Class: IX
SESSION : 2022-2023
SUBJECT: Mathematics
SAMPLE QUESTION PAPER - 1
with SOLUTION

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 (04 marks each) with subparts 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 π =22/7 wherever required if not stated.

Section A

1. The area of an equilateral triangle of side a is $4\sqrt{3}$ cm^2. Its height is given by **[1]**

   a) $\frac{2}{\sqrt{3}}$ cm b) $2\sqrt{3}$ cm

   c) $\frac{1}{3}$ cm d) $\sqrt{3}$ cm

2. If a < 0 and b > 0 then the point (a, b) lies in quadrant **[1]**

   a) III b) none of these

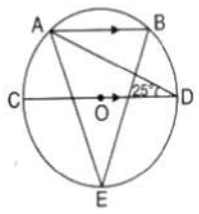
   c) IV d) II

3. In a histogram the class intervals or the groups are taken along **[1]**

   a) X-axis b) Y-axis

   c) both of X-axis and Y-axis d) in between X and Y axis

4. In the given figure, AB || CD and O is the centre of the circle. If $\angle ADC = 25^o$, then the measure of $\angle AEB$ is **[1]**



   a) 40^o b) 60^o

c) 25^o d) 80^o

5. If $\Delta PQR \cong \Delta EFD$, then ED = **[1]**

a) QR b) PQ

c) PR d) None of these

6. If $(16)^{2x+3} = (64)^{x+3}$, then 4^{2x-2} = **[1]**

a) 64 b) 256

c) 512 d) 32

7. If$x + 1$ is a factor of the polynomial $2x^2 + kx + 1$, then the value of 'k' is **[1]**

a) 2 b) -3

c) -2 d) 3

8. If 0 < y < x, which statement must be true? **[1]**

a) $\sqrt{xy} = \sqrt{x}\sqrt{y}$ b) $\sqrt{x} + \sqrt{x} = \sqrt{2x}$

c) $x\sqrt{y} = y\sqrt{x}$ d) $\sqrt{x} - \sqrt{y} = \sqrt{x - y}$

9. Which of the following is a linear equation in two variables? **[1]**

a) 2x – 5y = 0 b) x + 5 = 8

c) $x^2 = 5x + 3$ d) $5x = y^2 + 3$

10. Which of the following is rational: **[1]**

a) $\sqrt{3}$ b) $\frac{4}{0}$

c) $\frac{0}{4}$ d) π

11. In each of the questions one question is followed by two statements I and II. Choose the correct option. **[1]**
Is quadrilateral ABCD a parallelogram?

I. Diagonals AC and BD bisect each other.

II. Diagonals AC and BD are equal.

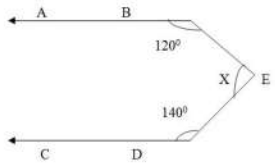
a) If the question can be answered by both the statements together but not by any one of the two

b) If the question can be answered by one of the given statements alone and not by the other

c) If the question cannot be answered by using both the statements together.

d) If the question can be answered by either statement alone

12. In figure, AB and CD are parallel to each other. The value of x is: **[1]**



a) 120° b) 100°

c) 140° d) 90°

13. For the equation $5x - 7y = 35$, if $y = 5$, then the value of 'x' is **[1]**

a) 12 b) -12

c) -14 d) 14

14. If a chord of a circle is equal to its radius, then the angle subtended by this chord in major segment is **[1]**

a) 30^o b) 90^o

c) 45^o d) 60^o

15. Choose the rational number which does not lie between $-\frac{2}{3}$ and $-\frac{1}{5}$ **[1]**

a) $-\frac{7}{20}$ b) $-\frac{3}{10}$

c) $-\frac{1}{4}$ d) $\frac{3}{10}$

16. If a linear equation has solutions (1, 2), (-1, -16) and (0, -7), then it is of the form **[1]**

a) $y = 9x - 7$ b) $9x - y + 7 = 0$

c) $x - 9y = 7$ d) $x = 9y - 7$

17. The name of each part of the plane formed by the two lines in the Cartesian plane is **[1]**

a) x-axis b) origin

c) quadrant d) y-axis

18. **Assertion (A):** ABCD is a square. AC and BD intersect at O. The measure of $\angle AOB = 90^o$. **[1]**
Reason (R): Diagonals of a square bisect each other at right angles.

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.

19. Which of the following is a polynomial. **[1]**

a) x - $\frac{1}{x}$ + 2

b) $\sqrt{x}$ + 3

c) $\frac{1}{x}$ + 5

d) -4

20. **Assertion (A):** 0.271 is a terminating decimal and we can express this number as $\frac{271}{1000}$ which is of the form $\frac{p}{q}$, where p and q are integers and q $\neq$ 0. **[1]**
Reason (R): A terminating or non-terminating decimal expansion can be expressed as rational number.

