\circ}$ $\angle QAB = \angle RAC$ (common angle) So, $\triangle ACR \sim \triangle ABQ$ (By AA similarity Rule)

Hence,
$$\frac{BQ}{CR} = \frac{AB}{AC}$$

 $\Rightarrow \qquad \frac{y}{z} = \frac{AB}{AC}$...(ii)

z AC On adding eqs. (i) and (ii), we get

$$\frac{y}{x} + \frac{y}{z} = \frac{BC}{AC} + \frac{AB}{AC}$$
$$y\left(\frac{1}{x} + \frac{1}{z}\right) = \frac{BC + AB}{AC}$$
$$y\left(\frac{1}{x} + \frac{1}{z}\right) = \frac{AC}{AC} \Rightarrow y\left(\frac{1}{x} + \frac{1}{z}\right) = 1$$
$$\frac{1}{x} + \frac{1}{z} = \frac{1}{y}$$
Hence Proved

35. Consider QR as the tower, PQ as the pole on it. Given, $\angle PAR = 60^\circ$ and $\angle QAR = 45^\circ$



Let
$$QR = h m$$

Since $PQ = 6 m$ (given)
 $\therefore PR = 6 + h$...(i)

In right ∆QAR,

$$\tan 45^\circ = \frac{QR}{AR}$$
$$1 = \frac{h}{AR}$$

$$AR = h m$$

In right ΔPAR ,

 \Rightarrow

 \Rightarrow

 \Rightarrow

=

=

 \Rightarrow

$$\tan 60^\circ = \frac{PR}{AR}$$

$$\sqrt{3} = \frac{6+h}{h}$$
 [From eq.(i) &(ii)]

...(ii)

$$\Rightarrow \qquad \sqrt{3}h = 6 + h$$

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

$$\Rightarrow \qquad h = \frac{6}{(1.732)}$$

 $h = \frac{6}{0.732} = \frac{6000}{732} = 8.196$

 $\Rightarrow h = 8.20 \text{ m}$ Height of tower, QR = h = 8.20 mDistance of point P from the foot of the tower = PR= 6 + h = 6 + 8.20 = 14.20 m

SECTION – E

36. (i) Let the original side length of each tile be *x* units. The area of the rectangular floor using 200 tiles $= 200 x^2 unit^2$ The area with increased side length (each side increased by 1 unit) using 128 tiles $= 128(x + 1)^2$ unit² So, required quadratic equation is: $200x^2 = 128(x+1)^2$ (ii) We have, 200x² = 128(x + 1)² 200x² = 128(x² + 2x + 1) 200x² = 128x² + 256x + 128 \Rightarrow \Rightarrow \Rightarrow 72 x^2 – 256x – 128 = 0, which is the quadratic equation is standard form. (iii) We have, $72x^2 - 256x - 128 = 0$ $9x^2 - 32x - 16 = 0$ or, or, $9x^2 - 36x + 4x - 16 = 0$ or, 9x(x-4) + 4(x-4) = 0 or, (x-4)(9x+4) = 0 $x = 4, -\frac{4}{9}$ or, Since, side cannot be negative, thus x = 4 units OR We have $9x^2 - 32x - 16 = 0$ On comparing with $ax^2 + bx + c = 0$, we get a = 9, b = -32 and c = -16Using quadratic formula, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(-32) \pm \sqrt{(-32)^2 - 4(9)(-16)}}{\sqrt{(-32)^2 - 4(9)(-16)}}$ *:*.. $= \frac{32 \pm \sqrt{1024 + 576}}{18}$ $= \frac{32 \pm \sqrt{1600}}{18} = \frac{32 \pm 40}{18}$ 32 + 4032 - 40

$$= \frac{2}{18} \text{ or } \frac{-4}{18}$$
$$= \frac{72}{18} \text{ or } \frac{-8}{18} = 4 \text{ or } \frac{-4}{9}$$

37. (i)	Numbers announced	No. of times	c.f.
	0-15	8	8
	15-30	9	17
	30-45	10	27
	45-60	12	39
	60-75	9	48
		N = 48	
	Here, $N = 48$,		

then
$$\frac{N}{2} = \frac{48}{2} = 24$$

 \therefore Median class : 30 – 45

(ii) The number of even numbers between 1 to 75 is 37, [i.e., (75 − 1) ÷ 2 = 37]

Prob.(calling out an even number) = $\frac{37}{75}$

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(iii) (a) From part (i), we have median class : 30-45 We have, l = 30, c.f. = 17, f = 10, h = 15

Median =
$$l + \frac{\frac{N}{2} - c.f.}{f} \times h$$

= $30 + \frac{24 - 17}{10} \times 15$
= $30 + \frac{7}{10} \times 15 = 30 + \frac{105}{10}$
= $30 + 10.5 = 40.5$

(b) From part (i), we see highest frequency is 12. So, modal class is 45-60.

$$l = 45, f_0 = 10, f_1 = 12, f_2 = 9, h = 15$$

Mode = $l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$
= $45 + \left(\frac{12 - 10}{2 \times 12 - 10 - 9}\right) \times 15$
= $45 + \left(\frac{2}{24 - 19}\right) \times 15 = 45 + \frac{2}{5} \times 15$
= $45 + 6 = 51$

38. (i) Given,



 $AB = 7 \,\mathrm{m}$

Delhi Set-2

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

SECTION - A



Now, In AABC, By Pythagoras Theroem

AP = ARHence, (Tangent drawn from an external point to the circle are equal in length) AR = x m*:*.. (ii) Since, AR = x m and AB = 7 mRB = (7 - x)m*.*... RB = BQAlso, (Tangents drawn from an external point to the circle) OR = OQ(radii of circle) $\angle ORB = \angle OQB = 90^{\circ}$ (Angle between radius and tangent) Also, $\angle RBQ = 90^{\circ}$ (angle between the walls AB and BC) Thus, $\angle ROQ = 90^{\circ}$ Thus, \Box BQOR is square. BC = 15 m(iii) Here, BQ = (7 - x)m $Q\widetilde{C} = 15 - (7 - x)$ *:*.. QC = (8 + x)mor, QC = PCAlso, (Tangents from an external points C to the circle) PC = (8 + x)mi.e., In right ΔABC, using Pythagoras theorem, $AC^{2} = AB^{2} + BC^{2}$ $AC^{2} = 7^{2} + 15^{2}$ = 49 + 225 = 274AC = 16.55 \Rightarrow AP + PC = 16.55 \Rightarrow x + 8 + x = 16.55 \Rightarrow 2x = 8.55 \Rightarrow $x = 4.275 \sim 4.28 \text{ m}$ \Rightarrow OR From part (iii) (a), we get x = 4.28 m From part (ii), we know that BQOR is a square BQ = OQ*.*.. \Rightarrow r = 7 - x

$$\Rightarrow \qquad r = 7 - 4.28$$
$$\Rightarrow \qquad r = 2.72 \text{ m}$$

30/1/2

$$AC^{2} = AB^{2} + BC^{2}$$

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

$$9x^{2} = AB^{2} + 4x^{2}$$

$$AB^{2} = 9x^{2} - 4x^{2}$$

$$AB^{2} = 5x^{2}$$

$$AB = \sqrt{5}x$$

$$\cot A = \frac{AB}{BC}$$

$$\left[\text{Since, } \cot \theta = \frac{B}{P} \right]$$

$$= \frac{\sqrt{5}x}{2x} = \frac{\sqrt{5}}{2}$$

7. Option (D) is correct.

Explanation: From option (D)
=
$$\frac{1}{0.89} = \frac{100}{89} = 1.123$$

We know that probability of any event can not be greater than 1.

