Sample Question Paper 3

Mathematics 10th (Basic)

Time : 3 Hrs. **Max. Marks :** 80

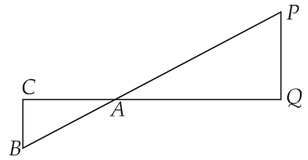
General Instructions

Read the following instructions carefully and follow them.

1. This question paper contains 38 questions. All questions are compulsory.
2. This question paper is divided into 5 section A, B, C, D and E.
3. In **Section A,** question numbers 1-18 are Multiple Choice Questions (MCQs) and question number 19 and 20 are Assertion-Reason based questions of 1 mark each.
4. In **Section B,** question numbers 21-25 are Very Short Answer (VSA) type questions, carrying 02 marks each.
5. In **Section C,** question numbers 26-31 are Short Answer (SA) type questions, carrying 03 mark each.
6. In **Section D,** question numbers 32-35 are Long Answer (LA) type questions, carrying 05 marks each.
7. In **Section E,** question numbers 36-38 are Case Study Based questions carrying 4 marks each with sub parts of the values 1, 1 and 2 marks each respectively.
8. There is no overall choice. However, an internal choice in 2 questions of section B, 2 questions of section C and 2 questions of section D has been provided. An internal choice has been provided in all the 2 marks questions of section E.
9. Draw neat and clear figures wherever required. Take $\pi = 22/7$ wherever required if not stated.
10. Use of calculators is not allowed.

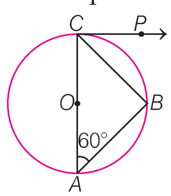
Section A Multiple Choice Questions (Each Que. carries 1 M)

1. In the adjoining figure, ΔAPQ is similar to ΔABC, $AQ = 10$ cm, $BC = 3.5$ cm and $PQ = 7$ cm then AC is equal to



(a) 5 cm (b) 3 cm (c) 4 cm (d) 2 cm

2. In given figure, AB is a chord of the circle and AOC is its diameter such that $\angle BAC = 60°$. If CP is the tangent to the circle at the point C then $\angle BCP$ is equal to



(a) 50° (b) 60° (c) 70° (d) 80°

3. The mean of the following distribution is

x_i	12	14	18	20
f_i	3	5	8	7

(a) 19.5 (b) 18 (c) 16.96 (d) 15.24

Stage II : **Proficiency Level**

4. A fair dice is rolled. Probability of getting a number greater than 3 is

(a) 0 (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{2}$

5. If $d_i = x_i - 20$, $\Sigma f_i d_i = 300$ and $\Sigma f_i = 40$, then the value of $\overline{x}$ is

(a) 20.3 (b) 32 (c) 27.5 (d) 22.9

6. If $2\sin 3\theta = \sqrt{3}$ then the value of θ is

(a) 60° (b) 30° (c) 20° (d) 15°

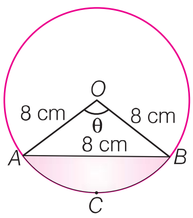
7. If 2 is a zero of polynomial $f(x) = 4x^2 + 4x - 4a$ then the value of a is

(a) 6 (b) 2 (c) 4 (d) 8

8. The roots of given equation $(x+4)(3x-5) = 0$ are

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

9. The area of shaded region of the figure given below is (take $\pi = \frac{22}{7}$, $\sqrt{3} = 1.73$)



(a) 4 cm^2 (b) 5.81 cm^2 (c) 5 cm^2 (d) 5.48 cm^2

10. In an arithmetic progression, if $a = 6$, $d = -8$ and $n = 6$ then a_n is

(a) -17 (b) -30 (c) -34 (b) Cannot be determined

11. The HCF of 85 and 152 is

(a) 1 (b) 17 (c) 13 (d) 19

12. The coordinates of the point which divides the line segment joining the points $(4, -3)$ and $(8, 5)$ in the ratio 1 : 3 internally are

(a) (4, 3) (b) (7, 3) (c) (3, 5) (d) $(5, -1)$

13. The value of $2\sin^2 30° - 4\cos^2 45° + \tan^2 45° + \cot^2 45°$ is

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

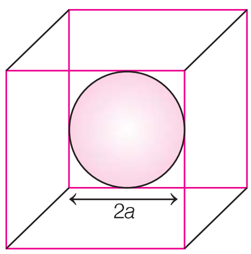
14. C is the mid-point of PQ, if P is $(4, x)$, C is $(y, -1)$ and Q is $(-2, 4)$ then x and y respectively, are

(a) -6 and 1 (b) -6 and 2 (c) 6 and -1 (d) 6 and -2

15. The LCM and HCF of two non-zero positive numbers are equal then the numbers must be

(a) prime (b) coprime (c) composite (d) equal

16. A solid spherical ball fits exactly inside the cubical box of side $2a$. The volume of the ball is



(a) $\frac{16}{3}\pi a^3$ (b) $\frac{1}{6}\pi a^3$ (c) $\frac{32}{3}\pi a^3$ (d) $\frac{4}{3}\pi a^3$

17. The prime factorisation of 352 is

(a) 2^8 (b) $2^6 \times 11$ (c) $2^5 \times 11$ (d) $2^6 \times 7$

18. The discriminant of the quadratic equation $6x^2 - 7x + 2 = 0$ is

(a) $\sqrt{41}$ (b) $\frac{1}{12}$ (c) 5 (d) None of these

Assertion-Reason Based Questions

In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

(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) A coin is tossed 30 times and head appears 20 times. Then, the probability of getting a tail is $1/3$.

Reason (R) Probability of happening of an event = $\frac{\text{Number of trials in which the event happened}}{\text{Total number of trials}}$

20. **Assertion** (A) Three consecutive terms $k, 2k+1, 5k-2$ form an AP, then k is equal to 2.

Reason (R) In an AP : $a, a+d, a+2d \ldots$, the sum of n terms of AP is $S_n = \frac{n}{2}[a+(n-1)d]$

Section B Very Short Answer Type Questions [Each Que. carries 2 M]

21. Find the radius of a circle, if the distance of tangent from the centre of circle is 13 cm and the length of tangent to the circle is 12 cm.

22. (a) Prove that $(1 + \tan^2\theta)(1 + \sin\theta)(1 - \sin\theta) = 1$.

Or

(b) Prove that $(\operatorname{cosec}\theta - \sin\theta)(\sec\theta - \cos\theta) = \frac{1}{\tan\theta + \cot\theta}$

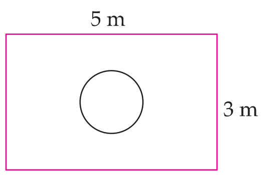
23. If the 3rd and 9th terms of an AP are 4 and -8, respectively then which term of this AP is zero?