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. Does Euclid's fifth postulate imply the existence of parallel lines ? Explain. **[2]**

22. How would you rewrite Euclid's fifth postulate so that it would be easier to understand? **[2]**

23. Name the quadrants in which the following points lie : **[2]**
(i) p(4, 4)
(ii) Q(–4, 4)
(iii) R(–4, –4)
(iv) S(4, –4)

24. Show that: $\left(\frac{x^{a^2+b^2}}{x^{ab}}\right)^{a+b}\left(\frac{x^{b^2+c^2}}{x^{bc}}\right)^{b+c}\left(\frac{x^{c^2+a^2}}{x^{ac}}\right)^{a+c} = x^{2(a^3+b^3+c^3)}$ **[2]**

OR

Rationalise the denominator of: $\frac{1}{5+3\sqrt{2}}$.

25. How many metres of cloth, 2.5 m wide, will be required to make a conical tent whose base radius is 7 m and height 24 m? **[2]**

OR

A 5m wide cloth is used to make a conical tent of base diameter 14 m and height 24 m. Find the cost of cloth used at the rate of ₹ 25 per metre.

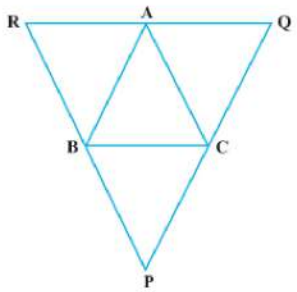
Section C

26. Draw a histogram to represent the following grouped frequency distribution: **[3]**

Ages (in years)	Number of teacher
20 - 24	10
25 - 29	28
30 - 34	32
35 - 39	48

40 - 44	50
45 - 49	35
50 - 54	12

27. Through A, B and C, lines RQ, PR and QP have been drawn, respectively parallel to sides BC, CA and AB of a $\triangle ABC$ as shown in Fig., Show that $BC = \frac{1}{2}QR$ **[3]**



28. Simplify $3\sqrt[3]{250} + 7\sqrt[3]{16} - 4\sqrt[3]{54}$ **[3]**

29. The following table gives the marks scored by 100 students in an entrance examination. **[3]**

Mark:	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
No. of Students (Frequency):	4	10	16	22	20	18	8	2

Represent this data in the form of a histogram.

OR

The population of Delhi State in different census years is as given below:

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.

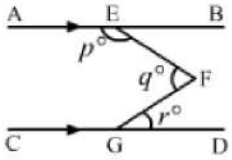
30. Find at least 3 solutions for the following linear equation in two variables: $5x + 3y = 4$. **[3]**

31. Check whether the polynomial $q(t) = 4t^3 + 4t^2 - t - 1$ is a multiple of $2t + 1$ or not. **[3]**

Section D

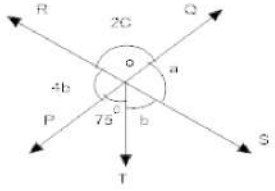
32. A hemispherical dome of a building needs to be painted. If the circumference of the base of the dome is 17.6 m, find the cost of painting it, given the cost of painting is ₹ 5 per 100 cm^2. **[5]**

33. In the given figure, AB || CD. Prove that $p + q - r = 180$. **[5]**



OR

In fig two straight lines PQ and RS intersect each other at O, if ∠POT = 75° Find the values of a, b and c



34. If $(x^3 + ax^2 + bx + 6)$ has (x - 2) as a factor and leaves a remainder 3 when divided by (x - 3), find the values of a and b. **[5]**

35. 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]**

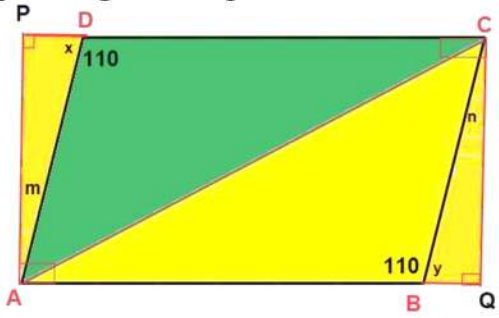
OR

One side of a right triangle measures 126 m and the difference in lengths of its hypotenuse and other side is 42 cm. Find the measures of its two unknown sides and calculate its area. Verify the result using Heron's Formula.

Section E

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

In the middle of the city, there was a park ABCD in the form of a parallelogram form so that AB = CD, AB||CD and AD = BC, AD || BC.
Municipality converted this park into a rectangular form by adding land in the form of ΔAPD and Δ BCQ. Both the triangular shape of land were covered by planting flower plants.



(i) Show that ΔAPD and ΔBQC are congruent.

(ii) PD is equal to which side?

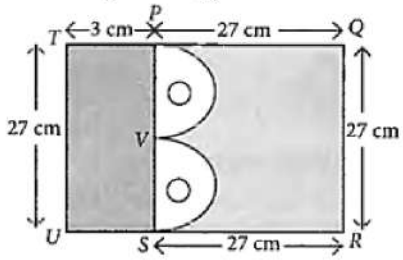
OR

What is the value of ∠m?

