SAMPLE PAPER TEST 4 FOR BOARD EXAM 2025

SUBJECT: MATHEMATICS **MAX. MARKS : 80**
CLASS : X **DURATION : 3 HRS**

General Instruction:

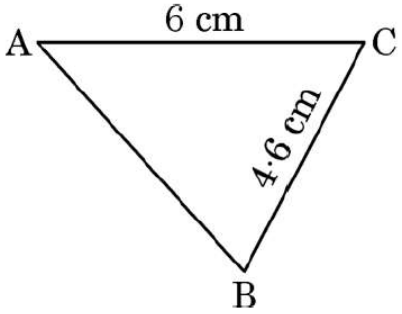
1. This Question Paper has 5 Sections A-E.
2. **Section A** has 20 MCQs carrying 1 mark each.
3. **Section B** has 5 questions carrying 02 marks each.
4. **Section C** has 6 questions carrying 03 marks each.
5. **Section D** has 4 questions carrying 05 marks each.
6. **Section E** has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated.

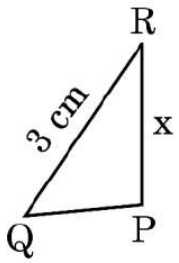
SECTION – A

Questions 1 to 20 carry 1 mark each.

1. A tangent to a circle is a line that touches the circle at :
(a) one point only (b) two points (c) three points (d) infinite number of points

2. In the given figure, if $\Delta ABC \sim \Delta QPR$, then the value of x is :
(a) 5·3 cm (b) 4·6 cm (c) 2·3 cm (d) 4 cm





3. A number x is chosen at random from the numbers -3, -2, -1, 0, 1, 2, 3 the probability that $|x| < 2$ is
(a) 1/7 (b) 2/7 (c) 3/7 (d) 5/7

4. A lamp post 9 m high casts a shadow 3 3 m long on the ground. The Sun's elevation at this moment is :
(a) 60° (b) 90° (c) 45° (d) 30°

5. If ½ is a root of the equation $x^2 + kx - 5/4 = 0$, then the value of k is
(a) 2 (b) – 2 (c) ¼ (d) ½

6. The following distribution gives the daily income of 50 workers of a factory :

Income (in Rs.)	400 – 424	425 – 449	450 – 474	475 – 499	500 – 524
Number of workers	12	14	8	6	10

The lower limit of the modal class is :
(a) 425 (b) 449 (c) 424·5 (d) 425·5

7. The number of quadratic polynomials having zeroes –1 and 3 is :
(a) 1 (b) 2 (c) 3 (d) more than 3

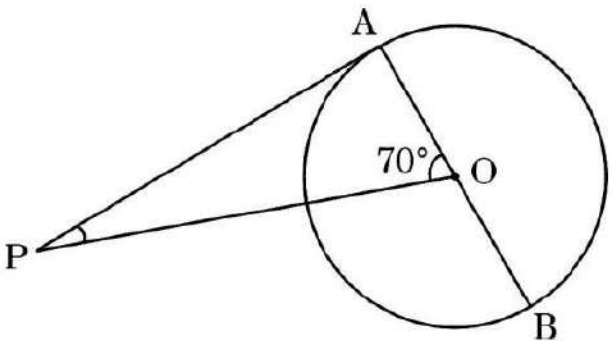
8. The values of k for which the quadratic equation $2x^2 – kx + k = 0$ has equal roots is
(a) 0 only (b) 8 only (c) 0,8 (d) 4

9. If $x = 2\sin^2\theta$ and $y = 2\cos^2\theta + 1$ then x + y is:
(a) 3 (b) 2 (c) 1 (d) 1/2

10. The region between a chord and either of the two arcs of a circle is called :
(a) an arc (b) a sector (c) a segment (d) a semicircle

11. If the LCM of a and 18 is 36 and the HCF of a and 18 is 2, then a =
(a) 1 (b) 2 (c) 3 (d) 4

12. In the given figure, PA is a tangent from an external point P to a circle with centre O. If ∠AOP = 70°, then the measure of ∠APO is :



(a) 70° (b) 90° (c) 110° (d) 20°

13. Which of the following is not a quadratic equation ?
(a) $(x – 2)^2 + 1 = 2x – 3$ (b) $(2x – 1)(x – 3) = (x + 5)(x – 1)$
(c) $x(x + 1) + 8 = (x + 2)(x – 2)$ (d) $2x + 3/x = 5$

14. The common difference of an A.P., if $a_{23} – a_{19} = 32$, is :
(a) 8 (b) – 8 (c) – 4 (d) 4

15. For the following distribution:

Marks	Below 10	Below 20	Below 30	Below 40	Below 50	Below 60
No. of students	3	12	27	57	75	80

the modal class is
(a) 10-20 (b) 20-30 (c) 30-40 (d) 50-60

16. In a circle of diameter 42cm, if an arc subtends an angle of 60º at the centre, then the length of the arc is:
(a) 22/7 cm (b) 11cm (c) 22 cm (d) 44 cm

17. The point on the x-axis which is equidistant from (– 4, 0) and (10, 0) is:
(a) (7, 0) (b) (5, 0) (c) (0, 0) (d) (3, 0)

18. The point which lies on the perpendicular bisector of the line segment joining point A (–2, –5) and B (2, 5) is:
(a) (0, 0) (b) (0, –1) (c) (–1, 0) (d) (1, 0)

Direction : In the question number 19 & 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 and 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 of getting number 8 on rolling a die is zero (0).
Reason (R): The probability of an impossible event is zero (0).

20. **Assertion (A):** The pair of linear equations $5x + 2y + 6 = 0$ and $7x + 6y + 18 = 0$ have infinitely many solutions.
Reason (R): The pair of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ have infinitely many solutions, if $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

SECTION-B

Questions 21 to 25 carry 2 marks each

21. A quadrilateral ABCD is drawn to circumscribe a circle. Prove that AB + CD = AD + BC.

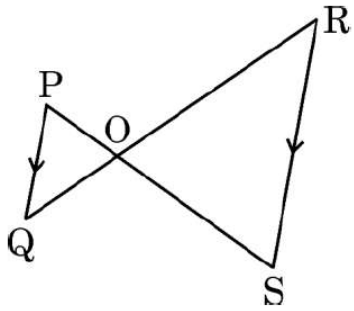
22. (a) If α, β are zeroes of the polynomial $8x^2 + 14x + 3$, then find the value of $\left(\frac{1}{\alpha} + \frac{1}{\beta}\right)$

OR

(b) Find a quadratic polynomial whose zeroes are – 9 and 6.