24. Without solving the following quadratic equation, find the value of p for which the roots are equal $px^2 - 9x - 6 = 0$.

25. (a) Two dice are thrown simultaneously. Find the probability of getting a multiple of 2 on one die and a multiple of 3 on the other die.

Or

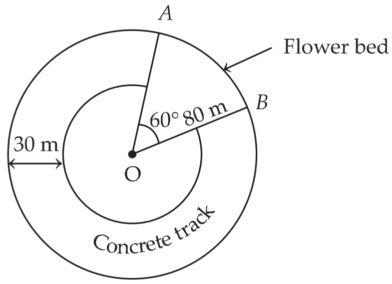
(b) Suppose you drop a die at random on the rectangular region shown in figure.



What is the probability that it will land inside the circle of diameter 2 m?

Section C Short Answer Type Questions (Each Que. carries 3 M)

26. In the given figure, AOB is a flower bed in the shape of a sector of a circle of radius 80 m and $\angle AOB = 60°$. Also, a 30 m wide concrete track is made as shown in the figure.



Two friends Vicky and Love went to the concrete track. Love said that area of the track is 10205 m^2. Is he right? Explain. (take $\pi = 3.14$)

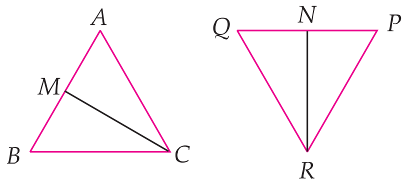
27. Two circles with centres O and O' of radii 6cm and 8 cm, respectively, intersect at two points P and Q such that OP and $O'P$ are tangents to the two circles. Find the length of the common chord PQ.

28. (a) Prove that $\sqrt{3}$ is an irrational.

Or

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

29. In the following figure, CM and RN are respectively the medians of ΔABC and ΔPQR. If $\Delta ABC \sim \Delta PQR$, prove that



(i) $\Delta AMC \sim \Delta PNR$

(ii) $\dfrac{CM}{RN} = \dfrac{AB}{PQ}$

30. (a) Find the value of $\dfrac{\tan^2 60° + 4\cos^2 45° + 3\sec^2 30° + 5\cos^2 90°}{\text{cosec}30° + \sec 60° - \cot^2 30°}$.

Or

(b) If $\cos(A+B) = 0$ and $\cot(A-B) = \sqrt{3}$, then find the value of $\cos A \cdot \cos B - \sin A \cdot \sin B$.

31. Solve for x, $2\left(\dfrac{2x+3}{x-3}\right) - 25\left(\dfrac{x-3}{2x+3}\right) = 5$.

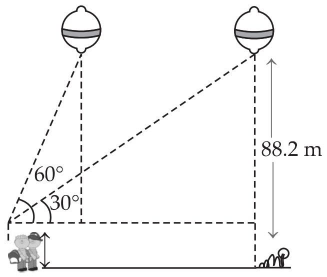
Section D Long Answer Type Questions (Each Que. carries 5 M)

32. (a) A right-angled triangle whose sides other than hypotenuse are 15 cm and 20 cm, is made to revolve about its hypotenuse. Find the volume and surface area of the double cone so formed. [take, $\pi = 3.14$]

Or

(b) A solid toy is in the form of a hemisphere surmounted by a right circular cone. Height of the cone is 4 cm and the diameter of the base is 8 cm. If a right circular cylinder circumscribes the solid, then find how much more space it will cover?

33. A 1.2 m tall girl spots a balloon moving with the wind in a horizontal line at a height of 88.2 m from the ground. The angle of elevation of the balloon from the eyes of the girl at any instant is 60°.



After sometime, the angle of elevation reduces to 30° (see the figure).

Find the distance travelled by the balloon during the interval.

34. (a) The following table shows the age distribution of cases of a certain disease admitted during a year in a particular hospital.

Age (in years)	5-14	15-24	25-34	35-44	45-54	55-64	**Total**
Number of cases	6	11	21	23	14	5	80

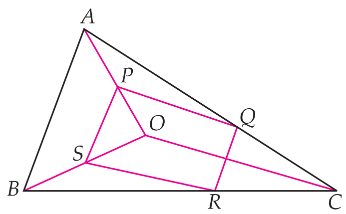
Find the modal age.

Or

(b) If the median of the distribution given below is 30, then find the values of x and y.

Class Interval	0-10	10-20	20-30	30-40	40-50	50-60	**Total**
Number of students	5	x	20	15	y	5	60

35. In the given figure, if $PQRS$ is a parallelogram and $AB \parallel PS$, then prove that $SR \parallel OC$.



Section E Case-Study/Passage-Based (Each Que. carries 4 M)

36. Vikas is working with TCS and he is sincere and dedicated to his work. He pays all his taxes on time and invests the some amount of his salary in funds for his future.

He invested some amount at the rate of 12% simple interest and some other amount at the rate of 10% simple interest. He received yearly interest of ₹ 130. But, if he interchanges the amounts invested, he would have received ₹ 4 more as interest.

On the basis of above information, answer the following questions.

(i) Consider the amount invested at 12% be p and at 10% be q. Then, formulate the required linear equation for first condition. $(1\frac{1}{2})$

(ii) Formulate the linear equation for the second condition? $(1\frac{1}{2})$

(iii) (a) Find the value of p and q. (1)

Or

(b) Solve the following pair of equations

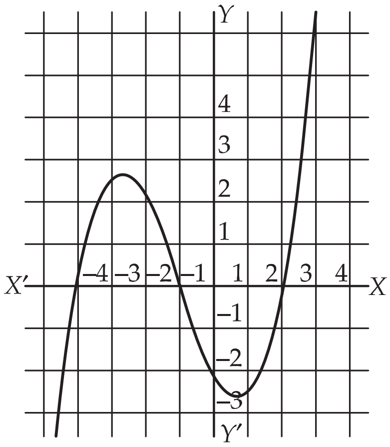
$$2x + y = 8 \text{ and } 3x + y = 20$$ (1)

37. Polynomials are everywhere. They play a key role in the study of algebra, in analysis and mathematical problems involving them.

Since, polynomial are used to describe curves of various types. Engineers use polynomials to graph the curves on roller coasters.

On the basis of above information, answer the following questions.

(i) If the roller coaster is represented by the following graph $y = p(x)$, then name the type of the polynomial it traces. (1)



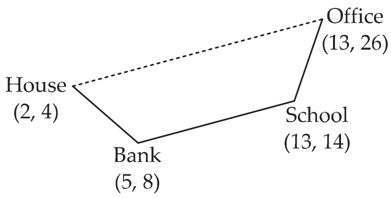
(ii) If $p(x) = 5x^2 - 14x + 8$ then find the sum and product of zeroes. (2)

(iii) (a) Find a quadratic polynomial, the sum and product of whose zeroes are –3 and 2, respectively. (1)

Or

(b) In the graph shown above, find the zeroes of $y = p(x)$. (1)

38. Walking is a good habit for human beings to improve health and stamina. In this order, Ayush starts walking from his house to office. Instead of going to the office directly, he goes to bank first, from there, he leaves his daughter to school and then reaches the office [assume that all distances covered are in straight lines], If the house is situated at (2, 4), bank at (5, 8), school at (13, 14) and office at (13, 26) and the coordinates are in kilometre.



