CBSE
Solved Paper 2023
Mathematics Basic
(Delhi & Outside Delhi Sets)

Time : 3 Hours **CLASS-X** 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) Question paper is divided into **FIVE** sections - Section **A, B, C, D** and **E**.*

*(iii) 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.*

*(iv) In section **B**, question number **21** to **25** are very short answer (VSA) type questions of **2** marks each.*

*(v) In section **C**, question number **26** to **31** are short answer (SA) type questions carrying **3** marks each.*

*(vi) In section **D**, question number **32** to **35** are long answer (LA) type questions carrying **5** marks each.*

*(vii) 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.*

*(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 in Section **E**.*

(ix) Draw neat figures wherever required. Take π = 22/7 wherever required if not stated.

*(x) Use of calculators is **not allowed**.*

Delhi Set-I **430/4/1**

SECTION — A

Section-A consists of Multiple Choice Type questions of 1 mark each

1. A quadratic polynomial the sum and product of whose zeroes are – 3 and 2 respectively, is: **1**

(a) $x^2 + 3x + 2$ **(b)** $x^2 - 3x + 2$

(c) $x^2 - 3x - 2$ **(d)** $x^2 + 3x - 2$

2. (HCF × LCM) for the numbers 70 and 40 is: **1**

(a) 10 **(b)** 280

(c) 2800 **(d)** 70

3. If the radius of a semi-circular protractor is 7cm, then its perimeter is: **1**

(a) 11 cm **(b)** 14 cm

(c) 22 cm **(d)** 36 cm

4. The number $(5-3\sqrt{5}+\sqrt{5})$ is: **1**

(a) an integer **(b)** a rational number

(c) an irrational number **(d)** a whole number

5. If $p(x) = x^2 + 5x + 6$, then $p(-2)$ is: **1**

(a) 20 **(b)** 0

(c) – 8 **(d)** 8

6. Which of the following **cannot** be the probability of an event? **1**

(a) 0.1 **(b)** $\frac{5}{3}$

(c) 3% **(d)** $\frac{1}{3}$

7. The pair of linear equations $x + 2y + 5 = 0$ and $-3x - 6y + 1 = 0$ has: **1**
(a) a unique solution **(b)** exactly two solutions
(c) infinitely many solutions **(d)** no solution

8. If $\Delta ABC \sim \Delta DEF$ and $\angle A = 47°$, $\angle E = 83°$, then $\angle C$ is equal: **1**
(a) 47° **(b)** 50°
(c) 83° **(d)** 130°

9. If the pair of linear equations $x - y = 1$, $x + ky = 5$ has a unique solution $x = 2$, $y = 1$, then the value of k is: **1**
(a) – 2 **(b)** – 3
(c) 3 **(d)** 4

10. The value of $5 \sin^2 90° - 2 \cos^2 0°$ is: **1**
(a) – 2 **(b)** 5
(c) 3 **(d)** – 3

11. The length of the arc of a circle of radius 14 cm which subtends an angle of 60° at the centre of the circle is: **1**
(a) $\frac{44}{3}$ cm **(b)** $\frac{88}{3}$ cm
(c) $\frac{308}{3}$ cm **(d)** $\frac{616}{3}$ cm

12. The angle of elevation of the top of a 30 m high tower at a point 30 m away from the base of the tower is: **1**
(a) 30° **(b)** 45°
(c) 60° (d) 90°

13. The mode of the numbers 2, 3, 3, 4, 5, 4, 4, 5, 3, 4, 2, 6, 7 is: **1**
(a) 2 **(b)** 3
(c) 4 **(d)** 5

14. From a well-shuffled deck of 52 playing cards, a card is drawn at random. What is the probability of getting a red queen? **1**
(a) $\frac{1}{52}$ **(b)** $\frac{1}{26}$
(c) $\frac{1}{13}$ **(d)** $\frac{12}{13}$

15. A quadratic equation whose one root is 2 and the sum of whose roots is zero, is: **1**
(a) $x^2 + 4 = 0$ **(b)** $x^2 - 2 = 0$
(c) $4x^2 - 1 = 0$ **(d)** $x^2 - 4 = 0$

16. Which of the following is not a quadratic equation? **1**
(a) $2(x - 1)^2 = 4x^2 - 2x + 1$ **(b)** $2x - x^2 = x^2 + 5$
(c) $(\sqrt{2}x + \sqrt{3})^2 + x^2 = 3x^2 - 5x$ **(d)** $(x^2 + 2x)^2 = x^4 + 3 + 4x^3$

17. How many tangents can be drawn to a circle from a point on it? **1**
(a) One **(b)** Two
(c) Infinite **(d)** Zero

18. The length of the tangent from an external point A to a circle, of radius 3 cm is 4 cm. The distance of A from the centre of the circle is: **1**
(a) 7 cm **(b)** 5 cm
(c) $\sqrt{7}$ cm **(d)** 25 cm

(Assertion - Reason type questions)

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 true and Reason (R) gives the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true but Reason (R) does not give 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 tangent to a circle is perpendicular to the radius through the point of contact.
Reason (R): The lengths of tangents drawn from an external point to a circle are equal. **1**

20. **Assertion (A):** If one root of the quadratic equation $4x^2 - 10x + (k - 4) = 0$ is reciprocal of the other, then value of k is 8.
Reason (R): Roots of the quadratic equation $x^2 - x + 1 = 0$ are real. **1**

SECTION — B

Section - B comprises of Very Short Answer (VSA) questions of 2 marks each.

21. If $\sin \alpha = \frac{1}{2}$, then find the value of $(3 \cos \alpha - 4 \cos^3 \alpha)$. **2**

22. **(a)** Find the coordinates of the point which divides the join of A(–1, 7) and B(4, –3) in the ratio 2 : 3. **2**

OR

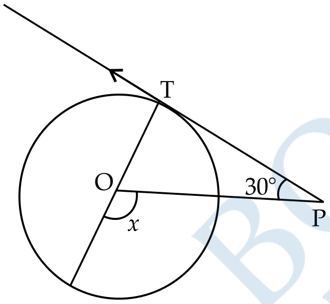
(b) If the points A(2, 3), B(–5, 6), C(6, 7) and D(p, 4) are the vertices of a parallelogram ABCD, find the value of p. **2**

23. **(a)** Find the discriminant of the quadratic equation $3x^2 - 2x + \frac{1}{3} = 0$ and hence find the nature of its roots. **2**

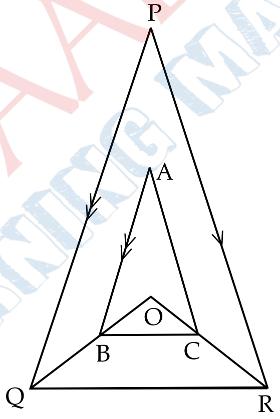
OR

(b) Find the roots of the quadratic equation $x^2 - x - 2 = 0$. **2**

24. In the adjoining figure, PT is a tangent at T to the circle with centre O. If $\angle$TPO = 30°, find the value of x. **2**



25. In the adjoining figure, A, B and C are points on OP, OQ and OR respectively such that AB || PQ and AC || PR. Show that BC || QR. **2**



SECTION — C

Section - C comprises of Short Answer (SA) type questions of 3 marks each.

26. Find the zeroes of the quadratic polynomial $x^2 + 6x + 8$ and verify the relationship between the zeroes and the coefficients. **3**

27. Prove that $\frac{1+\tan^2 A}{1+\cot^2 A} = \sec^2 A - 1$ **3**

28. **(a)** A lending library has a fixed charge for first three days and an additional charge for each day thereafter. Rittik paid 27 for a book kept for 7 days and Manmohan paid ₹ 21 for a book kept for 5 days. Find the fixed charges and the charge for each extra day. **3**

OR

(b) Find the values of 'a' and 'b' for which the system of linear equations $3x + 4y = 12$, $(a + b)x + 2(a - b)y = 24$ has infinite number of solutions. **3**

29. A die is rolled once. Find the probability of getting:

(i) an even prime number.

(ii) a number greater than 4.

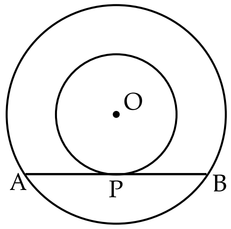
(iii) an odd number. **3**

30. Find the area of the sector of a circle of radius 7 cm and of central angle 90°. Also, find the area of corresponding major sector. **3**

31. **(a)** Prove that the lengths of tangents drawn from an external point to a circle are equal. **3**

OR

(b) Two concentric circles with centre O are of radii 3 cm and 5 cm. Find the length of chord AB of the larger circle which touches the smaller circle at P. **3**



SECTION — D

Section - D comprises of Long Answer (LA) type questions of 5 marks each.

32. **(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. **5**

OR

(b) 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. **5**

33. **(a)** Find the sum of first 25 terms of the A.P. whose nth term is given by $a_n = 5 + 6n$. Also, find the ratio of 20th term to 45th term. **5**

OR

(b) In an A.P., if $S_n = 3n^2 + 5n$ and $a_k = 164$, find the value of k. **5**

34. The following table gives the monthly consumption of electricity of 100 families:

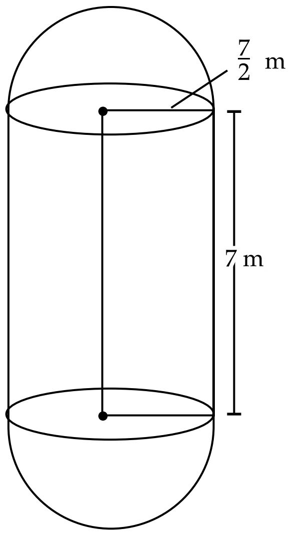
Monthly Consumption (in units)	130 – 140	140 – 150	150 – 160	160 – 170	170 – 180	180 – 190	190 – 200
Number of families	5	9	17	28	24	10	7

Find the median of the above data. **5**

35. The boilers are used in thermal power plants to store water and then used to produce steam. One such boiler consists of a cylindrical part in middle and two hemispherical parts at its both ends.

Length of the cylindrical part is 7 m and radius of cylindrical part is $\frac{7}{2}$ m.

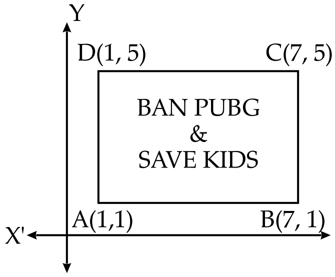
Find the total surface area and the volume of the boiler. Also, find the ratio of the volume of cylindrical part to the volume of one hemispherical part. **5**



SECTION — E

Section - E comprises of 3 Case Study / Passage Based questions of 4 marks each.

36. Use of mobile screen for long hours makes your eye sight weak and give you headaches. Children who are addicted to play "PUBG" can get easily stressed out. To raise social awareness about ill effects of playing PUBG, a school decided to start 'BAN PUBG' campaign, in which students are asked to prepare campaign board in the shape of a rectangle: One such campaign board made by class X student of the school is shown in the figure.



Based on the above information, answer the following questions:

(i) Find the coordinates of the point of intersection of diagonals AC and BD. **1**

(ii) Find the length of the diagonal AC. **1**

(iii) (a) Find the area of the campaign Board ABCD. **2**

OR

(b) Find the ratio of the length of side AB to the length of the diagonal AC. **2**

37. Khushi wants to organize her birthday party. Being health conscious, she decided to serve only fruits in her birthday party. She bought 36 apples and 60 bananas and decided to distribute fruits equally among all.
Based on the above information, answer the following questions:

(i) How many guests Khushi can invite at the most? **1**

(ii) How many apples and bananas will each guest get? **1**

(iii) (a) If Khushi decides to add 42 mangoes, how many guests Khushi can invite at the most? **2**

OR

(b) If the cost of 1 dozen of bananas is ₹ 60, the cost of 1 apple is ₹ 15 and cost of 1 mango is ₹ 20, find the total amount spent on 60 bananas, 36 apples and 42 mangoes. **2**

38. Observe the figures given below carefully and answer the questions:

Figure A

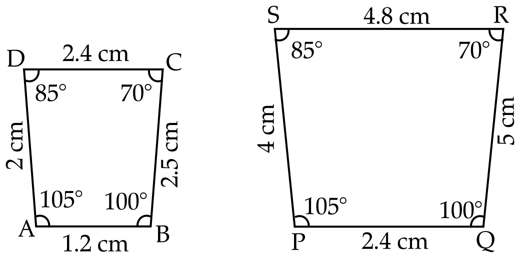


Figure B

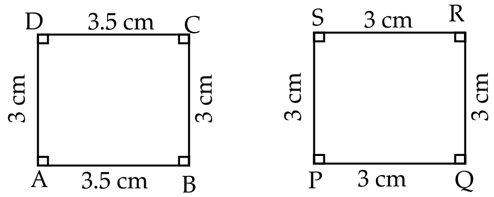
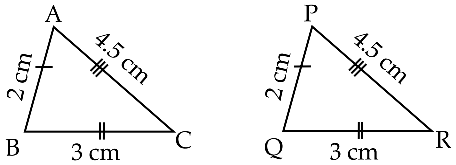