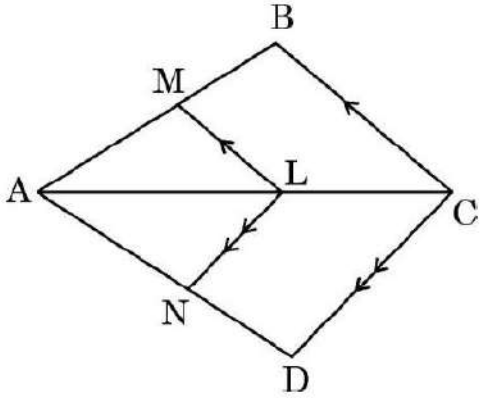
23. Evaluate: sin 30° cos 60° + cos 30° sin 60° – cot 45°

24. (a) In the given figure, PQ || RS. Prove that OP × OR = OQ × OS.



OR

(b) In the given figure, LM || CB and LN || CD. Prove that AM/AN = AB/AD

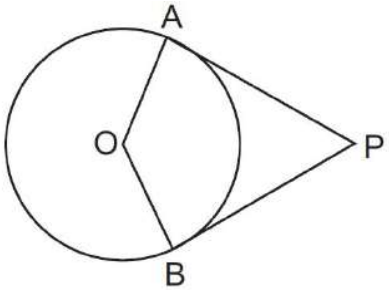


25. Given that HCF (306, 1314) = 18, find LCM of (306, 1314).

SECTION-C

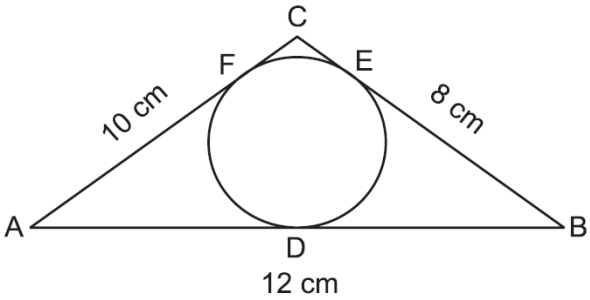
Questions 26 to 31 carry 3 marks each

26. In the given figure, OP is equal to diameter of the circle. Prove that ABP is an equilateral triangle.



OR

A circle is inscribed in a ΔABC having sides 8 cm, 10 cm and 12 cm as shown in the following figure. Find AD, BE and CF.



27. Show that $5 + 2\sqrt{7}$ is an irrational number, where $\sqrt{7}$ is given to be an irrational number.

28. If $\text{cosec}\theta + \cot\theta = p$, then prove that $\cos\theta = \dfrac{p^2 - 1}{p^2 + 1}$

29. A chord of a circle of radius 10 cm subtends a right angle at the centre of the circle. Find the area of the corresponding (i) minor sector (ii) major sector. (Use $\pi = 3{\cdot}14$)

30. (a) If Ritu were younger by 5 years than what she really is, then the square of her age would have been 11 more than five times her present age. What is her present age?

OR

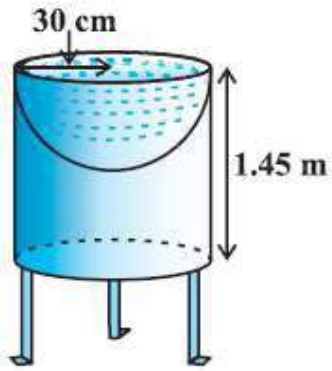
(b) Find the values of 'k' for which the quadratic equation $kx^2 - 2kx + 6 = 0$ has real and equal roots. Also, find the roots.

31. One card is drawn at random from a well-shuffled deck of 52 playing cards. Find the probability that the card drawn is: (i) a red king. (ii) not a black card. (iii) an ace of hearts.

SECTION-D

Questions 32 to 35 carry 5 marks each

32. Ramesh made a bird-bath for his garden in the shape of a cylinder with a hemispherical depression at one end. The height of the cylinder is 1.45 m and its radius is 30 cm. Find the total surface area of the bird-bath.



OR

A tent is in shape of a cylinder surmounted by a conical top. If the height and diameter of the cylindrical part are 2.1m and 4m respectively and the slant height of the top is 2.8m. Find the area of canvas used for making the tent. Also find the cost of canvas of the tent at the rate of 500 per m^2.

33. A manufacturer of TV sets produced 720 TV sets in the fourth year and 880 TV sets in the eighth year. Assuming that the production increases uniformly by a fixed number every year, find the production in the tenth year and the total production in the first seven years.

34. A contractor plans to install two slides for the children to play in a park. For the children below the age of 6 years, he prefers to have a slide whose top is at a height of 2·0 m and is inclined at an angle of 30° to the ground, whereas for older children, he wants to have a steep slide at a height of 4·0 m and inclined at an angle of 60° to the ground. What would be the length of the slide in each case ?

35. (a) If BD and QM are medians of triangles ABC and PQR, respectively, where $\Delta ABC \sim \Delta PQR$, prove that $AB/PQ = BD/QM$.

OR

(b) CD and GH are respectively the bisectors of $\angle ACB$ and $\angle EGF$ such that D and H lie on sides AB and FE of ΔABC and ΔFEG respectively. If $\Delta ABC \sim \Delta FEG$, show that :

(i) $CD/GH = AC/FG$ (ii) $\Delta DCB \sim \Delta HGE$

SECTION-E (Case Study Based Questions)

Questions 36 to 38 carry 4 marks each

36. Vocational training complements traditional education by providing practical skills and hands-on experience. While education equips individuals with a broad knowledge base, vocational training focuses on job-specific skills, enhancing employability thus making the student self- reliant. Keeping this in view, a teacher made the following table giving the frequency distribution of students/adults undergoing vocational training from the training institute.

Age (in years)	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54
Number of participants	62	132	96	37	13	11	10	4

From the above answer the following questions :

(i) What is the lower limit of the modal class of the above data ?