(iii) Show that ΔABC and ΔCDA are congruent.

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

Mr. Vivekananda purchased a plot QRUT to build his house. He leaves space of two congruent semicircles for gardening and a rectangular area of breadth 3 cm for car parking.



(i) Find the total area of Garden.

(ii) Find the area of rectangle left for car parking.

OR

Find the area of a semi-circle.

(iii) Find the radius of semi-circle.

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

Peter, Kevin James, Reeta and Veena were students of Class 9th B at Govt Sr Sec School, Sector 5, Gurgaon.
Once the teacher told **Peter to think a number x and to Kevin to think another number y** so that the difference of the numbers is 10 (x > y).
Now the teacher asked James to add double of Peter's number and that three times of Kevin's number, the total was found 120.
Reeta just entered in the class, she did not know any number.
The teacher said Reeta to form the 1st equation with two variables x and y.
Now Veena just entered the class so the teacher told her to form 2nd equation with two variables x and y.
Now teacher Told Reeta to find the values of x and y. Peter and kelvin were told to verify the numbers x and y.

(i) What are the equation formed by Reeta and Veena?

(ii) What was the equation formed by Veena?

(iii) Which number did Peter think?

OR

Which number did Kelvin think?

SOLUTION

Section A

1. **(b)** $2\sqrt{3}$ cm

   Explanation: Area of equilateral triangle = $\frac{\sqrt{3}}{4}(\text{Side})^2$

   $\Rightarrow \frac{\sqrt{3}}{4}(\text{Side})^2 = 4\sqrt{3}$

   $\Rightarrow (\text{Side})^2 = 4^2$

   $\Rightarrow$ Side = 4 cm

   Area of triangle = $\frac{1}{2}$ × Base × Height

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

   $\Rightarrow$ Height = $2\sqrt{3}$ cm

2. **(d)** II

   Explanation: Since, a < 0 $\Rightarrow$ a is -ve and b > 0 $\Rightarrow$ b is +ve.

   Recall that (+, +) lies in I quadrant, (-, +) lies in II quadrant (-, -) lies in III quadrant and (+, -) lies in IV quadrant.

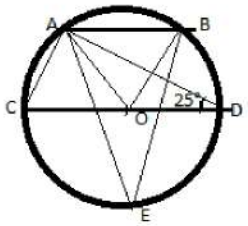
   Hence, (a, b) lies in II quadrant.

3. **(a)** X-axis

   Explanation: Histogram states that a two dimensional frequency density diagram is called as a histogram. The histograms are diagrams which represent the class interval and the frequency in the form of a rectangle. There will be as many adjoining rectangles as there are class intervals.

4. **(a)** 40^o

   Explanation:

   Here, AB || CD and $\angle ADC = 25^o$,

   So, $\angle DAB = 25^o$, (opposite interior angles are equal)

   Now, $\angle ADC = 25^o$, so, $\angle AOC$ = 50° (Angle subtended by arc AC at centre is twice the angle subtended at circumference)

   Similarly, $\angle DAB = 25^o$, So, $\angle DOB = 50^o$(Angle subtended by arc BD at centre is twice the angle subtended at circumference)

   $\angle AOB + \angle DOB + \angle AOC$ = 180° (All lie in straight line)

   $\angle AOB$ = 180 - 50 - 50 = 80°

   Now, $\angle AEB$ = 40° (Angle subtended by arc AB at centre is twice the angle subtended at circumference)

5. **(c)** PR

   Explanation: Since, by corresponding part of congruent triangle ED of △EFD is equal to the PR of △PQR.

6. **(b)** 256

   Explanation: $(16)^{2x+3} = (64)^{x+3}$

   $\Rightarrow (2^4)^{2x+3} = (2^6)^{x+3}$

$\Rightarrow 2^{8x+12} = 2^{6x+18}$

Comparing, we get

$8x + 12 = 6x + 18$

$\Rightarrow 8x - 6x = 18 - 12$

$\Rightarrow 2x = 6$

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

$\Rightarrow x=3$

Now $4^{2x-2} = 4^{2\times(3)-2} = 4^{6-2} = 4^4$

$= 4 \times 4 \times 4 \times 4 = 256$

7. **(d)** 3

   Explanation: If $x + 1$ is a factor of $p(x) = 2x^2 + kx + 1$, then

   $p(-1) = 0$

   $\Rightarrow 2x^2 + kx + 1 = 0$

   $\Rightarrow 2(-1)^2 + k(-1) + 1 = 0$

   $\Rightarrow 2 - k + 1 = 0$

   $\Rightarrow k = 3$

8. **(a)** $\sqrt{xy} = \sqrt{x}\sqrt{y}$

   Explanation: $0 < y < x$

   Only $\sqrt{xy} = \sqrt{x}\sqrt{y}$ is true

   as we know that

   $a^m \times b^m = (a \times b)^m$

9. **(a)** $2x - 5y = 0$

   Explanation: In linear equation power of variable x and y should be 1 and here, the given linear equation has two variable x and y.