Figure C



(i) Name the figure(s) where in two figures are similar. **1**

(ii) Name the figure(s) where in the figures are congruent. **1**

(iii) (a) Prove that congruent triangles are also similar but not the converse. **2**

OR

(b) What more is least needed for two similar triangles to be congruent ? **2**

Delhi Set-II **430/4/2**

Note: Except these, all other questions are from Delhi Set - I

SECTION — A

Section-A consists of Multiple Choice Type questions of 1 mark each

1. Let E be an event such that P(not E) = $\frac{1}{5}$, then P(E) is equal to: **1**

(a) $\frac{1}{5}$ **(b)** $\frac{2}{5}$

(c) 0 **(d)** $\frac{4}{5}$

7. A quadratic polynomial whose sum and product of zeroes are 2 and –1 respectively is: **1**

(a) $x^2 + 2x + 1$ **(b)** $x^2 - 2x - 1$

(c) $x^2 + 2x - 1$ **(d)** $x^2 - 2x + 1$

8. (HCF × LCM) for the numbers 30 and 70 is: **1**

(a) 2100 **(b)** 21

(c) 210 **(d)** 70

11. The angle of elevation of the top of a 15 m high tower at a point $15\sqrt{3}$ m away from the base of the tower is: **1**

(a) 30° **(b)** 45°

(c) 60° **(d)** 90°

12. $\left(\frac{2}{3}\sin 0° - \frac{4}{5}\cos 0°\right)$ is equal to: **1**

(a) $\frac{2}{3}$ **(b)** $\frac{-4}{5}$

(c) 0 **(d)** $\frac{-2}{15}$

13. From a well-shuffled deck of 52 cards, a card is drawn at random. What is the probability of getting king of hearts? **1**

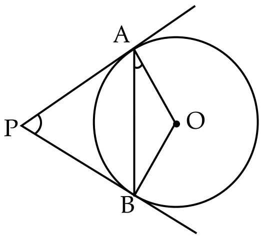
(a) $\frac{1}{52}$ **(b)** $\frac{1}{26}$

(c) $\frac{1}{13}$ **(d)** $\frac{12}{13}$

SECTION — B

Section - B comprises of Very Short Answer (VSA) questions of 2 marks each.

25. PA and PB are tangents drawn to the circle with centre O as shown in the figure.
Prove that ∠APB = 2 ∠OAB. **2**



SECTION — C

Section - C comprises of Short Answer (SA) type questions of 3 marks each.

27. If α, β are zeroes of the quadratic polynomial $x^2 - 5x + 6$, form another quadratic polynomial whose zeroes are $\frac{1}{\alpha}, \frac{1}{\beta}$. **3**

31. **(a)** If we add 1 to the numerator and subtract 1 from the denominator, a fraction reduces to 1. It becomes $\frac{1}{2}$ if we only add 1 to the denominator. What is the fraction? **3**

OR

(b) For which value of 'k' will the following pair of linear equations have no solution?.

$3x + y = 1$

$(2k - 1)x + (k - 1)y = 2k + 1$ **3**

SECTION — D

Section - D comprises of Long Answer (LA) type questions of 5 marks each.

32. **(a)** Find the sum of first 51 terms of an A.P. whose second and third terms are 14 and 18, respectively. **5**

OR

(b) The first term of an A.P. is 5, the last term is 45 and the sum is 400.

Find the number of terms and the common difference. **5**

33. The distribution below gives the weights of 30 students of a class. Find the median weight of the students:

Weight in kg	40 – 45	45 – 50	50 – 55	55 – 60	60 – 65	65 – 70	70 – 75
Number of Students	2	3	8	6	6	3	2

Delhi Set-III **430/4/3**

Note: Except these, all other questions are from Delhi Set - I & set II

SECTION — A

Section-A consists of Multiple Choice Type questions of 1 mark each

1. The value of k for which the equations $3x - y + 8 = 0$ and $6x - ky + 16 = 0$ represent coincident lines is: **1**

(a) $\frac{1}{2}$ **(b)** $-\frac{1}{2}$

(c) 2 **(d)** -2

2. A circle of radius 5.2 cm has two tangents AB and CD parallel to each other. What is the distance between the two tangents? **1**

(a) 5.2 cm **(b)** 10.4 cm

(c) 20.8 cm **(d)** can't find

3. The number of polynomials having zeroes -3 and 4 is: **1**

(a) 1 **(b)** 2

(c) 3 **(d)** more than 3

4. If the perimeter and the area of a circle are numerically equal, then the radius of the circle is: **1**

(a) 2 units **(b)** π units

(c) 4 units **(d)** 2π units

17. What is the length of arc of a circle of radius 7 cm which subtends an angle of 90° at the centre of the circle ? **1**

(a) 22 cm **(b)** 11 cm

(c) $\frac{77}{2}$ cm **(d)** $\frac{11}{2}$ cm

18. $(3 \sin^2 30° - 4 \cos^2 60°)$ is equal to: **1**

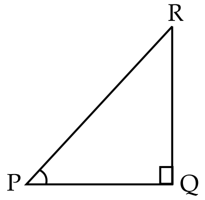
(a) $\frac{5}{4}$ **(b)** $-\frac{3}{4}$

(c) $-\frac{1}{4}$ **(d)** $-\frac{9}{4}$

SECTION — B

Section - B comprises of Very Short Answer (VSA) questions of 2 marks each.

25. In a right triangle PQR, right angled at Q. If tan P = $\sqrt{3}$, then evaluate 2 sin P cos P. **2**



SECTION — C

Section - C comprises of Short Answer (SA) type questions of 3 marks each.

26. Prove that $\frac{1+\sec\theta}{\sec\theta} = \frac{\sin^2\theta}{1-\cos\theta}$ **3**

27. An unbiased coin is tossed twice. Find the probability of getting:

(a) at least one head.

(b) exactly one tail.

(c) at most one head. **3**

SECTION — D

Section - D comprises of Long Answer (LA) type questions of 5 marks each.

34. **(a)** The first term of an A.P. is – 5 and the last term is 45. If the sum of all the terms of the A.P. is 120, find the number of terms and the common difference. **5**

OR

(b) If the sum of first 7 terms of an A.P. is 49 and that of first 17 terms is 289, find the sum of first n terms. **5**

35. **(a)** As observed from the top of a 75 m high light house from the sea- level, the angles of depression of two ships are 30° and 45°. If one ship is exactly behind the other on the same side of the light house, find the distance between the two ships. (use $\sqrt{3}$ = 1.73) **5**

OR

(b) From a point P on the ground, the angle of elevation of the top of a 10 m tall building is 30°. A flag is hoisted at the top of the building and the angle of elevation of the top of the flagstaff from P is 45°. Find the length of the flagstaff and the distance of the building from the point P. (use $\sqrt{3}$ = 1.73) **5**

Outside Delhi Set-I **430/6/1**

SECTION — A

Section-A consists of Multiple Choice Type questions of 1 mark each

1. The time, in seconds, taken by 150 athletes to run a 100 m hurdle race are tabulated below: **1**

Time (sec.)	13 – 14	14 – 15	15 – 16	16 – 17	17 – 18	18 – 19
Number of Athletes	2	4	5	71	48	20

The number of athletes who completed the race in less than 17 seconds is

(a) 11 **(b)** 71

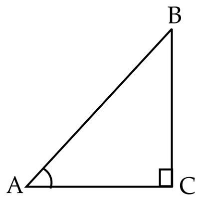
(c) 82 **(d)** 68

2. The distance of the point (5, 0) from the origin is: **1**

(a) 0 **(b)** 5

(c) $\sqrt{5}$ **(d)** 5^2

3. In ΔABC, right angled at C, if tan A = $\frac{8}{7}$, then the value of cot B is: **1**



(a) $\frac{7}{8}$ **(b)** $\frac{8}{7}$

(c) $\frac{7}{\sqrt{113}}$ **(b)** $\frac{8}{\sqrt{113}}$

4. Area of a quadrant of a circle of radius 7 cm is: **1**

(a) 154 cm^2 **(b)** 77 cm^2

(c) $\frac{77}{2}$ cm^2 **(d)** $\frac{77}{4}$ cm^2

5. If HCF (72, 120) = 24, then LCM (72, 120) is: **1**

(a) 72 **(b)** 120

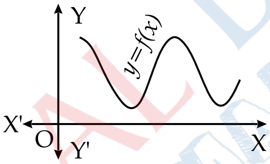
(c) 360 **(d)** 9640

6. One card is drawn at random from a well-shuffled deck of 52 playing cards. What is the probability of getting a black king? **1**

(a) $\frac{1}{26}$ **(b)** $\frac{1}{13}$

(c) $\frac{1}{52}$ **(d)** $\frac{1}{2}$

7. The graph of $y = f(x)$ is shown in the figure for some polynomial $f(x)$.



The number of zeroes of $f(x)$ is: **1**

(a) 0 **(b)** 2

(c) 3 **(d)** 4

8. The value of k, if $(6, k)$ lies on the line represented by $x - 3y + 6 = 0$, is: **1**

(a) – 4 **(b)** 12

(c) – 12 **(d)** 4

9. The prime factorisation of the number 2304 is: **1**

(a) $2^8 \times 3^2$ **(b)** $2^7 \times 3^3$

(c) $2^8 \times 3^1$ **(d)** $2^7 \times 3^2$

10. If n is a natural number, then 8^n cannot end with digit **1**

(a) 0 **(b)** 2

(c) 4 **(d)** 6

11. The median of first seven prime numbers is: **1**

(a) 5 **(b)** 7

(c) 11 **(d)** 13

12. If (2, 4) is the mid-point of the line-segment joining (6, 3) and $(a, 5)$, then the value of a is: **1**

(a) 2 **(b)** 4

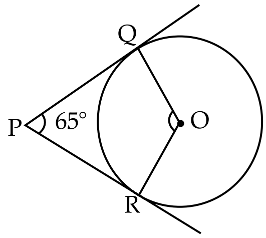
(c) – 4 **(d)** – 2

13. The value of 'k' for which the system of equations $kx + 2y = 5$ and $3x + 4y = 1$ have no solution, is: **1**

(a) $k = \frac{3}{2}$ **(b)** $k \neq \frac{3}{2}$

(c) $k \neq \frac{2}{3}$ **(d)** $k = 15$

14. In the given figure, PQ and PR are tangents drawn from P to the circle with centre O such that $\angle QPR = 65°$. The measure of $\angle QOR$ is. **1**



(a) 65° **(b)** 125°
(c) 115° **(d)** 90°

15. The zeroes of the quadratic polynomial $16x^2 - 9$ are: **1**

(a) $\frac{3}{4}, \frac{3}{4}$ **(b)** $-\frac{3}{4}, \frac{3}{4}$
(c) $\frac{9}{16}, \frac{9}{16}$ **(d)** $-\frac{3}{4}, -\frac{3}{4}$

16. If –5, x, 3 are three consecutive terms of an A.P., then the value of x is: **1**

(a) – 2 **(b)** 2
(c) 1 **(d)** – 1

17. An unbiased die is thrown. The probability of getting an odd prime number is: **1**

(a) $\frac{1}{6}$ **(b)** $\frac{1}{2}$
(c) $\frac{2}{3}$ **(d)** $\frac{1}{3}$

18. If the mean of 6, 7, x, 8, y, 14 is 9, then

(a) $x + y = 21$ **(b)** $x + y = 19$
(c) $x - y = 19$ **(d)** $x - y = 21$

(Assertion - Reason type questions)

Directions for Q. 19 & Q. 20: 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 true; and Reason (R) is the correct explanation of 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 probability that a leap year has 53 Sundays is $\frac{2}{7}$.

Reason (R): The probability that a non-leap year has 53 Sundays is $\frac{1}{2}$. **1**

20. **Assertion (A):** For $0 < 0 \le 90°$, cosec θ – cot θ and cosec θ + cot θ are reciprocal of each other.
Reason (R): $\cot^2 \theta - \text{cosec}^2 \theta = 1$. **1**

SECTION — B

Section - B consists of Very Short Answer (VSA) type questions of 2 marks each.

21. **Evaluate:** $5 \text{ cosec}^2 45° - 3 \sin^2 90° + 5 \cos 0°$. **2**

22. **(a)** Find a quadratic polynomial whose zeroes are 6 and – 3. **2**

OR

(b) Find the zeroes of the polynomial $x^2 + 4x - 12$. **2**

23. **(a)** Find the value of k for which the roots of the quadratic equation $5x^2 - 10x + k = 0$ are real and equal. **2**

OR

(b) If one root of the quadratic equation $3x^2 - 8x - (2k + 1) = 0$ is seven times the other, then find the value of k. **2**

24. A box contains 20 discs which are numbered from 1 to 20. If one disc is drawn at random from the box, then find the probability that the number the drawn disc is a

(i) 2-digit number

(ii) number less than 10 **1+1**

25. From a point P, the length of the tangent to a circle is 24 cm and the distance of P from the centre of the circle is 25 cm. Find the radius of the circle. **2**

SECTION — C

Section - C consists of Short Answer (SA) type questions of 3 marks each.

