CBSE SAMPLE PAPER - 10

Class 09 - Mathematics

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 value of $(0.00032)^{\frac{-2}{5}}$ is **[1]**

a) 1 b) 0

c) 5 d) 25

2. x = 2, y = -1 is a solution of the linear equation **[1]**

a) 2x + y = 0 b) x + 2y = 0

c) x + 2y = 4 d) 2x + y = 5

3. The point of intersect of the coordinate axes is **[1]**

a) quadrant b) ordinate

c) abscissa d) origin

4. In a bar graph, 0.25 cm length of a bar represents 100 people. Then, the length of bar which represents 2000 people is **[1]**

a) 4.5 cm b) 4 cm

c) 5 cm d) 3.5 cm

5. 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

6. Given four distinct points in a plane. How many line segments can be drawn using them when no three of them are collinear? [1]

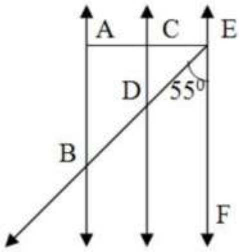
a) 8

b) 4

c) 6

d) 1

7. In the given figure, AB || CD || EF, EA ⊥ AB and BDE is the transversal such that ∠DEF = 55°, Then ∠AEB =? [1]



a) 35°

b) 45°

c) 25°

d) 55°

8. The figure formed by joining the mid-points of the adjacent sides of a quadrilateral is a [1]

a) rhombus

b) parallelogram

c) square

d) rectangle

9. The value of $x^3 - 8y^3 - 36xy - 216$, when $x = 2y + 6$ is [1]

a) 0

b) 3

c) 1

d) 2

10. For the equation 5x – 7y = 35, if y = 5, then the value of 'x' is [1]

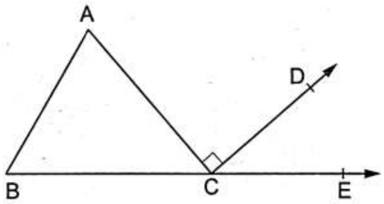
a) 12

b) -12

c) -14

d) 14

11. In a $\triangle ABC$, it is given that $\angle A : \angle B : \angle C = 3 : 2 : 1$ and $\angle ACD = 90^\circ$. If BC is produced to E then $\angle ECD$ = ? [1]



a) 40^o

b) 50^o

c) 60^o

d) 25^o

12. In Quadrilateral ABCD, $\angle A = (3x)^o$, $\angle B = (5x)^o$, $\angle C = (20x)^o$, $\angle D = (8x)^o$. Find the value of x? [1]

a) 9

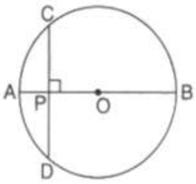
b) 20

c) 11

d) 10

13. P is a point on the diameter AB of a circle and CD is a chord perpendicular to AB. If AP = 4 cm and PB = 16 [1]

cm, the length of chord CD is



a) 16 cm

b) 10 cm

c) 20 cm

d) 8 cm

14. $9^3 + (-3)^3 - 6^3 = ?$ **[1]**

a) 540

b) 486

c) 270

d) 432

15. The degree of the polynomial $4x^4 + 0x^3 + 0x^5 + 5x + 7$ is **[1]**

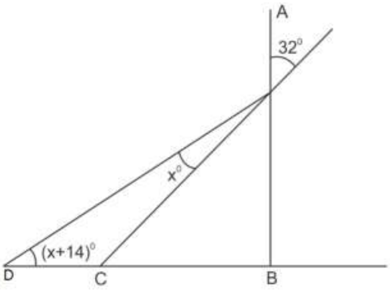
a) 5

b) 4

c) 7

d) 3

16. In Figure, if AB $\perp$ BC, then x = **[1]**



a) 25

b) 22

c) 18

d) 32

17. If (x + 5) is a factor of $p(x) = x^3 - 20x + 5k$ then k = ? **[1]**

a) 5

b) -3

c) 3

d) -5

18. A cubical block of side 7 cm is surmounted by a hemisphere. The greatest diameter of the hemisphere is **[1]**

a) 10.5cm

b) 7cm

c) 3.5cm

d) 14cm

19. **Assertion (A):** The sides of a triangle are 3 cm, 4 cm and 5 cm. Its area is 6 cm^2. **[1]**

Reason (R): If 2s = (a + b + c), where a, b, c are the sides of a triangle, then area = $\sqrt{(s-a)(s-b)(s-c)}$.

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):** The point (0, 3) lies on the graph of the linear equation 3x + 4y = 12. **[1]**

Reason (R): (0, 3) satisfies the equation 3x + 4y = 12.

a) Both A and R are true and R is the correct

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

c) A is true but R is false. d) A is false but R is true.