10. **(c)** $\frac{0}{4}$

    Explanation: Since 0 is rational number it is in the form of $\frac{p}{q}$, and where $q \neq 0$ as $\frac{0}{1}$

11. **(b)** If the question can be answered by one of the given statements alone and not by the other

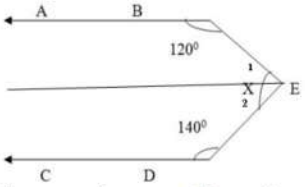
    Explanation: Here, as we know that if the diagonals of a quadrilateral bisects each other, then it is a parallelogram.

    But as per II, if the diagonals of a quadrilateral are equal, then it is not necessarily a parallelogram which is not true. Thus, II does not give the answer.

    So the question can be answered by the one of the given statement alone and not by the other.

12. **(b)** 100°

    Explanation:



    let us draw a line from point E parallel to line AB , CD

    $X = \angle 1 + \angle 2$

    $AB \parallel EF$

    $\angle 1 + 120° = 180°$ (co - interior angle)

    $\angle 1 = 180° - 120°$

    $\angle 1 = 60°$

CD || EF
$\angle 2 + 140° = 180°$ (co - interior angle)
$\angle 2 = 180° - 140°$
$\angle 1 = 40°$
$X = \angle 1 + \angle 2$
$X = 60° + 40°$

13. **(d)** 14
Explanation: For the equation $5x - 7y = 35$, if $y = 5$,

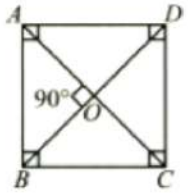
$$5x - 7y = 35$$
$$y = 5$$
$$5x - 7.5 = 35$$
$$5x - 35 = 35$$
$$5x = 35 + 35$$
$$5x = 70$$
$$x = \frac{70}{5} = 14$$
$$x = 14$$

14. **(a)** 30^o
Explanation: Since the chord is equal to the radius therefore, it will form an equilateral triangle inside the circle with the third vertex being the centre of the circle. So the chord will make an angle of 60^o at the centre. As the angle made by the chord at any other point of the circumference would be half.
So, we have that angle made at the major segment would be 30^o.

15. **(d)** $\frac{3}{10}$
Explanation: Since $\frac{3}{10} > -\frac{2}{3}$ and $\frac{3}{10} > -\frac{1}{5}$

16. **(a)** y = 9x - 7
Explanation: Since all the given co- ordinate (1, 2), (-1, -16) and (0, -7) satisfy the given line y = 9x - 7
For point (1, 2)
y = 9x - 7
2 = 9(1) - 7
2 = 9 - 7
2 = 2
Hence (2, 1) is a solution.
For point (-1, -16)
y = 9x - 7
-16 = 9(-1) - 7
-16 = -9 - 7
-16 = -16
Hence (-1, -16) is a solution.
For point (0,-7)
y = 9x - 7
-7 = 9(0) -7
-7 = -7
Hence (0, -7) is a solution.

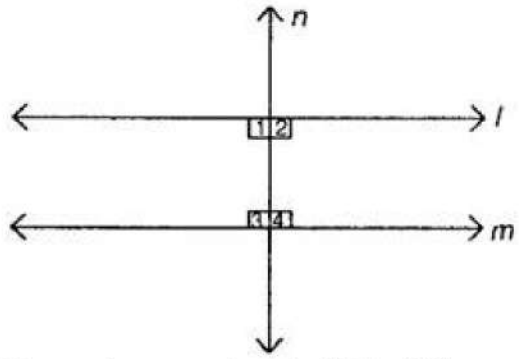
17. **(c)** quadrant
Explanation: In the Cartesian plane, there are two Axis one is x axis and other is y axis. when the both Axis cut one another it forms four quadrant(quadrant 1,2,3and 4)
18. **(a)** Both A and R are true and R is the correct explanation of A.
Explanation:
Since, diagonals of a square bisect each other at right angles.
$\angle AOB = 90^o$



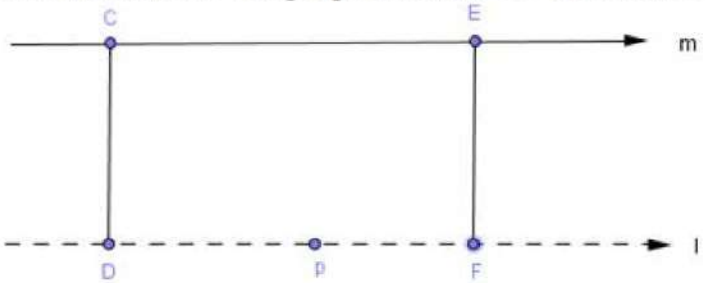
19. **(d)** -4
Explanation: -4 is a constant polynomial of degree zero.
20. **(c)** A is true but R is false.
Explanation: A is true but R is false.