26. The sum of the reciprocals of Varun's age (in years) 3 years ago and 5 years from now is $\frac{1}{3}$. Find his present age. **3**

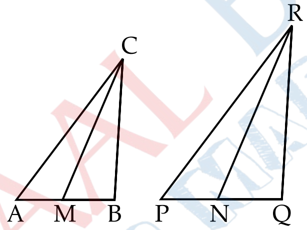
27. A survey conducted on 20 households in a locality by a group of students resulted in the following frequency table for the number of family members in a household:

Family size	1 – 3	3 – 5	5 – 7	7 – 9	9 – 11
Number of Families	7	8	2	2	1

Find the median of this data. **3**

28. (a) E is a point on the side AD produced of a parallelogram ABCD and BE intersects CD at F. Show that $\Delta ABE \sim \Delta CFB$. **3**

OR



(b) In the given figure, CM and RN are respectively the medians of ΔABC and ΔPQR. If $\Delta ABC \sim \Delta PQR$, then prove that $\Delta AMC \sim \Delta PNR$. **3**

29. Find the co-ordinates of the points of trisection of the line-segment joining the points (5, 3) and (4, 5). **3**

30. Prove that $3-2\sqrt{5}$ is an irrational number, given that $\sqrt{5}$ is an irrational number. **3**

31. (a) Prove that $\frac{\cot A-\cos A}{\cot A+\cos A}=\frac{\cos^2 A}{(1+\sin A)^2}$ **3**

OR

(b) Prove that $(\sec\theta + \tan\theta)(1 - \sin\theta) = \cos\theta$ **3**

SECTION — D

Section - D consists of Long Answer (LA) type questions of 5 marks each.

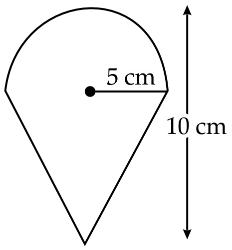
32. (a) From a point on a bridge across a river, the angles of depression of the banks on opposite sides of the river are 30° and 45° respectively. If the bridge is at a height of 3 m from the banks, find the width of the river. (Use $\sqrt{3}$ = 1.73) **5**

OR

(b) From a point on the ground, the angle of elevation of the bottom and top of a transmission tower fixed at the top of a 20 m high building are 45° and 60° respectively. Find the height of the tower. (Use $\sqrt{3}$ = 1.73) **5**

33. The first term of an A.P. is 22, the last term is -6 and the sum of all the terms is 64. Find the number of terms of the A.P. Also, find the common difference. **5**

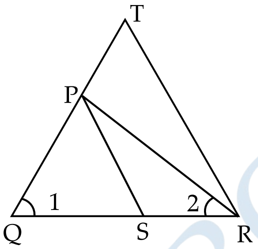
34. An ice-cream filled cone having radius 5 cm and height 10 cm is as shown in the figure. Find the volume of the ice-cream in 7 such cones. **5**



35. **(a)** Prove that a line drawn parallel to one side of a triangle to intersect the other two sides in distinct points, divides the two sides in the same ratio. **5**

OR

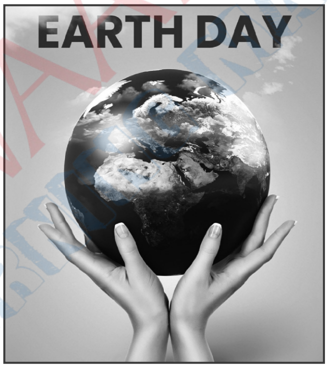
(b) In the given figure, $\frac{QR}{QS} = \frac{QT}{PR}$ and $\angle 1 = \angle 2$. Prove that $\Delta PQS \sim \Delta TQR$. **5**



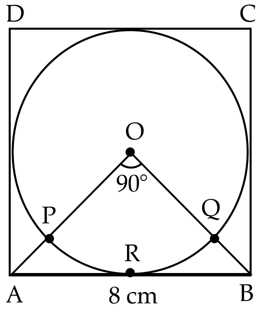
SECTION — E

Section - E comprises of 3 Case Study questions each of 4 marks.

36. For the inauguration of 'Earth day' week in a school, badges were given to volunteers. Organisers purchased these badges from an NGO, who made these badges in the form of a circle inscribed in a square of side 8 cm.



O is the centre of the circle and $\angle AOB = 90°$:



Based on the above information, answer the following questions:

(i) What is the area of square ABCD? **1**

(ii) What is the length of diagonal AC of square ABCD? **1**

(iii) Find the area of sector OPRQO. **2**

OR

(iii) Find the area of remaining part of square ABCD when area of circle is excluded. **2**

37.

Lokesh, a production manager in Mumbai, hires a taxi everyday to go to his office. The taxi charges in Mumbai consists of a fixed charges together with the charges for the distance covered. His office is at a distance of 10 km from his home. For a distance of 10 km to his office, Lokesh paid ₹ 105. While coming back home, he took another route. He covered a distance of 15 km and the charges paid by him were ₹ 155.

Based on the above information, answer the following questions:

(i) What are the fixed charges? **1**

(ii) What are the charges per km? **1**

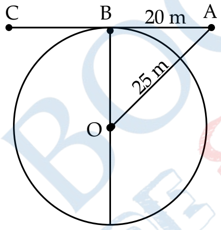
(iii) If fixed charges are ₹ 20 and charges per km are ₹ 10, then how much Lokesh have to pay for travelling a distance of 10 km? **2**

OR

(iii) Find the total amount paid by Lokesh for travelling 10 km from home to office and 25 km from office to home. [Fixed charges and charges per km are as in (i) & (ii). **2**

38.

Road



People of a circular village Dharamkot want to construct a road nearest to it. The road cannot pass through the village. But the people want the road at a shortest distance from the centre of the village. Suppose the road starts from A which is outside the circular village (as shown in the figure) and touch the boundary of the circular village at B such that AB = 20 m. Also the distance of the point A from the centre O of the village is 25 m.

Based on the above information, answer the following questions:

(i) If B is the mid-point of AC, then find the distance AC. **1**

(ii) Find the shortest distance of the road from the centre of the village. **1**

(iii) Find the circumference of the village. **2**

OR

(iii) Find the area of the village. **2**

Outside Delhi Set-II **430/6/2**

Note: Except these, all other questions are from Outside Delhi Set - I

SECTION — A

Section-A consists of Multiple Choice Type questions of 1 mark each

1. The HCF of the smallest 2-digit number and the smallest composite number is: **1**

(a) 4 **(b)** 20

(c) 2 **(d)** 10

2. The value of 'p' if $(-2, p)$ lies on the line represented by the equation $2x - 3y + 7 = 0$, is: **1**

(a) $-\frac{13}{2}$ **(b)** $\frac{13}{2}$

(c) -1 **(d)** 1

3. Distance of the point (6, 5) from the y-axis is: **1**

(a) 6 units **(b)** 5 units

(c) $\sqrt{61}$ units **(d)** 0 unit

13. The 20th term of an A.P, whose first term is – 2 and the common difference is 4, is **1**

(a) 78 **(b)** 74

(c) – 36 **(d)** – 34

14. The zeroes of the polynomial $p(x) = 25x^2 - 49$ are: **1**

(a) $\frac{49}{25}, \frac{49}{25}$ **(b)** $-\frac{49}{25}, \frac{49}{25}$

(c) $\frac{7}{5}, -\frac{7}{5}$ **(d)** $\frac{7}{5}, \frac{7}{5}$

15. The mean of first ten natural numbers is: **1**

(a) 5.5 **(b)** 55

(c) 45 **(d)** 4.5

SECTION — B

Section - B consists of Very Short Answer (VSA) type questions of 2 marks each.

25. **Evaluate:** $\dfrac{5\,\text{cosec}^2\, 30° - \cos 90°}{4\tan^2 60°}$ **2**

SECTION — C

Section - C consists of Short Answer (SA) type questions of 3 marks each.

26. Prove that $5+2\sqrt{3}$ is an irrational number, given that $\sqrt{3}$ is an irrational number. **3**

27. If A and B are (– 2, – 2) and (2,– 4) respectively; then find the co-ordinates of the point P such that $\frac{AB}{AB} = \frac{3}{7}$. **3**

SECTION — D

Section - D consists of Long Answer (LA) type questions of 5 marks each.

33. A solid is in the shape of a cone standing on a hemisphere with both their diameters being equal to 1 cm and the height of the cone is equal to its radius. Find the volume of the solid. [Use $\pi = 3.14$] **5**

Outside Delhi Set-III **430/6/3**

Note: Except these, all other questions are from Outside Delhi Set - I & Set - II

SECTION — A

Section - A consists of Multiple Choice Type questions of 1 mark each

1. The prime factorisation of the number 5488 is: **1**

(a) $2^3 \times 7^3$ **(b)** $2^4 \times 7^3$

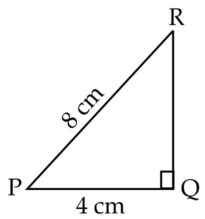
(c) $2^4 \times 7^4$ **(d)** $2^3 \times 7^4$

2. The Empirical relation between the three measures of central tendency is: **1**

(a) Mode = 3 Mean – 2 Median **(b)** Mode = 2 Median – 3 Mean

(c) Mode = 2 Mean – 3 Median **(d)** Mode = 3 Median – 2 Mean

3. In the given figure, ΔPQR is a right triangle right angled at Q. If PQ = 4 cm and PR = 8 cm, then P is: **1**



(a) 60° **(b)** 45°

(c) 30° **(d)** 15°

4. The median of first 10 natural numbers is: **1**

(a) 5 **(b)** 6

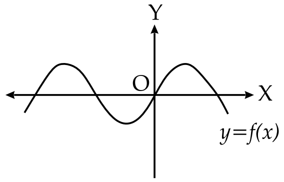
(c) 5.5 **(d)** 6.5

5. The zeroes of the polynomial $p(x) = 2x^2 - x - 3$ are: **1**

(a) $-\frac{3}{2}, 1$ **(b)** $\frac{3}{2}, 1$

(c) $-\frac{3}{2}, -1$ **(d)** $\frac{3}{2}, -1$

6. The graph of $y = f(x)$ is shown in the figure for some polynomial $f(x)$. The number of zeroes of $f(x)$ are **1**



(a) 4 **(b)** 3

(c) 2 **(d)** 1

SECTION — B

Section - B consists of Very Short Answer (VSA) type questions of 2 marks each.

21. A bag contains 30 discs numbered from 1 to 30. One disc is drawn at random from the bag. Find the probability that it bears a number

(a) divisible by 6.

(b) greater than 25. **2**

SECTION — C

Section - C consists of Short Answer (SA) type questions of 3 marks each.

26. Prove that $7+4\sqrt{5}$ is an irrational number, given that $\sqrt{5}$ is an irrational number. **3**

27. Solve for x: $\frac{1}{x} - \frac{1}{x-2} = 3; x \neq 0, 2$ **3**

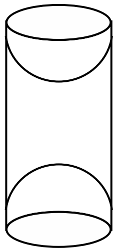
SECTION — D

Section - D consists of Long Answer (LA) type questions of 5 marks each.

34. The sum of the 4th and 8th term of an A.P. is 24 and the sum of the 6th and 10th term of the A.P. is 44. Find the A.P. Also, find the sum of first 25 terms of the A.P. **5**

35. A wooden article was made by scooping out a hemisphere from each end of a solid cylinder (as shown in the figure).

If the height of the cylinder is 10 cm and its base is of radius 3.5 cm, find the total surface area of the article.



ANSWERS

Delhi Set-I **430/4/1**

SECTION — A

1. Option (a) is correct

Explanation: Given that,

Sum of zeroes $= -3$

Product of zeroes $= 2$

Quadratic Polynomial is given by:

$x^2 -$ (sum of zeroes)x + (Product of zeroes)

So, $P(x)$: $x^2 - (-3)\,x + 2$

Required Quadratic Polynomial is $x^2 + 3x + 2$.

2. Option (b) is correct

Explanation: Given numbers are 70 and 40

We know that, HCF × LCM = Product of numbers

So, HCF × LCM = 70 × 40 = 280

3. Option (d) is correct

Explanation: Given that, Radius of semi-circle = 7 cm

Perimeter of semi-circular protractor $= \pi r + 2r$

$= \pi \times 7 + 2 \times 7$

$= 22 + 14 = 36$ cm

4. Option (c) is correct

Explanation: We have, The number is $(5 - 3\sqrt{5} + \sqrt{5})$

$= (5 - 2\sqrt{5})$ is also an irrational number.

5. Option (b) is correct

Explanation: We have,

$\Rightarrow \quad p(x) = x^2 + 5x + 6$

$\Rightarrow \quad p(-2) = (-2)^2 + 5(-2) + 6$

$= 4 - 10 + 6 = 0$

6. Option (b) is correct

Explanation: We know that, probability of an event cannot be greater than 1 so, $\frac{5}{3}$ cannot be the possible probability.