On the basis of above information, answer the following questions.

(i) Find the distance between bank and office. (1)

(ii) Find the shortest distance between house and office. (1)

(iii) (a) Find the extra distance travelled by Ayush in reaching his office. (2)

Or

(b) If on the shortest path from house to office, a point divides the path in the ratio 4 : 3. Find the coordinates of that point. (2)

Solutions

1. (a) Since, $\Delta APQ \sim \Delta ABC$

$\therefore \quad \frac{AQ}{AC} = \frac{PQ}{BC} \Rightarrow \quad \frac{10}{AC} = \frac{7}{3.5}$

$\Rightarrow \quad AC = \frac{10 \times 3.5}{7} \Rightarrow AC = 5\text{ cm}$

2. (b) Here, $\angle ABC = 90°$

[$\because$ angle in a semi-circle is right angle]

In ΔABC, $\angle BAC + \angle ABC + \angle ACB = 180°$

[angle sum property of triangle]

$\Rightarrow \quad 60° + 90° + \angle BCA = 180°$

$\Rightarrow \quad \angle BCA = 180° - 150° = 30°$

Now, $\angle OCP = 90°$ [$\because$ radius is perpendicular to the tangent at the point of contact]

$\therefore \quad \angle BCP = 90° - \angle BCA = 90° - 30° = 60°$

3. (c) Here, $\Sigma f_i x_i = 3 \times 12 + 5 \times 14 + 8 \times 18 + 7 \times 20$

$= 36 + 70 + 144 + 140 = 390$

$\therefore$ Mean $= \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{390}{3+5+8+7} = \frac{390}{23} = 16.96$

4. (d) Here, favourable outcomes = 4, 5, 6

Total number of outcomes = 6

$\therefore \; P = \frac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}} = \frac{3}{6} = \frac{1}{2}$

5. (c) Given, $\Sigma f_i d_i = 300$, $\Sigma f_i = 40$ and $d_i = x_i - 20$

We know that $d_i = x_i - a$

On comparing, we get $a = 20$

$\therefore \quad$ Mean, $\bar{x} = a + \left\{\frac{\Sigma f_i d_i}{\Sigma f_i}\right\} = 20 + \frac{300}{40}$

$= 20 + \frac{30}{4} = 20 + 7.5 = 27.5$

6. (c) We have, $2\sin 3\theta = \sqrt{3} \Rightarrow \sin 3\theta = \frac{\sqrt{3}}{2}$

$\Rightarrow \quad \sin 3\theta = \sin 60° \Rightarrow 3\theta = 60°$

$\Rightarrow \quad \theta = \frac{60°}{3}$

$\therefore \quad \theta = 20°$

7. (a) Given, polynomial is $f(x) = 4x^2 + 4x - 4a$.

Since, 2 is a zero of the given polynomial.

$\therefore \quad f(2) = 0 \Rightarrow 4(2)^2 + 4(2) - 4a = 0$

$\Rightarrow \quad 16 + 8 - 4a = 0 \Rightarrow 4a = 24 \Rightarrow a = \frac{24}{4} = 6$

8. (b) We have, $(x+4)(3x-5) = 0$

$\Rightarrow \quad x + 4 = 0$ or $3x - 5 = 0$

$\Rightarrow \quad x = -4$ or $x = \frac{5}{3}$

Hence, the roots of the given equation are -4 and $\frac{5}{3}$.

9. (b) Given figure, $OA = OB = AB = 8\text{cm}$

So, it's an equilateral triangle.

$\therefore \quad \theta = 60°$

Area of sector $OACB = \frac{60°}{360°} \times \pi \times (8)^2$

$= \frac{1}{6} \times \frac{22}{7} \times (8)^2 = 33.52\text{ cm}^2$

Area of an equilateral $\Delta OAB = \frac{\sqrt{3}}{4} \times (8)^2 \simeq 27.71\text{cm}^2$

Hence, the area of shaded region $= 33.52 - 27.71$

$= 5.81\text{cm}^2$

10. (c) Given, $a = 6$, $d = -8$ and $n = 6$

We know that $a_n = a + (n-1)d = 6 + (6-1) \times (-8)$

$= 6 + 5 \times (-8) = 6 - 40 = -34$

11. (a) Given numbers,

$85 = 1 \times 5 \times 17$ and $152 = 1 \times 2^3 \times 19$

$\therefore$ HCF $(85, 152) = 1$

12. (d) Let $(x_1, y_1) = (4, -3)$ and $(x_2, y_2) = (8, 5)$

Let (x, y) be the coordinates of the point which divides the line joining the points (x_1, y_1) and (x_2, y_2) in ratio $m : n = 1 : 3$ internally.

So, $(x, y) = \left(\frac{mx_2 + nx_1}{m+n}, \frac{my_2 + ny_1}{m+n}\right)$

$= \left(\frac{1(8) + 3(4)}{1+3}, \frac{1(5) + 3(-3)}{1+3}\right) = \left(\frac{20}{4}, \frac{-4}{4}\right)$

$= (5, -1)$

13. (c) We have,

$2\sin^2 30° - 4\cos^2 45° + \tan^2 45° + \cot^2 45°$

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

$\left[\because \sin 30° = \frac{1}{2}, \cos 45° = \frac{1}{\sqrt{2}}, \tan 45° = \cot 45° = 1\right]$

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

14. (a) Given, C is the mid-point of PQ, where $P(4, x)$, $Q(-2, 4)$ and $C(y, -1)$.

Therefore, $(y, -1) = \left(\frac{4-2}{2}, \frac{x+4}{2}\right)$

$\Rightarrow \quad (y, -1) = \left(1, \frac{x+4}{2}\right)$

On equating the coordinates, we get

$y = 1$

and $\quad -1 = \frac{x+4}{2} \Rightarrow x + 4 = -2 \Rightarrow x = -6$

$\therefore \quad x = -6$ and $y = 1$

15. (d) Given, LCM and HCF are equal.

Let two non-zero positive numbers are p and q.

Then, HCF $(p, q) = $ LCM (p, q) [given]

Let HCF $(p, q) = k \Rightarrow p = ka$ and $q = kb$

where, a and b are natural numbers.

$\because$ HCF $\times$ LCM = Product of numbers

$$k \times k = ka \times kb \Rightarrow a \times b = 1$$

$\therefore$ $a = b = 1$, as they are natural numbers.