Section B

21. Yes, According to Euclid's 5th postulate when n line falls on l and m if $\angle 1 + \angle 3 < 180^o$ and $\angle 2 + \angle 4 > 180^o$ then producing the l and m further will meet in the side of $\angle 1$ and $\angle 3$ which is less than 180^o.
Which gave the clue about the condition that $\angle 1 + \angle 2 = 180^o$ and the line l and m will not meet at any point.



22. We need to rewrite Euclid's fifth postulate so that it is easier to understand.
We know that Euclid's fifth postulate states that "No intersection of lines will take place when the sum of the measures of the interior angles on the same side of the falling line is exactly 180°"
We know that Playfair's axiom states that "For every line l and for every point P not lying on l, there exists a unique line m passing through P and parallel to l".
The above mentioned Playfair's axiom is easier to understand in comparison to the Euclid's fifth postulate. Let us consider a line l that passes through a point p and another line m. Let these lines be at a same plane.
Let us consider the perpendicular CD on l and FE on m.



From the above figure, we can conclude that CD = EF.
Therefore, we can conclude that the perpendicular distance between lines m and l will be constant throughout, and the lines m and l will never meet each other or in other words, we can say that the lines m and l are equidistant from each other.

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

24. LHS = $\left(\frac{x^{a^2+b^2}}{x^{ab}}\right)^{a+b}\left(\frac{x^{b^2+c^2}}{x^{bc}}\right)^{b+c}\left(\frac{x^{c^2+a^2}}{x^{ac}}\right)^{a+c}$

$= \left(x^{a^2+b^2-ab}\right)^{a+b}\left(x^{b^2+c^2-bc}\right)^{b+c}\left(x^{c^2+a^2-ca}\right)^{a+c}$ [using $\frac{a^m}{a^n} = a^{m-n}$]

$= x^{(a+b)(a^2-ab+b^2)} \cdot x^{(b+c)(b^2-bc+c^2)} \cdot x^{(c+a)(a^2-ac+c^2)}$

$= x^{a^3+b^3} \cdot x^{b^3+c^3} \cdot x^{c^3+a^3}$

$= x^{a^3+b^3+b^3+c^3+c^3+a^3}$

$= x^{2(a^3+b^3+c^3)}$ = RHS

OR

$\frac{1}{5+3\sqrt{2}}$

$= \frac{1}{5+3\sqrt{2}} \times \frac{5-3\sqrt{2}}{5-3\sqrt{2}}$

$= \frac{5-3\sqrt{2}}{5^2-3\sqrt{2}^2}$

$= \frac{5-3\sqrt{2}}{25-18}$

$= \frac{5-3\sqrt{2}}{7}$

25. We have radius of the conical tent, r = 7 m
Height of the conical tent, h = 24 m
Now, $l = \sqrt{r^2+h^2} = \sqrt{49+576} = \sqrt{625} = 25$ m
Curved surface area of the cone = $\pi rl = \frac{22}{7} \times 7 \times 25 = 550$
Width of the cloth = 2.5 m
Therefore, Length of the cloth = $\frac{area\ of\ the\ cloth}{width\ of\ the\ cloth} = \frac{550}{2.5} = 220$ m

OR

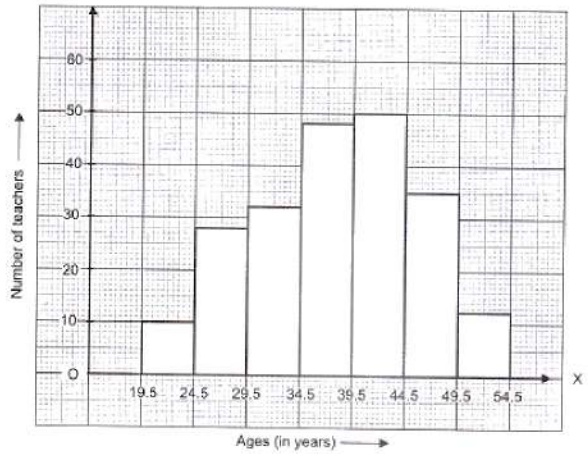
Given: Radius of base (r) and height (h) of the conical tank are 7 m and 24 m
$\Rightarrow$ Slant height (l) = $r^2 + h^2$
$= \sqrt{r^2+h^2} = \sqrt{7^2+24^2}$
$= \sqrt{625} = 25\text{m}$
C.S.A. $= \pi rl$
$= \frac{22}{7} \times 7 \times 25 = 550\text{m}^2$
Let x m of cloth is required
CSA of tent = area of cloth.
or, $5x = 550$ or, $x = \frac{550}{5} = 110\text{m}$
$\therefore$ 110 m of cloth is required.
Cost of cloth $= 25 \times 110 = Rs.2750$

Section C

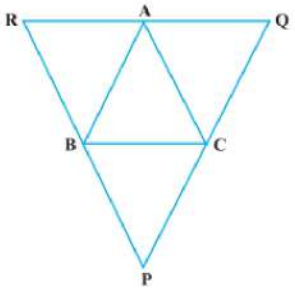
26. The given table is in inclusive form. So, we first convert it into an exclusive form, as given below.