7. Option (d) is correct

Explanation: Given that,

$x + 2y + 5 = 0$

and $\quad -3x - 6y + 1 = 0$

We have, $\quad \frac{a_1}{a_2} = \frac{1}{-3} = -\frac{1}{3}$

$\Rightarrow \quad \frac{b_1}{b_2} = \frac{2}{-6} = -\frac{1}{3}$

$\Rightarrow \quad \frac{c_1}{c_2} = \frac{5}{1}$

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

Hence, there is no solution for these pair of linear equations.

8. Option (b) is correct

Explanation: We have,

In triangle ABC and DEF,

$\Rightarrow \angle A + \angle E + \angle C = 180°$

$\Rightarrow 47° + 83° + \angle C = 180°$

$\Rightarrow \quad \angle C = 180° - 130° = 50°$

9. Option (c) is correct

Explanation: We have,

$\Rightarrow \quad x - y = 1$ and $x + ky = 5$

$x = 2$ and $y = 1$

$\Rightarrow \quad 2 + k = 5$

$\Rightarrow \quad k = 3$

10. Option (c) is correct

Explanation: We have,

$\Rightarrow 5 \sin^2 90° - 2 \cos^2 0°$

$\Rightarrow 5 \times (1)^2 - 2 \times (1)^2 = 5 - 2 = 3$

11. Option (a) is correct

Explanation: Given that,

Radius = 14 cm

Angle subtended at centre = 60°

Length of arc $= \frac{2\pi r}{6} = \frac{2\pi \times 14}{6} = \frac{44}{3}$ cm

12. Option (b) is correct

Explanation: Let the angle be x

$\Rightarrow \quad \tan x = \frac{\text{height of tower}}{\text{distance}}$

$\Rightarrow \quad \tan x = \frac{30}{30} = 1$

$\Rightarrow \quad \tan x = \tan 45°$

$\Rightarrow \quad x = 45°$

13. Option (c) is correct

Explanation: We have, 4 occurs maximum times in given data set

So, mode = 4

14. Option (b) is correct

Probability of getting red queen $= \frac{2}{52} = \frac{1}{26}$

15. Option (d) is correct

Explanation: Given that,

One root is 2 and sum of roots = 0

Other root = −2

Required quadratic equation is $(x - 2)(x + 2) = 0$

$\Rightarrow \quad x^2 - (2)^2 = 0$

$\Rightarrow \quad x^2 - 4 = 0$

16. Option (c) is correct

Explanation:

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

$\Rightarrow \quad 2x^2 + 3 + 2\sqrt{6}x + x^2 = 3x^2 - 5x$

$\Rightarrow \quad 5x + 2\sqrt{6}x + 3 = 0$

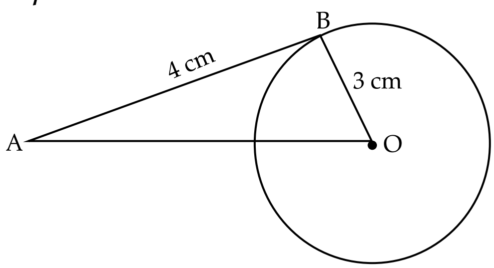
Hence, it is not a quadratic equation.

17. Option (a) is correct

Explanation: We know that, only one tangent can be drawn from a point to a circle.

18. Option (b) is correct

Explanation:



In triangle, AOB

We have, $(OA)^2 = (AB)^2 + (OB)^2$

$\Rightarrow \quad (AO)^2 = (3)^2 + (4)^2$

$= 9 + 16 = 25$

$\Rightarrow \quad AO = 5$ cm

19. Option (b) is correct

Explanation: **Assertion:** A tangent to a circle is always perpendicular to the radius through the point of contact.

Reason: The lengths of tangents drawn from an external point to a circle are equal.

So, both assertion and reason are correct but assertion is not the correct explanation for assertion.

20. Option (c) is correct

Explanation: **Assertion:** We have,

$4x^2 - 10x + (k-4) = 0$

Product of zeroes $= 1$

So, $\dfrac{k-4}{4} = 1$

$k = 8$

Assertion is correct

Reason:

For quadratic equation, $x^2 - x + 1 = 0$

We have, Discriminant $= (-1)^2 - 4 = -3 < 0$

So, no real roots are possible.

Reason is incorrect

Hence, Assertion is correct and reason is incorrect.

SECTION — B

21. Given that,

$$\sin\alpha = \frac{1}{2}$$

So, $\sin\alpha = \sin 30° = \dfrac{1}{2}$

$\Rightarrow \quad \alpha = 30°$

Now, $(3\cos\alpha - 4\cos^3\alpha)$

$$= (3\cos 30° - 4\cos^3 30°)$$

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

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

$$= 0$$

22. Given that, ratio is 2 : 3

A(– 1, 7) and B(4, – 3)

$(x_1, y_1) = (-1, 7)$ and $(x^2, y^2) = (4, -3)$

Coordinates of point be (x, y)

So, $m : n = 2 : 3$

$$\Rightarrow \quad x = \frac{mx_2 + nx_1}{m+n}$$

$$y = \frac{my_2 + ny_1}{m+n}$$

On putting values,

$$\Rightarrow \quad x = \frac{2\times 4 + (-1)\times 3}{5} = 1$$

$$\Rightarrow \quad y = \frac{2\times(-3) + 3\times 7}{5} = 3$$

So, Coordinates of required point are (1, 3).

OR

Given that,

$\Rightarrow$ A(2, 3), B(– 5, 6), C(6, 7) and D(p, 4)

We know that, diagonals of a parallelogram bisect each other

So, midpoint of line segment joining points A and C is same as midpoint of line segment joining points B and D

$$\Rightarrow \left[\frac{2+6}{2}, \frac{3+7}{2}\right] = \left[\frac{-5+p}{2}, \frac{6+4}{2}\right]$$

$$\Rightarrow \quad (4, 5) = \left[\frac{p-5}{2}, 5\right]$$

On comparing,

$$\Rightarrow \quad \frac{p-5}{2} = 4$$

$\Rightarrow \quad p - 5 = 8$

$\Rightarrow \quad p = 13$

23. Given that,

$$\Rightarrow \quad 3x^2 - 2x + \frac{1}{3} = 0$$

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

$$= 4 - 4 = 0$$

So, the given quadratic equation has real and equal roots.

OR

Given quadratic equation is $x^2 - x - 2 = 0$

$\Rightarrow \quad x^2 - x - 2 = 0$

$\Rightarrow \quad x^2 - 2x + x - 2 = 0$

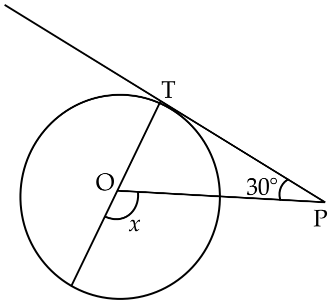
$\Rightarrow x(x-2) + 1(x-2) = 0$

$\Rightarrow \quad (x-2)(x+1) = 0$

$\Rightarrow \quad x = 2, -1$

So, the roots are –1, 2.

24. Given that,



PT is a tangent at T to circle

Also, $\angle TPO = 30°$

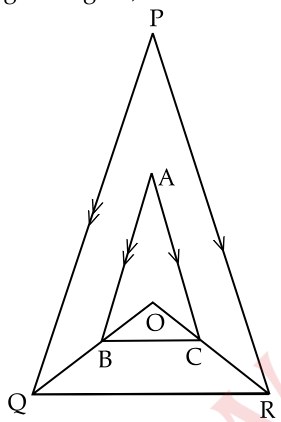
So, TPO is right angled triangle with $\angle T = 90°$

We have, $\angle POT = (180°) - (30° + 90°) = 60°$

As, $x + \angle POT = 180°$ (linear pair angles)

$\Rightarrow \quad x = 180° - 120° = 60°$

25. From the given figure,



We have, $AB||PQ$ and $AC||PR$

In triangle POQ,

$$\Rightarrow \quad \frac{OB}{BQ} = \frac{OA}{AP} \quad \text{...(i)}$$

In triangle POR,

$$\Rightarrow \quad \frac{OA}{AP} = \frac{OC}{CR} \quad \text{...(ii)}$$

From equations (i) and (ii),

$$\Rightarrow \quad \frac{OB}{BQ} = \frac{OA}{AP}$$

So, in triangle OQR, $BC||QR$ **Hence, proved.**

SECTION — C

26. Given that,

Quadratic polynomial is $x^2 + 6x + 8$

$\Rightarrow x^2 + 6x + 8$

$\Rightarrow x^2 + 4x + 2x + 8$

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

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

Zeroes are $-2, -4$

Now, Sum of zeroes $= -2 + (-4) = -6$

Product of zeroes $= (-2) \times (-4) = 8$

Also, Sum of zeroes $= \frac{-b}{a} = \frac{-6}{1} = -6$

Product of zeroes $= \frac{c}{a} = \frac{8}{1} = 8$

Hence, relationship between zeroes and coefficients verified.

27. To Prove: $\dfrac{(1+\tan^2 A)}{(1+\cot^2 A)} = \sec^2 A - 1$

LHS.

$$\text{We have, } \frac{\left(\dfrac{1+\sin^2 A}{\cos^2 A}\right)}{\left(\dfrac{1+\cos^2 A}{\sin^2 A}\right)}$$

$$= \frac{\left[\dfrac{(\cos^2 A + \sin^2 A)}{\cos^2 A}\right]}{\left[\dfrac{(\sin^2 A + \cos^2 A)}{\sin^2 A}\right]}$$

$$= \frac{\left(\dfrac{1}{\cos^2 A}\right)}{\left(\dfrac{1}{\sin^2 A}\right)}$$

[As $\sin^2 A + \cos^2 A = 1$]

$$= \frac{(\sin^2 A)}{(\cos^2 A)}$$

$= \tan^2 A$

$= \sec^2 A - 1$ **Hence, proved.**

28. Let the fixed charge be x and charge for each extra day be y

So, we have

$\Rightarrow \quad x + 7y = 27$

$\Rightarrow \quad x + 5y = 21$

On solving these pair of linear equations

$\Rightarrow \quad 2y = 6$

$\Rightarrow \quad y = 3$

And $\quad x = 6$

So, the fixed charge is ₹ 6 and charge for each extra day is ₹ 3.

OR

Given that,

$3x + 4y = 12$

$(a + b)x + 2(a - b)y = 24$

For infinite number of solutions,

$$\Rightarrow \quad \frac{3}{(a+b)} = \frac{4}{2(a-b)} = \frac{12}{24}$$

$$\Rightarrow \quad \frac{3}{(a+b)} = \frac{1}{2}$$

$\Rightarrow \quad a + b = 6 \quad$ ...(i)

$$\text{Also, } \quad \frac{2}{(a-b)} = \frac{1}{2}$$

$\Rightarrow \quad a - b = 4 \quad$ ...(ii)

From equations (i) and (ii),

$\Rightarrow a = 5, b = 1$

29. Given that,

A dice is rolled

(i) We know that on single throw of dice even prime numbers are {2}

So, required probability of getting even prime number $= \frac{1}{6}$

(ii) Numbers greater than 4 are {5, 6}

So, probability of getting number greater than 4

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

(iii) Odd numbers are {1, 3, 5]

So, probability of getting odd number $= \frac{3}{6} = \frac{1}{2}$

30. Given that,

Radius of circle $= 7$ cm

Central angle $= 90°$

Now, area of minor sector of circle

$$= \frac{\pi r^2 \theta}{360°}$$

$$= \frac{\pi(7)^2}{4} = \frac{22 \times 7 \times 7}{7 \times 4}$$

$$= 38.5 \text{ cm}^2$$

Area of complete circle $= \pi r^2 = \pi(7)^2$

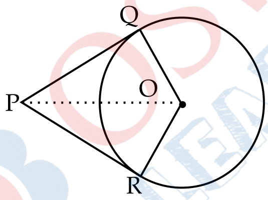
$= 154 \text{ cm}^2$

Now, area of major sector = Area of complete circle – Area of minor sector

$= 154 - 38.5$

$= 115.5 \text{ cm}^2$

31. We have,



Let PQ and PR are two tangents from a point P to a circle with centre at O.

We need to prove that $PR = PQ$

Here, $OQ \perp PQ$ and $OR \perp PR$

As tangent is perpendicular to the radius through the point of contact

Therefore,

$$\angle OQP = \angle ORP = 90°$$

In triangles, OQP and ORP,

$\Rightarrow \quad OR = OP$

$\Rightarrow \quad \angle OPQ = \angle ORP$

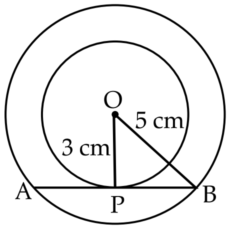
$\Rightarrow \quad OP = OP$

So, triangle OQP is congruent to triangle ORP

Therefore, $\quad PR = PQ \quad$ (By CPCT)

Hence proved.