Hence, $p = q$ or the numbers must be equal.

16. (d) Given spherical ball is exactly fit in the cubical box. Therefore, the diameter of the sphere is equal to the side of the cube.

i.e. $d = 2a$

$\therefore$ Radius of the sphere $(r) = \frac{d}{2} = \frac{2a}{2} = a$

$\therefore$ Volume of the solid spherical ball $= \frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi a^3$ cu units

17. (c) We have, $352 = 2 \times 2 \times 2 \times 2 \times 2 \times 11$

$\therefore$ $352 = 2^5 \times 11$

18. (d) Given, $6x^2 - 7x + 2 = 0$ ...(i)

On comparing Eq. (i) with $ax^2 + bx + c = 0$, we get

$$a = 6,\ b = -7 \text{ and } c = 2$$

We know that $D = b^2 - 4ac = (-7)^2 - 4(6)(2) = 49 - 48 = 1$

Hence, the value of discriminant is 1.

19. (a) Total number of times in which tail appeared

$= 30 - 20 = 10$

$\therefore$ Probability of getting a tail $= \frac{10}{30} = \frac{1}{3}$

So, the given Assertion (A) is true.

The given Reason (R) is also true.

Hence, both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

20. (c) Taking first two terms,

common difference $= 2k + 1 - k = k + 1$

Taking second and third terms,

common difference $= 5k - 2 - 2k - 1 = 3k - 3$

Since, the terms are in AP.

$\therefore$ $k + 1 = 3k - 3 \Rightarrow -2k = -4 \Rightarrow k = 2$

So, the given Assertion (A) is true.

We know that sum of n terms of an AP

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

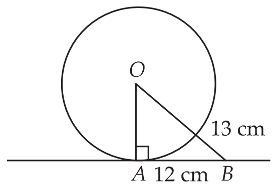
So, the given Reason (R) is false.

21. Let AB be a tangent drawn at point A to a circle with centre O such that $AB = 12$ cm and $OB = 13$ cm.

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

$\therefore$ In ΔAOB, $OA \perp AB$

Now, in right angled ΔOAB, $OB^2 = OA^2 + AB^2$



(1)

$\Rightarrow$ $(13)^2 = OA^2 + (12)^2 \Rightarrow 169 = OA^2 + 144$

$\Rightarrow$ $OA^2 = 169 - 144 = 25$

$\therefore$ $OA = 5$ cm

Hence, the radius of the required circle is 5 cm. (1)

22. (a) LHS $= (1 + \tan^2\theta)(1 + \sin\theta)(1 - \sin\theta)$

$= (1 + \tan^2\theta)(1 - \sin^2\theta) = \sec^2\theta \times \cos^2\theta$ (1)

$[\because \sec^2\theta - \tan^2\theta = 1 \text{ and } \sin^2\theta + \cos^2\theta = 1]$

$= \frac{\cos^2\theta}{\cos^2\theta} = 1 =$ RHS $\left[\because \sec A = \frac{1}{\cos A}\right]$ (1)

Or (b) LHS $= (\text{cosec}\,\theta - \sin\theta)(\sec\theta - \cos\theta)$

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

$= \left(\frac{1 - \sin^2\theta}{\sin\theta}\right) \cdot \left(\frac{1 - \cos^2\theta}{\cos\theta}\right)$ $[\because 1 = \sin^2 A + \cos^2 A]$

$= \frac{\cos^2\theta \cdot \sin^2\theta}{\sin\theta \cdot \cos\theta} = \sin\theta \cdot \cos\theta$ ...(i) (1)

RHS $= \frac{1}{\tan\theta + \cot\theta} = \frac{1}{\frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\sin\theta}} = \frac{\sin\theta \cdot \cos\theta}{\sin^2\theta + \cos^2\theta}$

$= \sin\theta \cdot \cos\theta$ $[\because \sin^2 A + \cos^2 A = 1]$ ...(ii) (1)

From Eqs. (i) and (ii), LHS = RHS

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

$\because$ The nth term of an AP is $a_n = a + (n-1)d$

$\therefore$ $a_3 = a + 2d \Rightarrow a + 2d = 4$ ...(i)

$[\because a_3 = 4 \text{ (given)}]$

and $a_9 = a + 8d \Rightarrow a + 8d = -8$ ...(ii)

$[\because a_9 = -8 \text{ (given)}]$

On subtracting Eq. (i) from Eq. (ii), we get

$$6d = -12 \Rightarrow d = \frac{-12}{6} = -2$$

$\therefore$ From Eq. (i), $a + 2 \times (-2) = 4$

$\Rightarrow$ $a - 4 = 4 \Rightarrow a = 4 + 4 = 8$ (1)

Let the nth term of this AP is zero.

Then, $a_n = 0$

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

$\Rightarrow$ $8 + (n-1)(-2) = 0$

$\Rightarrow$ $(n-1)(-2) = -8 \Rightarrow n - 1 = \frac{-8}{-2} = 4$

$\Rightarrow$ $n = 4 + 1 = 5$

Hence, 5th term of this AP is zero. (1)

24. Given, quadratic equation is $px^2-9x-6=0$

On comparing it with $ax^2+bx+c=0$, we get

$a=p, b=-9$ and $c=-6$ (1)

Since, the given equation has equal roots.

So, the discriminant D will be zero.

$\therefore \quad D=b^2-4ac=0$

$\Rightarrow \quad (-9)^2-4\times p\times(-6)=0 \Rightarrow 81+24p=0$

$\Rightarrow \quad 24p=-81 \Rightarrow p=\frac{-81}{24}$

$\therefore \quad p=\frac{-27}{8}$ (1)

25. (a) Here, two dice are thrown, so possible outcomes are

(1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6),
(2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6),
(3, 1), (3, 2), (3, 3), (3, 4), (3, 5), (3, 6),
(4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6),
(5, 1), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6),
(6, 1), (6, 2), (6, 3), (6, 4), (6, 5) and (6, 6)

$\therefore$ Total number of outcomes = 36 (1)

Let E = Event of getting a multiple of 2 on one die and a multiple of 3 on the other die.

Here, multiples of 2 are 2, 4 and 6 and multiples of 3 are 3 and 6.

So, favourable outcomes for event E are (2, 3), (4, 3), (6, 3), (2, 6), (4, 6), (6, 6), (3, 2), (3, 4), (3, 6), (6, 2) and (6, 4).