Ages (in years)	Number of teachers
19.5 – 24.5	10
24.5 – 29.5	28
29.5 – 34.5	32
34.5 – 39.5	48
39.5 – 44.5	50
44.5 – 49.5	35
49.5 – 54.5	12

A histogram for this table is shown in the figure given below:



27.



Given,
PQ||AB, PR||AC and RQ||BC.
In quadrilateral BCAR,
BR||CA and BC||RA
∴ BCAR is a parallelogram
∴BC = AR …(i)
Now, in quadrilateral BCQA,
BC||AQ and AB||QC
∴BCQA is a parallelogram
∴BC = AQ …(ii)
Adding Eqn. (i) and (ii), we get
2BC = AR + AQ
2BC = RQ
$BC = \frac{QR}{2}$
Hence proved.

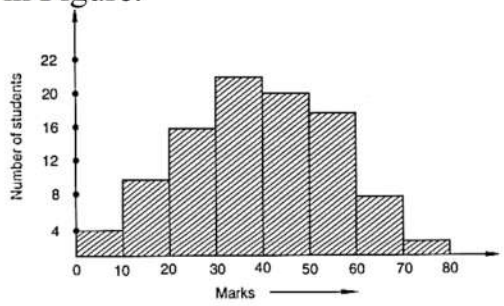
28. $3\sqrt[3]{250} + 7\sqrt[3]{16} - 4\sqrt[3]{54}$
$3\sqrt[3]{5 \times 5 \times 5 \times 2} + 7\sqrt[3]{2 \times 2 \times 2 \times 2} - 4\sqrt[3]{3 \times 3 \times 3 \times 2}$
$3 \times 5\sqrt[3]{2} + 7 \times 2\sqrt[3]{2} - 4 \times 3\sqrt[3]{2}$

$15\sqrt[3]{2} + 14\sqrt[3]{2} - 12\sqrt[3]{2}$

$(15 + 14 - 12)\sqrt[3]{2}$

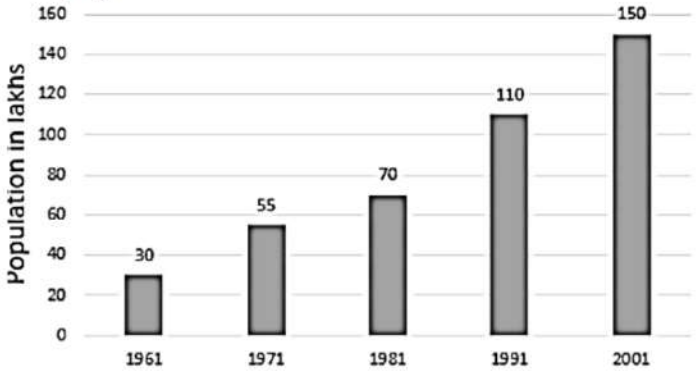
$= 17\sqrt[3]{2}$

29. Taking class-intervals as bases and the corresponding frequencies as heights, we construct rectangles to obtain the histogram of the given frequency distribution as shown in Figure.



OR

the population of Delhi State in different census years



30. $5x + 3y = 4$

$\Rightarrow 3y = 4 - 5x$

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

put x = 0, then $y = \frac{4-5(0)}{3} = \frac{-4}{3}$

Put x = 1, then $y = \frac{4-5(1)}{3} = -\frac{1}{3}$

Put x = 2, then $y = \frac{4-5(2)}{3}$ = - 2

Put x = 3, then $y = \frac{4-5(3)}{3} = \frac{-11}{3}$

$\therefore \left(0, \frac{4}{3}\right), \left(1, \frac{-1}{3}\right)$, (2, -2), and $\left(3, \frac{-11}{3}\right)$ are the solutions of the equation 5x + 3y = 4.

31. Given polynomial is $q(t) = 4t^3 + 4t^2 - t - 1$

Let g(t) = 2t + 1

For the zero of g(t) put g(t) = 0

$\therefore 2t + 1 = 0 \Rightarrow t = -1/2$

On putting $t = -\frac{1}{2}$ in q(t), we get

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

$= 4\left(\frac{-1}{8}\right) + 4\left(\frac{1}{4}\right) + \frac{1}{2} - 1$

$= -\frac{1}{2} + 1 + \frac{1}{2} - 1 = 0$

At $t = -\frac{1}{2}$, we get $q\left(-\frac{1}{2}\right) = 0$

i.e. the remainder obtained on dividing q(t) by g(t) is 0.

Hence, (2t +1) is a factor of q(t), i.e. q(t) is a multiple of (2t + 1).

