# Class IX Session 2024-25
# Subject - Mathematics
# Sample Question Paper - 9

**Time Allowed: 3 hours** **Maximum Marks: 80**

**General Instructions:**

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 carrying 04 marks each.
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 2 marks questions of Section E.
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

## Section A

1. The signs of abscissa and ordinate of a point in quadrant II are respectively _____. **[1]**

   a) (-, -) b) (+, -)

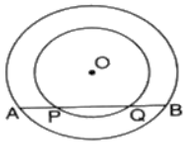
   c) (-, +) d) (+, +)

2. The sides of a triangle are 11 cm, 15 cm and 16 cm. The altitude to the largest side is **[1]**

   a) $30\sqrt{7}$,cm b) 30 cm

   c) $\frac{15\sqrt{7}}{2}$cm d) $\frac{15\sqrt{7}}{4}$cm

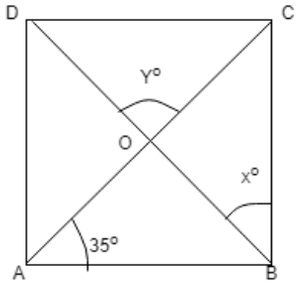
3. If a straight line APQB is drawn to cut two concentric circles, then **[1]**




   a) AP $>$ BQ b) AP $<$ BQ

   c) AQ $>$ PB d) AP = BQ

4. In the figure, ABCD is a Rectangle. Find the values of x and y? **[1]**




a) x = 55° and y = 110°

b) x = 100° and y = 100°

c) x = 50° and y = 100°

d) x = 60° and y = 120°

5. The value of $7^{\frac{1}{2}} \cdot 8^{\frac{1}{2}}$ is **[1]**

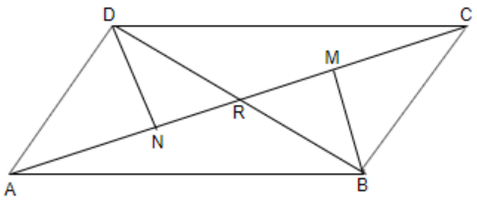
a) $(28)^{1/2}$

b) $(56)^{1/2}$

c) $(14)^{1/2}$

d) $(42)^{1/2}$

6. In quadrilateral ABCD, BM and DN are drawn perpendiculars to AC such that BM = DN. If BR = 8 cm. then BD is **[1]**




a) 12 cm

b) 4 cm

c) 16 cm

d) 2 cm

7. Which of the following points lie on the line y = 3x – 4? **[1]**

a) (2, 2)

b) (4, 12)

c) (5, 15)

d) (3, 9)

8. Which of the following is a binomial? **[1]**

a) $x + 3 + \frac{1}{x}$

b) $x^2 + 4$

c) $2x^2$

d) $x^2 + x + 3$

9. The number $0.\overline{3}$ in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$, is **[1]**

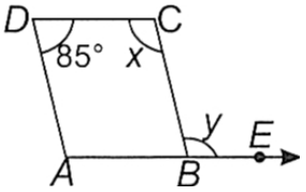
a) $\frac{3}{100}$

b) $\frac{3}{10}$

c) $\frac{33}{100}$

d) $\frac{1}{3}$

10. ABCD is a parallelogram in which $\angle ADC = 85°$ and side AB is produced to point E as shown in the figure. Find the value of (x + y). **[1]**




a) 85°

b) 190°

c) 95°

d) 160°

11. The value of $\frac{\sqrt{48}+\sqrt{32}}{\sqrt{27}+\sqrt{18}}$, is **[1]**

a) $\frac{4}{3}$ b) 4

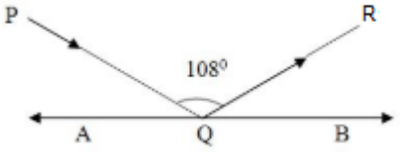
c) 3 d) $\frac{3}{4}$

12. The taxi fare in a city is as follows: For the first kilometer, the fare is ₹8 and for the subsequent distance it is ₹5 per kilometer. Taking the distance covered as x km and total fare as ₹y, write a linear equation for this information. **[1]**

a) y = 5x + 3 b) y = 5x – 3

c) x = 5y – 3 d) x = 5y + 3

13. In the given figure AB is a mirror, PQ is the incident ray and QR is the reflected ray. If ∠PQR = 108°, then ∠AQP = ? **[1]**




a) 36° b) 72°

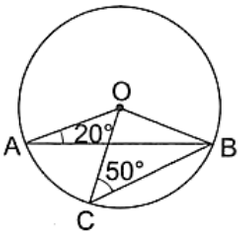
c) 54° d) 18°

14. The simplest rationalising factor of $\sqrt{3}+\sqrt{5}$,is **[1]**

a) $\sqrt{3}+\sqrt{5}$ b) $\sqrt{3}-\sqrt{5}$

c) $\sqrt{3}-5$ d) $3-\sqrt{5}$

15. In the given figure, O is the centre of a circle in which ∠OAB = 20° and ∠OCB = 50°. Then, ∠AOC = ? **[1]**




a) 20° b) 70°

c) 60° d) 50°

16. If P(3, 9) and Q(-3, -4), then (abscissa of P) - (ordinate of Q) is **[1]**

a) 1 b) 7

c) -1 d) -7

17. The graph of x + y = 6 intersect coordinate axes at **[1]**

a) Both (0, 6) and (6, 0) b) (6, 0)

c) (0, 6) d) (2, 3)