13. Option (B) is correct. *Explanation*: If α and β are the zeroes of a quadratic polynomial then Given, 1-

$$\alpha + \beta = 2\sqrt{3}$$
 and $\alpha\beta = 3$
Now, Quadratic polynomial is

$$p(x) = x^{2} - (\alpha + \beta)x + \alpha\beta$$

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

17. Option (C) is correct.

Explanation: Given,

 $T_n = 7n + 4$ (*n*th term at an A.P.) $T_1 = 7(1) + 4$ = 7 + 4 = 11Put n = 1, $\begin{array}{l} T_2 = 7(2) + 4 \\ = 14 + 4 = 18 \end{array}$ Put n = 2, Now, common difference

$$= T_2 - T_1 = 18 - 11 = 7$$



Given: (i) In trapezium ABCD Diagonals AC and BD intersect at O (ii) AB || DC DO 1

(iii)
$$\frac{DO}{OB} = \frac{1}{2}$$

To prove: AB = 2CDProof: In $\triangle OAB$ and $\triangle OCD$ $\angle AOB = \angle COD$ (vertically opposite angle) $\angle OAB = \angle OCD$ (Alternate interior angle as given, AB || DC) $\Delta OAB \sim \Delta OCD$ (by AA similarity Rule) $\frac{OC}{OA} = \frac{CD}{AB} = \frac{DO}{BO} \Rightarrow \frac{CD}{AB} = \frac{DO}{BO}$ Now, $\frac{CD}{AB} = \frac{1}{2}$ (given) AB = 2CDHence, Proved 2p + 3q = 1323. ...(i) 5p - 4q = -2and ...(ii) On multiplying eq (i) by 4 and eq (ii) by 3 $(2p + 3q = 13) \times 4$ $(5p - 4q = -2) \times 3$ On adding both equations 8p + 12q = 5215p - 12q = -623p = 46 $p = \frac{46}{23}$ p = 2Put p = 2 in eq (i) 2(2) + 3q = 134 + 3q = 13

$$3q = 9 \Rightarrow q = \frac{9}{3}$$

 $q = 3 \Rightarrow p = 2$ and $q = 3$
SECTION – C

27. Let, taking x litres quantity of 50% acid solution and y litres quantity of 25% acid solution. Given, After mixed both type of acid. Solution, Total quantity is 10 litres. Therefore, x + y = 10...(i) According to the question, $\frac{50}{100}x + \frac{25}{100}y = \frac{40}{100} \times 10 \implies \frac{x}{2} + \frac{y}{4} = 4$ 2x + y = 16...(ii) On subtracting eq (i) from eq (ii)

x = 6 litres Put x = 6 in eq (i) to get y6 + y = 10

29

$$y = 10 - 6 \Rightarrow y = 4$$
 litres

Hence, we should take 6 litres from 50% Acid solution and 4 litres from 25% Acid solution.



Given, r = 7 cm and h = 20 cm Total surface Area of Toy = CSA fo cylinder + (inner CSA of Hemi-sphere) $\times 2$ $= 2\pi rh + (2\pi r^{2}) \times 2$ = $2\pi rh + 4\pi r^{2} = 2\pi r(h + 2r)$ $= 2 \times \frac{22}{7} \times 7(20 + 2 \times 7)$ - 44(34) = 1496 cm²

$$= 44(34) = 1496 \text{ cm}$$

SECTION - D

33. Let the horizontal distance between the building and lamp post is BC



(ii) Here,
$$ED = BC = 20\sqrt{3}$$
 m
(Distance between two parallel lines)
In $\triangle AED$, $\angle AED = 90^{\circ}$
 $\cos D = \frac{ED}{AD}$ $\left[\because \cos \theta = \frac{B}{H}\right]$
 $\cos 30^{\circ} = \frac{20\sqrt{3}}{AD}$
 $\Rightarrow \frac{\sqrt{3}}{2} = \frac{20\sqrt{3}}{AD}$

35. Given, diameter hemisphere
$$d = 14$$
 cm

AD = 40 m



Delhi Set-3

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

SECTION - A

2. Option (C) is correct. *Explanation:* Given, 1^{st} term = a = -16common difference = d = -2then, we know that sum of *n* terms = S_n $S_n = \frac{n}{2}[2a + (n-1).d]$ Here n = 10

So

$$S_{10} = \frac{10}{2} [2 \times -16 + (10 - 1).(-2)]$$

= 5[-32 - 18] = 5[-50]
= -250

7. Option (B) is correct. *Explanation*: Let E = event of getting a red card which is an ace card. S = Total elements in sample space \Rightarrow n(S) = 52n(E) = 2& We know that, Probability of any event (E) Number of favourable outcomes = Total number of outcomes n(E)2 1

10

$$\Rightarrow P(E) = \frac{n(E)}{n(S)} = \frac{2}{52} = \frac{1}{26}$$

9. Option (B) is correct. Explanation: Given, $\theta = 30^{\circ}$ then, $2\sin 30^{\circ} \cdot \cos 30^{\circ} = 2 \times \frac{1}{2} \times \frac{\sqrt{3}}{2} = \frac{\sqrt{3}}{2}$

$$r = \frac{d}{2} = \frac{14}{2}$$

$$r = 7 \text{ cm}$$
Height of cylinder $h = 6 \text{ cm}$
Total inner surface Area of vessel = CSA of cylinder
+ CSA of hemi-sphere

$$= 2\pi rh + 2\pi r^{2}$$

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

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

$$= 44 \times 13$$

$$= 572 \text{ cm}^{2}$$
Now, Valume of weed

Now, Volume of vessel

+

$$= \pi r^{2}h + \frac{2}{3}\pi r^{3}$$

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

$$= \frac{22}{7} \times (7)^{2}\left(6 + \frac{2}{3} \times 7\right)$$

$$= 154 \times \frac{32}{3}$$

$$= 1642.67 \text{ cm}^{3}$$

30/1/3

16. Option (B) is correct.

Explanation: Given, α , β are the zeroes of the polynomial 2

$$P(x) = 6x^{2} - 5x - 4$$

$$\Rightarrow \qquad \alpha + \beta = \text{sum of zeroes} = \frac{-(-5)}{6} = \frac{5}{6}$$

$$\& \qquad \alpha \cdot \beta = \frac{-4}{6} = \frac{-2}{3}$$
So,
$$\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha + \beta}{\alpha \beta} = \frac{\frac{5}{6}}{\frac{-2}{3}}$$

$$= \frac{5}{6} \times \frac{3}{-2} = \frac{-5}{4}$$
SECTION - B 24. Let,
$$2x + 5y = -4 \qquad \dots(i)$$

$$\& 4x - 3y = 5 \qquad \dots(ii)$$
from equation (i) × 2 - equation (ii), we get
$$4x + 10y = -8$$

$$4x - 3y = 5 \text{ (by method of elimination)}$$

$$\frac{- + -}{2}$$

$$\Rightarrow \qquad 13y = -8 - 5$$

$$y = \frac{-13}{13} = -1$$
Putting the value of $y = -1$ in (i) we get
$$2x + 5 \times (-1) = -4$$

$$\Rightarrow \qquad 2x = +5 - 4$$

$$x = \frac{1}{2} \text{ So, } x = \frac{1}{2}$$

$$y = -1$$

27.