OR



Given that,

Radius of smaller circle = 3 cm

Radius of larger circle = 5 cm

In triangle, OPB

$\Rightarrow \quad (OB)^2 = (OP)^2 + (BP)^2$

$\Rightarrow \quad (5)^2 = (3)^2 + (BP)^2$

$\Rightarrow \quad (BP)^2 = 25 - 9 = 16 = (4)^2$

$\Rightarrow \quad BP = 4$ cm

Also, $\quad AP = BP$

(As tangent is bisected at the point of contact)

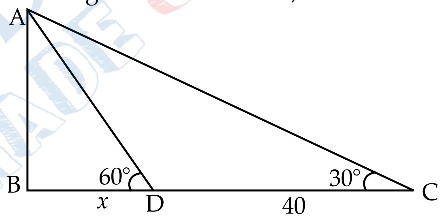
So, $\quad AP = BP = 4$ cm

$\Rightarrow \quad AB = 4 + 4 = 8$ cm

Length of chord $AB = 8$ cm.

SECTION — D

32. From the given data we have,



Shadow was 40 m longer when altitude of sun changes

Let $BD = x$ then $BC = 40 + x$

Now, in triangle ABD

$$\Rightarrow \quad \tan 60° = \frac{AB}{BD}$$

$$\Rightarrow \quad \tan 60° = \frac{AB}{x}$$

$$\Rightarrow \quad AB = x \tan 60° \quad \text{...(i)}$$

In triangle ABC,

$$\Rightarrow \quad \tan 30° = \frac{AB}{BC}$$

$$\Rightarrow \quad \tan 30° = \frac{AB}{(40 + x)}$$

$$\Rightarrow \quad AB = (40 + x)\tan 30° \quad \text{...(ii)}$$

From eqn (i) and (ii),

$\Rightarrow \quad x \tan 60° = (40 + x) \tan 30°$

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

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

$\Rightarrow \quad 2x = 40$

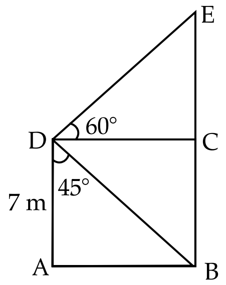
$\Rightarrow \quad x = 20$ m

So, $AB = x \tan 60° = 20\sqrt{3}$ m

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

OR

We have,



Let $AB = DC = x$ and $EB = y$

In triangle, ADB

$\Rightarrow \quad \tan 45° = \dfrac{AB}{DA}$

$\Rightarrow \quad 1 = \dfrac{AB}{7}$

$\Rightarrow \quad AB = 7$ m

So, $\quad AB = DC = 7$m

Also, $\quad AD = BC = 7$ m

In triangle, DEC

$\Rightarrow \quad \tan 60° = \dfrac{EC}{DC}$

$\Rightarrow \quad \sqrt{3} = \dfrac{EC}{7}$

$\Rightarrow \quad EC = 7\sqrt{3}$ m

$\Rightarrow \quad y = 7+7\sqrt{3}$

$= 19.12$ m

Height of tower $= 19.12$ m

33. Given that,

$\Rightarrow \quad a_n = 5 + 6n$

We have,

$\Rightarrow \quad a_1 = 5 + 6(1) = 11$

$\Rightarrow \quad a_2 = 5 + 6(2) = 17$

So, $a = 11$, $d = 6$

Sum of first 25 terms $= \dfrac{n}{2}(2a+(n-1)d)$

$= \dfrac{25}{2}[2(11)+(25-1)6]$

$= \dfrac{25}{2}[22+144]$

$= \dfrac{25}{2}[166]$

$= 2075$

Now, $\quad a_{20} = a + 19d$

$= 11 + 19(6)$

$= 125$

$\Rightarrow \quad a_{45} = a + 44d$

$= 11 + 44(6) = 275$

Required ratio $= \dfrac{a_{20}}{a_{45}}$

$= \dfrac{125}{275} = \dfrac{5}{11}$

Ratio is 5:11.

OR

Given that,

$\Rightarrow \quad S_n = 3n^2 + 5n$

$\Rightarrow \quad a_k = 164$

We have,

$S_1 = 3(1)^2 + 5(1) = 8$

$S_2 = 3(2)^2 + 5(2) = 22$

Now, $\quad S_2 - S_1 = 22 - 8 = 14$

$\Rightarrow \quad a_1 = a = 8$ and $a_2 = 14$

$\Rightarrow \quad d = a_2 - a_1 = 14 - 8 = 6$

Also, $\quad a_n = a + (n-1)d$

$\Rightarrow \quad a_n = 8 + 6(n-1) = 2 + 6n$

Also, $\quad a_k = 164$

$\Rightarrow \quad 2 + 6k = 164$

$\Rightarrow \quad 6k = 162$

$\Rightarrow \quad k = 27$

34. From the given table,

Monthly Consumption	Number of Families (f)	Cumulative frequency ($C.f.$)
130-140	5	5
140-150	9	14
150-160	17	31
160-170	28	59
170-180	24	83
180-190	10	93
190-200	7	100

We have, $\quad N = 100$

$\dfrac{N}{2} = 50$

Median class $= 160 - 170$

$\Rightarrow l = 160, f = 28, Cf = 31, h = 10$

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

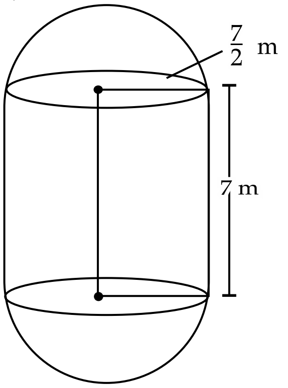
$$= 160 + \left[\frac{(50-31)}{28}\right] \times 10$$

$$= 160 + \left[\frac{19}{28}\right] \times 10$$

$= 160 + 6.78$

$= 166.78$

35. Given that,



Length of cylindrical part = 7 m

Radius of cylindrical part = $\frac{7}{2}$ m

Total surface area of figure = $2\pi rh + 2(2\pi r^2)$

$$= 2\pi\left[\frac{7}{2}\times 7 + 2\times\left(\frac{7}{2}\right)^2\right]$$

$= 308\ m^2$

Volume of boiler = Volume of cylindrical part + volume of two hemispherical parts

$$= \pi r^2 h + \left(\frac{4}{3}\right)\pi r^3$$

$$= \pi\left(\frac{7}{2}\right)^2\times(7) + \left(\frac{4}{3}\right)\pi\left(\frac{7}{2}\right)^3$$

$= 269.5 + 179.66$

$= 449.167\ m^3$

Required Ratio

$$= \frac{\text{Volume of cylindrical part}}{\text{Volume of one hemispherical part}}$$

$$= \frac{269.5}{89.83}$$

$= 3$

SECTION — E

36. We have, A(1, 1), B(7, 1), C(7, 5), D(1, 5)

From these coordinates it is clear that the board is in the shape of rectangle

(i) Point of intersection of diagonals is their midpoint

So, $\left[\frac{(1+7)}{2}, \frac{(1+5)}{2}\right] = (4, 3)$

(ii) Length of diagonal AC

$$AC = \sqrt{(7-1)(7-1)+(5-1)(5-1)}$$

$= \sqrt{52}$ units

(iii) Area of campaign board = 6 × 4 = 24 units square

OR

Ratio of lengths = $\frac{AB}{AC} = \frac{6}{\sqrt{52}} = 6:\sqrt{52}$

37. Khushi has 36 apples and 60 bananas

(i) Khushi can invite guests = HCF(36, 60) = 12

So, she can invite at most 12 guests.

(ii) Each guest get bananas = $\frac{60}{12}$ = 5 bananas

Each guest get apples = $\frac{36}{12}$ = 3 apples

(iii) If Khushi add 42 mangoes

She can invite guests = HCF (36, 60, 42) = 6

OR

Total amount spent = 5 × (60) + 15 × (36) + (42) × (20)

= 300 + 540 + 840

= ₹ 1680

38. **(i)** Figures are similar in Figure A, B and C.

(ii) Only Figure C is congruent.

(iii) All congruent figures are similar but all similar figures are not congruent.

For example, A pair of triangles which are similar by A.A.A. test of similarity are not congruent pairs of triangles since the definite lengths of sides are unknown.

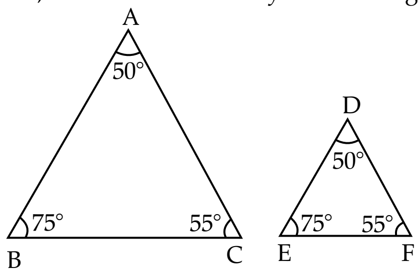
In ΔABC and ΔDEF,

$\angle A = \angle D = 50°$,

$\angle B = \angle E = 75°$

and $\angle C = \angle F = 55°$.

Hence, ΔABC~ΔDEF but they are not congruent.



OR

The length of corresponding sides must be equal.

Delhi Set-II **430/4/2**

SECTION — A

1. Option (d) is correct

Explanation: Given that,

$$P(\text{not } E) = \frac{1}{5}$$

So, $$P(E) = 1 - \frac{1}{5}$$

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

7. Option (b) is correct

Explanation: Given, that

sum of zeroes = 2

product of zeroes = – 1

Quadratic polynomial is given

x^2 – (sum of zeroes) x + product at zeroes

$\Rightarrow x^2 - (2)\,x + (-1)$

$\Rightarrow x^2 - 2\,x - 1$

8. Option (a) is correct

Explanation: We have,

$$\begin{aligned} \text{HCF} \times \text{LCM} &= \text{Product of numbers} \\ &= 30 \times 70 \\ &= 2100 \end{aligned}$$

11. Option (a) is correct

Explanation: Let the angle be x

$$\begin{aligned} \text{So,} \qquad \tan x &= \frac{15}{15\sqrt{3}} \\ &= \frac{1}{\sqrt{3}} \\ \Rightarrow \qquad \tan x &= \tan 30° \end{aligned}$$

So, Angle of elevation = 30°

12. Option (b) is correct

Explanation: We have,

$$\Rightarrow \frac{2}{3}\sin 0° - \frac{4}{5}\cos 0°$$

$$\Rightarrow \frac{2}{3} \times 0 - \frac{4}{5} \times 1$$

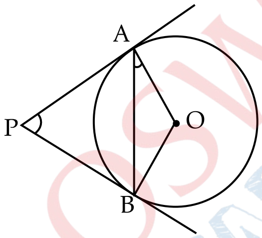
$$= -\frac{4}{5}$$

13. Option (a) is correct

Probability of getting king of hearts = $\frac{1}{52}$

SECTION — B

25. Let $\angle APB = x$



Now by theorem, the lengths of a tangents drawn from an external point to a circle are equal

So, PAB is an isosceles triangle

$$\begin{aligned} \text{Therefore,} \quad \angle PAB &= \angle PBA \\ &= \frac{1}{2}(180° - x) \\ &= 90° - \frac{x}{2} \end{aligned}$$

Also by theorem, the tangents at any point of a circle is perpendicular to the radius through the point of contact $\angle OPT = 90°$

$$\begin{aligned} \text{Therefore,} \quad \angle OAB &= \angle OAP - \angle PAB \\ &= 90° - (90° - \frac{x}{2}) \\ &= \frac{x}{2} = \frac{1}{2}\angle \text{APB} \\ \text{Hence,} \quad \angle APB &= 2\angle OAB. \end{aligned}$$

SECTION — C

27. Given that α and β are zeroes of quadratic polynomial $x^2 - 5x + 6$

$$\begin{aligned} \text{So,} \qquad \alpha + \beta &= 5 \\ \text{And} \qquad \alpha\beta &= 6 \end{aligned}$$

Polynomial whose zeroes are 1/α and 1/β is

$$\Rightarrow x^2 - \left(\frac{1}{\alpha} + \frac{1}{\beta}\right)x - \left(\frac{1}{\alpha}\right)\left(\frac{1}{\beta}\right)$$

$$\Rightarrow x^2 - \left(\frac{(\alpha+\beta)}{\alpha\beta}\right)x - \frac{1}{\alpha\beta}$$

$$\Rightarrow x^2 - \frac{5}{6}x - \frac{1}{6}$$ is the required polynomial.

31. Let the numerator be x and denominator be y

$$\Rightarrow \qquad \left(\frac{x+1}{y-1}\right) = 1$$

$$\Rightarrow \qquad \frac{x}{(y+1)} = \frac{1}{2}$$

We get,

$$\begin{aligned} \Rightarrow \qquad x + 1 &= y - 1 \text{ or } x - y = -2 \qquad \text{...(i)} \\ \Rightarrow \qquad 2x &= y + 1 \text{ or } 2x - y = 1 \qquad \text{...(ii)} \end{aligned}$$

On solving these equations (i) and (ii),

We have, $x = 3$ and $y = 5$

So, fraction is $\frac{x}{y} = \frac{3}{5}$

OR

Given that,

Pair of linear equation having no solution

$$\begin{aligned} 3x + y &= 1 \\ (2k-1)x + (k-1)y &= 2k + 1 \end{aligned}$$

$$\text{So,} \qquad \frac{3}{(2k-1)} = \frac{1}{(k-1)} \neq \frac{1}{(2k+1)}$$

On comparing,

$$\begin{aligned} \frac{3}{(2k-1)} &= \frac{1}{(k-1)} \\ \Rightarrow \qquad 3k - 3 &= 2k - 1 \\ \Rightarrow \qquad k &= 2 \end{aligned}$$

$$\begin{aligned} \text{Also,} \qquad \frac{1}{(k-1)} &\neq \frac{1}{(2k+1)} \\ 2k + 1 &\neq k - 1 \\ \Rightarrow \qquad k &\neq -2 \end{aligned}$$

Hence, $k = 2$ and $k \neq -2$.