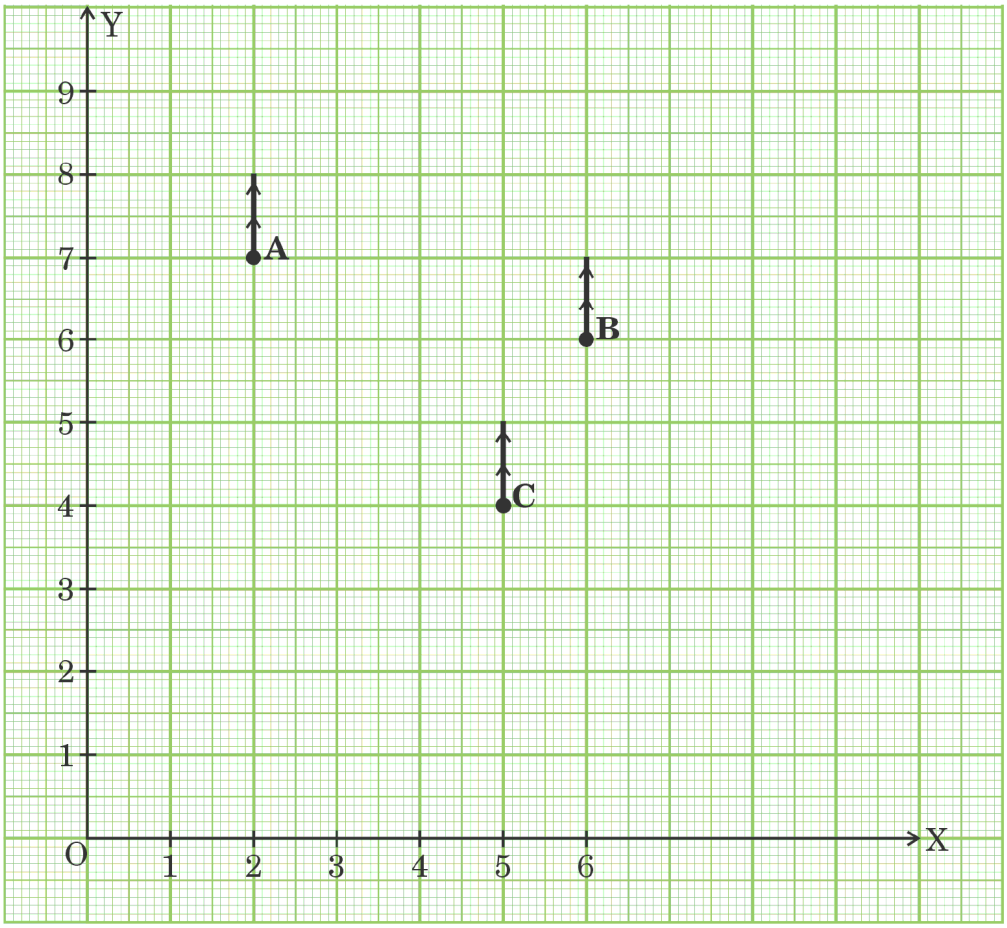
(ii) (a) Find the median class of the above data.

OR

(b) Find the number of participants of age less than 50 years who undergo vocational training.

(iii) Give the empirical relationship between mean, median and mode.

37. Resident Welfare Association (RWA) of Gulmohar Society in Delhi, have installed three electric poles A, B and C in the society's common park. Despite these three poles, some parts of the park are still in the dark. So, RWA decides to have one more electric pole D in the park. The park can be modelled as a coordinate system given below.



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

(i) What is the position of the pole C ? (1)

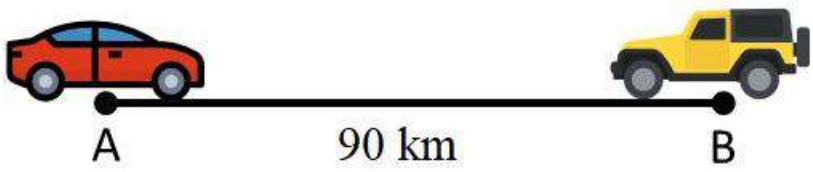
(ii) What is the distance of the pole B from the corner O of the park ? (1)

(iii) (a) Find the position of the fourth pole D so that the four points A, B, C and D form a parallelogram ABCD. (2)

OR

(b) Find the distance between poles A and C. (2)

38. On the roadway, Points A and B, which stand in for Chandigarh and Kurukshetra, respectively, are located nearly 90 kilometres apart. At the same time, a car departs from Kurukshetra and one from Chandigarh. These cars will collide in 9 hours if they are travelling in the same direction, and in 9/7 hours if they are travelling in the other direction. Let X and Y be two cars that are travelling at x and y kilometres per hour from places A and B, respectively. On the basis of the above information, answer the following questions:



(a) When both cars move in the same direction, then find the situation can be represented algebraically. [2]

OR

(a) When both cars move in the opposite direction, then find the situation can be represented algebraically. [2]

(b) Find the speed of car x. [1]

(c) Find the speed of car y. [1]

SAMPLE PAPER TEST 4 FOR BOARD EXAM 2025
(ANSWERS)

SUBJECT: MATHEMATICS
CLASS : X

MAX. MARKS : 80
DURATION : 3 HRS

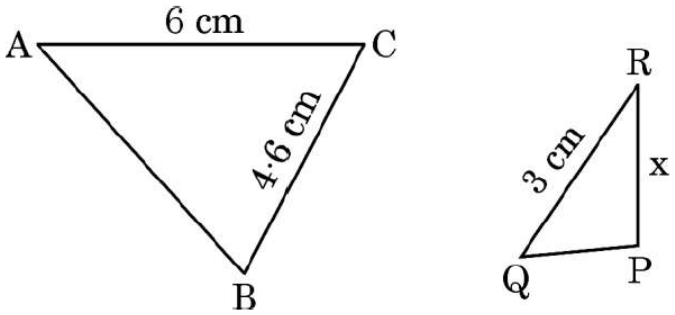
General Instruction:

1. This Question Paper has 5 Sections A-E.
2. **Section A** has 20 MCQs carrying 1 mark each.
3. **Section B** has 5 questions carrying 02 marks each.
4. **Section C** has 6 questions carrying 03 marks each.
5. **Section D** has 4 questions carrying 05 marks each.
6. **Section E** has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated.

SECTION – A
Questions 1 to 20 carry 1 mark each.