$\therefore$ Number of outcomes favourable to $E = 11$

$\therefore$ Required probability = $P(E)$

$$=\frac{\text{Number of favourable outcomes to } E}{\text{Total number of outcomes}}$$

$$=\frac{11}{36}$$ (1)

Or

(b) Area of rectangle $= 5\times3 = 15\text{ m}^2$

and area of circle of radius 1 m $=\pi(1)^2=\pi\text{ m}^2$

$$\left[\because \text{diameter} = 2\text{m} \Rightarrow \text{radius} = \frac{2}{2} = 1\text{ m}\right]$$ (1)

Now, probability that the die land inside the circle $=\frac{\pi}{15}$ (1)

26. Given, radius of circle = 80 m

and angle of sector = 60°

$\therefore$ Angles for the major sectors of both the circles at θ is same i.e. 300°.

Radius of inner circle = 80 − 30 = 50 m (1)

$\therefore$ Area of concrete track

$$=\frac{300^\circ}{360^\circ}\times\pi\times(80)^2-\frac{300^\circ}{360^\circ}\times\pi\times50^2$$ (1)

[$\because$ area of track = area of outer sector − area of inner sector]

$$=\frac{5}{6}\times\pi\times(6400-2500)=\frac{5}{6}\times3.14\times3900$$

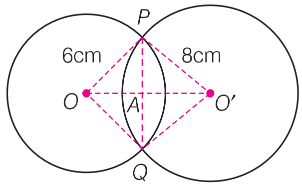
$=10205\text{ m}^2$

$\therefore$ Yes, Love is right. (1)

27. Here, two circles are of radii $OP = 6$ cm and $O'P = 8$ cm

These two circles intersect at P and Q.

Here, OP and $O'P$ are two tangents drawn at point P



$\therefore \quad \angle OPO' = 90^\circ$

[tangents at any point of circle is perpendicular to radius through the point of contact]

In $\Delta OPO'$, by Pythagoras theorem,

$OO'^2 = OP^2 + PO'^2$

$\Rightarrow \quad 6^2+8^2 = OO'^2$

$36+64=OO'^2$

$\Rightarrow \quad OO' = 10$ cm (1)

Also, $PA \perp OO'$

Let $OA = x$, then $AO' = 10 - x$

In ΔOAP,

$OP^2 = OA^2 + AP^2$ [by Pythagoras theorem]

$\Rightarrow \quad AP^2 = 6^2 - x^2 = 36 - x^2$ …(i)

Now, in $\Delta APO'$,

$PO'^2 = PA^2 + AO'^2$ [by Pythagoras theorem]

$\Rightarrow \quad PA^2 = 8^2-(10-x)^2$ …(ii) (1)

From Eqs. (i) and (ii), we get

$36-x^2 = 64-(10-x)^2$

$\Rightarrow \quad 36-x^2 = 64-100-x^2+20x \Rightarrow 20x = 72$

$\Rightarrow \quad x=\frac{18}{5}=3.6$ cm

From Eq (i), we get

$AP^2 = 36-12.96 = 23.04 \Rightarrow AP = 4.8$ cm

$\therefore$ Length of common chord

$= PQ = 2AP = 2\times4.8 = 9.6$ cm (1)

28. (a) Let $\sqrt{3}$ be rational in the simplest form of $\frac{p}{q}$, where p and q are integers and having no common factor other than 1 and $q\neq0$, i.e. $\sqrt{3}=\frac{p}{q}$.

On squaring both sides, we get

$3=\frac{p^2}{q^2} \Rightarrow 3q^2 = p^2$ …(i)

Since, $3q^2$ is divisible by 3.

$\therefore$ p^2 is also divisible by 3.

$\Rightarrow$ p is divisible by 3. …(ii) (1/2)

Let $p = 3c$, for some integer c.

On putting $p=3c$ in Eq. (i), we get

$3q^2=(3c)^2$

$\Rightarrow \quad 3q^2 = 9c^2 \Rightarrow q^2 = 3c^2$ (1/2)

Since, $3c^2$ is divisible by 3.

$\therefore$ q^2 is divisible by 3.

$\Rightarrow$ q is divisible by 3. ...(iii) (1)

From Eqs. (ii) and (iii), we get 3 is a common factor of p and q. But this contradicts our assumption that p and q are having no common factor other than 1.

Therefore, our assumption that $\sqrt{3}$ is rational, is wrong.

Hence, $\sqrt{3}$ is an irrational. **Hence proved.** (1)

Or

(b) Time taken by Sania to drive one round of the field $= 18$ min

Time taken by Ravi to drive one round of the field $= 12$ min (1)

The LCM of 18 and 12 gives the exact number of minutes after which they will meet at the starting point again. (1)

Now, $18 = 2\times3\times3 = 2\times3^2$ and $12 = 2\times2\times3 = 2^2\times3$

$\therefore$ LCM of 18 and $12 = 2^2\times3^2 = 4\times9 = 36$

Hence, Sania and Ravi will meet again at the starting point after 36 min. (1)

29. **Given** $\Delta ABC \sim \Delta PQR$

CM is the median of ΔABC and RN is the median of ΔPQR.

To prove (i) $\Delta AMC \sim \Delta PNR$ (ii) $\frac{CM}{RN} = \frac{AB}{PQ}$

Proof

(i) Given, $\Delta ABC \sim \Delta PQR$

$$\therefore \quad \frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR} \quad \text{...(i)}$$

[$\because$ in similar triangles, corresponding sides are proportional]

and $\angle A = \angle P, \angle B = \angle Q$ and $\angle C = \angle R$ ...(ii)

[$\because$ In similar triangles, corresponding angles are equal] (1/2)

We know that the median bisects the opposite side.

$\therefore$ $AM = MB$

$\Rightarrow$ $AB = 2\,AM$

and $PN = NQ$

$\Rightarrow$ $PQ = 2PN$ (1/2)

From Eq. (i), we have

$$\frac{AB}{PQ} = \frac{AC}{PR} \Rightarrow \frac{2AM}{2PN} = \frac{AC}{PR}$$

$$\Rightarrow \quad \frac{AM}{PN} = \frac{AC}{PR} \quad \text{...(iii)}$$

In ΔAMC and ΔPNR, we have

$\angle A = \angle P$ [from Eq. (ii)]

and $\frac{AM}{PN} = \frac{AC}{PR}$ [from Eq. (iii)]

So, $\Delta AMC \cong \Delta PNR$

[by SAS similarity criterion] (1)

(ii) We have, $\Delta AMC \sim \Delta PNR$

$$\Rightarrow \quad \frac{AM}{PN} = \frac{AC}{PR} = \frac{CM}{RN}$$

[$\because$ triangles are similar, so corresponding sides will be proportional]

$$\therefore \quad \frac{CM}{RN} = \frac{AC}{PR} \Rightarrow \frac{CM}{RN} = \frac{AB}{PQ} \quad \text{[from Eq. (i)]}$$

Hence proved. (1)