Section B

21. Find the area of an equilateral triangle having altitude h cm. **[2]**

22. Factorise: $3x^2 + 4y^2 + 25z^2 - 4\sqrt{3}xy - 20yz + 10\sqrt{3}zx$. **[2]**

23. Find the surface area of a sphere whose volume is 4851 cm^3. **[2]**

24. A teacher told 8 students to write a polynomial on the blackboard. Students wrote the following polynomials: **[2]**

(i) $x^2 + 9$	(v) $x^3 + 5x + 2x + 6$
(ii) $x^3 + 2x^2 + x + 5$	(vi) $5x + 6$
(iii) $2x^4 + 3x^3 + 2x + 7$	(vii) $x^4 + x^3 - 5x^2 + 3x + 8$
(iv) $x^2 + 5x + 6$	(viii) $x^2 - 7x + 12$

i. How many students wrote quadratic polynomials?

ii. If α and β are zeros of the polynomial $x^2 + 5x + 6$, then what is the value of $\alpha + \beta$?

OR

Find the value of k, if x - 1 is a factor of p(x): $p(x) = 2x^2 + kx + \sqrt{2}$.

25. Solve the equation for x: $5(4x + 3) = 3(x - 2)$ **[2]**

OR

Find whether (0, 2)is the solution of the equation $x - 2y = 4$ or not?

Section C

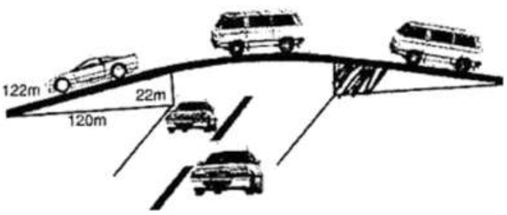
26. Find the values of a and b in each of $\frac{\sqrt{2}+\sqrt{3}}{3\sqrt{2}-2\sqrt{3}} = 2 - b\sqrt{6}$ **[3]**

27. Find the values of a and b so that (x + 1) and (x - 1) are the factors of $x^4 + ax^3 - 3x^2 + 2x + b$ **[3]**

28. The sides of a triangular field are 41m, 40m and 9m. Find the number of rose beds that can be prepared in the field, if each rose bed on an average needs 900 cm^2 space. **[3]**

OR

The triangular side walls of a flyover have been used for advertisements. The sides of the walls are 122 m, 22 m and 120 m (see Fig.). The advertisements yield an earning of ₹ 5000 per m^2 per year. A company hired one of its walls for 3 months. How much rent did it pay?



29. Let y varies directly as x. If y = 12 when x = 4, then write a linear equation. What is the value of y when x = 5? **[3]**

30. S is any point on side QR of a △PQR. Show that: PQ + QR + RP > 2PS. **[3]**

OR

ABC is an isosceles triangle with AB = AC and BD and CE are its two medians. Show that BD = CE.

31. How will you describe the position of a table lamp on your study table to another person? **[3]**

Section D

32. If a = 3 + 2$\sqrt{2}$, then find the value of: [5]

i. $a^2 + \frac{1}{a^2}$

ii. $a^3 + \frac{1}{a^3}$

OR

Express $0.6 + 0.\overline{7} + 0.4\overline{7}$ in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$.

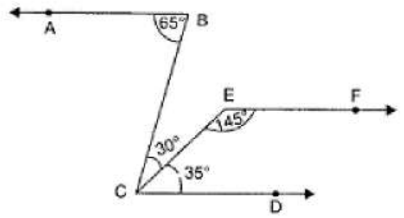
33. Read the following statements which are taken as axioms: [5]

i. If a transversal intersects two parallel lines, then corresponding angles are not necessarily equal.

ii. If a transversal intersect two parallel lines, then alternate interior angles are equal.

Is this system of axioms consistent? Justify your answer.

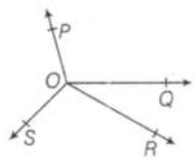
34. In figure, ∠ABC = 65°, ∠BCE = 30°, ∠DCE = 35° and ∠CFE = 145°. Prove that AB || EF. [5]



OR

In the given figure, OP, OQ, OR and OS are four rays. Prove that

∠POQ + ∠ROQ + ∠SOR + ∠POS = 360°.



35. The runs scored by two teams A and B on the first 60 balls in a cricket match are given below : [5]

Number of balls	**Team A**	**Team B**
1-6	2	5
7-12	1	6
13-18	8	2
19-24	9	10
25-30	4	5
31-36	5	6
37-42	6	3
43-48	10	4
49-54	6	8
55-60	2	10

Represent the data of both the teams on the same graph by frequency polygons.

[Hint: First make the class intervals continuous.]

Section E

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

While dusting a maid found a button whose upper face is of red color, as shown in the figure. The diameter of each of the smaller identical circles is $\frac{1}{4}$ of the diameter of the larger circle whose radius is 16 cm.

(i) Find the area of each of the smaller circle.

(ii) Find the area of the larger circle.

(iii) Find the area of the black colour region.

OR

Find the area of quadrant of a smaller circle.

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

Vinod and Basant have an adventure tourism business in Rishikesh. They have a resort in Rishikesh but now they are planning to build some tent houses too.

The newly built tent house will have all the basic amenities and it will attract the young tourists coming for adventure. Their conical tent is 9 m high and the radius of its base is 12 m.

(i) What is the cost of the canvas required to make it, if 1 m^2 canvas costs ₹10?