1. A tangent to a circle is a line that touches the circle at :
(a) one point only (b) two points (c) three points (d) infinite number of points
Ans. (a) one point only

2. In the given figure, if $\Delta ABC \sim \Delta QPR$, then the value of x is :
(a) 5·3 cm (b) 4·6 cm (c) 2·3 cm (d) 4 cm



Ans. (c) 2·3 cm

3. A number x is chosen at random from the numbers -3, -2, -1, 0, 1, 2, 3 the probability that $|x| < 2$ is
(a) 1/7 (b) 2/7 (c) 3/7 (d) 5/7
Ans: (c) 3/7
Total possible number of events (n) = 7
Now for $|x| < 2$, possible values of x = -1, 0, 1
∴ Required probability = 3/7

4. A lamp post 9 m high casts a shadow 3 3 m long on the ground. The Sun's elevation at this moment is :
(a) 60° (b) 90° (c) 45° (d) 30°
Ans. (a) 60°

5. If ½ is a root of the equation $x^2 + kx - 5/4 = 0$, then the value of k is
(a) 2 (b) – 2 (c) ¼ (d) ½

Ans: (a) 2
If ½ is a root of the equation
$x^2 + kx - 5/4 = 0$ then, substituting the value of ½ in place of x should give us the value of k.
Given, $x^2 + kx - 5/4 = 0$ where, $x = ½$
$(½)^2 + k(½) - (5/4) = 0$
$\Rightarrow (k/2) = (5/4) - ¼ \Rightarrow k = 2$

6. The following distribution gives the daily income of 50 workers of a factory :

Income (in Rs.)	400 – 424	425 – 449	450 – 474	475 – 499	500 – 524
Number of workers	12	14	8	6	10

The lower limit of the modal class is :
(a) 425 (b) 449 (c) 424·5 (d) 425·5
Ans. (c) 424·5

7. The number of quadratic polynomials having zeroes –1 and 3 is :
(a) 1 (b) 2 (c) 3 (d) more than 3
Ans. (d) more than 3

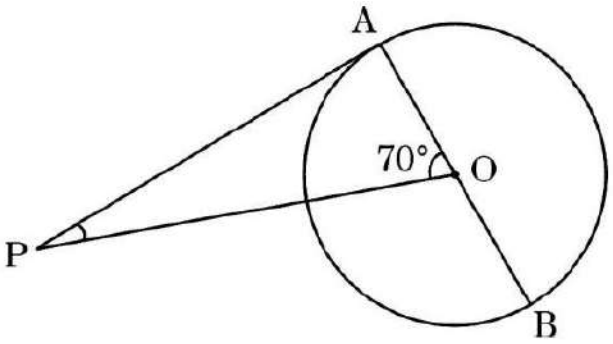
8. The values of k for which the quadratic equation $2x^2 - kx + k = 0$ has equal roots is
(a) 0 only (b) 8 only (c) 0,8 (d) 4
Ans: (c) 0,8
For equal roots, $D = b^2 - 4ac = 0$
$\Rightarrow (-k)^2 - 4(2)(k) = 0$
$\Rightarrow k^2 - 8k = 0 \Rightarrow k(k - 8) = 0 \Rightarrow k = 0,8$

9. If $x = 2\sin^2\theta$ and $y = 2\cos^2\theta + 1$ then x + y is:
(a) 3 (b) 2 (c) 1 (d) 1/2
Ans: (a) 3

10. The region between a chord and either of the two arcs of a circle is called :
(a) an arc (b) a sector (c) a segment (d) a semicircle
Ans. (c) a segment

11. If the LCM of a and 18 is 36 and the HCF of a and 18 is 2, then a =
(a) 1 (b) 2 (c) 3 (d) 4
Ans. (d) 4

12. In the given figure, PA is a tangent from an external point P to a circle with centre O. If ∠AOP = 70°, then the measure of ∠APO is :



(a) 70° (b) 90° (c) 110° (d) 20°
Ans. (d) 20°

13. Which of the following is not a quadratic equation ?
(a) $(x - 2)^2 + 1 = 2x - 3$ (b) $(2x - 1)(x - 3) = (x + 5)(x - 1)$
(c) $x(x + 1) + 8 = (x + 2)(x - 2)$ (d) $2x + 3/x = 5$

Ans. (c) $x(x + 1) + 8 = (x + 2)(x – 2)$

14. The common difference of an A.P., if $a_{23} – a_{19} = 32$, is :
(a) 8 (b) – 8 (c) – 4 (d) 4
Ans. (a) 8

15. For the following distribution:

Marks	Below 10	Below 20	Below 30	Below 40	Below 50	Below 60
No. of students	3	12	27	57	75	80

the modal class is
(a) 10-20 (b) 20-30 (c) 30-40 (d) 50-60
Ans: (c) 30-40

16. In a circle of diameter 42cm, if an arc subtends an angle of 60^o at the centre, then the length of the arc is:
(a) 22/7 cm (b) 11cm (c) 22 cm (d) 44 cm
Ans: (c) 22 cm

17. The point on the x-axis which is equidistant from (– 4, 0) and (10, 0) is:
(a) (7, 0) (b) (5, 0) (c) (0, 0) (d) (3, 0)
Ans. (d) (3, 0)

18. The point which lies on the perpendicular bisector of the line segment joining point A (–2, –5) and B (2, 5) is:
(a) (0, 0) (b) (0, –1) (c) (–1, 0) (d) (1, 0)
Ans. (a) (0, 0)

Direction : In the question number 19 & 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 and 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.

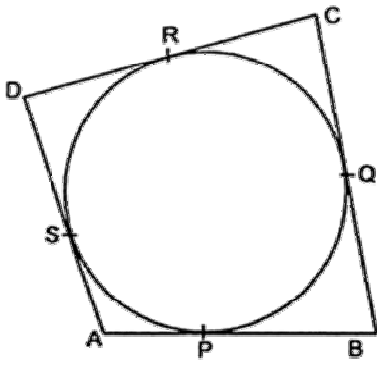
19. **Assertion (A):** The probability of getting number 8 on rolling a die is zero (0).
Reason (R): The probability of an impossible event is zero (0).
Ans. (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A)

20. **Assertion (A):** The pair of linear equations $5x + 2y + 6 = 0$ and $7x + 6y + 18 = 0$ have infinitely many solutions.
Reason (R): The pair of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ have infinitely many solutions, if $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$
Ans. (d) Assertion (A) is false but reason(R) is true.

SECTION-B

Questions 21 to 25 carry 2 marks each

21. A quadrilateral ABCD is drawn to circumscribe a circle. Prove that AB + CD = AD + BC.
Ans: We know that the lengths of tangents drawn from an exterior point to a circle are equal.



AP = AS ... (i) [tangents from A]
BP = BQ ... (ii) [tangents from B]
CR = CQ ... (iii) [tangents from C]
DR = DS ... (iv) [tangents from D]
AB + CD = (AP + BP) + (CR + DR)
= (AS + BQ) + (CQ + DS) [using (1), (ii), (iii), ('v)]
= (AS + DS) + (BQ + CQ)
=AD+ BC.
Hence, AB + CD = AD + BC.