18. If $p(x) = x^3 - x^2 + x + 1$, then the value of $\frac{p(-1)+p(1)}{2}$ is **[1]**

a) 2 b) 3

c) 0 d) 1

19. **Assertion (A):** Two opposite angles of a parallelogram are $(3x - 2)^o$ and $(50 - x)^o$. The measure of one of the angle is $37^o$. **[1]**

**Reason (R):** Opposite angles of a parallelogram are equal.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

20. **Assertion (A):** Rational number lying between two rational numbers a and b is $\frac{a+b}{2}$. **[1]**

**Reason (R):** There is one rational number lying between any two rational numbers.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

## Section B

21. Read the following two statements which are taken as axioms: **[2]**

i. If two lines intersect each other, then the vertically opposite angles are not equal.

ii. If a ray stands on a line, then the sum of two adjacent angles so formed is equal to 180°.

Is this system of axioms consistent? Justify your answer.

22. If a point C lies between two points A and B such that AC = BC, then prove that AC = $\frac{1}{2}$ AB. Explain by drawing the figure. **[2]**

23. In which quadrant will the point lie, if : **[2]**

(i) The y-coordinate is 3 and the x-coordinate is –4?

(ii) The x-coordinate is –5 and the y-coordinate is –3?

(iii) The y-coordinate is 4 and the x-coordinate is 5?

(iv) The y-coordinate is 4 and the x-coordinate is –4?

24. Simplify: $\left(\frac{5^{-1}\times 7^2}{5^2\times 7^{-4}}\right)^{7/2} \times \left(\frac{5^{-2}\times 7^3}{5^3\times 7^{-5}}\right)^{-5/2}$ **[2]**

OR

Simplify: $\left[5\left(8^{\frac{1}{3}}+27^{\frac{1}{3}}\right)^3\right]^{\frac{1}{4}}$

25. The largest sphere is carved out of a solid cube of side 21 cm. Find the volume of the sphere. **[2]**

OR

The radius and slant height of a cone are in the ratio 4 : 7. If its curved surface area is 792 $cm^2$, find its radius. (Use $\pi = \frac{22}{7}$).

## Section C

26. Give three rational numbers between $\frac{1}{3}$ and $\frac{1}{2}$. **[3]**

27. The population of Delhi State in different census years is as given below: **[3]**

| Census year | 1961 | 1971 | 1981 | 1991 | 2001 |
|---|---|---|---|---|---|
| Population in Lakhs | 30 | 55 | 70 | 110 | 150 |

Represent the above information with the help of a bar graph.

28. ABC is a triangle right angled at C. A line through the mid-point M of hypotenuse AB and parallel to BC intersects AC at D. Then prove that, **[3]**

i. D is the midpoint AC

ii. MD is perpendicular to AC

iii. CM = AM = $\frac{1}{2}$ AB

29. Find solutions of the form x = a, y = 0 and x = 0, y = b for the following pairs of equations. Do they have any **[3]**

common such solution?

3x + 2y = 6 and 5x + 2y = 10

30. Following table shows a frequency distribution for the speed of cars passing through at a particular spot on a high way: **[3]**

| Class interval (km/h) | Frequency |
|---|---|
| 30 - 40 | 3 |
| 40 - 50 | 6 |
| 50 - 60 | 25 |
| 60 - 70 | 65 |
| 70 - 80 | 50 |
| 80 - 90 | 28 |
| 90 - 100 | 14 |

Draw histogram and frequency polygon representing the data above.

OR

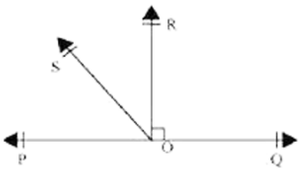
Construct a histogram for the following data:

| Monthly School fee (in ₹): | 30-60 | 60-90 | 90-120 | 120-150 | 150-180 | 180-210 | 210-240 |
|---|---|---|---|---|---|---|---|
| No of Schools | 5 | 12 | 14 | 18 | 10 | 9 | 4 |

31. Factorise: $(2x - 3y)^3 + (3y - 4z)^3 + (4z - 2x)^3$ **[3]**

**Section D**

32. In the given figure, POQ is a line. Ray OR is perpendicular to line PQ. OS is another ray lying between rays OP and OR. Prove that $\angle ROS = \frac{1}{2}(\angle QOS - \angle POS)$. **[5]**




OR

If is given that $\angle XYZ = 64^\circ$ and XY is produced to point P. Draw a figure from the given information. If ray YQ bisects ∠ZYP, find ∠XYQ and reflex ∠QYP.