SECTION — D

32. Given that,

Let a be the first term and d be the common difference of AP

$$\begin{aligned} \Rightarrow \qquad a_2 &= 14 \\ \Rightarrow \qquad a_3 &= 18 \\ \text{So,} \qquad a + d &= 14 \\ \text{And} \qquad a + 2d &= 18 \end{aligned}$$

From these conditions,

$$\Rightarrow \qquad d = 4 \text{ and } a = 10$$

$$\text{Sum of 51 terms} = \left(\frac{51}{2}\right)[2(10)+(51-1)4]$$

$$= \left(\frac{51}{2}\right)[20+200]$$

$$= \left(\frac{51}{2}\right)(220)$$

$$= 5610$$

OR

Given that,

$\Rightarrow$ First term, $a = 5$

$\Rightarrow$ Last term, $l = 45$

Sum of $AP = 400$

We know that,

$$\text{Sum} = \frac{n}{2}[a+l]$$

$$400 = \frac{n}{2}[5+45]$$

$\Rightarrow$ $n = 16$

So, there are 16 terms in AP

Now, $a_n = l = 45$

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

[d is common difference of AP]

$\Rightarrow$ $45 = 5 + (16-1)d$

$\Rightarrow$ $40 = 15d$

$\Rightarrow$ $d = \frac{8}{3}$

33. We have,

Weight in kg	Number of Students (f)	Cumulative Frequency (Cf)
40-45	2	2
45-50	3	5
50-55	8	13
55-60	6	19
60-65	6	25
65-70	3	28
70-75	2	30

Here,

$$N = 30$$

$$\frac{N}{2} = 15$$

So, Median class is 55-60

Also, $l = 55, f = 6, Cf = 13, h = 5$

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

$$= 55 + \left[\frac{(15-13)}{6}\right] \times 5$$

$$= 55 + 1.66$$

$$= 56.66$$

Delhi Set-III **430/4/3**

SECTION — A

1. Option (c) is correct

Explanation: We know that,

For coincident lines,

$\Rightarrow$ $\frac{3}{6} = \frac{-1}{-k} = \frac{8}{16}$

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

$\Rightarrow$ $k = 2$

2. Option (b) is correct

Explanation: The distance between two parallel tangents will be the diameter of circle

So, Distance between tangents

$= 2 \times 5.2$ cm

$= 10.4$ cm

3. Option (d) is correct

Explanation: The number of polynomials having zeroes -3 and 4 are infinite or more than 3.

Required polynomial $= (x+3)(x-4)$

$= x^2 - x - 12$

Now, we can check that any other quadratic polynomial that fits these conditions will be of the form $k(x^2 - x - 12)$. Where k is real.

4. Option (a) is correct

Explanation: Given that,

$\Rightarrow$ $2\pi r = \pi r^2$

$\Rightarrow$ $r = 2$ units

17. Option (b) is correct

Explanation: Given that,

Radius of circle $= 7$ cm

Central angle $= 90°$

$$\text{Length of arc} = 2\pi r\left(\frac{90°}{360°}\right)$$

$$= \pi\frac{r}{2}$$

$$= \frac{22}{7} \times \frac{7}{2}$$

$$= 11 \text{ cm}$$

18. Option (c) is correct

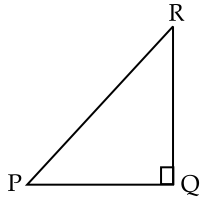
Explanation: $\Rightarrow 3\sin^2 30° - 4\cos^2 60°$

$\Rightarrow 3 \times \left(\frac{1}{2}\right)^2 - 4 \times \left(\frac{1}{2}\right)^2$

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

SECTION — B

25.



We have,

$\Rightarrow$ $\tan P = \sqrt{3}$

$\Rightarrow$ $\tan P = \frac{RQ}{PQ}$

$$= \sqrt{3} = \tan 60°$$

$\Rightarrow$ $P = 60°$

So, $2 \sin P \cos P = 2 \times \sin 60° \times \cos 60°$

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

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

SECTION — C

26. To prove:

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

We have,

$$\text{LHS} = \frac{(1+\sec\theta)}{\sec\theta}$$

$$= \frac{1}{\sec\theta} + \frac{\sec\theta}{\sec\theta}$$

$$= 1 + \cos\theta$$

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

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

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

$\Rightarrow (1 + \cos\theta)$

LHS = RHS **Hence proved.**

27. On tossing a coin twice,
Possible outcomes are {TT, HH, HT, TH}

(a) Required outcomes are {HH, HT, TH}
Probability of getting at least one head = 3/4

(b) Required outcomes are {TH, HT}
Probability of getting exactly one tail = 2/4

(c) Required outcomes are {HT, TH, TT}
Probability of getting at most one head = 3/4

SECTION — D

34. Given that,
First term, $a = -5$
Last term, $l = 45$
Sum of AP = 120
We know that,

$$\text{Sum} = \frac{n}{2}(a+l)$$

$$\Rightarrow 120 = \frac{n}{2}(-5+45)$$

$\Rightarrow$ $n = 6$

So, there are 6 terms in AP
Also, $a_n = l = 45$

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

d is common difference of AP

$\Rightarrow$ $45 = -5 + (6-1)d$

$\Rightarrow$ $50 = 5d$

$\Rightarrow$ $d = 10$

OR

Given that,

$S_7 = 49$

$S_{17} = 289$

So,

$$49 = \frac{7}{2}[2a + 6d]$$

$\Rightarrow$ $a + 3d = 7$ ...(i)

Also,

$$289 = \frac{17}{2}[2a + 16d]$$

$\Rightarrow$ $a + 8d = 17$ ...(ii)

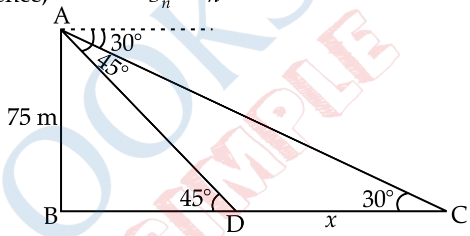
From equations (i) and (ii),
We get, $d = 2$ and $a = 1$

So, Sum of n terms $= \frac{n}{2}[2(1) + (n-1)2]$

$$= \frac{n}{2}[2 + 2n - 2] = n^2$$

Hence, $S_n = n^2$

35. (a)



Let the distance between two ships be x
Now,
In triangle ABC,

$$\Rightarrow \tan 30° = \frac{AB}{BC}$$

$$\Rightarrow BC = \frac{AB}{\tan 30°} = 75/\ (1/\sqrt{3}) = 75\sqrt{3}\text{ m}$$

Now,
In triangle ABD,

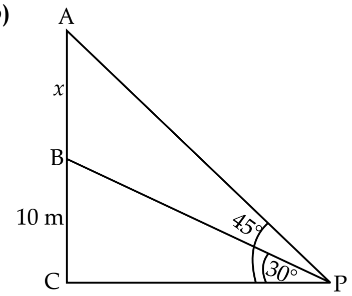
$$\Rightarrow \tan 45° = \frac{AB}{BD}$$

$$\Rightarrow 1 = \frac{AB}{BD}$$

$\Rightarrow$ AB = BD = 75 m
Also, DC = x = BC – BD
$\Rightarrow x = 75\sqrt{3} - 75 = 75(\sqrt{3} - 1) = 54.91$ m
Hence, distance between the two ships is 54.91m.

OR

(b)



Let the length of flagstaff be x
We have,
In triangle BDP,

$$\Rightarrow \tan 30° = \frac{BC}{CP}$$

$$\Rightarrow CP = \frac{BC}{\tan 30°} = 10/\ (1/\sqrt{3}) = 10\sqrt{3}\text{ m}$$

So, the distance of building from point P is $10\sqrt{3}$ m

Now, In triangle ACP,

$$\Rightarrow \tan 45° = \frac{AC}{CP}$$

$$\Rightarrow 1 = \frac{AC}{CP}$$

$\Rightarrow$ AC = CP = $10\sqrt{3}$ m

Also,

AB + BC = CP

$\Rightarrow x = 10 = 10\sqrt{3}$

$\Rightarrow x = 10\sqrt{3} - 10 = 10(\sqrt{3} - 1) = 10 \times 0.73 = 7.3$m

Hence, the length of flagstaff is 7.3 m

Outside Delhi Set-I — 430/6/1

SECTION — A

1. Option (c) is correct

Explanation: Number of athletes who completed the race in less than 17 seconds is:

$$2 + 4 + 5 + 71 = 82$$

2. Option (b) is correct

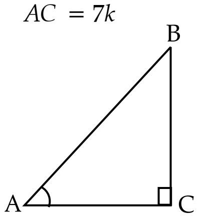
Explanation: Distance of the point (5, 0) from the origin is 5 units.

3. Option (b) is correct

Explanation: $\tan A = \frac{8}{7}$

$\therefore$ $BC = 8k$

and $AC = 7k$



where $k \neq 0$

$$\cot B = \frac{BC}{AC} = \frac{8k}{7k} = \frac{8}{7}$$

4. Option (c) is correct

Explanation: Area of Quadrant of Circle

$$= \frac{\theta}{360}\pi r^2$$

$$= \frac{90°}{360°} \times \frac{22}{7} \times 7 \times 7$$

$$= \frac{77}{2} \text{ cm}^2$$

5. Option (c) is correct

Explanation: Product of two numbers

$$= \text{HCF} \times \text{LCM}$$

$$72 \times 120 = 24 \times \text{LCM}$$

$$\therefore \quad \text{LCM} = \frac{72 \times 120}{24} = 360$$

6. Option (a) is correct

Explanation: number of Black kings = 2

Total Cards = 52

Required Probability $= \frac{2}{52} = \frac{1}{26}$

7. Option (a) is correct

Explanation: $y = f(x)$ is not intersect or touch the X-axis.

$\therefore$ Number of Zeroes of $f(x) = 0$

8. Option (d) is correct

Explanation: $x - 3y + 6 = 0$

$$6 - 3k + 6 = 0$$

$$\Rightarrow \quad k = 4$$

9. Option (a) is correct

Explanation: $2304 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3$

$$= 2^8 \times 3^2$$

2	2304
2	1152
2	576
2	288
2	144
2	72
2	36
2	18
3	9
3	3

10. Option (a) is correct

Explanation: $8^2 = 64, 8^4 = 4096, 8^3 = 512$

$\therefore 8^n$ Can not end with dight 0

11. Option (b) is correct

Explanation: 2, 3, 5, 7, 11, 13, 17

$\therefore$ Median is 7.

12. Option (d) is correct

Explanation: $x = \frac{x_1 + x_2}{2}$

$$2 = \frac{6 + a}{2}$$

$$\therefore \quad a = -2$$

13. Option (a) is correct

Explanation: $kx + 2y - 5 = 0$

$$3x + 4y - 1 = 0$$

For No Solution

$$\frac{k}{3} = \frac{2}{4} \neq \frac{-5}{-1}$$

$$k = \frac{6}{4} = \frac{3}{2}$$

14. Option (c) is correct

Explanation: $\angle QPR + \angle QOR = 180°$

$$\therefore \quad \angle QOR = 180° - \angle QPR$$

$$= 180° - 65°$$

$$= 115°$$

15. Option (b) is correct

Explanation: $16x^2 - 9 = 0$

$$(4x - 3)(4x + 3) = 0$$

$$\therefore \quad x = \pm\frac{3}{4}$$

16. Option (d) is correct

Explanation: – 5, x, 3 in A.P.

$$\therefore \quad x - (-5) = 3 - x$$

$$x + 5 = 3 - x$$

$$2x = -2$$

$$x = -1$$

17. Option (d) is correct

Explanation: Odd prime numbers are 3 and 5

$\therefore$ Required probability $= \frac{2}{6} = \frac{1}{3}$

18. Option (b) is correct

Explanation: $\frac{6+7+x+8+y+14}{6} = 9$

$x + y + 35 = 54$

$\therefore \quad x + y = 19$

19. Option (b) is correct

20. Option (c) is correct

SECTION — B

21. $5 \operatorname{cosec}^2 45° - 3 \sin^2 90° + 5 \cos 0°$

$= 5(\sqrt{2})^2 - 3(1)^2 + 5(1)$

$= 10 - 3 + 5$

$= 12.$

22. (a) $P(x) = k[x^2 - Sx + p]$

where k = non zero constant

S = Sum of zeroes

p = product of zeroes

$\therefore \quad P(x) = k[x^2 - (6-3) + 6(-3)]$

$= k(x^2 - 3x - 18)$

OR

(b) $x^2 + 4x - 12$

$= x^2 + 6x - 2x - 12$

$= x(x+6) - 2(x+6)$

$= (x+6)(x-2)$

$\therefore$ Zeroes of the polynomial – 6 and 2.