30. (a) We have, $\dfrac{\tan^2 60^\circ + 4\cos^2 45^\circ + 3\sec^2 30^\circ + 5\cos^2 90^\circ}{\text{cosec}\,30^\circ + \sec 60^\circ - \cot^2 30^\circ}$

$$= \frac{(\sqrt{3})^2 + 4\left(\frac{1}{\sqrt{2}}\right)^2 + 3\left(\frac{2}{\sqrt{3}}\right)^2 + 5(0)}{2+2-(\sqrt{3})^2}$$

$$\left[\begin{array}{l}\because \tan 60^\circ = \sqrt{3}, \cos 45^\circ = \frac{1}{\sqrt{2}}, \\ \sec 30^\circ = \frac{2}{\sqrt{3}}, \text{cosec}\,30^\circ = \frac{2}{\sqrt{3}}, \sec 60^\circ = 2, \cot 30^\circ = \sqrt{3}\end{array}\right] \quad (2)$$

$$= \frac{3 + \frac{4}{2} + 3\times\frac{4}{3} + 0}{4-3} = \frac{3+2+4}{1} = 9 \quad (1)$$

Or

(b) Given, $\cos(A+B) = 0 \Rightarrow \cos(A+B) = \cos 90^\circ$

$\Rightarrow$ $A + B = 90^\circ$ ...(i)

and $\cot(A-B) = \sqrt{3} \Rightarrow \cot(A-B) = \cot 30^\circ$

$\Rightarrow$ $A - B = 30^\circ$ ...(ii) (1)

On solving Eqs. (i) and (ii), we get

$A = 60^\circ$ and $B = 30^\circ$

$\therefore \cos A\cdot\cos B - \sin A\cdot\sin B$

$= \cos 60^\circ\cdot\cos 30^\circ - \sin 60^\circ\cdot\sin 30^\circ$

$$= \frac{1}{2}\times\frac{\sqrt{3}}{2} - \frac{\sqrt{3}}{2}\times\frac{1}{2} = \frac{\sqrt{3}}{4} - \frac{\sqrt{3}}{4} = 0$$

$$\left[\begin{array}{l}\because \cos 60^\circ = \frac{1}{2}, \cos 30^\circ = \frac{\sqrt{3}}{2}, \\ \sin 30^\circ = \frac{1}{2}, \sin 60^\circ = \frac{\sqrt{3}}{2}\end{array}\right] \quad (2)$$

31. Given, $2\left(\frac{2x+3}{x-3}\right) - 25\left(\frac{x-3}{2x+3}\right) = 5$

Let $\frac{2x+3}{x-3} = y$ ...(i)

Then, $\frac{x-3}{2x+3} = \frac{1}{y}$ (1/2)

Therefore, the given equation reduces to

$$2y - 25\frac{1}{y} = 5 \Rightarrow 2y^2 - 25 = 5y$$

$\Rightarrow$ $2y^2 - 5y - 25 = 0$

$\Rightarrow$ $2y^2 - 10y + 5y - 25 = 0$

$\Rightarrow$ $2y(y-5) + 5(y-5) = 0$

$\Rightarrow$ $(y-5)(2y+5) = 0$

$\Rightarrow$ $y = 5$ or $y = \frac{-5}{2}$ (1)

Now, on putting $y=5$ in Eq. (i), we get

$$\frac{2x+3}{x-3}=\frac{5}{1} \Rightarrow 5x-15=2x+3$$

$\Rightarrow$ $3x=18 \Rightarrow x=6$ (1/2)

Again, on putting $y=-\frac{5}{2}$ in Eq. (i), we get

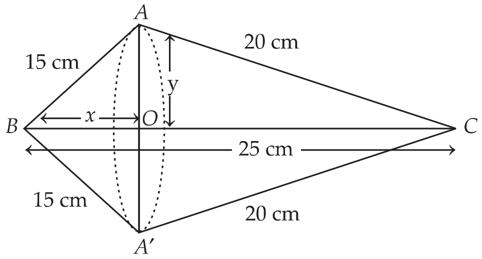
$$\frac{2x+3}{x-3}=-\frac{5}{2} \Rightarrow -5x+15=4x+6$$

$\therefore$ $9x=9 \Rightarrow x=1$

Hence, the values of x are 1 and 6. (1)

32. (a) Let BAC be a right-angled triangle such that $AB=15$ cm and $AC=20$ cm.

Using Pythagoras theorem, we have



$$BC^2=AB^2+AC^2 \Rightarrow BC^2=15^2+20^2$$

$\Rightarrow$ $BC^2=225+400=625$

$\therefore$ $BC=25$ cm [take positive square root] (1)

Let $OB=x$ and $OA=y$.

Again, using Pythagoras theorem in ΔOAB and ΔOAC, we have

$$AB^2=OB^2+OA^2 \Rightarrow 15^2=x^2+y^2$$

$\Rightarrow$ $x^2+y^2=225$ ...(i)

and $AC^2=OA^2+OC^2 \Rightarrow 20^2=y^2+(25-x)^2$

$\Rightarrow$ $(25-x)^2+y^2=400$ ...(ii)

On subtracting Eq. (i) from Eq. (ii), we get

$$\{(25-x)^2+y^2\}-\{x^2+y^2\}=400-225$$

$\Rightarrow$ $(25-x)^2-x^2=175$

$\Rightarrow$ $(25-x-x)(25-x+x)=175$

[$\because a^2-b^2=(a-b)(a+b)$]

$\Rightarrow$ $(25-2x)\times 25=175 \Rightarrow 25-2x=7$

$\Rightarrow$ $2x=18 \Rightarrow x=9$ (1)

On putting $x=9$ in Eq. (i), we get

$$81+y^2=225 \Rightarrow y^2=144$$

$\therefore$ $y=12$

[taking positive square root]

Thus, we have $OA=12$ cm and $OB=9$ cm (1)

$\therefore$ Volume of the double cone

= Volume of cone CAA' + Volume of cone BAA'

$$=\frac{1}{3}\pi(OA)^2\times OC+\frac{1}{3}\pi(OA)^2\times OB$$

$$=\frac{1}{3}\pi\times 12^2\times 16+\frac{1}{3}\pi\times 12^2\times 9$$

[$\because OC=25-9=16$ cm]

$$=\frac{1}{3}\pi\times 144(16+9)$$

$$=\frac{1}{3}\times 3.14\times 144\times 25\ \text{cm}^3$$

$=3768\ \text{cm}^3$ (1)

$\therefore$ Total surface area of the double cone

= Curved surface area of cone CAA'

+ Curved surface area of cone BAA'

$=\pi\times OA\times AC+\pi\times OA\times AB$ [$\because$ CSA of cone $=\pi rl$]

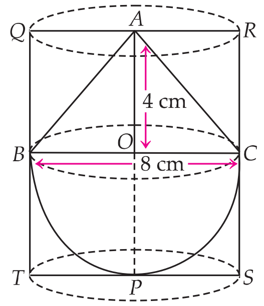
$=\pi\times 12\times 20+\pi\times 12\times 15$

$=420\pi=420\times 3.14=1318.8\ \text{cm}^2$ (1)

Or

(b) Let BPC be the hemisphere and ABC be the cone mounted on the base of the hemisphere.