33. A cloth having an area of 165 $m^2$ is shaped into the form of a conical tent of radius 5 m. **[5]**

i. How many students can sit in the tent if a student on an average, occupies $\frac{5}{7}$ $m^2$ on the ground?

ii. Find the volume of the cone.

34. Find the area of the triangle whose sides are 42 cm, 34 cm and 20 cm in length. Hence, find the height corresponding to the longest side. **[5]**

OR

Find the area of a triangular field whose sides are 91 m, 98 m and 105 m in length. Find the height corresponding to the longest side.

35. If x - 3 and x - $\frac{1}{3}$ are both factors of $px^2 + 5x + r$, then show that p = r **[5]**

## Section E

36. **Read the following text carefully and answer the questions that follow:** **[4]**

Ajay is writing a test which consists of 'True' or 'False' questions. One mark is awarded for every correct answer while ¼ mark is deducted for every wrong answer. Ajay knew answers to some of the questions. Rest of the questions he attempted by guessing.

i. If he answered 110 questions and got 80 marks and answer to all questions, he attempted by guessing were wrong, then how many questions did he answer correctly? (1)

ii. If he answered 110 questions and got 80 marks and answer to all questions, he attempted by guessing were wrong, then how many questions did he guess? (1)

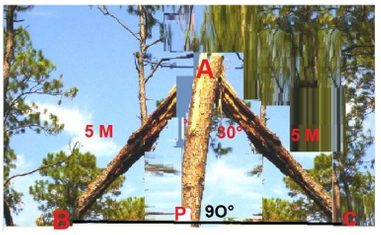
iii. If answer to all questions he attempted by guessing were wrong and answered 80 correctly, then how many marks he got? (2)

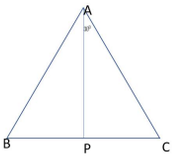
**OR**

If answer to all questions he attempted by guessing were wrong, then how many questions answered correctly to score 95 marks? (2)

37. **Read the following text carefully and answer the questions that follow:** **[4]**

In a forest, a big tree got broken due to heavy rain and wind. Due to this rain the big branches AB and AC with lengths 5m fell down on the ground. Branch AC makes an angle of 30° with the main tree AP. The distance of Point B from P is 4 m. You can observe that $\Delta ABP$ is congruent to $\Delta ACP$.




i. Show that △ACP and △ABP are congruent. (1)

ii. Find the value of ∠ACP? (1)

iii. Find the value of ∠BAP? (2)

**OR**

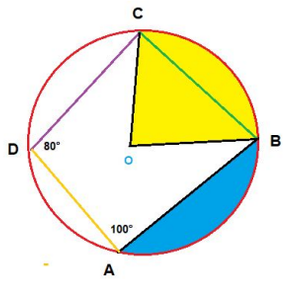
What is the total height of the tree? (2)

38. **Read the following text carefully and answer the questions that follow:** **[4]**

There was a circular park in Defence colony at Delhi. For fencing purpose poles A, B, C and D were installed at the circumference of the park.

Ram tied wires From A to B, B to C and C to D, and he managed to measure the ∠A = 100° and ∠D = 80°

Point O in the middle of the park is the center of the circle.




i. Name the quadrilateral ABCD. (1)

ii. What is the value of $\angle C$? (1)

iii. What is the value of $\angle B$. (2)

**OR**

Write any three properties of cyclic quadrilateral? (2)

# Solution

**Section A**

1.

**(c)** (-, +)

**Explanation:** (-, +)

2.

**(d)** $\frac{15\sqrt{7}}{4}$ cm

**Explanation:** s = $\frac{11+15+16}{2}$ = 21 cm

Area of $= \Delta = \sqrt{s(s-a)(s-b)(s-c)}$ = $\sqrt{21 \times 10 \times 6 \times 5} = 30\sqrt{7}\text{cm}^2$

Also if we choose largest side and its Altitude, the area would be

A = $\frac{1}{2}$ × largest side × h

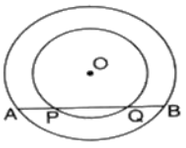
$\Rightarrow \frac{1}{2} \times 16 \times h = 30\sqrt{7}$

$\Rightarrow h = \frac{30\sqrt{7}}{8}$ = $\frac{15\sqrt{7}}{4}$cm

3.

**(d)** AP = BQ

**Explanation:**




Let OD is perpendicular to AB. Then AD = DB.

Also DP = DQ

Therefore, AP = AD - PD

= BD - DQ

= BQ

Hence, AP = BQ

4. **(a)** x = 55° and y = 110°

**Explanation:** ABCD is a rectangle

The diagonals of a rectangle are congruent and bisect each other. Therefore, in △AOB, we have:

OA = OB

∠OAB = ∠OBA = 35°

x = 90° – 35° = 55° and ∠AOB = 180° – (35° + 35°) = 110°

y = ∠AOB = 110° [Vertically opposite angles]

Hence, x = 55° and y = 110°

5.