Section D

32. Since only the rounded surface of the dome is to be painted, we would need to find the curved surface area of the hemisphere to know the extent of painting that needs to be done. Now, circumference of the dome = 17.6 m. Therefore, $17.6 = 2\pi r$

$2 \times \frac{22}{7} r = 17.6$ m

So, the radius of the dome = $17.6 \times \frac{7}{2\times 22}$ m = 2.8 m

The curved surface area of the dome = $2\pi r^2$

$= 2 \times \frac{22}{7} \times 2.8 \times 2.8$ m^2

$= 49.28$ m^2

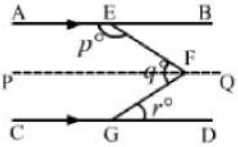
Now, the cost of painting 100 cm^2 is Rs. 5.

So, the cost of painting 1 m^2 = Rs. 500

Therefore, the cost of painting the whole dome

= Rs. 500 × 49.28

= Rs. 24640

33. 

Draw PFQ || AB || CD

Now, PFQ || AB and EF is the transversal.

Then,

$\angle AEF + \angle EFP = 180^\circ$ ...(i)

[Angles on the same side of a transversal line are supplementary]

Also, PFQ || CD.

$\angle PFG = \angle FGD = r^\circ$ [Alternate Angles]

and $\angle EFP = \angle EFG - \angle PFG = q^\circ - r^\circ$

putting the value of ∠EFP in equation (i)

we get,

p° + q °- r° = 180° [∠AEF = p°]

OR

PQ intersect RS at O

$\therefore \angle QOS = \angle POR$ [vert'ically opposite angles]

a = 4b ...(1)

Also,

a + b + 75° = 180° [∵POQ is a straight lines]

∴ a + b = 180° - 75°

= 105°

Using, (1)

4b + b = 105°

5b = 105°

Or

b = = $\frac{105^\circ}{5}$ = 21°

Now a=4b

a = 4 × 21°

a = 84°

Again,∠QOR and ∠QOS

$\therefore a + 2c = 180°$

Using, (2) $84° + 2c = 180°$

$2c = 180° - 84°$

$2c = 96°$

$c = \frac{96^0}{2} = 48°c$

Hence,

$a = 84°$, $b = 21°$ and $c = 48°$

34. Let: $f(x) = x^3 + ax^2 + bx + 6$

$f(x)$ is divisible by $x - 2$

Then $f(2) = 0$

$2^3 + a \times 2^2 + b \times 2 + 6 = 0$

$8 + 4a + 2b + 6 = 0$

$4a + 2b = -14$

$2a + b = -7$ ...(i)

If $f(x)$ is divided by $x - 3$ remainder is 3

$\therefore f(3) = 3$

$3^3 + a \times 3^2 + b \times 3 + 6 = 3$

$9a + 3b = -30$

$3a + b = -10$ ...(ii)

Subtracting (i) from (ii)

$-a = 3$ and $a = -3$

Put $a = -3$ in eq (i)

$2 \times -3 + b = -7$

$-6 + b = -7$

$b = -7 + 6$

$b = -1$

35. Let:

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

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

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

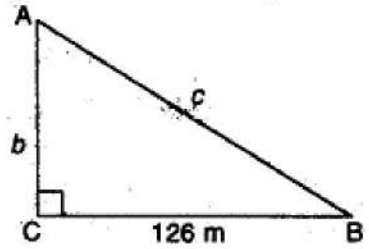
$\Rightarrow \frac{1}{2} \times$ Base $\times$ Height = 336

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

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

OR

Let ABC be the right triangle right angles at C.



a = 126 m . . . (1)

In right triangle ACB.

$AB^2 = AC^2 + BC^2$ . . .[By Pythagoras theorem]

$\Rightarrow c^2 = a^2 + b^2$

$\Rightarrow c = \sqrt{a^2 + b^2}$ . . .(2)

$\Rightarrow c - b = 42$ . . .(3)

$\Rightarrow \sqrt{a^2 + b^2} - b = 42$ . . .[From (2)]

$\Rightarrow \sqrt{126^2 + b^2} - b = 42$ . . .[From (1)]

$\Rightarrow \sqrt{126^2 + b^2} = (42+b)$

$\Rightarrow (126)^2 + b^2 = (42 + b)^2$

$\Rightarrow 15876 + b^2 = 1764 + b^2 + 84b$

$\Rightarrow 84b = 15876 - 1764$

$\Rightarrow 84\ b = 14112$

$\Rightarrow b = \frac{14112}{84}$

$\Rightarrow b = 168$ m . . . (4)

From (3) and (4)

$c - 168 = 42$

$\therefore c = 168 + 42 = 210$ m . . . (5)

$\therefore$ Area of the right triangle $= \frac{1}{2} \times$ base $\times$ height