32.



$$BC = \sqrt{BE^{2} + EC^{2}}$$

$$= \sqrt{9^{2} + 12^{2}} \text{ cm}$$

$$= \sqrt{81 + 144} \text{ cm} = \sqrt{225} \text{ cm}$$

$$BC = 15 \text{ cm}$$

$$BD = (15 - x) \text{ cm}$$
Now, Area $\Delta ABC = \frac{1}{2} \times BC \times AD = \frac{1}{2} \times AC \times BE$

$$\{As \text{ area of } \Delta ABC = \frac{1}{2} \text{ base } \times \text{ height } \}$$

$$\Rightarrow \qquad \frac{1}{2} \times 15 \times 7 = \frac{1}{2} AC \times 9$$

Now, In ΔADC, $\angle ADC = 90^{\circ}$ So, Again from pythagoras theorem, $DC^2 = AC^2 - AD^2$ $DC = \sqrt{\left(\frac{35}{3}\right)^2 - 7^2}$ cm = $7.\sqrt{\frac{5^2}{3^2} - 1^2}$ cm $= 7.\sqrt{\frac{25-9}{9}}$ cm $= 7.\frac{4}{3}$ cm $= \frac{28}{3}$ cm $DC = \frac{28}{3}$ cm \Rightarrow

 $AC = \frac{15 \times 7}{9} = \frac{35}{3}$ cm

SECTION - C

26. Let, unit digit = xtens digit = y& number = 10y + xthen, Also number obtained after interchanging its digit = 10x + yAccording to question, ...(i) x + y = 1410x + y - (10y + x) = 18 $\Rightarrow \qquad 9x - 9y = 18$ ⇒ \Rightarrow x - y = 2...(ii) From eqn (i) + (ii), we have x + y = 14x - y = 22x = 16x = 8So, y = 14 - 8 = 6[from (i)] thus,

Required number = $10y + x = 10 \times 6 + 8 = 68$



 $x \approx 12.99 \text{ m}$

Hence height of the tower = 7.5 + 15 = 22.5 m & distance between tower and building = 12.99 m



Given, OA = 10 cmAC & BD are diameters intersect at O hence O is centre $\Rightarrow OA = OB = OC = 10 \text{ cm}$ & $\angle AOB = 60^{\circ}$ $\Rightarrow \angle ABO = \angle BAO = \frac{120^{\circ}}{2} = 60^{\circ}$

Outside Delhi Set-1

SECTION – A 1. Option (B) is correct. Explanation: Given equation are 3x - y + 8 = 0 6x - ky + 16 = 0 $a_1 = 3, b_1 = -1, c_1 = 8$ $a_2 = 6, b_2 = -k, c_2 = 16$ For Infinite many solution $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ $\Rightarrow \qquad \frac{3}{6} = \frac{-1}{-k} \Rightarrow \frac{1}{2} = \frac{1}{k}$ $\Rightarrow \qquad K = 2$

2. Option (C) is correct.
 Explanation: Let P(x, y) be the point We know that

$$x = \frac{m_{1}x_{2} + m_{2}x_{1}}{m_{1} + m_{2}}$$

$$5 : 2$$
A (4, -5) P (x, y) B (1, 2)
$$x = \frac{5 \times 1 + 2 \times 4}{5 + 2} \Rightarrow x = \frac{5 + 8}{7} = \frac{13}{7}$$

$$y = \frac{m_{1}y_{2} + m_{2}y_{1}}{m_{1} + m_{2}}$$

$$y = \frac{5 \times 2 + 2 \times (-5)}{5 + 2} = \frac{10 - 10}{7}$$

$$y = 0$$
(13)

Therefore, Coordinates of point $P = \left(\frac{13}{7}, 0\right)$

3. Option (A) is correct.

Explanation: Given

$$a_{15} - a_{11} = 48$$

 $\Rightarrow a + 14d - a - 10d = 48$
 $\Rightarrow 4d = 48 \Rightarrow d = 12$

4. Option (D) is correct. *Explanation*: Given equation is $x^2 + x + 1 = 0$

$$[\because OA = OB \Rightarrow \angle OAB = \angle OBA]$$

Hence, $\triangle OAB =$ equilateral triangle
(i) So $AB = OA = OB = 10$ cm (Sides of equilateral triangle)
(ii) Area of shaded region
= Sector area (OBPC) + [Sector area $OAQB$ – area of $\triangle OAB$]
 $= \left[\frac{120^{\circ}}{360^{\circ}} \times \pi \times 10^{2} + \frac{60^{\circ}}{360^{\circ}} \times \pi \times 10^{2} - \frac{\sqrt{3}}{4} \times 10^{2}\right] \text{cm}^{2}$
 $= \left(\frac{180^{\circ}}{360^{\circ}} \times \pi \times 100 - \frac{\sqrt{3}}{4} \times 100\right) \text{cm}^{2}$
 $= \left(50\pi - \frac{\sqrt{3}}{4} \times 100\right) \text{cm}^{2}$
 $= (50 \times 3.14 - 1.73 \times 25) \text{cm}^{2}$
 $= 157 \text{ cm}^{2} - 43.25 \text{ cm}^{2} = 113.75 \text{ cm}^{2}$

30/2/1

Where
$$a = 1, b = 1, c = 1$$

 $D = b^2 - 4ac$
 $(1)^2 - 4 \times 1 \times 1$
 $D = -3$
Where $D < 0$
When $D < 0$ roots are not-real.
5. Option (A) is correct.
Explanation: Given
HCF = 40
LCM = 252 × k
We know that
LCM × HCF = Product of two number
 $\Rightarrow 40 \times 252 \times k = 2520 \times 6600$
 $\Rightarrow \qquad k = \frac{2520 \times 6600}{40 \times 252} \therefore k = 1650$