22. (a) If α, β are zeroes of the polynomial $8x^2 + 14x + 3$, then find the value of $\left(\frac{1}{\alpha}+\frac{1}{\beta}\right)$

Ans.
As α, β are zeroes of the polynomial

$$\therefore \alpha + \beta = \frac{-14}{8}$$

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

$$\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\beta + \alpha}{\alpha\beta} = \frac{-14}{3}$$

OR

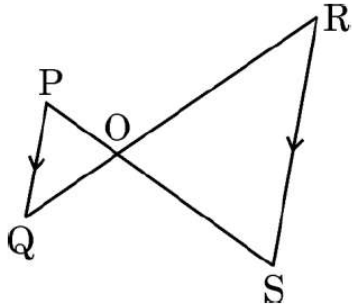
(b) Find a quadratic polynomial whose zeroes are – 9 and 6.
Ans. Sum of zeroes = – 3
Product of zeroes = – 54
Quadratic polynomial is : $k(x^2 + 3x – 54)$ or $x^2 + 3x – 54$

23. Evaluate: sin 30° cos 60° + cos 30° sin 60° – cot 45°
Ans. sin 30° cos 60° + cos 30° sin 60° – cot 45°

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

$$= 0$$

24. (a) In the given figure, PQ || RS. Prove that OP × OR = OQ × OS.

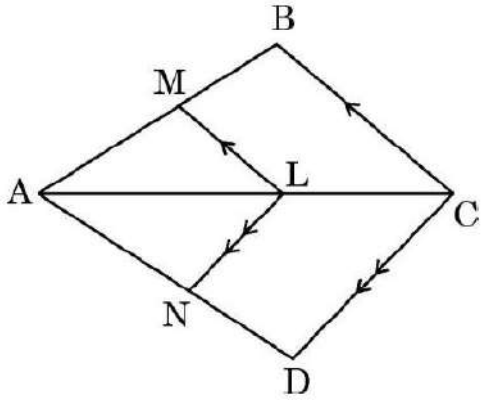


Ans. In ΔPOQ and ΔSOR
∠POQ = ∠SOR (vertically opposite angles)
∠OPQ = ∠OSR (alternate interior angles as PQ SR)
ΔPOQ ~ ΔSOR (AA criteria)

⇒ OP/OS = OQ/OR ⇒ OP × OR = OQ × OS

OR

(b) In the given figure, LM || CB and LN || CD. Prove that AM/AN = AB/AD



Ans. In ΔABC, LM || CB
AM/AB = AL/AC _____ (i)
In ΔADC, LN || CD
AN/AD = AL/AC _____ (ii)
from (i) and (ii) we get AM/AB = AN/AD ⇒ AM/AN = AB/AD

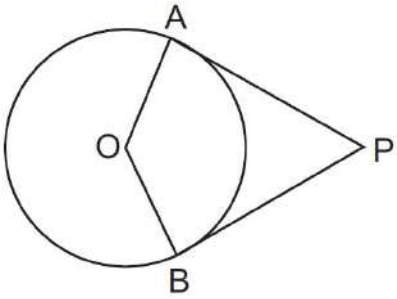
25. Given that HCF (306, 1314) = 18, find LCM of (306, 1314).
Ans. LCM × 18 = 306 × 1314

$$\text{LCM} = \frac{306 \times 1314}{18} = 22,338$$

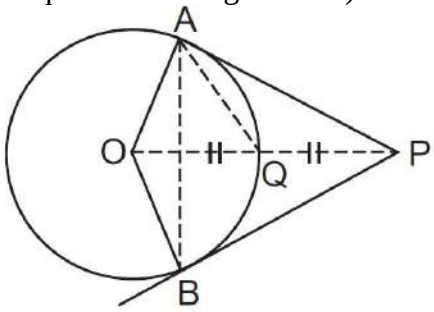
SECTION-C

Questions 26 to 31 carry 3 marks each

26. In the given figure, OP is equal to diameter of the circle. Prove that ABP is an equilateral triangle.



Ans: Join OP and let it meets the circle at point Q.
Since OP = 2r (Diameter of the circle)
⇒ OQ = QP = r
Consider ΔAOP in which OA ⊥ AP and OP is the hypotenuse.
∴ OQ = AQ = OA
(Mid-point of the hypotenuse is equidistant from the vertices)
⇒ OAQ is an equilateral triangle.
⇒ ∠AOQ = 60° (Each angle of an equilateral triangle is 60°)



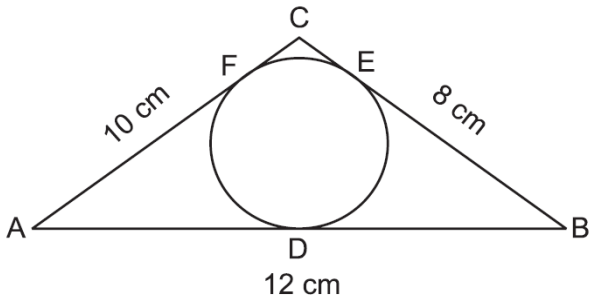
Consider right-angled triangle OAP.
∠AOQ = 60° (Proved above)
∠OAP = 90° ⇒ ∠APO = 30°
∠APB = 2∠APO = 2 × 30° = 60°
Also PA = PB (Tangents to a circle from an external point are equal.)
⇒ ∠PAB = ∠PBA (Angles opposite to equal sides in ΔPAB)
In ΔABP, ∠APB = 60°

$\Rightarrow \angle PAB = \angle PBA = \frac{180^0 - 60^0}{2} = 60^0$

⇒ Each angle of DPAB is 60°
⇒ PAB is an equilateral triangle.

OR

A circle is inscribed in a ΔABC having sides 8 cm, 10 cm and 12 cm as shown in the following figure. Find AD, BE and CF.