23. $5x^2 - 10x + k = 0$

(a) For real and equal roots $b^2 - 4ac = 0$

Where $a = 5, b = -10$ and $c = k$

$(-10)^2 - 4(5)(k) = 0$

$k = \frac{100}{20} = 5$

$\therefore \quad k = 5$

OR

(b) $3x^2 - 8x - (2k+1) = 0$

$\alpha = 7\beta$ (Given)

$\alpha + \beta = -\frac{-8}{3} = \frac{8}{3}$

$7\beta + \beta = \frac{8}{3} \Rightarrow \beta = \frac{1}{3}$

$\alpha\beta = \frac{-(2k+1)}{3}$

$7\beta\beta = \frac{-(2k+1)}{3}$

$7 \times \frac{1}{9} = \frac{-(2k+1)}{3}$

$7 = -6k - 3$

$k = \frac{10}{-6} = \frac{-5}{3}$

$\therefore \quad k = \frac{-5}{3}$

24. $S = \{1, 2, 3, 4, 5, \ldots 20\}$

$\therefore \quad n(S) = 20$

(i) 2 digit number $\{10, 11, 12, \ldots 20\}$

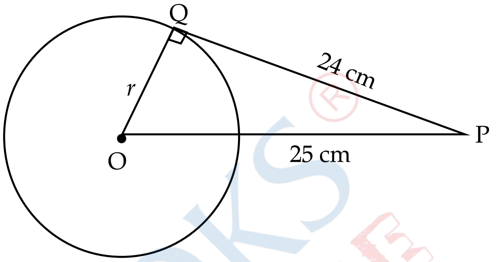
$\therefore \quad n(E) = 11$

Required Probability $= \frac{n(E)}{n(S)} = \frac{11}{20}$

(ii) number less then 10 = $\{1, 2, 3, 4, 5 \ldots 9\}$

Required probability $= \frac{9}{20}$

25. Let the radius of Circle be r cm



$\Delta OPQ, \angle Q = 90°$

$\therefore \quad OP^2 = OQ^2 + PQ^2$

$(25)^2 = r^2 + (24)^2$

$625 - 576 = r^2$

$49 = r^2$

$r = \pm 7$

$\therefore$ radius of circle = 7 cm

SECTION — C

26. Let the verun's present age be x years

According the Question

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

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

$\frac{2x+2}{x^2+2x-15} = \frac{1}{3}$

$x^2 + 2x - 15 = 6x + 6$

$x^2 - 4x - 21 = 0$

$x^2 - 7x + 3x - 21 = 0$

$x(x-7) + 3(x-7) = 0$

$(x-7)(x+3) = 0$

if $x - 7 = 0, \quad x = 7$

if $x + 3 = 0, \quad x = -3$

Age can not be negative

$\therefore \quad x = 7$

Hence Varun's age be 7 years.

27.

Family Size	Number of families (f)	Cumulative frequency (Cf)
1 – 3	7	7
3 – 5	8	15
5 – 7	2	17
7 – 9	2	19
9 – 11	1	20 = N

Median $= \frac{N^{th}}{2}$ term $= 10^{th}$ term

Median class 3 – 5

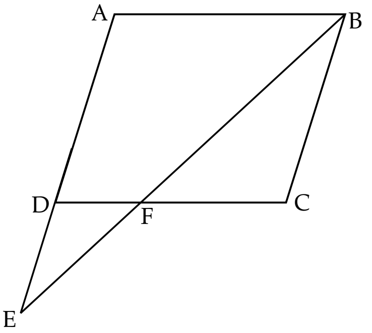
$$\text{Median} = l + \frac{\frac{N}{2} - Cf}{f} \times h$$

$$= 3 + \frac{10-7}{8} \times 2$$

$$= 3 + 0.75$$

$$\therefore \quad \text{median} = 3.75$$

28. (a) Given: $ABCD$ is a $||^{gm}$



To Prove: $\Delta ABE \sim \Delta CFB$

Proof: $\angle BAE = \angle FCB$ (opposite angles of $||^{gm}$)

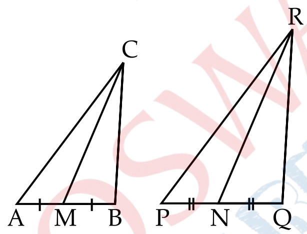
$\angle AEB = \angle FBC$ (Alternative angles of parallel lines AE and BC)

$\therefore \quad \Delta ABE \sim \Delta CFB$ (AA Test)

Hence Proved.

OR

(b)



Given: $\Delta ABC \sim \Delta PQR$

and CM and RN are medians of ΔABC and ΔPQR respectively.

To Prove: $\Delta AMC \sim \Delta PNR$

Proof: $\Delta ABC \sim \Delta PQR$ (Given)

$\therefore \quad \angle A = \angle P,$

and $$\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}$$

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

$$\frac{2AM}{2PN} = \frac{AC}{PR}$$

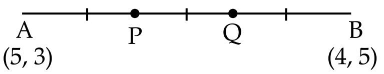
$$\frac{AM}{PN} = \frac{AC}{PR}$$

and $\angle A = \angle P$

$\therefore \quad \Delta AMC \sim \Delta PQR$ (SAS Test)

Hence Proved.

29.



Given: $AP = PQ = BQ$

$$\therefore \quad \frac{AP}{BP} = \frac{1}{2}$$

and $$\frac{AQ}{BQ} = \frac{2}{1}$$

$$\text{Coordinate of } P = \frac{m_1x_2 + m_2x_1}{m_1+m_2}, \frac{m_1y_2 + m_2y_1}{m_1+m_2}$$

$$= \frac{1\times4+2\times5}{1+2}, \frac{1\times5+2\times3}{1+2}$$

$$= \left(\frac{14}{3}, \frac{11}{3}\right)$$

$$\text{Coordinate of } Q = \frac{2\times4+1\times5}{1+2}, \frac{2\times5+1\times3}{1+2}$$

$$= \left(\frac{13}{3}, \frac{13}{3}\right)$$

30. To Prove: $3 - 2\sqrt{5}$ is an irrational number

Given $\sqrt{5}$ is an irrational number

Let $3 - 2\sqrt{5}$ is a rational number

$$\therefore \quad 3 - 2\sqrt{5} = \frac{p}{q} \qquad (\text{Where } q \neq 0)$$

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

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

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

p and q of are integers

$\therefore \frac{3q-p}{2q}$ is a rational number but $\sqrt{5}$ is an irrational number

Hence Rational number $\neq$ irrational number

So our assumption is wrong by contradiction fact

$\therefore 3 - 2\sqrt{5}$ is an irrational number. **Hence Proved.**

31. (a) $$\frac{\cot A - \cos A}{\cot A + \cos A} = \frac{\cos^2 A}{(1+\sin A)^2}$$

L.H.S. $$\frac{\cot A - \cos A}{\cot A + \cos A}$$

$$= \frac{\frac{\cos A}{\sin A} - \cos A}{\frac{\cos A}{\sin A} + \cos A}$$

$$= \frac{\cos A\left(\frac{1}{\sin A} - 1\right)}{\cos A\left(\frac{1}{\sin A} + 1\right)}$$

$$= \frac{\frac{1}{\sin A} - 1}{\frac{1}{\sin A} + 1}$$

$$= \frac{1-\sin A}{1+\sin A}$$

$$= \frac{1-\sin A}{1+\sin A} \times \frac{1+\sin A}{1+\sin A}$$

$$= \frac{1-\sin^2 A}{(1+\sin A)^2}$$

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

= R.H.S. **Hence Proved.**

OR

(b) $(\sec\theta + \tan\theta)(1-\sin\theta) = \cos\theta$

L.H.S. $(\sec\theta + \tan\theta)(1-\sin\theta)$

$$= \left(\frac{1}{\cos\theta} + \frac{\sin\theta}{\cos\theta}\right)(1-\sin\theta)$$

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

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

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

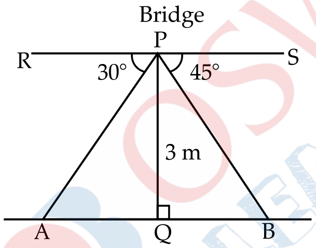
$$= \frac{\cos^2\theta}{\cos\theta}$$

$= \cos\theta$

= R.H.S. **Hence Proved.**

SECTION — D

32. (a)



Let the width of the river be x m

i.e., $AB = x$ m

P is the point on the bridge

$\therefore$ $PQ = 3$ m

and $\angle RPA = 30°$ and $\angle SPB = 45°$

In ΔAPQ, $\angle Q = 90°$ $\angle A = 30°$

$$\tan A = \frac{PQ}{AQ}$$

$$\tan 30° = \frac{3}{AQ}$$

$$\frac{1}{\sqrt{3}} = \frac{3}{AQ}$$

$\therefore$ $AQ = 3\sqrt{3}$ m ...(1)

In ΔPQB, $\angle Q = 90°$, $\angle B = 45°$

$$\tan B = \frac{PQ}{BQ}$$

$$\tan 45° = \frac{3}{BQ}$$

$$1 = \frac{3}{BQ}$$

$BQ = 3$ ...(2)

$AB = AQ + BQ$

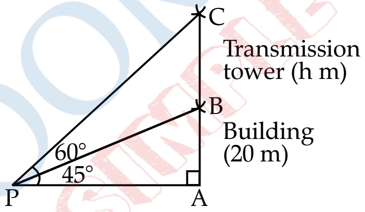
$= 3\sqrt{3} + 3 = 3(\sqrt{3}+1)$m

Width of River $= 3(\sqrt{3}+1)$

$= 3 \times 2.73 = 8.19$ m.

OR

(b)



Ler AB be the building

$\therefore$ $AB = 20$ m (Given)

Be be the transmission tower

$\therefore$ $BC = h$m

P is the point of observation

$\therefore$ $\angle CPA = 60°$ and $\angle BPA = 45°$

In ΔPAB

$$\tan \angle BPA = \frac{AB}{AP}$$

$$\tan 45° = \frac{AB}{AP}$$

$$1 = \frac{20}{AP}$$

therefore $AP = 20$ m ...(1)

In ΔCAP

$$\tan 60° = \frac{AC}{AP}$$

$$\tan 60° = \frac{AB+BC}{AP}$$

$$\sqrt{3} = \frac{20+h}{20}$$

$20\sqrt{3} = 20 + h$

$\therefore$ $h = 20\sqrt{3} - 20$

$= 20 \times 1.73 - 20$

Height of tower $= 34.6 - 20 = 14.60$ m

33. first team $(a) = 22$

Last term $(a_n) = -6$

Sum of n terms $(S_n) = 64$

$a_n = -6$

$a + (n-1) = -6$

$22 + (n-1)d = -6$

$$(n-1)\,d = -28 \quad ...(1)$$
$$S_n = 64$$
$$\frac{n}{2}(a+a_n) = 64$$
$$\frac{n}{2}(22-6) = 64$$
$$n = \frac{64\times 2}{16} = 8$$

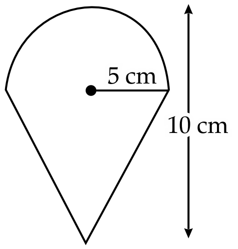
∴ Number of terms is 8.

from equation (1)

$$(n-1)d = -28$$
$$7d = -28$$
$$\therefore \quad d = -4$$

Common difference = – 4.

34.



Given,

Radius of cone (r) = Radius of hemisphere (r) = 5 cm

Height of Cone (h) = 10 cm

No. of Cones = 7

Volume of ice cream in one cone

= Vol of cone + Vol. of hemisphere

$$= \frac{1}{3}\pi r^2 h + \frac{2}{3}\pi r^3$$
$$= \frac{\pi}{3} r^2 (h+2r)$$
$$= \frac{22}{7}\times\frac{1}{3}\times 5\times 5(10+2\times 7)$$
$$= \frac{22}{7}\times\frac{1}{3}\times 5\times 5(10+10)$$
$$= \frac{22\times 25\times 20}{21}$$
$$= 523.8 \text{ cm}^3$$

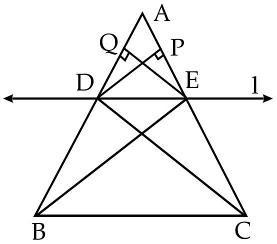
Volume of ice cream in 7 cones

$= 523.8 \times 7 \text{ cm}^3$

$= 3666.63 \text{ cm}^3$

$= 3.67$ litres

35. (a)



Given: In ΔABC, line l is parallel to side BC and intersects other two sides at the point D and E respectively.