(ii) How many persons can be accommodated in the tent, if each person requires 2 m^2 on the ground?

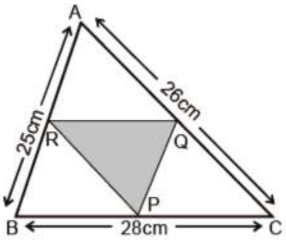
OR

If each person requires 20 m^3 of space to breathe in and 100 person can be accommodated then what should be height of tent?

(iii) How many persons can be accommodated in the tent, if each person requires 15 m^3 of space to breathe in?

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

There is a Diwali celebration in the DPS school Janakpuri New Delhi. Girls are asked to prepare Rangoli in a triangular shape. They made a rangoli in the shape of triangle ABC. Dimensions of $\triangle$ABC are 26 cm, 28 cm, 25 cm.



(i) In fig R and Q are mid-points of AB and AC respectively. Find the length of RQ.

(ii) Find the length of Garland which is to be placed along the side of $\triangle$QPR.

OR

R, P, Q are the mid-points of corresponding sides AB, BC, CA in ΔABC, then name the figure so obtained BPQR.

(iii) R, P and Q are the mid-points of AB, BC, and AC respectively. Then find the relation between area of $\triangle$PQR and area of $\triangle$ABC.

Solution

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Class 09 - Mathematics

Section A

1. **(d)** 25

Explanation:
$$(0.00032)^{\frac{-2}{5}}$$
$$=\left(\frac{32}{100000}\right)^{\frac{-2}{5}}$$
$$=\left(\frac{2}{10}\right)^{5\times\frac{-2}{5}}$$
$$=\left(\frac{1}{5}\right)^{-2}=25$$

2. **(b)** x + 2y = 0
Explanation: 2 + 2(-1) = 2 - 2 = 0

3. **(d)** origin
Explanation: The point where coordinate axes intersect is known as origin O(0,0).

4. **(c)** 5 cm
Explanation: Use unitary method
0.25 cm - 100 people
So 1 cm - 400 people
So for 2000 people:
$\frac{2000}{400}$ = 5 cm

5. **(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.

6. **(c)** 6
Explanation: If the four points are A,B,C and D, we can drawthe lines: A–B, A–C, A–D, B–C, B–D, C–D

7. **(a)** 35°
Explanation: EA ⊥ AB
∠AEF = 90°
∠AEF = ∠BEF + ∠AEB
∠BEF + ∠AEB = 90°
∠BEF = 55°
55° + ∠AEB = 90°
∠AEB = 90° - 55°
∠AEB = 55°

8. **(b)** parallelogram
Explanation:
Let ABCD be a quadrilateral in which P, Q, R and S are the mid-points of AB, BC, CD and DA respectively.
Join AC

In $\triangle$ABC, the points P and Q are the mid-points of sides AB and BC respectively.

$\therefore\quad PQ \| AC$ and $PQ = \frac{1}{2}AC$ (By Mid-point Theorem) .... (i)

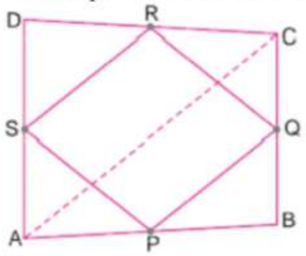
Again, in ΔDAC, the points S and R are the mid-points of AD and DC.

$\therefore\quad SR \| AC$ and $SR = \frac{1}{2}AC$ ..... (ii)

From (i) and (ii)

$PQ \| SR$ and PQ = SR

Hence, quadrilateral PQRS is a parallelogram.



9. **(a)** 0

Explanation: $x^3 - 8y^3 - 36xy - 216$

Putting x = 2y + 6,

$(2y+6)^3 - 8y^3 - 36(2y+6)y - 216$

$= 8y^3 + 216 + 3 \times 2y \times 6(2y+6) - 8y^3 - 36(2y+6)y - 216$

$= 8y^3 + 216 + 72y^2 + 216y - 8y^3 - 72y^2 - 216y - 216$

= 0

10. **(d)** 14

Explanation: For the equation 5x – 7y = 35, if y = 5,

$5x - 7y = 35$

$y = 5$

$5x - 7.5 = 35$

$5x - 35 = 35$

$5x = 35 + 35$

$5x = 70$

$x = \frac{70}{5} = 14$

$x = 14$

11. **(c)** 60^o

Explanation: Let $\angle A = (3x)^\circ, \angle B = (2x)^\circ$ and $\angle C = x^\circ$

Then ,

3x + 2x + x = 180^o [Sum of the angles of a triangle]

$\Rightarrow 6x = 180^\circ$

$\Rightarrow$ x = 30^o

Hence, the angles are

$\angle A = 3 \times 30^\circ = 90^\circ, \angle B = 2 \times 30^\circ = 60^\circ$ and $\angle C = 30^\circ$

Side BC of triangle ABC is produced to E.

$\therefore \angle ACE = \angle A + \angle B$

$\Rightarrow \angle ACD + \angle ECD = 90^\circ + 60^\circ$

$\Rightarrow 90^\circ + \angle ECD = 150^\circ$

$\Rightarrow \angle ECD = 60^\circ$

Hence the correct answer is 60^o.