**(b)** $(56)^{1/2}$

**Explanation:** $7^{\frac{1}{2}} \cdot 8^{\frac{1}{2}}$

= $(7 \cdot 8)^{\frac{1}{2}}$

$(56)^{1/2}$

6.

**(c)** 16 cm

**Explanation:** In triangles $\triangle DNR$ and $\triangle BMR$,

∠N = ∠M = $90^o$

∠NRD = ∠MRB (vertically opposite angles)

BM = DN(Given)

Therefore, $\triangle DNR$ and $\triangle MRB$ are congruent
Therefore, BR = DR = 8 cm
BD = 16 cm

7. **(a)** (2, 2)
**Explanation:** When we put x=2 in the given equation,
Then, y = (3×2) – 4
y =6–4 = 2, so point is (2, 2)satisfied the given equation,
Hence point (2, 2) will lie on the line y = 3x - 4

8. **(b)** $x^2 + 4$
**Explanation:** Clearly, $x^2 + 4$ is an expression having two non-zero terms. So, it is a binomial.

9. **(d)** $\frac{1}{3}$
**Explanation:** Let $x = 0.\overline{3}$
i,e, x = 0.333...---(i)
multiply eq.(i) by 10 we get,
10 x = 3.333... ---(ii)
Subtracting eq. (i) from (ii) we get
10 x -x = 3.333... - 0.333...
9 x = 3
$x = \frac{3}{9}$
$x = \frac{1}{3}$

10. **(b)** 190°
**Explanation:** ∠ADC + ∠DCB = 180° (Sum of adjacent angles of a parallelogram is 180°)
⇒ 85° + x = 180° ⇒ x = 95°
Now, DC || AE and CB is a transversal.
∴ y - x - 95° (Alternate interior angles)
∴ x + y = 95° + 95° = 190°

11. **(a)** $\frac{4}{3}$
**Explanation:** $\frac{\sqrt{48}+\sqrt{32}}{\sqrt{27}+\sqrt{18}}$
$= \frac{\sqrt{4\times4\times3}+\sqrt{4\times4\times2}}{\sqrt{3\times3\times3}+\sqrt{3\times3\times2}}$
$= \frac{4\sqrt{3}+4\sqrt{2}}{3\sqrt{3}+3\sqrt{2}}$
$= \frac{4(\sqrt{3}+\sqrt{2})}{3(\sqrt{3}+\sqrt{2})}$
$= \frac{4}{3}$

12. **(a)** y = 5x + 3
**Explanation:** Taxi fare for first kilometer = ₹8
Taxi fare for subsequent distance = ₹5
Total distance covered = x
Total fare = y
Since the fare for first kilometer = ₹8
According to problem, Fare for (x - 1) kilometer = 5(x - 1)
So, the total fare y = 5(x - 1) + 8
⇒ y = 5(x - 1) + 8
⇒ y = 5x – 5 + 8
⇒ y = 5x + 3
Hence, y = 5x + 3 is the required linear equation.

13. **(a)** 36°
**Explanation:** According to question,

∠AQP = ∠BQR = x

∠AQP + ∠BQR + ∠PQR = 180° (Linear Pair)

2x + 108° = 180°

x = 36°

14.

**(b)** $\sqrt{3} - \sqrt{5}$

**Explanation:** The simplest rationalising factor of $\sqrt{3} + \sqrt{5}$ is $\sqrt{3} - \sqrt{5}$

15.

**(c)** 60°

**Explanation:** OA = OB ⇒ ∠OBA = ∠OAB = 20°.

In △OAB,

∠OAB + ∠OBA + ∠AOB = 180°

⇒ 20° + 20° + ∠AOB = 180°

⇒ ∠AOB = 140°.

OB = OC ⇒ ∠OBC = ∠OCB = 50°.

In △OCB,

∠OCB + ∠OBC + ∠COB = 180°

⇒ 50° + 50° + ∠COB = 180°

⇒ ∠COB = 80°.

∠AOB = 140° ⇒ ∠AOC + ∠COB = 140°

⇒ ∠AOC + 80° = 140°

⇒ ∠AOC = 140° - 80°

⇒ ∠AOC = 60°.

16.

**(b)** 7

**Explanation:** From the given data we have,

The abscissa of P = 3 and ordinate of Q = -4,

So, according to question,

(abscissa of P) - (ordinate of Q)

= 3 - (-4)

= 7

17. **(a)** Both (0, 6) and (6, 0)

**Explanation:** Both (0, 6) and (6, 0)

18.

**(c)** 0

**Explanation:** $p(x) = x^3 - x^2 + x + 1$

$= \frac{p(-1)+p(1)}{2}$

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

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

$= \frac{0}{2}$

= 0

19. **(a)** Both A and R are true and R is the correct explanation of A.

**Explanation:** Since, opposite angles of a parallelogram are equal.

Therefore, 3x - 2 = 50 - x

x = 13

One angle is $37^o$

20.