To Prove: $\dfrac{AD}{DB} = \dfrac{AE}{CE}$

Construction: Draw $DP \perp AC$, $EQ \perp AB$ and join BE and CD

Proof: $\text{Ar } \Delta ADE = \frac{1}{2} AD\times EQ \quad ...(1)$

$$\text{Ar. } \Delta BDE = \frac{1}{2}\times BD\times EQ \quad ...(2)$$
$$\text{Ar. } \Delta ADE = \frac{1}{2}\times AE\times DP \quad ...(3)$$
$$\text{Ar. } \Delta CDE = \frac{1}{2}\times CE\times DP \quad ...(4)$$

from (1) & (2)

$$\frac{\text{Ar}\,\Delta ADE}{\text{Ar}\,\Delta BDE} = \frac{AD}{BD} \quad ...(5)$$

from (3) & (4)

$$\frac{\text{Ar}\,\Delta\, ADE}{\text{Ar}\,\Delta\, CDE} = \frac{AE}{CE} \quad ...(6)$$

ΔBDE and ΔCDE are lying between two parallel lines and having common base (DE)

$$\therefore \quad \text{Ar } \Delta BDE = \text{Ar } \Delta CDE \quad ...(7)$$

From (5), (6) and (7)

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

Hence Proved.

OR

(b) Given: $\dfrac{QR}{QS} = \dfrac{QT}{PR}$

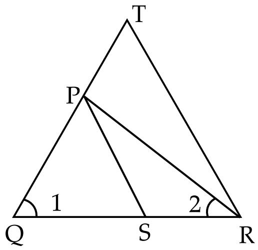
$\angle 1 = \angle 2$

To Prove: $\Delta PQS \sim \Delta TQR$

Proof: $\angle 1 = \angle 2$ (Given)

∴ $PQ = PR$ ...(1)

[Opposite sides of equal angles in ΔPQR]



$$\frac{QR}{QS} = \frac{QT}{PR} \quad \text{(Given)}$$
$$\frac{QR}{QS} = \frac{QT}{PQ} \quad \text{(from equ.(1))}$$
$$\frac{QR}{QT} = \frac{QS}{PQ}$$

and $\angle 1$ is common

∴ $\Delta PQS \sim \Delta TQR$ (*SAS* Test)

Hence Proved.

SECTION — E

36. (i) Ar. of Square $ABCD$ = (Side)^2,

$= (8)^2$

$= 64 \text{ cm}^2$

(ii) $\Delta ABC, \angle B = 90°$

$$\therefore \quad AC^2 = AB^2 + BC^2 = 2AB^2$$
$$AC = \sqrt{2}\,AB$$
$$\text{Diagonal } AC = 8\sqrt{2}\,\text{cm}$$

(iii) Area of Sector $OPRQO$

$$= \frac{\theta}{360}\pi r^2$$
$$= \frac{90°}{360°}\times\frac{22}{7}\times 4\times 4\,\text{cm}^2$$

[radius of inscribed Circle $= \frac{1}{2}$ side of square]

$$\text{Area of Sector } OPRQO = \frac{88}{7} = 12\frac{4}{7}\text{cm}^2$$

OR

(iii) Area of Circle $= \pi r^2 = \frac{22}{7}\times(4)^2$

$$= \frac{352}{7}\text{cm}^2$$

$$\therefore \quad \text{Required Area} = 64 - \frac{352}{7}$$
$$= \frac{448-352}{7} = \frac{96}{7}\text{cm}^2$$
$$= 13\frac{5}{7}\text{cm}^2$$

37. Let the fixed charge be ₹ x and per kilometer charge be ₹ y

$$\therefore \quad x + 10y = 105 \quad \text{...(1)}$$
$$x + 15y = 155 \quad \text{...(2)}$$

from (1) & (2)

$$5y = 50$$
$$\therefore \quad y = \frac{50}{5} = 10$$

from equ (i) $x + 100 = 105$

$$x = 105 - 100 = 5$$

(i) Fixed charges = ₹ 5

(ii) Per km charges = ₹ 10

(iii) $a + 10b$

$20 + 10 \times 10$ = ₹ 120

OR

Total amount $= x + 10y + x + 25y$

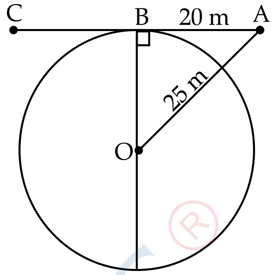
$= 2x + 35y$

$= 2 \times 5 + 35 \times 10$

$= 10 + 350$

= ₹ 360

38.



(i) B is the mid-point of AC

$$\therefore \quad AC = 2AB$$
$$AC = 2 \times 20 = 40 \text{ m}$$

(ii) Shortest distance of the road from the centre of circle = Radius of circle

In ΔOAB, $\quad \angle B = 90°$

$$\therefore \quad OB^2 + AB^2 = OA^2$$
$$OB^2 + 20^2 = 25^2$$
$$OB^2 = 625 - 400$$
$$OB = \sqrt{225} = 15$$

$\therefore$ Shortest distance = 15 m

(iii) Circumference of the village

$$= 2\pi r = 2\times\frac{22}{7}\times 15$$
$$= \frac{660}{7}$$
$$= 94\frac{2}{7}\text{m}$$

OR

Area of the village $= \pi r^2 = \frac{22}{7}\times 15\times 15$

$$= \frac{4950}{7} = 707\frac{1}{7}\text{m}^2$$

Outside Delhi Set-II **430/6/2**

SECTION — A

1. Option (c) is correct

Explanation: Smallest 2 digit no. = 10

Smallest Composite no. = 4

H.C.F (10, 4) = 2

2. Option (d) is correct

Explanation: $2x - 3y + 7 = 0$

$$2(-2) - 3p + 7 = 0$$
$$3p = 3 \Rightarrow p = 1$$

3. Option (a) is correct

Explanation: Distance of the point (6, 5) from the y-axis = 6 units

13. Option (b) is correct

Explanation: $\quad a_n = a + (n-1)\,d$

$$a_{20} = -2 + 19 \times 4 = 74$$

14. Option (c) is correct

Explanation: $\quad p(x) = 25x^2 = 49$

$$= (5x-7)(5x+7)$$
$$\therefore \quad x = \frac{7}{5} \text{ and } \frac{-7}{5}$$

15. Option (a) is correct

Explanation:

$$\frac{1+2+3+4+5+6+7+8+9+10}{10} = \frac{55}{10} = 5.5$$

SECTION — B

25. $\dfrac{5\operatorname{cosec}^2 30° - \cos 90°}{4\tan^2 60°}$

$$= \frac{5(2)^2-(0)}{4\times(\sqrt{3})^2}$$

$$= \frac{20}{4\times 3}$$

$$= \frac{5}{3}$$

SECTION — C

26. Let $5+2\sqrt{3}$ is a rational number

$$\therefore \quad 5+2\sqrt{3} = \frac{p}{q}$$

(Where p and d are integers and $q \neq 0$)

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

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

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

but $\sqrt{3}$ is an irrational number

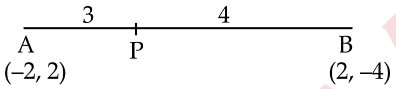
$$\therefore \quad \sqrt{3} \neq \frac{p-5q}{2d}$$

Thus our assumption is not correct.

$\therefore$ $5+2\sqrt{3}$ is an irrational number by contradiction.

Hence Proved.

27.



$$\frac{AP}{AB} = \frac{3}{7}$$

$$\therefore \quad \frac{AP}{PB} = \frac{3}{4}$$

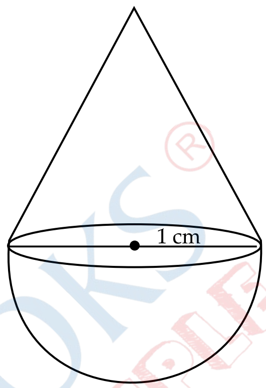
$$P\left(\frac{m_1x_2+m_2x_1}{m_1+m_2}, \frac{m_1y_2+m_2y_1}{m_1+m_2}\right)$$

$$= \frac{3\times 2+4(-2)}{3+4}, \frac{3\times -4+4\times(2)}{3+4}$$

$$= \left(\frac{-2}{7}, -\frac{4}{7}\right)$$

SECTION — D

33.



diameter of cone (r) = diameter of hemi sphere (r)

Height of Cone(h) = radius of cone = $\frac{1}{2}$cm

Volume of the solid = Volume of the cone + Volume of the Hemisphere

$$= \frac{1}{3}\pi r^2 h + \frac{2}{3}\pi r^3$$

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

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

$$= \frac{\pi}{3\times 4}\left(\frac{3}{2}\right)\text{cm}^3$$

$$= \frac{3.14}{8}\text{cm}^3$$

$\therefore$ Volume of the Solid = 0.3925 cm^3

Outside Delhi Set-III **430/6/3**

SECTION — A

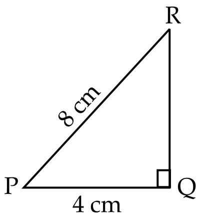
1. Option (b) is correct

Explanation: 5488 $= 2\times 2\times 2\times 2\times 7\times 7\times 7$
$= 2^4 \times 7^3$

2. Option (d) is correct

3. Option (a) is correct

Explanation:



$$\cos P = \frac{PQ}{PR} = \frac{4}{8} = \frac{1}{2}$$

$$\cos P = \cos 60° \Rightarrow P = 60°$$

4. Option (c) is correct

Explanation: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

$$\text{Median} = \frac{5+6}{2} = 5.5$$

5. Option (d) is correct

Explanation: $2x^2 - x - 3$

$$2x^2 - 3x + 2x - 3$$

$$x(2x-3) + 1(2x-3)$$

$$(2x-3)(x+1)$$

Zeroes are $\frac{3}{2}$ and -1

6. Option (a) is correct

Explanation: $f(x)$ intersects the x-axis at 4 points.

SECTION — B

21.
$$S = \{1, 2, 3, 4, 5, \ldots 30\}$$

$$n(S) = 30$$

(a) divisible by 6

$$E = \{6, 12, 18, 24, 30\}$$
$$n(E) = 5$$

$$\text{Required Probability} = \frac{n(E)}{n(S)}$$
$$= \frac{5}{30} = \frac{1}{6}$$

(b) greater them 25 {26, 27, 28, 29, 30}

$$\therefore \text{Required probability} = \frac{5}{30} = \frac{1}{6}$$

SECTION — C

26. Let $7+4\sqrt{5}$ is a rational number

$$\therefore \quad 7+4\sqrt{5} = \frac{p}{q}$$

[where p and q are integers and $q \neq 0$]

$$7+4\sqrt{5} = \frac{p}{q}$$
$$7q+4\sqrt{5}q = p$$
$$\sqrt{5} = \frac{p-7q}{4q}$$

p and q are integers $\therefore$ $\frac{p-7q}{4q}$ is a rational no. while

$\sqrt{5}$ is an irrational number

So $\quad \sqrt{5} \neq \frac{p-7q}{4q}$

Hence our assumption is wrong

So $7+4\sqrt{5}$ is an irrational number by Contradiction fact.

27.
$$\frac{1}{x} - \frac{1}{x-2} = 3$$
$$\frac{x-2-x}{x(x-2)} = 3$$
$$-2 = 3x^2 - 6x$$
$$3x^2 - 6x + 2 = 0$$

Compare the equation $ax^2 + bx + c = 0$

$$a = 3, b = -6 \text{ and } c = 2$$

$$\therefore \quad x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$
$$x = \frac{+6 \pm \sqrt{36-24}}{2\times 3}$$
$$x = \frac{6 \pm 2\sqrt{3}}{6} = \frac{3 \pm \sqrt{3}}{3}$$
$$\therefore \quad x = \frac{3-\sqrt{3}}{3} \text{ and } \frac{3-\sqrt{3}}{3}$$

SECTION — D

34. Given
$$a_4 + a_8 = 24$$
$$a_6 + a_{10} = 44$$

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

$$a_4 + a_8 = 24$$
$$a + 3d + a + 7d = 24$$
$$2a + 10d = 24$$
$$a + 5d = 12 \qquad ...(1)$$
$$a_6 + a_{10} = 44$$
$$a + 5d + a + 9d = 44$$
$$2a + 14d = 44$$
$$a + 7d = 22 \qquad ...(2)$$

from equation (1) and (2)

$$d = 5 \text{ and } a = -13$$

$\therefore$ First term of A.P. $= -13$

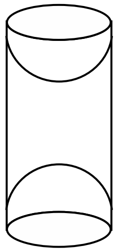
and Common difference $= 5$

$$S_n = \frac{n}{2}\{2a+(n-1)d]$$
$$S_{25} = \frac{25}{2}[-26+24\times 5]$$
$$= \frac{25}{2}\times 94$$

Sum of 25 terms $= 25 \times 47 = 1175$

35. Total Surface Area of the Solid = C.S.A of cylinder + 2 × C.S.A of Hemisphere

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



$$= 2\pi r\,(h + 2r)$$
$$= 2\times\frac{22}{7}(3.5)(10+2\times 3.5)$$
$$= 2 \times \frac{22}{7} \times 3.5\,(17)$$
$$= \frac{22}{7} \times 7 \times 17$$
$$= 374 \text{ cm}^2$$

Total surface area of the solid = 374 cm^2.