Let $QRST$ be the right circular cylinder circumscribing the given toy.



(1)

We have, height of cone, $OA=4$ cm

Diameter of the base of the cone, $d=8$ cm

$\therefore$ Radius of the base of cone, $r=\frac{d}{2}=\frac{8}{2}=4$ cm

Here, $AP=AO+OP=4+4=8$ cm (1)

Required space

= Volume of cylinder − (Volume of cone + Volume of hemisphere)

$$=\pi r^2H-\left[\frac{1}{3}\pi r^2h+\frac{2}{3}\pi r^3\right]$$

$$=\pi r^2H-\frac{1}{3}\pi r^2h-\frac{2}{3}\pi r^3$$

$$=\pi(4)^2\left[8-\frac{1}{3}\times 4-\frac{2}{3}\times 4\right]$$

$$=\pi r^2\left[H-\frac{1}{3}h-\frac{2}{3}r\right] \quad \left[\begin{array}{l}\text{here } H=AP=8\text{cm}\\ \text{and } h=AO=4\text{cm}\end{array}\right]$$ (1)

$$=16\pi\left[8-\frac{4}{3}-\frac{8}{3}\right]$$

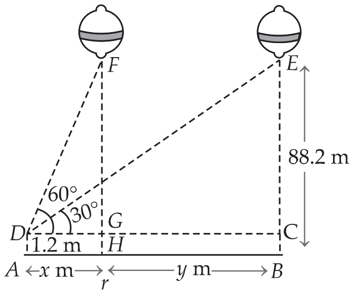
$$=16\pi\left[\frac{24-4-8}{3}\right]$$

$$=16\pi\times\frac{12}{3}=64\pi\ \text{cm}^3$$

Hence, the right circular cylinder covers $64\pi\ \text{cm}^3$ more space than the solid toy. (2)

33. Let $AD = 1.2$ m be the height of girl standing on the horizontal line AB and let $FH = EB = 88.2$ m be the height of balloon from the line AB.

At the eyes of the girl, the angles of elevation are $\angle FDC = 60^\circ$ and $\angle EDC = 30^\circ$.



Now, $FG = EC = 88.2 - 1.2 = 87$ m (1)

Let the distance travelled by the balloon,

$HB = y$ m and $AH = x$ m.

$\therefore \quad DG = AH = x$ m

and $\quad GC = HB = y$ m

In right angled ΔFGD,

$$\tan 60^\circ = \frac{FG}{DG}$$

$$\Rightarrow \quad \sqrt{3} = \frac{87}{x} \qquad [\because \tan 60^\circ = \sqrt{3}]$$

$$\Rightarrow \quad x = \frac{87}{\sqrt{3}} \qquad \ldots\text{(i)} \quad (1)$$

In right angled ΔECD,

$$\tan 30^\circ = \frac{EC}{DC}$$

$$\Rightarrow \quad \frac{1}{\sqrt{3}} = \frac{87}{DG + GC}$$

$$\left[\because \tan 30^\circ = \frac{1}{\sqrt{3}} \text{ and } DC = DG + GC\right]$$

$$\Rightarrow \quad \frac{1}{\sqrt{3}} = \frac{87}{x + y} \qquad (1)$$

$$\Rightarrow \quad x + y = 87\sqrt{3} \qquad \ldots\text{(ii)}$$

On putting $x = \frac{87}{\sqrt{3}}$ from Eq. (i) in Eq. (ii), we get

$$\frac{87}{\sqrt{3}} + y = 87\sqrt{3} \Rightarrow y = 87\left(\sqrt{3} - \frac{1}{\sqrt{3}}\right) \qquad (1)$$

$$\Rightarrow \quad y = \frac{87(3-1)}{\sqrt{3}}$$

$$= \frac{87 \times 2}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} \qquad \text{[rationalising]}$$

$$= \frac{87 \times 2\sqrt{3}}{3}$$

$$= 29 \times 2\sqrt{3} = 58\sqrt{3} \text{ m}$$

Hence, the distance travelled by the balloon during the interval is $58\sqrt{3}$ m. (1)

34. (a) As the distribution is discontinuous, so firstly we will convert it into a continuous distribution by using adjustment factor of $\frac{15-14}{2} = 0.5$, hence we get the following table

Age (in years)	**Number of cases**
4.5-14.5	6
14.5-24.5	11
24.5-34.5	21
34.5-44.5	23
44.5-54.5	14
54.5-64.5	5
Total	80

(2)

As, the class 34.5-44.5 has maximum frequency, so it is the modal class.

Here, $l = 34.5$, $f_1 = 23$, $f_2 = 14$, $f_0 = 21$ and $h = 10$

$$\therefore \quad \text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h \qquad (1)$$

$$= 34.5 + \left(\frac{23 - 21}{2 \times 23 - 21 - 14}\right) \times 10$$

$$= 34.5 + \frac{2}{46 - 35} \times 10 = 34.5 + \frac{20}{11}$$

$$= 34.5 + 1.82 = 36.32 \text{ (approx)}$$

Hence, the modal age is 36.32 yr. (2)

Or

(b) The cumulative frequency table for the given data is

Class Interval	**Frequency** (f)	**Cumulative frequency** (cf)
0-10	5	5
10-20	x	$5 + x\,(cf)$
20-30	$20\,(f)$	$25 + x$
30-40	15	$40 + x$
40-50	y	$40 + x + y$
50-60	5	$45 + x + y$
Total	$\Sigma f_i = 60$	

(2)

$\because$ Median = 30

So, it lies in the interval 20-30.

Thus, 20-30 is the median class.

$\therefore \; l = 20, h = 10, f = 20, cf = 5 + x$ and $N = 60$

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

$$\therefore \quad 30 = 20 + \frac{\frac{60}{2} - (5 + x)}{20} \times 10$$

$$\Rightarrow \quad 10 = \frac{30 - 5 - x}{2}$$

$\Rightarrow \quad 20 = 25 - x \Rightarrow x = 5$ (2)

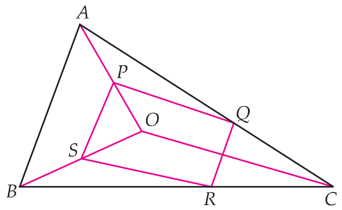
Also, we have $60 = 45 + x + y$

$\Rightarrow \quad 15 = x + y \Rightarrow 15 = 5 + y \Rightarrow y = 10$

Hence, the values of x and y are 5 and 10. (1)

35. **Given** $PQRS$ is a parallelogram.