12. **(d)** 10

Explanation: angle A + angle B + angle C + angle D = 360 (angle sum property)

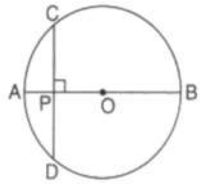
3x + 5x + 20x + 8x = 360

36x = 360

x = 10

13. **(a)** 16 cm

Explanation:



Join AC, BC. Let CD = 2x. Then CP = x

Now, in triangle ACP,

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

$\Rightarrow AC^2 = 4^2 + x^2$ ....(1)

And $BC^2 = CP^2 + BP^2$

$\Rightarrow BC^2 = x^2 + 16^2$ ...(2)

Again, in triangle ABC,

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

$\Rightarrow 20^2 = x^2 + 4^2 + x^2 + 16^2$

$\Rightarrow 400 = 2x^2 + 16 + 256$

$\Rightarrow 128 = 2x^2$

$\Rightarrow x^2 = 64$

$\Rightarrow x = 8$ cm

$\Rightarrow 2x = 16$ cm

CD = 16 cm

14. **(b)** 486

Explanation: $9^3 + (-3)^3 - 6^3$

= 729 - 27 - 216

=729 - 243

=486

15. **(b)** 4

Explanation: $4x^4 + 0x^3 + 0x^5 + 5x + 7$

= $4x^4 + 5x + 7$

Here, the height power is 4.

Therefore, the degree of given polynomial is 4.

16. **(b)** 22

Explanation: AB $\perp$ BC

$\Rightarrow \angle ABC = 90^\circ$

$\angle CAB = 32^\circ$ (Opposite angles)

Now, in $\triangle$ABD

$\angle$DAB = $x^\circ + 32^\circ$

$\angle$ABD = 90°

$\angle$BDA = $x^\circ + 14^\circ$

In a $\triangle$, sum of all angles = 180°

$\Rightarrow \angle DAB + \angle ABD + \angle BDA = 180^\circ$

$\Rightarrow x^\circ + 32^\circ + 90^\circ + x^\circ + 14^\circ = 180^\circ$

$\Rightarrow 2x^\circ = 180^\circ - 136^\circ$

$\Rightarrow 2x^\circ = 44$

$\Rightarrow x^\circ = 22$

17. **(a)** 5

Explanation: (x + 5) is a factor of $p(x) = x^3 - 20x + 5k$

$\therefore p(-5) = 0$

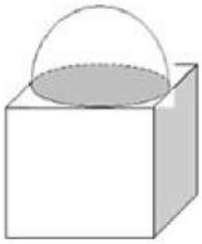
$\Rightarrow (-5)^3 - 20 \times (-5) + 5k = 0$

$\Rightarrow$ -125 + 100 + 5k = 0

$\Rightarrow$ 5k = 25

$\Rightarrow$ k = 5

18. **(b)** 7cm

Explanation: 

It is clear that Maximum diameter of hemisphere can be the side of the cube.

$\therefore$ The greatest diameter of the hemisphere = 7 cm

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

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

s = $\frac{3+4+5}{2}$ = 6 cm

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

= $\sqrt{(6)(6-3)(6-4)(6-5)}$

= $\sqrt{(6)(3)(2)(1)}$ = 6 cm^2

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

Explanation: Both A and R are true and R is the correct explanation of A.

Section B

21. The altitude of an equilateral triangle, having side a is given by

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

Substituting the given value of altitude h, we get

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

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

Area of an equilateral triangle, say A having each side a cm is given by

A = $\frac{\sqrt{3}}{4}$a^2

Area of the given equilateral triangle having each equal side equal to $\frac{2}{\sqrt{3}}$h is given by;

A = $\frac{\sqrt{3}}{4}\left(\frac{2}{\sqrt{3}}h\right)^2$

A = $\frac{\sqrt{3}}{4} \times \frac{4}{3}h^2$

A = $\frac{h^2}{\sqrt{3}}$ cm^2

22. $3x^2 + 4y^2 + 25z^2 - 4\sqrt{3}xy - 20yz + 10\sqrt{3}zx$

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

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

= $(\sqrt{3}x - 2y + 5z)(\sqrt{3}x - 2y + 5z)$

23. Let the radius of the sphere be r cm.

Then, its volume = $\left(\frac{4}{3}\pi r^3\right)$cm^3

Therefore, $\frac{4}{3}\pi r^3$ = 4851

$\Rightarrow \frac{4}{3} \times \frac{22}{7} \times r^3$ = 4851

$\Rightarrow$ r^3 = $\left(4851 \times \frac{3}{4} \times \frac{7}{22}\right) = \left(\frac{441 \times 21}{8}\right) = \left(\frac{21}{2}\right)^3$

$\Rightarrow$ r = $\frac{21}{2}$ = 10.5

Thus, the radius of the sphere is 10.5 cm.