Ans: Let AD = x_1, BE = x_2 and CF = x_3;
then AF = AD = x_1, BD = BE = x_2
and CE = CF = x_3.
∴ $x_1 + x_2 = 12$; $x_2 + x_3 = 8$; $x_1 + x_3 = 10$ (1)
Adding,
$2(x_1 + x_2 + x_3) = 30$
⇒ $x_1 + x_2 + x_3 = 15$
Solve for x_1, x_2 and x_3 to get
AD = 7 cm, BE = 5 cm, CF = 3 cm

27. Show that $5 + 2\sqrt{7}$ is an irrational number, where $\sqrt{7}$ is given to be an irrational number.
Ans: Let $5 + 2\sqrt{7}$ is a rational number such that
$5 + 2\sqrt{7} = a$, where a is a rational number

$\Rightarrow 2\sqrt{7} = a - 5 \Rightarrow \sqrt{7} = \frac{a-5}{2}$

Since a is a rational number and 2, 5 are integers, therefore $\frac{a-5}{2}$ is a rational number

⇒ $\sqrt{7}$ is a rational number which contradicts the fact that $\sqrt{7}$ is an irrational number
Therefore, our assumption is wrong
Hence, $5 + 2\sqrt{7}$ is an irrational number

28. If cosecθ + cotθ = p, then prove that $\cos\theta = \frac{p^2 - 1}{p^2 + 1}$

Ans: Given cosecθ + cotθ = p ….. (1)

$\Rightarrow (cosec\theta - \cot\theta)(cosec\theta + \cot\theta) = 1 \Rightarrow (cosec\theta - \cot\theta)\, p = 1$

$\Rightarrow \cos ec\theta - \cot\theta = \frac{1}{p}$ ……. (2)

Adding (1) and (2), we get

$$cosec\theta = \frac{p+\frac{1}{p}}{2} = \frac{p^2+1}{2p}; \cot\theta = \frac{p-\frac{1}{p}}{2} = \frac{p^2-1}{2p}$$

$$\text{Now, } \cos\theta = \frac{\cot\theta}{\cos ec\theta} = \frac{\frac{p^2-1}{2p}}{\frac{p^2+1}{2p}} = \frac{p^2-1}{p^2+1}$$

29. A chord of a circle of radius 10 cm subtends a right angle at the centre of the circle. Find the area of the corresponding (i) minor sector (ii) major sector. (Use $\pi = 3{\cdot}14$)

Ans.

(i) Area of minor sector $= \frac{\pi r^2 \theta}{360^\circ} = \frac{3.14 \times 10 \times 10 \times 90}{360}$

$= \frac{314}{4}$ cm^2 or $\frac{157}{2}$ cm^2 or 78·5 cm^2

(ii) Area of circle $= \pi r^2 = 3{\cdot}14 \times 10 \times 10 = 314$ cm^2

$\therefore$ Area of major sector $= 314 - 78{\cdot}5 = 235{\cdot}5$ cm^2

30. (a) If Ritu were younger by 5 years than what she really is, then the square of her age would have been 11 more than five times her present age. What is her present age?

Ans. Let the present age of Ritu be x years.

According to the question, $(x-5)^2 = 5x + 11$

$\Rightarrow x^2 - 15x + 14 = 0 \Rightarrow (x-14)(x-1) = 0$

$\Rightarrow x = 1$ or 14

$\Rightarrow x = 14$ years (rejecting $x = 1$ as in that case Ritu's age 5 years ago will be – ve)

OR

(b) Find the values of 'k' for which the quadratic equation $kx^2 - 2kx + 6 = 0$ has real and equal roots. Also, find the roots.

Ans. $kx^2 - 2kx + 6 = 0$

Quadratic Equation has equal roots (given)

$\therefore$ D = 0 $\Rightarrow 4k^2 - 24k = 0$ 1

$\Rightarrow 4k(k-6) = 0 \Rightarrow k = 6 \ (k \neq 0)$

Putting k = 6 we get

$6x^2 - 12x + 6 = 0 \Rightarrow x^2 - 2x + 1 = 0$

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

31. One card is drawn at random from a well-shuffled deck of 52 playing cards. Find the probability that the card drawn is :

(i) a red king.

(ii) not a black card.

(iii) an ace of hearts.

Ans. (i) P (Red king) = 2/52 = 1/26

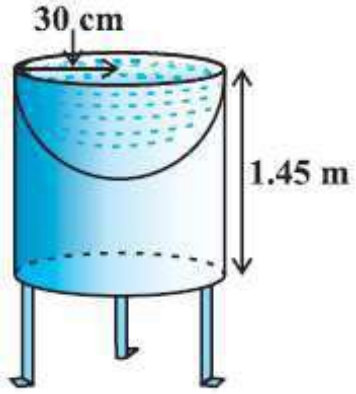
(ii) P(not a black card) = 26/52 = 1/2

(iii) P(ace of hearts) = 1/52

SECTION-D

Questions 32 to 35 carry 5 marks each

32. Ramesh made a bird-bath for his garden in the shape of a cylinder with a hemispherical depression at one end. The height of the cylinder is 1.45 m and its radius is 30 cm. Find the total surface area of the bird-bath.



Ans: Let h be height of the cylinder, and r the common radius of the cylinder and hemisphere.
Then, the total surface area = CSA of cylinder + CSA of hemisphere
$= 2\pi rh + 2\pi r^2 = 2\pi\ r\ (h + r)$
$= 2 \times \frac{22}{7} \times 30\ (145 + 30)\ cm^2$
$= 2 \times \frac{22}{7} \times 30 \times 175\ cm^2$
$= 33000\ cm^2 = 3.3\ m^2$

OR

A tent is in shape of a cylinder surmounted by a conical top. If the height and diameter of the cylindrical part are 2.1m and 4m respectively and the slant height of the top is 2.8m. Find the area of canvas used for making the tent. Also find the cost of canvas of the tent at the rate of 500 per m^2.
Ans: Radius = 2m, Slant height l= 2.8m , height h= 2.1m
Cost of canvas per m^2= Rs.500
Area of canvas used = CSA of cone + CSA of cylinder
$= \pi rl + 2\pi rh$
$=22/7 \times 2 \times 2.8 + 2 \times 22/7 \times 2 \times 2.1$
$=17.6 + 26.4$
$=44m^2$
Cost of the canvas of tent =44 x 500
=Rs.22,000

33. A manufacturer of TV sets produced 720 TV sets in the fourth year and 880 TV sets in the eighth year. Assuming that the production increases uniformly by a fixed number every year, find the production in the tenth year and the total production in the first seven years.
Ans. Let first term= a and common difference = d
Production in 4th year = 720
$a_4 = 720 \Rightarrow a + 3d = 720$ _____ (i)
Production in 8th year = 880
$a_8 = 880 \Rightarrow a + 7d = 880$ _____ (ii)
Solving (i) and (ii)
d = 40 and a = 600
$\Rightarrow$ Production in 10th year $=a_{10}= 600 + 9 \times 40 = 960$
Total Production in the first seven years= $S_7= \frac{7}{2}[2(600) + 6(40)] = 5040$

34. A contractor plans to install two slides for the children to play in a park. For the children below the age of 6 years, he prefers to have a slide whose top is at a height of 2·0 m and is inclined at an angle of 30° to the ground, whereas for older children, he wants to have a steep slide at a height of 4·0 m and inclined at an angle of 60° to the ground. What would be the length of the slide in each case ?
Ans.