**(c)** A is true but R is false.

**Explanation:** There are infinitely many rational numbers between any two given rational numbers.

**Section B**

21. It is known that, if two lines intersect each other, then the vertically opposite angles are equal. It is a theorem, therefore,given Statement I is false and not an axiom.
Also, we know that, if a ray stands on a line, then the sum of two adjacent angles so formed is equal to 180°. It is an axiom.
Therefore, given statement parallel is true and an axiom.
Thus, in given statements, first is false and second is an axiom. Therefore, given system of axioms is not consistent.

22. A C B
Given, AC = BC
AC + AC = BC + AC . . . . [AC are added to both the side]
2AC = AB . . . . [BC + AC coincides with AB]
$\therefore$ AC = $\frac{1}{2}$AB

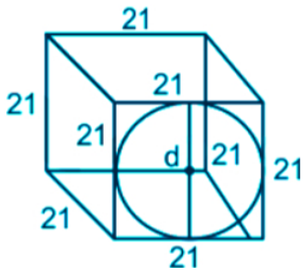
23. (i) II
(ii) III
(iii) I
(iv) II

24. We have,
$\left(\frac{5^{-1}\times 7^2}{5^2\times 7^{-4}}\right)^{\frac{7}{2}} \times \left(\frac{5^{-2}\times 7^3}{5^3\times 7^{-5}}\right)^{-\frac{5}{2}}$
$= \left(\frac{7^{2+4}}{5^{2+1}}\right)^{\frac{7}{2}} \times \left(\frac{7^{3+5}}{5^{3+2}}\right)^{-\frac{5}{2}}$
$= \left(\frac{7^6}{5^3}\right)^{\frac{7}{2}} \times \left(\frac{7^8}{5^5}\right)^{-\frac{5}{2}}$
$= \frac{7^{6\times\frac{7}{2}}}{5^{3\times\frac{7}{2}}} \times \frac{7^{8\times-\frac{5}{2}}}{5^{5\times-\frac{5}{2}}}$
$= \frac{7^{21-20}}{5^{\frac{21}{2}-\frac{25}{2}}} = \frac{7}{5^{-\frac{4}{2}}}$
$= 7 \times 5^{\frac{4}{2}} = 7 \times 5^2$
$= 7 \times 25 = 175$

OR

$\left[5\left(8^{\frac{1}{3}} + 27^{\frac{1}{3}}\right)^3\right]^{\frac{1}{4}}$
$= \left[5\left((2^3)^{\frac{1}{3}} + (3^3)^{\frac{1}{3}}\right)^3\right]^{\frac{1}{4}}$
$= \left[5\left((2)^{\frac{1}{3}\times 3} + (3)^{\frac{1}{3}\times 3}\right)^3\right]^{\frac{1}{4}}$
$= \left[5(2+3)^3\right]^{\frac{1}{4}}$
$= \left[5(5)^3\right]^{\frac{1}{4}}$
$= \left[5^4\right]^{\frac{1}{4}}$
$= 5$

25. Given: Side of cube = 21 cm
Formulas used:
Volume of sphere = $\frac{4}{3}\pi r^3$
Calculation:




The largest sphere that can be carved out of a cube of side 21 cm will have the diameter equal to 21 cm.
Radius of sphere = $\frac{21}{2}$ cm

Volume of sphere = $\frac{4}{3} \times \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2}$

$\Rightarrow 11 \times 21 \times 21$

$\Rightarrow 4851\ cm^3$

$\therefore$ The required result is $4851\ cm^3$

OR

Let the radius of cone $(r) = 4x\ cm$ and the slant height of the cone $(l) = 7x\ cm$

Curved surface area of cone $= \pi rl$

$\therefore \pi rl = 792 cm^2$

$\Rightarrow \frac{22}{7} \times 4x \times 7x = 792$

$\Rightarrow x^2 = \frac{792}{22 \times 4} = 9$

$\Rightarrow x = 3cm$

$\therefore$ Radius of the cone $= 4 \times 3 = 12cm$

**Section C**

26. Here a = $\frac{1}{3}$, b = $\frac{1}{2}$, n = 3

$\therefore \frac{b-a}{n+1} = \frac{\frac{1}{2}-\frac{1}{3}}{3+1} = \frac{\frac{3-2}{6}}{4} = \frac{\frac{1}{6}}{4} = \frac{1}{24}$

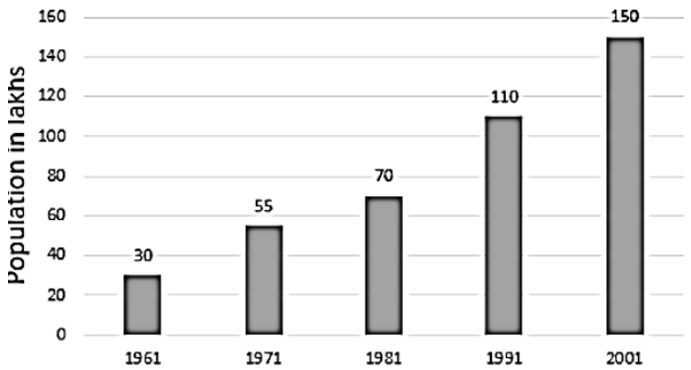
$\therefore$ Three rational numbers between $\frac{1}{3}$ and $\frac{1}{2}$ are