Surface area of the sphere = (47πr^2) sq units

= $\left(4 \times \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2}\right)$ cm^2

= 1386 cm^2

24. i. We observe that polynomials $x^2 + 9$, $x^2 + 5x + 6$ and $x^2 - 7x + 12$ are in the form of $ax^2 + bx + c$, which is the standard form of quadratic polynomial. Hence, 3 quadratic polynomials were written.

ii. α and β are zeros of polynomial $x^2 + 5x + 6$.

We know that for any quadratic polynomial:

Sum of zeros $= -\frac{\text{coefficient of x}}{\text{coefficient of } x^2}$

So, $\alpha + \beta = -\frac{5}{1} = -5$

OR

$p(x) = 2x^2 + kx + \sqrt{2}$

According to the factor theorem,

$p(a) = 0$, if $x - a$ is a factor of $p(x)$.

We conclude that if $(x - 1)$ is a factor of $p(x) = 2x^2 + kx + \sqrt{2}$, then $p(1) = 0$.

$p(1) = 2(1)^2 + k(1) + \sqrt{2} = 0$

$2 + k + \sqrt{2} = 0$

$k = -(2 + \sqrt{2})$

$\therefore$, we can conclude that the value of k is $-(2 + \sqrt{2})$.

25. According to the question, given equation is 5(4x + 3) = 3(x-2).

$\Rightarrow$ 20x +15 = 3x - 6

$\Rightarrow$ 20x - 3x = -6-15

$\Rightarrow 17x = -21 \Rightarrow x = \frac{-21}{17}$

OR

The given equation is x – 2y = 4

Put x = 0 and y = 2 in given equation, we get

x – 2y =4

0 – 2(2) = –4, which is not 4.

$\therefore$ (0, 2) is not a solution of given equation.

Section C

26. LHS $= \frac{\sqrt{2}+\sqrt{3}}{3\sqrt{2}-2\sqrt{3}} = \frac{\sqrt{2}+\sqrt{3}}{3\sqrt{2}-2\sqrt{3}} \times \frac{3\sqrt{2}+2\sqrt{3}}{3\sqrt{2}+2\sqrt{3}}$

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

$= \frac{6+2\sqrt{6}+3\sqrt{6}+6}{18-12}$

$= \frac{12+5\sqrt{6}}{6} = 2 + \frac{5\sqrt{6}}{6}$

Now, $2 - b\sqrt{6} = 2 + \frac{5}{6}\sqrt{6} \Rightarrow b = -\frac{5}{6}$

27. Here, $f(x) = x^4 + ax^3 - 3x^2 + 2x + b$

The factors are (x + 1) and (x - 1)

From factor theorem, if x = 1, -1 are the factors of f(x), then f(1) = 0 and f(-1) = 0

Substitute value of x = -1 in f(x)

$f(-1) = (-1)^4 + a(-1)^3 - 3(-1)^2 + 2(-1) + b = 0$

= 1 - a - 3 - 2 + b = 0

= - a + b - 4 = 0

$\Rightarrow$ - a + b = 4 ....(1)

Substitute value of x = 1 in f(x)

$f(1) = (1)^4 + a(1)^3 - 3(1)^2 + 2(1) + b = 0$

= 1 + a - 3 + 2 + b = 0

= a + b = 0....(2)

Solve equations 1 and 2

- a + b = 4

a + b = 0

2b = 4

b = 2

substitute value of b in eq 2

a + 2 = 0

a = - 2

the values are a = -2 and b = 2

28. Let a = 41m, b = 40m, c = 9m.

$s = \frac{a+b+c}{2} = \frac{41+40+9}{2} = \frac{90}{2}$

s = 45m

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

$= \sqrt{45(45-41)(45-40)(45-9)}$

$= \sqrt{45 \times 4 \times 5 \times 36}$

=180 m^2

=1800000 cm^2

Number of rose beds= $\frac{\text{Total area}}{\text{Area needed for one rose bed}} = \frac{1800000}{900} = 2000$

OR

Given: = 122 m, = 22 m and = 120 m

Semi-perimeter of triangle (s)= $\frac{122+22+120}{2} = \frac{264}{2}$ = 132 m Using Heron's Formula,

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

= $\sqrt{132(132-122)(132-22)(132-120)}$

$= \sqrt{132 \times 10 \times 110 \times 12}$

$= \sqrt{11 \times 12 \times 10 \times 10 \times 11 \times 12}$

= $10 \times 11 \times 12$

= 1320 m^2

$\because$ Rent for advertisement on wall for 1 year = Rs. 5000 perm^2

$\therefore$ Rent for advertisement on wall for 3 months for 1320 m^2; $\frac{5000}{12} \times 3 \times 1320$

= Rs.1650000

Hence rent paid by company = Rs. 16,50,000

29. y varies of directly as x.

$\Rightarrow\ y \propto x$,

$\therefore\ y = kx$

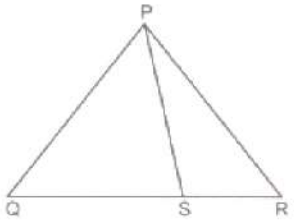
Substituting y = 12 when x = 4, we get

$12 = k \times 4 \Rightarrow k = 12 \div 4 = 3$

Hence, the required equation is y = 3x.