6. Option (C) is correct. *Explanation*: Given



$$\Rightarrow \tan \theta = 1$$

$$\theta = \frac{\pi}{4}$$

then (sec θ . sin θ)
Put $\theta = \frac{\pi}{4}$

$$\Rightarrow \sec \frac{\pi}{4} \cdot \sin \frac{\pi}{4}$$

$$\Rightarrow \sqrt{2} \cdot \frac{1}{\sqrt{2}} = 1$$

8. Option (D) is correct.

Explanation: When two dice are rolled together then sample space

$$S = \{(1, 1) (1, 2) (1, 3)....(6, 6)\}$$

$$n(S) = 36$$

Sum of two numbers to be more than 10

$$A = \{(6, 5) (5, 6) (6, 6)\}$$

$$n(A) = 3$$

$$\therefore P(A) = \frac{3}{36} = \frac{1}{12}$$

9. Option (C) is correct. Explanation: Given equation is $5x^2 + 3x - 7$

a = 5, b = 3, c = -7Here α , β are zero's of the polynomial. So, Sum of zero's $= -\frac{b}{a}$ $\alpha + \beta = \frac{-b}{a},$ Product of zero's $= \frac{c}{a}$, $\alpha\beta = \frac{c}{a}$ $\alpha + \beta = \frac{-3}{5}$, $\alpha\beta = \frac{-7}{5}$ $\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha + \beta}{\alpha\beta} \Rightarrow \frac{\frac{-3}{5}}{\frac{-7}{5}} = \frac{3}{7}$ Find

10. Option (B) is correct.

Explanation: The ratio of the corresponding sides of similar triangles is same as the ratio of their perimeter ----

$$\therefore \quad \Delta ABC \sim \Delta PQR \text{ or } \Delta PQR \sim \Delta ABC$$
$$\Rightarrow \quad \frac{PQ}{AB} = \frac{QR}{BC} = \frac{PR}{AC} = \frac{48}{56} \Rightarrow \frac{PQ}{AB} = \frac{6}{7}$$

11. Option (D) is correct.

Explanation:

 $\angle APD = \angle CPB$ [vertically opposite angle] $\angle ADP = \angle CBP$

[Angle subtends on the same segment] : AA similarity

- $\Delta ADP \sim \Delta CBP$
- 12. Option (A) is correct. Explanation: When value of each observation in

data is increased by 2. So, median of data is Increases by 2

13. Option (C) is correct.

Explanation: Given, A box contains card numbered 6 to 55. Perfect square number are

$$= {9, 16, 25, 36, 49}$$

$$S = \{6, 7, 8, \dots, 55\},$$

$$n(S) = 50$$

$$A = \{9, 16, 25, 36, 49\}$$

$$n(A) = 5$$

$$P(A) = \frac{5}{50} = \frac{1}{10}$$

14. Option (B) is correct. Explanation: Given PA = 5 cm $PA \perp PB$ ∠OAP [90°, AP is a tangent] ∠OBP [90°, BP is a tangent] So, APBO is square or Δ APB is a Right angle Triangle $AB^{2} = AP^{2} + PB^{2}$ $AB^{2} = 2AP^{2}$ $AB^{2} = 2 \times 5^{2}$ [AP = PB] $AB = 5\sqrt{2}$ cm \Rightarrow

15. Option (A) is correct.

 \Rightarrow



We know that, Length of Diagonals are equal In Rectangle

$$ZO = YX$$

$$\Rightarrow \sqrt{(x-0)^2 + (y-0)^2} = \sqrt{(0+3)^2 + (4-0)^2}$$

$$\Rightarrow \sqrt{x^2 + y^2} = \sqrt{25}$$

$$\Rightarrow x^2 + y^2 = 5 \qquad \text{Both Diagonal are 5 units}$$

$$(ZO)^2 = (ZX)^2 + (XO)^2$$

$$(ZO)^2 = 4^2 + 3^2$$

$$(ZO)^2 = 25$$

$$ZO = 5$$

$$Again (YX)^2 = (YO)^2 + (XO)^2$$

$$= 4^2 + 3^2$$

$$(YX)^2 = 25$$

$$YX = 5$$
16. Option (B) is correct.
Explanation: Given

$$a = -29$$

$$d = -26 - (-29)$$

$$d = -26 - (-29) = -26 + 29 = 3 d = 3 an = 16$$

=

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

$$\Rightarrow 16 = -29 + (n-1)3$$

$$\Rightarrow \frac{16+29}{3} = n-1$$

$$\Rightarrow 15 = n-1$$

$$\therefore n = 16$$
17. Option (D) is correct.
Explanation: Given
 $\angle CAT = 40^{\circ}$
Find $\angle CBA$
 $\angle BAT = 90^{\circ}$
 $\Rightarrow \angle BAC + \angle CAT = 90^{\circ}$
 $\Rightarrow \angle BAC = 50^{\circ}$
 $\Rightarrow \angle ACB = 90^{\circ}$ [Angle in semi-circle]
In $\triangle ABC$
 $\angle A + \angle B + \angle C = 180^{\circ}$
 $50^{\circ} + \angle B + 90^{\circ} = 180^{\circ}$
 $\angle B = 180^{\circ} - 140^{\circ}$
 $\angle B = 40^{\circ}$

18. Option (B) is correct.*Explanation*: Mode = The Most Common or (Maximum). Number that appears in your set of data.

19. Option (A) is correct.

Explanation: Given, $\sin A = \frac{1}{3}$

Here,
$$\sin A = \frac{\text{Perpendicular}}{\text{Hypotenuse}}$$

We know that $H^2 = P^2 + B^2$
 $\Rightarrow \qquad (3)^2 = (1)^2 + B^2$
 $\Rightarrow \qquad 9 - 1 = B^2$
 $B = 2\sqrt{2}$
 $\cos A = \frac{\text{Base}}{\text{Hypotenuse}}$
 $\cos A = \frac{2\sqrt{2}}{3} \rightarrow \text{True}$
Reason
When θ is equal

When θ is equal then $\sin^2\theta + \cos^2\theta = 1$ $H^2 = P^2 + B^2$ \Rightarrow $\frac{H^2}{H^2} = \frac{P^2}{H^2} + \frac{B^2}{H^2}$ \Rightarrow $[1 = \sin^2 \theta + \cos^2 \theta] \rightarrow \text{True}$ \Rightarrow 20. (Bonus) Explanation: Given Edge of cube = 10 cmIn cube length = Breadth = Height When join two cube New length is = 20 cmheight = 10 cmwidth = 10 cmIt convert in cuboid Total surface Area of cuboid = 2(lb + bh + hl) $= 2[20 \times 10 + 10 \times 10 + 10 \times 20]$ = 2[200 + 100 + 200] $= 2[500] = 1000 \text{ cm}^2$ Assertion is wrong.

Reason

Area of each surface = $10 \times 10 \text{ cm}^2$ = 100 cm^2

Reason is true but not the correct explanation of assertion.

Hence, no correct option has been given.

SECTION – B

21. If 15¹⁵ ends with 0 or 5, then it must have 5 as a factor.

But only prime factors of 15 are 3 and 5. $\therefore 15^n = (5 \times 3)n = 3^n \times 5^n$

From the fundamental theorem of arithmetic, the prime factorization of every composite number is unique.

 $\therefore 15^n$ can never end with 0 or 5.