$\frac{1}{3} + \frac{1}{24}, \frac{1}{3} + 2\left(\frac{1}{24}\right), \frac{1}{3} + 3\left(\frac{1}{24}\right)$

$\frac{1}{3} + \frac{1}{24}, \frac{1}{3} + \frac{1}{12}, \frac{1}{3} + \frac{1}{8}$

$\frac{3}{8}, \frac{5}{12}, \frac{11}{24}$

27. the population of Delhi State in different census years

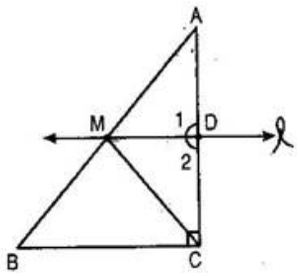



28. i. In $\triangle$ABC, M is the mid-point of AB[Given]

MD $\parallel$ BC

$\therefore$ AD = DC[Converse of mid-point theorem]

Thus D is the mid-point of AC.




ii. $l \parallel$ BC (given) consider AC as a transversal.

$\therefore \angle 1 = \angle C$ [Corresponding angles]

$\Rightarrow \angle 1 = 90^\circ$ [ $\angle C = 90^\circ$ ]

Thus MD $\perp$ AC.

iii. In $\triangle$AMD and $\triangle$CMD,

AD = DC[proved above]

$\angle 1 = \angle 2 = 90^\circ$ [proved above]

MD = MD[common]

$\therefore \triangle AMD \cong \triangle CMD$ [By SAS congruency]

$\Rightarrow$ AM = CM[By C.P.C.T.].....(i)

Given that M is the mid-point of AB.

$\therefore AM = \frac{1}{2}$ AB…….(ii)

From eq. (i) and (ii),

CM = AM = $\frac{1}{2}$ AB

29. 3x + 2y = 6

Put y = 0, we get

3x + 2(0) = 6

$\Rightarrow$ 3x = 6

$\Rightarrow x = \frac{6}{3} = 2$

$\therefore$ (2, 0) is a solution.

3x + 2y = 6

put x = 0, we get

3(0) + 2y = 6

$\Rightarrow$ 2y = 6

$\Rightarrow y = \frac{6}{2} = 3$

$\therefore$ (0, 3) is a solution.

5x+ 2y = 10

Put y = 0, we get

5x + 2(0) = 10

$\Rightarrow$ 5x = 10

$\Rightarrow x = \frac{10}{5} = 2$

$\therefore$ (2, 0) is a solution.

5x + 2y = 10

Put x = 0, we get

5(0) + 2y = 10

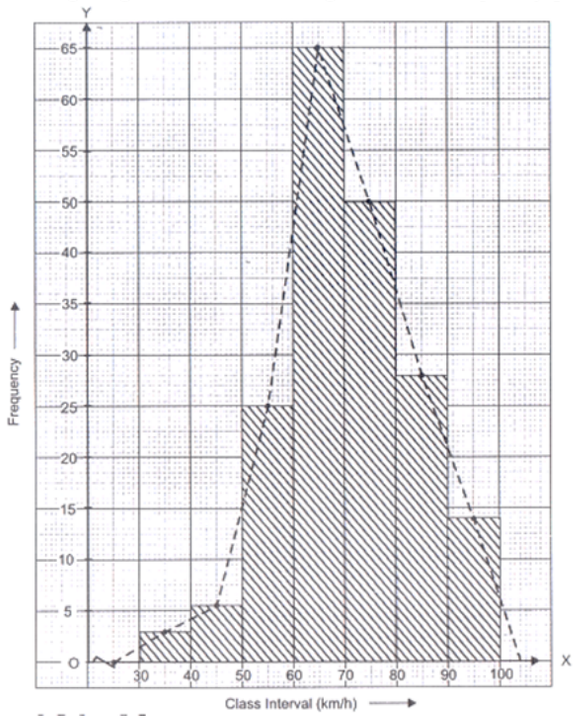
$\Rightarrow$ 2y = 10

$\Rightarrow y = \frac{10}{2} = 5$

$\therefore$ (0, 5) is a solution.

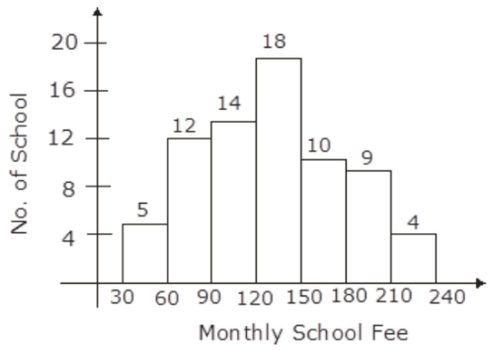
The given equations have a common solution (2, 0).