The value of y when x = 5 is $y = 3 \times 5 = 15$.

30. Given: A Point S on side QR of $\triangle$PQR.



To prove: PQ + QR + RP > 2PS

Proof: In ΔPQS, we have

PQ + QS > PS…(1)

[$\because$ Sum of the length of any two sides of a triangle must be greater than the third side]

Now, in $\triangle$PSR, we have

RS + RP > PS…(2)

[$\because$ Sum of the length of any two sides of triangle must be greater than the third side]

Adding (1) and (2), we get

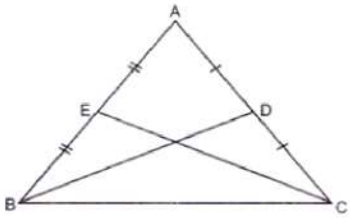
PQ + QS + RS + RP > 2PS

$\Rightarrow$ PQ + QR + RP > 2PS

Hence, proved.

OR

Given: ΔABC with AB = AC



And AD = CD, AE = BE.

To prove: BD = CE

Proof: In ΔABC we have

AB = AC [Given]

$\Rightarrow \frac{1}{2}AB = \frac{1}{2}AC$

$\Rightarrow$ AE = AD

[$\because$ D is the mid-point of AC and E is the mid-point of AB]

Now, in ΔABD and ΔACE, we have

AB = AC [Given]

$\angle A = \angle A$ (Common angle]

AE = AD [Proved above]

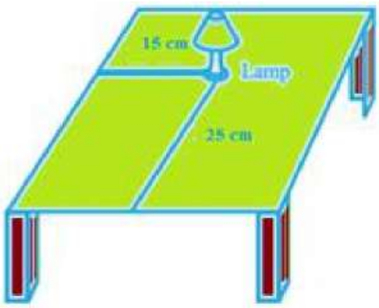
SO, by SAS criterion of congruence, we have

$\Delta ABD \cong \Delta ACE$

$\Rightarrow$ BD = CE [CPCT]

Hence, proved.

31. Let us consider the given below figure of a study stable, on which a study lamp is placed.



Let us consider the lamp on the table as a point and the table as a plane. From the figure, we can conclude that the table is rectangular in shape, when observed from the top. The table has a short edge and a long edge. Let us measure the distance of the lamp from the shorter edge and the longer edge. Let us assume that the distance of the lamp from the shorter edge is 15 cm and from the longer edge, its 25 cm. Therefore, we can conclude that the position of the lamp on the table can be described in two ways depending on the order of the axes as $(15, 25)$ or $(25, 15)$.

Section D

32. i. Given, $a = 3 + 2\sqrt{2}$

and $\frac{1}{a} = \frac{1}{3+2\sqrt{2}}$

Now, $\frac{1}{a} = \frac{1}{3+2\sqrt{2}} \times \frac{3-2\sqrt{2}}{3-2\sqrt{2}} = \frac{3-2\sqrt{2}}{3^2-(2\sqrt{2})^2} = \frac{3-2\sqrt{2}}{9-8}$

$\therefore \quad \frac{1}{a} = 3 - 2\sqrt{2}$

$a + \frac{1}{a} = 3 + 2\sqrt{2} + 3 - 2\sqrt{2} = 6$

$\left(a + \frac{1}{a}\right)^2 = a^2 + \frac{1}{a^2} + 2$

$6^2 = a^2 + \frac{1}{a^2} + 2$

$\Rightarrow \quad a^2 + \frac{1}{a^2} = 36 - 2$

$\Rightarrow \quad a^2 + \frac{1}{a^2} = 34$

ii. Now,

$\left(a + \frac{1}{a}\right)^3 = a^3 + \frac{1}{a^3} + 3 \times a^2 \times \frac{1}{a} + 3 \times a \times \frac{1}{a^2}$

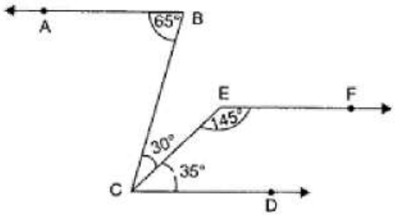
$\Rightarrow \left(a + \frac{1}{a}\right)^3 = \left(a^3 + \frac{1}{a^3}\right) + 3\left(a + \frac{1}{a}\right)$

$6^3 = a^3 + \frac{1}{a^3} + 3 \times 6$
$\Rightarrow a^3 + \frac{1}{a^3}$
$= 216 - 18 = 198$

OR

We have $0.6 = \frac{6}{10}$ ...(1)
Let $x = 0.\bar{7} = 0.777...$ ...(2)
Subtracting (1) from (2), we get
9x = 7 $\Rightarrow x = \frac{7}{9}$ or $0.\bar{7} = \frac{7}{9}$
Now, let $y = 0.4\bar{7} = 0.4777...$
$\therefore\ 10y = 4.\bar{7}$ ...(3)
And $100y = 47.\bar{7}$ ...(4)
Subtracting (3) from (4), we get
90y = 43 $\Rightarrow y = \frac{43}{90}$
$\therefore\ 0.4\bar{7} = \frac{43}{90}$
Now, $0.6 + 0.\bar{7} + 0.4\bar{7} = \frac{6}{10} + \frac{7}{9} + \frac{43}{90} = \frac{54+70+43}{90} = \frac{167}{90}$
So, $\frac{167}{90}$ is of the form $\frac{p}{q}$ and $q \neq 0$.