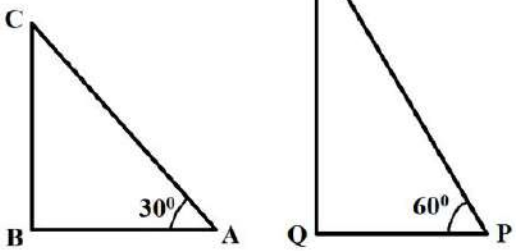
In Δ ABC, $\frac{BC}{AC} = \sin 30° \Rightarrow \frac{2}{AC} = \frac{1}{2} \Rightarrow AC = 4$ m

$\therefore$ length of slide meant for children below 6 years = 4 m

In Δ PQR, $\frac{QR}{PR} = \sin 60° \Rightarrow \frac{4}{PR} = \frac{\sqrt{3}}{2}$

$\Rightarrow PR = \frac{8\sqrt{3}}{3}$ m

or $\frac{13 \cdot 856}{3}$ m or 4·62 m approx.



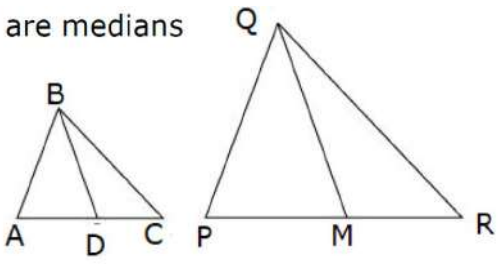
$\therefore$ length of slide meant for older children = 4·62 m

35. (a) If BD and QM are medians of triangles ABC and PQR, respectively, where $\Delta ABC \sim \Delta PQR$, prove that AB/PQ = BD/QM.

Ans.

Given : Δ ABC ~ Δ PQR and BD, QM are medians

To prove : $\frac{AB}{PQ} = \frac{BD}{QM}$



Proof : Δ ABC ~ Δ PQR (given)

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

$\Rightarrow \frac{AB}{PQ} = \frac{2AD}{2PM}$ (BD and QM are medians) $\Rightarrow \frac{AB}{PQ} = \frac{AD}{PM}$

In Δ ABD and Δ PQM

$\frac{AB}{PQ} = \frac{AD}{PM}$ (proved above)

$\angle A = \angle P$ (Δ ABC ~ Δ PQR)

$\therefore \Delta$ ABD ~ Δ PQM (SAS criteria) $\therefore \frac{AB}{PQ} = \frac{BD}{QM}$ (C.P.S.T.)

OR

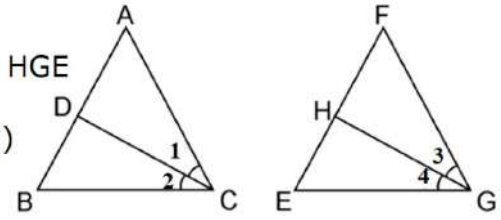
(b) CD and GH are respectively the bisectors of $\angle$ACB and $\angle$EGF such that D and H lie on sides AB and FE of ΔABC and ΔFEG respectively. If $\Delta ABC \sim \Delta FEG$, show that :

(i) CD/GH = AC/FG (ii) $\Delta DCB \sim \Delta HGE$

Ans.

Given: Δ ABC ~ Δ FEG and CD, GH are bisectors of $\angle$ACB and $\angle$EGF respectively.

To Prove (i) $\frac{CD}{GH} = \frac{AC}{FG}$ (ii) Δ DCB ~ Δ HGE



(i) $\angle ACB = \angle FGE$ (Δ ABC ~ Δ FEG)

$\Rightarrow \frac{1}{2}\angle ACB = \frac{1}{2}\angle FGE$

(CD and GH are bisectors of $\angle$ACB and $\angle$EGF)

$\Rightarrow \angle 1 = \angle 3$ and $\angle 2 = \angle 4$

In Δ ACD and Δ FGH

$\angle A = \angle F$ (Δ ABC ~ Δ FEG)

$\angle 1 = \angle 3$ (proved above)

$\Rightarrow \Delta$ ACD ~ Δ FGH (AA criteria) $\Rightarrow \frac{CD}{GH} = \frac{AC}{FG}$

SECTION-E (Case Study Based Questions)

Questions 36 to 38 carry 4 marks each

36. Vocational training complements traditional education by providing practical skills and hands-on experience. While education equips individuals with a broad knowledge base, vocational training focuses on job-specific skills, enhancing employability thus making the student self- reliant. Keeping this in view, a teacher made the following table giving the frequency distribution of students/adults undergoing vocational training from the training institute.

Age (in years)	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54
Number of participants	62	132	96	37	13	11	10	4

From the above answer the following questions :

(i) What is the lower limit of the modal class of the above data ?

(ii) (a) Find the median class of the above data.

OR

(b) Find the number of participants of age less than 50 years who undergo vocational training.

(iii) Give the empirical relationship between mean, median and mode.

Ans. (i) Modal class is 19.5 – 24.5

Lower limit =19.5

(ii) (a)

Age (in years)	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54
Number of participants	62	132	96	37	13	11	10	4
cf	62	194	290	327	340	351	361	365