22. Given

Vertices of a triangle



Distance of

$$AB = \sqrt{(1+5)^2 + (0-0)^2}$$

$$\Rightarrow AB = 6$$

Distance of
$$AC = \sqrt{(1+2)^2 + (0-5)^2}$$
$$\Rightarrow AC = \sqrt{9+25}$$
$$\Rightarrow AC = \sqrt{34}$$
$$\Rightarrow Distance of BC$$
$$BC = \sqrt{(-2+5)^2 + (5-0)^2}$$
$$= \sqrt{9+25}$$

 $BC = \sqrt{34}$

 \Rightarrow

When two sides are equal, isosceles triangle is form. **23.** (a) $2 \sin^2 30^\circ \sec 60^\circ + \tan^2 60^\circ$

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

$$= 2 \times \frac{1}{4} \times 2 + 3$$

$$= 1 + 3 = 4$$
OR
(b) $2 \sin (A + B) = \sqrt{3}$

$$\Rightarrow \sin(A + B) = \frac{\sqrt{3}}{2}$$

$$\Rightarrow \sin(A + B) = \sin 60$$

$$A + B = 60$$

$$\cos(A - B) = 1$$

$$\cos(A - B) = \cos 0$$

$$A - B = 0$$
...(ii)
Adding (i) and (ii)

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$$2A = 60$$

$$A = 30^{\circ}$$
From (i)
$$30 + B = 60$$

$$B = 30^{\circ}$$

$$\angle A = 30^{\circ}, \angle B = 30^{\circ}$$
24. Tangent to a circle from an external point are equal



So,

 $\angle RAC = \angle RCA$ Let $\angle RAC = \angle RCA = x$ We know that BAR and DCR are straight line. $\angle BAC + \angle CAR = RC$ $\Rightarrow \angle BAC + x = 180$ $\Rightarrow \angle BAC = 180 - x$ Similarly, $\angle DCA = 180 - x$ So $\angle BAC = \angle DCA$ 25. When the line segment

А	Κ		1	В
(3, –5)		Р		(–1, 6)

Let Ratio

 $m_1: m_2 = K: 1$

Let Co-ordinate of P(x, y) divide the line segment in the ratio K: 1

$$x = \frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}, \ y = \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2}$$
$$x = \frac{K(-1) + 1 \times 3}{K+1}, \ y = \frac{K \times 6 - 1 \times 5}{K+1}$$
$$x = \frac{-K+3}{K+1}, \ y = \frac{6K-5}{K+1}$$

Given line y = x

Put value of x and y in the equ. of line -K+3 6K-5

$$\frac{-K+3}{K+1} = \frac{6K-3}{K+1}$$

$$\Rightarrow -K+3 = 6K-5$$

$$\Rightarrow -K-6K = -5-3$$

$$7K = 8$$

$$K = \frac{8}{7}$$

(b) A(3, 0), B(6, 4) and C(– 1, 3) are vertices of \triangle ABC and E on AC



A median of a triangle is a line segment that connects a vertex to the midpoint of the opposite side. \therefore *E* is mid point of *AC*

Co-ordinate of *E*

$$\left(\frac{-1+3}{2}, \frac{0+3}{2}\right) = \left(1, \frac{3}{2}\right)$$

Distance of BE is

$$BE = \sqrt{(6-1)^2 + \left(4 - \frac{3}{2}\right)^2} \\ = \sqrt{5^2 + \left(\frac{5}{2}\right)^2} \\ = \sqrt{25 + \frac{25}{4}} \\ = \sqrt{\frac{125}{4}} \\ = \frac{5\sqrt{5}}{2}$$

SECTION – C

 S_n

26. Given:

$$S_m =$$

Show: $S_{(m+n)} = 0$ Let the *A*.*P*. be denoted as $a_1, a_2, a_3, \dots, a_n \dots$

With common difference d.

$$S_m = \frac{m}{2} [2a_1 + (m-1)d]$$
$$S_n = \frac{n}{2} [2a_1 + (n-1)d]$$

Given both are equal

$$\frac{m}{2}[2a_1 + (m-1)d] = \frac{n}{2}[2a_1 + (n-1)d]$$

$$\Rightarrow \frac{1}{2}[2a_1m + (m-1)md] = \frac{1}{2}[2a_1n + (n-1)nd]$$

$$\Rightarrow \frac{1}{2}[2a_1m + m^2d - md] - \frac{1}{2}[2a_1n + n^2d - nd] = 0$$

$$\Rightarrow \frac{1}{2}[2a_1m - 2a_1n + m^2d - n^2d - md + nd] = 0$$

$$\Rightarrow \frac{1}{2}[2a_1(m-n) + d(m^2 - n^2) - d(m-n)] = 0$$

$$\Rightarrow \frac{1}{2}(m-n)[2a_1 + (m+n-1)d] = 0$$

$$2a_1 = -[m+n-1]d...(i)$$

Sum of the first (m + n) term of the given A.P.

$$S_{m+n} = \frac{m+n}{2} [2a_1 + (m+n-1)d]$$
 ...(ii)

Put (i) in (ii)

$$\Rightarrow \qquad S_{m+n} = \frac{m+n}{2} [-(m+n-1)d + (m+n-1)d]$$
$$S_{m+n} = 0$$

OR

(b)

Three consecutive term are
$$a - d$$
, a , $a + d$
Given, Sum of three consecutive = 24
 $a - d + a + a + d = 0$
 $\Rightarrow \qquad 3a = 24$
 $a = 8$...(i)
 $(a - d)^2 + a^2 + (a + d)^2 = 194$
 $\Rightarrow a^2 + d^2 - 2ad + a^2 + a^2 + d^2 + 2ad = 194$
 $\Rightarrow \qquad 3a^2 + d^2 = 194$
 $\Rightarrow \qquad 3 \times 64 + d^2 = 194$
 $d^2 = 194 - 192$
 $d^2 = 2$
 $d = \pm \sqrt{2}$

The Number $8 \pm \sqrt{2}, 8, 8 \mp \sqrt{2}$

27. If possible, let $\sqrt{5}$ be rational and let its simplest

form be $\frac{p}{q}$.

Then *p* and *q* are integers having no common factor other than 1, and $q \neq 0$

Now
$$\sqrt{5} = \frac{p}{q}$$

 $\Rightarrow 5 = \frac{p^2}{q^2}$ [on squaring both sides]
 $\Rightarrow 5q^2 = p^2$...(i)
 $\Rightarrow 5$ divides p^2

 \Rightarrow 5 divides *p*

[\because 5 is prime and 5 divides $p^2 \Rightarrow 5$ divides p] Let p = 5R for some integer R Putting p = 5R in (i), we get $5q^2 = 25R^2$ $\Rightarrow q^2 = 5R^2$ $\Rightarrow 5$ divides q^2 [\because 5 divides $5R^2$]

 $\Rightarrow 5 \text{ divides } q \qquad [:: 5 \text{ divides } dr]$

Thus, 5 is a common factor of p and q. But, this contradicts the fact that p and q have no common factor other than 1. Hence, $\sqrt{5}$ is irrational.