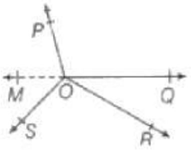
33. i. A system of axiom is called consistent if there is no statement which can be deduced from these axioms such that it contradicts any axiom. It is known that, if a transversal intersects two parallel lines, then each pair of corresponding angles are equal, which is a theorem. Therefore, Statement I is false and it is not an axiom.
ii. It is known that, if a transversal intersects two parallel lines, then each pair of alternate interior angles are equal. It is also a theorem. So, Statement parallel is true and an axiom. Therefore, in the given statement, first is false and second is an axiom. Therefore, given system of axioms is not consistent.

34.


$\angle ABC = 65^o$
$\angle BCD = \angle BCE + \angle ECD = 30^o + 35^o = 65^o$
$\therefore \angle ABC = \angle BCD$
These angles form a pair of equal alternate angles
$\therefore$ AB || CD . . . (1)
$\angle FEC + \angle ECD = 145^o + 35^o = 180^o$
These angles are consecutive interior angles formed on the same side of the transversal.
$\therefore$ CD || EF . . . . (2)
AB || EF . . . [From (1) and (2)]

OR

Let us produce a ray OQ backwards to a point M, then MOQ is a straight line.
Now, OP is a ray on the line MOQ. Then, by linear pair axiom, we have
$\angle MOP + \angle POQ = 180^o$ ......(i)



Similarly, OS is a ray on the line MOQ. Then, by linear pair axiom, we have
$\angle MOS + \angle SOQ = 180^o$ ....(ii)
Also, $\angle SOR$ and $\angle ROQ$ are adjacent angles.
$\therefore \angle SOQ = \angle SOR + \angle ROQ$ ...(iii)
On putting the value of $\angle SOQ$ from Eq.(iii) in Eq.(ii), we get
$\angle MOS + \angle SOR + \angle ROQ = 180^o$ ....(iv)

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

$\angle MOP + \angle POQ + \angle MOS + \angle SOR + \angle ROQ = 180^o + 180^o$

$\Rightarrow \angle MOP + \angle MOS + \angle POQ + \angle SOR + \angle ROQ = 360^o$ ....(iv)

But $\angle MOP + \angle MOS = \angle POS$

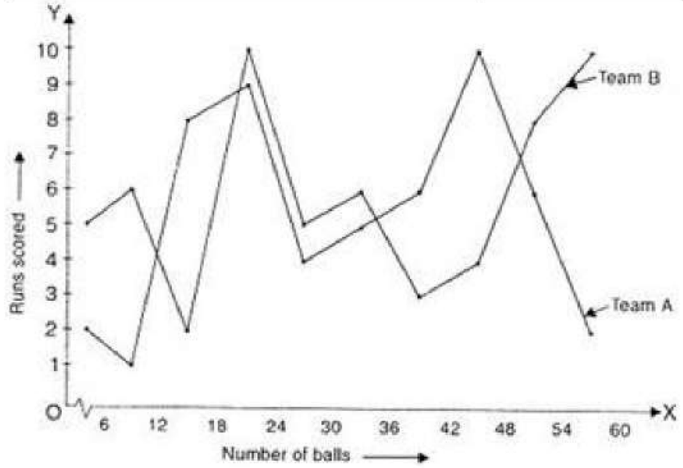
Then, from Eq.(v), we get

$\angle POS + \angle POQ + \angle SOR + \angle ROQ = 360^o$

Hence proved.

35.

Number of balls	Class-Marks	Team A	Team B
0.5-6.5	3.5	2	5
6.5-12.5	9.5	1	6
12.5-18.5	15.5	8	2
18.5-24.5	21.5	9	10
24.5-30.5	27.5	4	5
30.5-36.5	33.5	5	6
36.5-42.5	39.5	6	3
42.5-48.5	45.5	10	4
48.5-54.5	51.5	6	8
54.5-60.5	57.5	2	10



Section E

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

While dusting a maid found a button whose upper face is of red color, as shown in the figure. The diameter of each of the smaller identical circles is $\frac{1}{4}$ of the diameter of the larger circle whose radius is 16 cm.

(i) Let r and R be the radii of each smaller circle and larger circle respectively.

d and D are diameter of each smaller circle and larger circle respectively.

We have, $d = \frac{1}{4}D$

$\Rightarrow r = \frac{1}{4}R \Rightarrow r = \frac{1}{4} \times 16 \Rightarrow r = 4$ cm

Area of smaller circle = πr^2

$= \frac{22}{7} \times 4 \times 4 = 50.28$ cm^2

(ii) Let r and R be the radii of each smaller circle and larger circle respectively.