30. In the figure given below, a histogram and a frequency polygon (in dotted lines) are drawn on the same scale.




OR

REQUIRED GRAPH




31. Let $a = 2x - 3y,\ b = 3y - 4z,\ c = 4z - 2x$

$then\ a + b + c = 2x - 3y + 3y - 4z + 4z - 2x = 0$

$\therefore a^3 + b^3 + c^3 = 3abc$

$(2x - 3y)^3 + (3y - 4z)^3 + (4z - 2x)^3 = 3(2x - 3y)(3y - 4z)(4z - 2x)$

$= 3(2x - 3y)(3y - 4z) \times 2(2z - x)$

$= 6(2x - 3y)(3y - 4z)(2z - x)$

**Section D**

32. To Prove: $\angle ROS = \frac{1}{2}(\angle QOS - \angle POS)$

Given: OR is perpendicular to PQ, or ∠QOR = 90°

From the given figure, we can conclude that ∠POR and ∠QOR form a linear pair.

We know that sum of the angles of a linear pair is 180°.

∴ ∠POR + ∠QOR = 180°

or ∠POR = 90°

From the figure, we can conclude that

∠POR = ∠POS + ∠ROS

⇒ ∠POS + ∠ROS = 90°

⇒ ∠ROS = 90° - ∠POS...(i)

Again,

∠QOS + ∠POS = 180°

$\Rightarrow \frac{1}{2}(\angle QOS + \angle POS) = 90^\circ$ .(ii)

Substitute (ii) in (i), to get

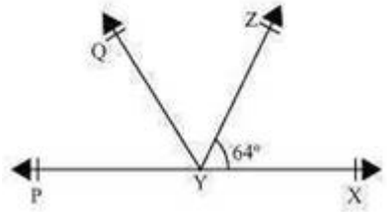
$\angle ROS = \frac{1}{2}(\angle QOS + \angle POS) - \angle POS$

$= \frac{1}{2}(\angle QOS - \angle POS)$.

Therefore, the desired result is proved.

OR

We are given that ∠XYZ = 64°, XY is produced to P and YQ bisects ∠ZYP We can conclude the given below figure for the given situation:




We need to find ∠XYQ and reflex ∠QYP

From the given figure, we can conclude that ∠XYZ and ∠ZYP form a linear pair.

We know that sum of the angles of a linear pair is 180°.

∠XYZ + ∠ZYP = 180°

But ∠XYZ = 64°

⇒ 64° + ∠ZYP = 180°

⇒ ∠ZYP = 116°

Ray YQ bisects ∠ZYP,or

$\angle QYZ = \angle QYP = \frac{116^\circ}{2} = 58^\circ$

$\angle XYQ = \angle QYZ + \angle XYZ$

$= 58^o + 64^o = 122^o$.

Reflex $\angle QYP = 360^\circ - \angle QYP$

$= 360^o - 58^o$

$= 302^o$.

Therefore, we can conclude that $\angle XYQ = 122^o$ and Reflex $\angle QYP = 302^o$

33. Suppose l be the slant height of the conical tent.

Radius of the base of conical tent $(r) = 5m$

i. Area of the circular base of the cone = $\pi r^2 = \frac{22}{7} \times 5^2 m^2$

Number of student = $\frac{Area\ of\ the\ base}{Area\ occupied\ by\ one\ student}$

$= \frac{\frac{22}{7} \times 5 \times 5m^2}{\frac{5}{7}m^2} = \frac{22}{7} \times 5 \times 5 \times \frac{7}{5} = 110$

ii. Also, curved surface area of cone = $\pi rl$

$\Rightarrow 165 = \frac{22}{7} \times 5 \times l$

$\Rightarrow l = \frac{165 \times 7}{22 \times 5}$

$\Rightarrow l = \frac{21}{2}m = 10.5m$

Also, $h^2 = l^2 - r^2$

$\Rightarrow h = \sqrt{(10.5)^2 - 5^2} = \sqrt{15.5 \times 5.5} \approx$<p

Volume of conical tent = $\frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \frac{22}{7} \times 5^2 \times 9.23m^3 = 241.74m^3$.

34. Let:

a = 42 cm, b = 34 cm and c = 20 cm

$\therefore s = \frac{a+b+c}{2} = \frac{42+34+20}{2} = 48$cm

By Heron's formula, we have:

Area of triangle $= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{48(48-42)(48-34)(48-20)}$

$= \sqrt{48 \times 6 \times 14 \times 28}$

$= \sqrt{4 \times 2 \times 6 \times 6 \times 7 \times 2 \times 7 \times 4}$

$= 4 \times 2 \times 6 \times 7$

Area of triangle = 336 $cm^2$

We know that the longest side is 42 cm.

Thus, we can find out the height of the triangle corresponding to 42 cm.