28. (a)

$$\angle BQP = \angle BAQ$$
($\angle s$ in alternate segment are equal)
 $\Rightarrow \qquad \angle BQP = 30^{\circ}$

(:: $\angle BAQ = 30^{\circ}$ given) As *AB* is a diameter, *AQB* is a Semicircle. $\angle AQB = 90^{\circ}$ (angle in semicircle = 90°) From Fig. $\angle AQP = \angle AQB + \angle BQP$ $\angle AQP = 90^{\circ} + 30^{\circ}$ \Rightarrow $= 120^{\circ}$ In $\triangle AQP$, $\angle QPA + \angle BAQ + \angle AQP = 180^{\circ}$ \Rightarrow $\angle QPA + 30^{\circ} + 120^{\circ} = 180^{\circ}$ \Rightarrow $\angle QPA = 180 - (30^{\circ} + 120^{\circ})$ \Rightarrow $\angle QPA = 30^{\circ}$...(ii) From (i) and (ii) we get $\angle BQP = \angle QPB = 30^{\circ}$ Therefore, QB = BPOR

(b) Given A quad. ABCD circumscribes a circle with centre O.



To Prove

and

$$\angle AOB + \angle COD = 180^{\circ}$$
$$\angle AOD + \angle BOC = 180^{\circ}$$

Join OP, OQ, OR and OS.

We know that the tangent drawn from an external point of a circle subtends equal angles at the centre.

$$\therefore \qquad \qquad \angle 1 = \angle 2, \\ \angle 3 = \angle 4, \\ \angle 5 = \angle 6, \\ \angle 7 = \angle 8, \\ \text{And } \angle 1 + \angle 2 + \angle 3 + \angle 4 + \angle 5 + \angle 6 + \angle 7 + \angle 8 \\ = 360^{\circ} \quad [\angle S \text{ at a Point}] \\ \Rightarrow 2(\angle 2 + \angle 3) + 2(\angle 6 + \angle 7) = 360^{\circ} \\ 2(\angle 1 + \angle 8) + 2(\angle 4 + \angle 5) = 360^{\circ} \\ \Rightarrow \quad \angle 2 + \angle 3 + \angle 6 + \angle 7 = 180^{\circ} \\ \angle 1 + \angle 8 + \angle 4 + \angle 5 = 180^{\circ} \\ \Rightarrow \quad \angle AOB + \angle COD = 180^{\circ} \\ \angle AOD + \angle BOC = 180^{\circ} \\ \end{vmatrix}$$

29.
$$\sec^2\theta - \tan^2\theta = 1$$

...(i)

$$(\sec \theta - \tan \theta)(\sec \theta + \tan \theta) = 1$$
L.H.S
$$= \frac{(\sec \theta - \tan \theta)(\sec \theta + \tan \theta) + (\sec \theta - \tan \theta)}{1 + \sec \theta + \tan \theta}$$

$$= \frac{(\sec \theta - \tan \theta)[\sec \theta + \tan \theta + 1]}{[1 + \sec \theta + \tan \theta]}$$

$$= \sec \theta - \tan \theta$$

$$= \frac{1}{\cos \theta} - \frac{\sin \theta}{\cos \theta}$$

$$= \frac{1 - \sin \theta}{\cos \theta}$$
L.H.S = R.H.S Hence Proved.

30.

Marks obtained	Number of Students f_i	<i>x</i> _{<i>i</i>}	<i>x_i</i> – 25	u _i f _i
0–10	12	5	- 20	- 240
10-20	23	15	- 10	- 230
20–30	34	25	0	0
30-40	25	35	10	250
40–50	6	45	20	120
	100			- 100

Let assumed mean = 25 $u_i = x_i - 25$

Short cut method

$$\overline{x} = a + \sum \frac{u_i f_i}{f_i}$$
$$= 25 + \frac{(-100)}{100}$$
$$= 25 - 1$$

x = 24**31.** Let the digit in ten's place be *x*. Then the one's place digit will be x - 5The product of two digit = 36x(x-5) = 36

$$x^{2}-5x-36 = 0$$

$$\Rightarrow x^{2}-9x + 4x - 36 = 0$$

$$\Rightarrow (x-9)(x+4) = 0$$

$$x = 9, -4$$

SECTION – D
32. (a)
$$3x + y + 4 = 0$$
 $3x - y + 2 = 0$



(b) Let *x* be the number of Right Answer *y* be the number of wrong Answer : According to the question, 3x - y = 404x - 2y = 50...(i) ...(ii) Multiply with 2 in eq. (i) 6x - 2y = 80...(iii) 4x - 2y = 50...(iv) 2x = 30x = 15Putting the value of *x* in eqn. (i) $3 \times 15 - y = 40$ -y = 40 - 45



33. (a) Given: A $\triangle ABC$ in which DE ||BC and DEintersects AB and AC at D and



Join BE and CD. Draw EL \perp AB and DM \perp AC. We have,

$$ar(\Delta ADE) = \frac{1}{2} \times AD \times EL \quad \left[\therefore \Delta = \frac{1}{2}B \times H \right]$$

and
$$ar(\Delta DBE) = \frac{1}{2} \times DB \times EL$$

$$\therefore \quad \frac{ar(\Delta ADE)}{ar(\Delta DBE)} = \frac{\frac{1}{2} \times AD \times EL}{\frac{1}{2} \times DB \times EL}$$

$$= \frac{AD}{aD}$$
(i)

...(i)

= DB Similarly

$$ar(\Delta ADE) = ar(\Delta ECD)$$
$$= \frac{1}{2} \times AE \times DM$$

and $ar(\Delta ECD)$

...

$$\therefore \qquad \frac{ar(\Delta ADE)}{ar(\Delta ECD)} = \frac{AE}{EC} \qquad \dots (ii)$$

Now $\triangle DBE$ and $\triangle ECD$ being on the same base DE and between the same parallel DE and BC $ar(\Delta DBE) = ar(\Delta ECD)$

OR

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

(b) We have



$$=\frac{\frac{1}{2}BC}{\frac{1}{2}QR}=\frac{BD}{QM}\qquad \dots(i)$$

In $\triangle ABD$ and $\triangle PQM$, we have $AB \qquad AD \qquad BD$

$$\frac{AB}{PQ} = \frac{AB}{PM} = \frac{BB}{QM}$$
 from (i)

 $\begin{array}{ll} \therefore & \Delta ABD \sim \Delta PQM & [by SSS-Similarity] \\ And So, & \angle B = \angle Q \\ [Corresponding angles of similar triangles are equal] \end{array}$

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

and
$$\frac{AB}{PQ} = \frac{BC}{QR}$$
 [Proved above] [From (i)]



Given : Height of a light house AB = 45 m To find: CD = ?Sol: Distance between the ships = CD $\angle ACB = 30^{\circ}$ and $\angle ADB = 60^{\circ}$ (alternate angles are equal) Now, In right angle $\triangle ABC$ tan $30 = \frac{AB}{\Delta B}$

$$\frac{1}{\sqrt{3}} = \frac{45}{BC}$$
$$BC = 45\sqrt{3} \qquad \dots(i)$$

In right angle $\triangle ABD$,

$$\tan 60^\circ = \frac{AB}{BD}$$
$$\sqrt{3} = \frac{45}{BD}$$
$$BD = \frac{45 \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}} = \frac{45\sqrt{3}}{3} = 15\sqrt{3}$$