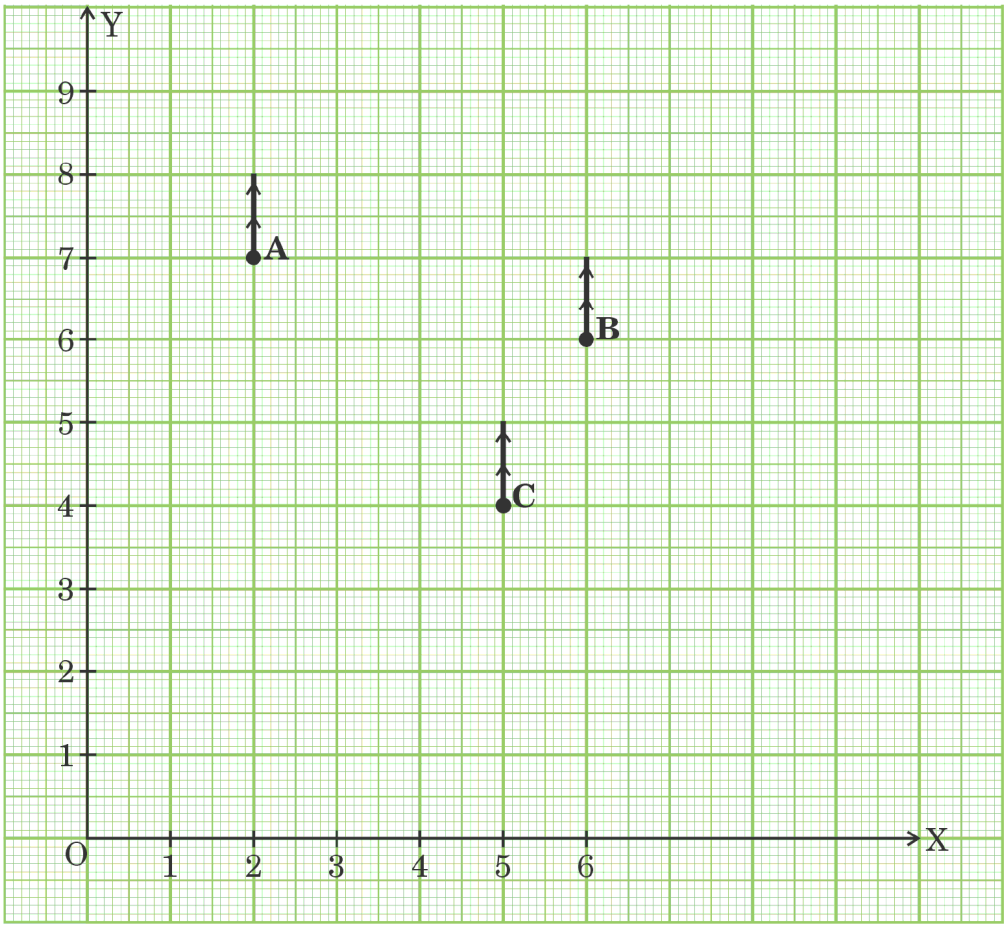
$\frac{n}{2} = \frac{365}{2} = 182.5 \Rightarrow$ median class = 19.5 – 24.5

OR

(ii) (b) 62 + 132 + 96 + 37 + 13 + 11 + 10 = 361

(iii) 3median = mode + 2 mean

37. Resident Welfare Association (RWA) of Gulmohar Society in Delhi, have installed three electric poles A, B and C in the society's common park. Despite these three poles, some parts of the park are still in the dark. So, RWA decides to have one more electric pole D in the park. The park can be modelled as a coordinate system given below.



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

(i) What is the position of the pole C ? (1)

(ii) What is the distance of the pole B from the corner O of the park ? (1)

(iii) (a) Find the position of the fourth pole D so that the four points A, B, C and D form a parallelogram ABCD. (2)

OR

(b) Find the distance between poles A and C. (2)

Ans (i) Position of the pole C(5, 4)

(ii) B(6, 6)

$\therefore$ BO = $\sqrt{(6-0)^2+(6-0)^2} = \sqrt{36+36} = \sqrt{72} = 6\sqrt{2}$

(iii) (a) A(2, 7), B(6, 6), C(5, 4)

Let D(x, y). Since, ABCD forms a parallelogram

therefore, Mid-point of AC = Mid-point of BD

$\Rightarrow \left(\frac{2+5}{2}, \frac{7+4}{2}\right) = \left(\frac{6+x}{2}, \frac{6+y}{2}\right) = \left(\frac{7}{2}, \frac{11}{2}\right)$

$\frac{6+x}{2} = \frac{7}{2}, \frac{6+y}{2} = \frac{11}{2} \Rightarrow$ **x =1, y = 5**

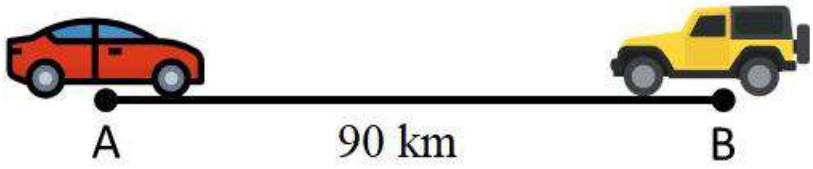
Position of the fourth pole D is (1, 5)

OR

(iii)(b) AC = $\sqrt{(5-2)^2+(4-7)^2} = \sqrt{9+9} = \sqrt{18} = 3\sqrt{2}$

38. On the roadway, Points A and B, which stand in for Chandigarh and Kurukshetra, respectively, are located nearly 90 kilometres apart. At the same time, a car departs from Kurukshetra and one from Chandigarh. These cars will collide in 9 hours if they are travelling in the same direction, and in 9/7 hours if they are travelling in the other direction. Let X and Y be two cars

that are travelling at x and y kilometres per hour from places A and B, respectively. On the basis of the above information, answer the following questions:



(a) When both cars move in the same direction, then find the situation can be represented algebraically. [2]

OR

(a) When both cars move in the opposite direction, then find the situation can be represented algebraically. [2]
(b) Find the speed of car x. [1]
(c) Find the speed of car y. [1]

Ans: (a) Suppose two cars meet at point Q. Then, Distance travelled by car X = AQ, Distance travelled by car Y = BQ. It is given that two cars meet in 9 hours.
∴ Distance travelled by car X in 9 hours = 9x km = AQ = 9x
Distance travelled by car Y in 9 hours = 9y km = BQ = 9y
Clearly, AQ - BQ = AB = 9x - 9y = 90 = x - y = 10

OR

Suppose two cars meet at point P. Then Distance travelled by car X = AP and Distance travelled by car Y = BP.

In this case, two cars meet in $\frac{9}{7}$ hours. Distance travelled by car X in $\frac{9}{7}$ hours

$= \frac{9}{7}$ x km $\Rightarrow$ AP = $\frac{9}{7}$x

Distance travelled by car Y in $\frac{9}{7}$ hours

$= \frac{9}{7}$y km $\Rightarrow$ BP = $\frac{9}{7}$y

Clearly, AP + BP = AB

$\Rightarrow \frac{9}{7}x + \frac{9}{7}y = 90 \Rightarrow \frac{9}{7}(x + y) = 90 \Rightarrow x + y = 70$

(b) We have x - y = 10 and x + y = 70
Adding equations (i) and (ii), we get 2x = 80 $\Rightarrow$ x = 40
Hence, speed of car X is 40 km/hr.
(c) We have x - y = 10 $\Rightarrow$ 40 - y = 10 $\Rightarrow$ y = 30
Hence, speed of car y is 30 km/hr