We have:

Area of triangle = 336 $cm^2$

$\Rightarrow \frac{1}{2} \times$ Base $\times$ Height = 336

$\Rightarrow \frac{1}{2}$ (42)(height) = 336

$\Rightarrow$ Height $= \frac{336 \times 2}{42}$ = 16 cm

OR

Let:

a = 91 m, b = 98 m, and c = 105 m

$\therefore s = \frac{a+b+c}{2} = \frac{91+98+105}{2}$ = 147 m

$\Rightarrow$ s = 147 m

By Heron's formula, we have:

Area of triangle $= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{147(147-91)(147-98)(147-105)}$

$= \sqrt{147 \times 56 \times 49 \times 42}$

$= \sqrt{7 \times 3 \times 7 \times 2 \times 2 \times 2 \times 7 \times 7 \times 7 \times 7 \times 3 \times 2}$

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

= 1446 $m^2$

We know that the longest side is 105 m.

Thus, we can find out the height of the triangle corresponding to 42 cm.

Area of triangle = 4116 $m^2$

$\Rightarrow \frac{1}{2} \times$ Base $\times$ Height = 4116 $\Rightarrow \frac{1}{2} \times$ (105)(Height) = 4116

$\Rightarrow$ Height $= \frac{4116 \times 2}{105} =$ 78.4 m

35. $\because$ x - 3 and x - $\frac{1}{3}$ are factors of

$px^2 + 5x + r \therefore x = 3, x = \frac{1}{3}$

zero of $px^2 + 5x + r$

Putting x = 3 in given polynomial,

$\therefore p(3)^2 + 5 \times 3 + r = 0$

9p + 15 + r = 0

9p + r = - 15 - - - - - (1)

Again putting x = $\frac{1}{3}$ in given polynomial,

$p\left(\frac{1}{3}\right)^2 + 5 \times \frac{1}{3} + r = 0$

$\frac{p}{9} + \frac{5}{3} + r = 0$

$\frac{p+15+9r}{9} = 0$

$p + 9r = -15 - - - - - - -(2)$

Fron eq.(1) and eq.(2), we have,

9p + r = p + 9r

9p-p=9r-r

8p=8r

p=r

Hence proved

**Section E**

36. i. Let the no of questions whose answer is known to Ajay be x and number questions attempted by guessing be y.

x + y = 110

x + 14y = 80 $\Rightarrow$ 4x + y = 320x + y = 110 ...(1)

4x + y = 320 ...(2)

Solving (1) and (2)

x + y - 4x - y = 110 - 320 = -210

$\Rightarrow$ -3x = -210

$\Rightarrow$ x = 70

ii. x + y = 110

x + 14y = 80 $\Rightarrow$ 4x + y = 320

x + y = 110 ...(1)

4x + y = 320 ...(2)

Solving (1) and (2)

x + y - 4x - y = 110 - 320 = - 210

$\Rightarrow$ - 3x = - 210

$\Rightarrow$ x = 70

Put x = 70 in (1)

70 + y = 110

$\Rightarrow$ y = 40

40 question he answered by guessing.

iii. $70 - 40 \times \frac{1}{4} = 70 - 10$ = 60 marks

He scored 60 marks.x - $\frac{1}{4}$(110 - x) = 95

**OR**

$\Rightarrow$ 4x - 110 + x = 380

$\Rightarrow$ 5x = 380 + 110 = 490

$\Rightarrow$ x = $\frac{490}{5}$ = 98

So he answered 98 correct answers 12 by guessing.

37. i. In △ACP and △ABP

AB = AC (Given)

AP = AP (common)

$\angle APB = \angle APC = 90^o$

By RHS criteria △ACP ≅ △ABP

ii. In △ACP

$\angle APC + \angle PAC + \angle ACP = 180^o$

$\Rightarrow 90^o + 30^o + \angle ACP = 180^o$ (angle sum property of △)

$\Rightarrow \angle ACP = 180^o - 120^o = 60^o$

$\angle ACP = 60^o$

iii. △ACP ≅ △ABP

Corresponding part of congruent triangle

$\angle BAP = \angle CAP$

$\angle BAP = 30^o$ (given $\angle CAP = 30^o$)

**OR**

△ACP

$AC^2 = AP^2 + PC^2$

$\Rightarrow 25 = AP^2 + 16$

$\Rightarrow AP^2 = 25 - 16 = 9$

$\Rightarrow AP = 3$

Total height of the tree = AP + 5 = 3 + 5 = 8 m

38. i. ABCD is cyclic quadrilateral.

A quadrilateral ABCD is called cyclic if all the four vertices of it lie on a circle.

Here all four vertices A, B, C and D lie on a circle.

ii. We know that the sum of both pair of opposite angles of a cyclic quadrilateral is 180º.

$\angle C + \angle A = 1800$

$\angle C = 1800 - 1000 = 800$

iii. We know that

The sum of both pair of opposite angles of a cyclic quadrilateral is 180º.

$\angle B + \angle D = 1800$

$\angle B = 1800 - 800 = 1000$

**OR**

I. In a cyclic quadrilateral, all the four vertices of the quadrilateral lie on the circumference of the circle.

II. The four sides of the inscribed quadrilateral are the four chords of the circle.

III. The sum of a pair of opposite angles is 180° (supplementary). Let ∠A, ∠B, ∠C, and ∠D be the four angles of an inscribed quadrilateral. Then, ∠A + ∠C = 180° and ∠B + ∠D = 180°.