From (i) and (ii) we get, PD = RC + RD

$$BD = BC + BD$$

= $45\sqrt{3} + 15\sqrt{3} = 60\sqrt{3}$
= 60×1.73
= 103.8 m
35. Let the radius of circle be *r* and the arc length is *l*
Perimeter of a sector is given as. [$\because l = r\theta$]

$$P = 2r + r\theta \qquad r = 5.6 \text{ m}$$

$$P = 20 \text{ m}$$

[:: I radian =
$$\frac{180}{\pi}$$
 degree $\pi = \frac{22}{7}$]

$$\theta = \frac{11}{7} \times \frac{180}{\pi} \text{ degree}$$

$$\theta = 90^{\circ} \text{ degree}$$
Area of sector
$$= \frac{\theta}{360} \times \pi r^{2}$$

$$= \frac{90}{360^{\circ}} \times \frac{22}{7} \times 5.6 \times 5.6$$

$$= \frac{1}{4} \times \frac{22}{7} \times 5.6 \times 5.6 = \frac{689.92}{28}$$
Area
$$= 24.64 \text{ m}^{2}$$
SECTION – E

36. (i) Two

[The point at which curve touch the *x*-axis is zero's] Here, x = 0, 5(ii) Given

$$h = 25t - 5t^{2}$$
Maximum height at a point $\left(\frac{5}{2}, 0\right)$

$$h = 25 \times \frac{5}{2} - 5\left(\frac{5}{2}\right)^{2}$$

$$= \frac{125}{2} - \frac{125}{4}$$

$$= 62.5 - 31.25$$

$$h = 31.25$$
(iii) (a) Ball take time to reach height 30 m
 $30 = 25t - 5t^{2}$
 $5t^{2} - 25t + 30 = 0$
 $\Rightarrow t^{2} - 5t + 6 = 0$
 $\Rightarrow t^{2} - 3t - 2t + 6 = 0$
 $(t - 3)(t - 2) = 0$
 $t = 3, 2$
(b) when height is $= 20$ m
 $20 = 25t - 5t^{2}$
 $\Rightarrow 5t^{2} - 25t + 20 = 0$
 $\Rightarrow t^{2} - 5t + 4 = 0$
 $t^{2} - 4t - t + 4 = 0$
 $(t - 4)(t - 1) = 0$
 $t = 4, 1$
Given
Cylindrical height $= 8$ m

Cylindrical height = 8 mDiameter of base = 28 m

37.

Total height of tent = 18.5 m

(i) Radius = 14 m
(Slant height)² = (Height)² + (Radius)²
$$\uparrow$$
 \uparrow



 $l^2 = (10.5)^2 + (14)^2$ = 110.25 + 196 $l^2 = 306.25$ l = 17.5 m(ii) Floor Area of Tent is $= \pi r^2$ $=\frac{22}{7}\times14\times14$ $= 22 \times 7 \times 14$ Area = 616 m² (iii) (a) Area of cloth used for making tent. $= 2\pi rh \times \pi lr$ $=2\pi r[h+l]$ $= 2 \times \frac{22}{7} \times 14[8 + 17.5]$ $= 2 \times 22 \times 2[25.5] \\= 88 \times 25.5$ $= 2244 \text{ m}^2$ OR (b) Total volume Inside the Test $= \pi r^2 h + \frac{1}{2} \pi r^2 h$ $=\pi r^2 \left(h+\frac{1}{3h}\right)$ $=\frac{22}{7} \times 14 \times 14 \left(8 + \frac{1}{3} \times 10.5\right)$ $= 22 \times 2 \times 14(8 + 3.5) \\= 616 \times 11.5$ $= 7084 \text{ cm}^3$ No. of favourable outcomes **38.** P(A) =(i) Given Bus + Ship = 33 + 36 $= 69^{\circ}$

 $Total = 360^{\circ}$ (Bus or ship) = $\frac{69^{\circ}}{360} \times 120$ Total person on Bus or Ship = 23 people $P(A) = \frac{23}{120}$ *:*.. A = he/she travelled by bus or ship (ii) Car is most favourite mode of transport No. of people = $\frac{177}{360} \times 120$ = 59 people (iii) (a) Probability that he did not use train is $\frac{4}{5}$ Probability that people use train is $\frac{1}{5}$ $[\because P(A) + P(\overline{A}) = 1]$ No. of people who used train $\frac{1}{5} \times 120$ = 24 people OR (b) Given Probability that randomly selected person used aeroplane is $\frac{7}{60}$ Total No. of people = $\frac{7}{60} \times 120$

we know

= 14 peopleRevenue collected by air is $= 14 \times 5000$ = ₹ 70,000

30/2/2

Note: Except these, all other questions have been given in Outside Delhi Set-1 SECTION - A 2. Option (D) is correct. **Explanation:** 65° Ο Т $\angle OPQ + \angle OQP + \angle QOP = 180^{\circ}$ $2\angle OPO + 65^{\circ} = 180^{\circ}$ $\angle OPQ = \frac{180 - 65}{2} = 57.5^{\circ}$ $\angle OPT = 90^{\circ}$ $\angle OPQ + \angle QPT = 90^{\circ}$ $\angle QPT = 90^{\circ} - 57.5^{\circ} = 32.5^{\circ}$ 6. Option (B) is correct. *Explanation*: $2x^2 - 9x + 5$

Outside Delhi Set-2

$$\alpha + \beta = \frac{9}{2}$$
$$\alpha\beta = \frac{5}{2}$$
$$\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta$$
$$= \left(\frac{9}{2}\right)^2 - 2 \times \frac{5}{2}$$
$$= \frac{81}{4} - 5$$
$$= \frac{61}{4}$$

13. Option (D) is correct. Explanation: $p(x) = 5x^2 - 4x + (2 + k)$ p(2) = 0 $5(2)^2 - 4(2) + 2 + k = 0$ 20 - 8 + 2 + k = 0k = -14

Explanation: 1 + 2 + 3 + ... + 200

$$S_n = \frac{n(n+1)}{2} = \frac{200(200+1)}{2}$$
$$= 20100$$

SECTION - B

23.
$$7 \times 11 \times 13 + 13 = 13(7 \times 11 + 1)$$

 $= 13 \times 78$
 $= 13 \times 13 \times 2 \times 3 \times 1$
It has more than 2 factors.
 \therefore It is composite number
 $7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 + 5$
 $5(7 \times 6 \times 4 \times 3 \times 2 + 1)$
 $5(1008 + 1) = 5 \times 1009$
 $= 5 \times 1009 \times 1$
It is also composite number.