$= \frac{1}{2} \times 126 \times 168$

$= 10584\ m^2$

Using Heron's Formula

a = 126 m, b = 168 m, c = 210 m

$\therefore s = \frac{a+b+c}{2}$

$= \frac{126+168+210}{2} = \frac{504}{2} = 252$ m

$\therefore$ Area of the right triangle

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

$= \sqrt{252(252-126)(252-168)(252-210)}$

$= \sqrt{252(126)(84)(42)}$

$= \sqrt{(63 \times 4)(63 \times 2)(42 \times 2)(42)}$

$= 63 \times 2 \times 2 \times 42 = 10584\ m^2$

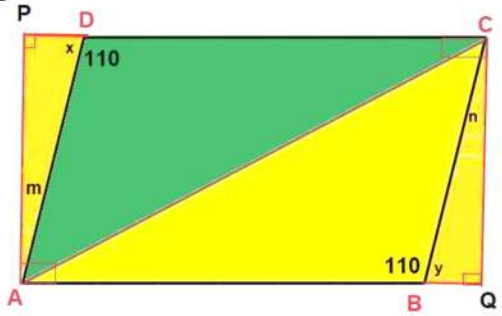
Section E

36. **Read the text carefully and answer the questions:**

In the middle of the city, there was a park ABCD in the form of a parallelogram form so that AB = CD, AB||CD and AD = BC, AD || BC.

Municipality converted this park into a rectangular form by adding land in the form of ΔAPD and Δ BCQ. Both the triangular shape of land were covered by planting flower

plants.



(i) In △APD and △BQC
AD = BC (given)
AP = CQ (opposite sides of rectangle)
$\angle APD = \angle BQC = 90^o$
By RHS criteria △APD ≅ △CQB

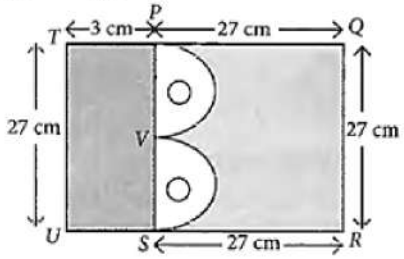
(ii) △APD ≅ △CQB
Corresponding part of congruent triangle
side PD = side BQ

OR

In △APD
$\angle APD + \angle PAD + \angle ADP = 180^o$
$\Rightarrow 90^o + (180^o - 110^o) + \angle ADP = 180^o$ (angle sum property of △)
$\Rightarrow \angle ADP = m = 180^o - 90^o - 70^o = 20^o$
$\angle ADP = m = 20^o$

(iii) In △ABC and △CDA
AB = CD (given)
BC = AD (given)
AC = AC (common)
By SSS criteria △ABC ≅ △CDA

37. **Read the text carefully and answer the questions:**
Mr. Vivekananda purchased a plot QRUT to build his house. He leaves space of two congruent semicircles for gardening and a rectangular area of breadth 3 cm for car parking.



(i) Area of Garden is = 2 × semicircles
Area of a semi-circle = $2 \times \frac{1}{2}\pi r^2$
$= \frac{22}{7} \times 6.75 \times 6.75 = 144.43\ cm^2$

(ii) Area of rectangle left for car parking is area of region PSUT = $27 \times 3 = 81\ cm^2$

OR

Diameter of semi-circle = PV = $\frac{PS}{2} = \frac{27}{2}$ = 13.5 cm

$\therefore$ Radius of semi-circle = $\frac{13.5}{2}$ = 6.75 cm

Area of a semi-circle = $\frac{1}{2}\pi r^2$

= $\frac{1}{2} \times \frac{22}{7} \times 6.75 \times 6.75 = 71.59$ cm^2

(iii) Diameter of semi-circle = PV = $\frac{PS}{2} = \frac{27}{2}$ = 13.5 cm

$\therefore$ Radius of semi-circle = $\frac{13.5}{2}$ = 6.75 cm

38. **Read the text carefully and answer the questions:**

Peter, Kevin James, Reeta and Veena were students of Class 9th B at Govt Sr Sec School, Sector 5, Gurgaon.

Once the teacher told **Peter to think a number x and to Kevin to think another number y** so that the difference of the numbers is 10 (x > y).

Now the teacher asked James to add double of Peter's number and that three times of Kevin's number, the total was found 120.

Reeta just entered in the class, she did not know any number.

The teacher said Reeta to form the 1st equation with two variables x and y.

Now Veena just entered the class so the teacher told her to form 2nd equation with two variables x and y.

Now teacher Told Reeta to find the values of x and y. Peter and kelvin were told to verify the numbers x and y.

(i) x - y = 10

2x + 3y = 120

(ii) 2x + 3y = 120

(iii) x - y = 10 ...(1)

2x + 3y = 120 ...(2)

Multiply equation (1) by 3 and to equation (2)

3x - 3y + 2x + 3y = 30 + 120

$\Rightarrow$ 5x = 150

$\Rightarrow$ x = 30

Hence the number thought by Prateek is 30.

OR

We know that x - y = 10 ...(i) and 2x + 3y = 120 ...(ii)

Put x = 30 in equation (i)

30 - y = 10

$\Rightarrow$ y = 40

Hence number thought by Kevin = 40