So, $PQ \parallel SR$ and $PS \parallel QR$. Also, $AB \parallel PS$.



To prove $OC \parallel SR$ (1)

Proof In ΔOAB and ΔOPS,

$AB \parallel PS$

$\angle AOB = \angle POS$ [common angle]

$\angle OBA = \angle OSP$ [corresponding angles]

$\therefore$ By AA similarity criterion,

$\Delta OAB \sim \Delta OPS$

Then, $\dfrac{OS}{OB} = \dfrac{PS}{AB}$ ...(i)

In ΔCAB and ΔCQR,

$AB \parallel PS \parallel QR$

$\angle ABC = \angle QRC$ [corresponding angles]

$\angle ACB = \angle QCR$ [common angle]

$\therefore$ By AA similarity criterion,

$\Delta CAB \sim \Delta CQR$

Then, $\dfrac{CR}{CB} = \dfrac{QR}{AB} \Rightarrow \dfrac{CR}{CB} = \dfrac{PS}{AB}$ ...(ii)

$[\because PS = QR]$

From Eqs. (i) and (ii), we get

$\dfrac{CR}{CB} = \dfrac{OS}{OB}$ or $\dfrac{CB}{CR} = \dfrac{OB}{OS}$ (1)

On subtracting 1 from both sides, we get

$\dfrac{CB}{CR} - 1 = \dfrac{OB}{OS} - 1$

$\Rightarrow \dfrac{CB - CR}{CR} = \dfrac{OB - OS}{OS} \Rightarrow \dfrac{BR}{CR} = \dfrac{BS}{OS}$ ...(iii)

By converse of BPT,

$SR \parallel OC$ **Hence proved.** (1)

36. (i) Vikas received ₹ 130 as profit.

$\therefore$ According to the situation,

$\dfrac{12}{100}p + \dfrac{10}{100}q = 130$

$\Rightarrow \quad 12p + 10q = 13000$ $(1\frac{1}{2})$

(ii) Vikas received ₹ 4 extra, if he interchange the investment amount.

$\therefore$ According to the situation,

$\dfrac{10}{100}p + \dfrac{12}{100}q = 130 + 4$

$\Rightarrow \quad 10p + 12q = 13400$ $(1\frac{1}{2})$

(iii) From above situations, we have

$12p + 10q = 13000$ ...(i)

and $10p + 12q = 13400$ ...(ii)

On adding Eqs. (i) and (ii), we get

$22p + 22q = 26400$

$\Rightarrow \quad p + q = 1200$ ...(iii)

Now, subtracting Eq. (ii) from Eq. (i), we get

$2p - 2q = -400$

$\Rightarrow \quad p - q = -200$ ...(iv)

Now, on adding Eqs. (iii) and (iv), we get

$2p = 1000 \Rightarrow p = ₹500$

On putting the value of p in Eq. (iii), we get

$q = 1200 - 500 = ₹\ 700$ (1)

Or

We have, $2x + y = 8$ ...(i)

$3x + y = 20$ ...(ii)

$\Rightarrow \quad y = 20 - 3x$

On substituting the value of y from Eq. (ii) in Eq. (i), we get

$2x + 20 - 3x = 8$

$\Rightarrow \quad -x = 8 - 20 = -12 \Rightarrow x = 12$

On putting the value of x in Eq. (i), we get

$2 \times 12 + y = 8 \Rightarrow y = 8 - 24 \Rightarrow y = -16$ (1)

37. (i) Since, graph of given polynomial intersects X-axis at 3 points. So, it has three zeroes. (1)

Hence, it is a cubic polynomial.

(ii) On comparing given polynomial $5x^2 - 14x + 8$ with $ax^2 + bx + c$, we get

$a = 5, b = -14$ and $c = 8$

Now, sum of zeroes, $\alpha + \beta = \dfrac{-b}{a} = -\dfrac{(-14)}{5} = \dfrac{14}{5}$ (1)

and product of zeroes, $\alpha\beta = \dfrac{c}{a} = \dfrac{8}{5}$ (1)

(iii) (a) Given, sum of zeroes, $\alpha + \beta = -3 = \dfrac{-b}{a}$

and product of zeroes, $\alpha\beta = 2 = \dfrac{c}{a}$

We know that if α and β are zeroes of a polynomial, then that quadratic polynomial is given by

$x^2 - (\alpha + \beta)x + \alpha\beta$

$\therefore$ Quadratic polynomial is $x^2 + 3x + 2$. (1)

Or

(b) The graph of given polynomial intersects X-axis at points $-4, -1$ and 2. So, zeroes of given polynomial are $-4, -1$ and 2. (1)

38. (i) Here, required distance $= \sqrt{(13-5)^2 + (26-8)^2}$

$= \sqrt{8^2 + 18^2} = \sqrt{64 + 324}$

$= \sqrt{388} = 2\sqrt{97}$ km

(ii) Here, required distance $= \sqrt{(13-2)^2 + (26-4)^2}$

$= \sqrt{11^2 + 22^2}$

$= \sqrt{121 + 484}$

$= \sqrt{605} = 24.6$ km

(iii) (a) Here, extra distance = Distance from house to bank
+ Distance from bank to school
+ Distance from school to office
− Distance from house to office

$$= \sqrt{(5-2)^2 + (8-4)^2} + \sqrt{(13-5)^2 + (14-8)^2} + \sqrt{(13-13)^2 + (26-14)^2} - \sqrt{(13-2)^2 + (26-4)^2}$$

$$= \sqrt{9 + 16} + \sqrt{64 + 36} + \sqrt{0 + 144} - \sqrt{121 + 484}$$

$$= \sqrt{25} + \sqrt{100} + \sqrt{144} - \sqrt{605}$$

$= 5 + 10 + 12 - 24.6 = 27 - 24.6$

$= 2.4$ km

Or

(b) Let the coordinates of the required point be (x, y) which divides the path between house and office in ratio 4 : 3. Then, by section formula,

$$(x, y) = \left(\frac{4 \times 13 + 3 \times 2}{4 + 3}, \frac{4 \times 26 + 3 \times 4}{4 + 3}\right)$$

$$(x, y) = \left(\frac{52 + 6}{7}, \frac{104 + 12}{7}\right)$$

$$\Rightarrow \quad (x, y) = \left(\frac{58}{7}, \frac{116}{7}\right)$$

∴ The coordinates of the point are $\left(\frac{58}{7}, \frac{116}{7}\right)$.

My Reflection & Problem Points

Write down any difficulties, doubts, or mistakes you faced in this paper.

Discuss these points with your teacher and sort them out.

Concept (s) I got stuck on ....

....

Question (s) I couldn't complete ....

....

What confused me most ....

....

Time issue faced in ....