24. BD is the median of $\triangle ABC$

: D is the mid-point of side AC



SECTION - C

28. Let the three consecutive no. be x, x + 1 and x + 2 $(x+1)^2 + x(x+2) = 161$ $\Rightarrow x^{2} + 2x + 1 + x^{2} + 2x - 161 = 0$ $2x^2 + 4x - 160 = 0$ \Rightarrow $x^2 + 2x - 80 = 0$ \Rightarrow $x^2 + 10x - 8x - 80 = 0$ \Rightarrow x(x+10) - 8(x+10) = 0 \Rightarrow (x+10)(x-8) = 0 \Rightarrow x + 10 = 0If x = -10It is not natural number x - 8 = 0If x = 8: Consecutive no.s are 8, 9 and 10. **31.** L.H.S. $\sin^6\theta + \cos^6\theta$ $= (\sin^2\theta)^3 + (\cos^2\theta)^3$ $= (\sin^2\theta + \cos^2\theta)^3 - 3\sin^2\theta\cos^2\theta(\sin^2\theta + \cos^2\theta)$ $[a^{3} + b^{3} = (a + b)^{3} - 3ab(a + b)]$

$$= (1)^{3} - 3 \sin^{2}\theta \cos^{2}\theta (1)$$

= 1 - 3 sin^{2}\theta cos^{2}\theta (sin^{2}\theta + cos^{2}\theta = 1)
= R.H.S. Hence Proved





$$xy - 5y + 2x - 10 = xy - 80$$

$$2x - 5y = -70$$
 ...(i)

$$(x + 10)(y - 5) = xy + 50$$

$$xy - 5x + 10y - 50 = xy + 50$$

$$-5x + 10y = 100$$

(ii)

$$-x + 2y = 20$$
 ...(11)
 $2x - 5y = -70$...(i)

from (i) & (ii) x = 40 m, y = 30 m \therefore length of rectangle = 40 m and breadth of rectangle = 30 m

Outside Delhi Set-3

Note: Except these, all other questions have been given in Outside Delhi Set-1 & 2 SECTION - A 1. Option (B) is correct. *Explanation:* $d = \left| \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \right|$ $= \left| \sqrt{\left(a\sin\theta - a\cos\theta \right)^2 + \left(a\cos\theta + a\sin\theta \right)^2} \right|$ $= |\sqrt{a^2 \sin^2 \theta + a^2 \cos^2 \theta - 2a^2 \sin \theta \cos \theta + a^2 \cos^2 \theta + a^2 \cos^2 \theta} + a^2 \sin^2 \theta + a^2 \sin^2$ $+a^2\sin^2\theta+2a^2\sin\theta\cos\theta$ $= \left| \sqrt{2a^2(\sin^2\theta + \cos^2\theta)} \right|$ $= |\sqrt{2a^2}|$ $=\sqrt{2}a$ units 8. Option (C) is correct. *Explanation*: $4x^2 - 5x + 4$ $D = \sqrt{25 - 64} = \sqrt{-39} < 0$ Discriminant :. Roots are not real 9. Option (A) is correct. Explanation: $a_{20} - a_{15} = 20$ a + 19d - a - 14d = 205d = 20d = 412. Option (C) is correct. *Explanation:* $-x^2 + 8x + 9$ $\alpha+\beta\,=\,\frac{-8}{-1}\,=8$ $\alpha.\beta = \frac{9}{-1} = -9$ $\begin{aligned} (\alpha-\beta)^2 &= (\alpha+\beta)^2 - 4\alpha\beta \\ &= 64 + 36 = 100 \end{aligned}$ $\alpha - \beta = \sqrt{100} = \pm 10$ *:*.. SECTION – B 23. γ ➤ X X 0 А In ∆OAB OA = OB Equal radii As, $\angle OBA = \angle OAB = 45^{\circ}$ Now, In triangle *OCB* $\sin B = \frac{OC}{OB}$ $\sin 45^\circ = \frac{OC}{7}$

$$\frac{1}{\sqrt{2}} = \frac{OC}{7}$$
$$OC = \frac{7}{\sqrt{2}}$$
$$= \frac{7\sqrt{2}}{2} \text{ cm}$$

:..

- **25.** For a number to end with digit 0 its prime factorisation should have 2 and 5 as a common factor $(8)^n = (2^3)^n = (2^{3n})$
 - 8^n does not have 5 in its prime factorisation. $\therefore 8^n$ can not end with the digit 0

SECTION - C

26. L.H.S. =
$$\frac{\csc^2 \theta - \sec^2 \theta}{\csc^2 \theta + \sec^2 \theta}$$

= $\frac{1 + \cot^2 \theta - 1 - \tan^2 \theta}{1 + \cot^2 \theta + 1 + \tan^2 \theta}$
= $\frac{\cot^2 \theta - \tan^2 \theta}{2 + \cot^2 \theta + \tan^2 \theta}$
= $\frac{7 - \frac{1}{7}}{2 + \frac{1}{7} + 7}$
= $\frac{49 - 1}{\frac{7}{63 + 1}}$
= $\frac{48}{64}$
= $\frac{3}{4}$
= R.H.S. Hence Proved
30. Let the cost price be ₹ x
Selling price = ₹ 75
Gain = 75 - x
Given, $\frac{75 - x}{x} = \frac{x}{100}$
 $7500 - 100x = x^2$
 $x^2 + 100x - 7500 = 0$
 $x(x + 150) - 50(x + 150) = 0$
 $(x + 150)(x - 50) = 0$
if $x + 150 = 0$
 $x = -150$ Not possible (price cannot be negative)
 $x - 50 = 0$
 $x = 50$
 \therefore Cost price be ₹ 50

30/2/3



Let the height of the tower (PD) be h m and width of the river (AD) be x m

In ΔAOD ,

$$\tan A = \frac{PD}{AD}$$
$$\tan 60^\circ = \frac{h}{x}$$
$$\sqrt{3} = \frac{h}{x}$$
$$h = x\sqrt{3} \qquad \dots(i)$$

In ΔDBP ,

$$\tan B = \frac{PD}{BD}$$
$$\tan B = \frac{h}{x+30}$$
$$\frac{1}{\sqrt{3}} = \frac{h}{x+30}$$
$$x + 30 = \sqrt{3}h$$
$$x + 30 = 3x$$
$$x = 15 \text{ m}$$
$$\therefore \text{ width of the river 15 m}$$
from (i)
$$h = x\sqrt{3}$$

from (i)

: Height of the tower is 25.98 m



		y = -	2	
x	0	2	4	
у	-5	-2	1	
$5x + 3y = 4$ $y = \frac{4 - 5x}{3}$				
x	-1	2	5	
у	3	-2	-7	
		x = 2a OR	and $y = 2$	

(b) Let the greater no. be *x* and smaller no. be *y* 3x = 4y + 3Given, ...(i) By using: $Dividend = Divisor \times Quotient + Remainder.$ 7y = 5x + 1...(ii) Multiply by eqn (i) by 5 and (ii) by 3 15x - 20y = 15...(iii) -15x + 21y = 3...(iv) 21y = 3y = 18 $x = \frac{18 \times 4 + 3}{3} = \frac{75}{3} = 25$ On adding from eqn (i) Greater number = 25Smallest number = 18