We have, $d = \frac{1}{4}D$

$\Rightarrow r = \frac{1}{4}R \Rightarrow r = \frac{1}{4} \times 16 \Rightarrow r = 4$ cm

Area of larger circle = πR^2

$= \frac{22}{7} \times 16 \times 16 = \frac{5632}{7} = 804.57$ cm^2

(iii)Let r and R be the radii of each smaller circle and larger circle respectively.

We have, $d = \frac{1}{4}D$

$\Rightarrow r = \frac{1}{4}R \Rightarrow r = \frac{1}{4} \times 16 \Rightarrow r = 4$ cm

Area of the black colour region = Area of larger circle - Area of 4 smaller circles

$= 804.57 - 4 \times 50.28 = 603.45$ cm^2

OR

Let r and R be the radii of each smaller circle and larger circle respectively.

We have, $d = \frac{1}{4}D$

$\Rightarrow r = \frac{1}{4}R \Rightarrow r = \frac{1}{4} \times 16 \Rightarrow r = 4$ cm

Area of quadrant of a smaller circle

$= \frac{1}{4} \times 50.28 = 12.57$ cm^2

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

Vinod and Basant have an adventure tourism business in Rishikesh. They have a resort in Rishikesh but now they are planning to build some tent houses too.

The newly built tent house will have all the basic amenities and it will attract the young tourists coming for adventure.

Their conical tent is 9 m high and the radius of its base is 12 m.

(i) We have,

r = Radius of the base of the conical tent = 12 m

h = Height of the conical tent = 9 m

$\therefore$ l = Slant height of the conical tent = $\sqrt{r^2 + h^2}$

$= \sqrt{12^2 + 9^2}\text{m} = \sqrt{225}\text{m} = 15$

Area of lateral surface = $\pi rl = \frac{22}{7} \times 12 \times 15$ m^2 = 565.7 m^2

$\therefore$ Total cost of canvas = ₹(565.2 × 10) = ₹5652

(ii) We have,

r = Radius of the base of the conical tent = 12 m

h = Height of the conical tent = 9 m

$\therefore$ l = Slant height of the conical tent = $\sqrt{r^2 + h^2}$

$= \sqrt{12^2 + 9^2}\text{m} = \sqrt{225}\text{m} = 15$

Area of the base of the conical tent = $\pi r^2 = \frac{22}{7} \times 12 \times 12$ m^2 = 452.16 m^2

Since each person requires 2 sq. meters of floor area.

$\therefore$ Max. no. of persons who will have enough space on the ground = $\frac{452.16}{2} = 226$

OR

We have,

r = Radius of the base of the conical tent = 12 m

h = Height of the conical tent = 9 m.

$\therefore$ l = Slant height of the conical tent = $\sqrt{r^2 + h^2}$

$= \sqrt{12^2 + 9^2}\text{m} = \sqrt{225}\text{m} = 15$

Let new height is H and radius = 12 m

Each person requires 20 m^3 of space to breathe

Thus volume of air required for 100 persons = 20 × 100 = 2000 m^3

$2000 = \frac{1}{3}\pi \times r^2h$

$2000 = \frac{1056h}{7}$

h = 13.25 m

Thus new height would be 13.25 m.

(iii) We have,

r = Radius of the base of the conical tent = 12 m

h = Height of the conical tent = 9 m.

$\therefore$ l = Slant height of the conical tent = $\sqrt{r^2 + h^2}$

$= \sqrt{12^2 + 9^2}\text{m} = \sqrt{225}\text{m} = 15$

Volume of the conical tent = $\frac{1}{3}$ × Area of the base × Height

$\Rightarrow$ Volume of the conical tent = $\frac{1}{3}$ × 452.16 × 9 m^3

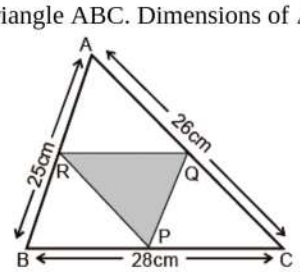
We have, Air space required person = 15 m^3

$\therefore$ No. of persons who will have enough air space to breathe in = $\frac{1356.48}{15}$ = 90

Hence, 90 persons can be accommodated.

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

There is a Diwali celebration in the DPS school Janakpuri New Delhi. Girls are asked to prepare Rangoli in a triangular shape. They made a rangoli in the shape of triangle ABC. Dimensions of $\triangle$ABC are 26 cm, 28 cm, 25 cm.



(i) We know that line joining mid points of two sides of triangle is half and parallel to third side.

Hence RQ is parallel to BC and half of BC.

RQ = $\frac{28}{2}$ = 14 cm

Length of RQ = 14 cm

(ii) By mid-point theorem we know that line joining mid points of two sides of triangle is half and parallel to third side.

$PQ = \frac{AB}{2} = \frac{25}{2}$ = 12.5 cm

$QR = \frac{BC}{2} = \frac{28}{2}$ = 14 cm

$RP = \frac{AC}{2} = \frac{26}{2}$ = 13 cm

Length of garland = PQ + QR + RP = 12.5 + 14 + 13 = 39.5 cm

Length of garland = 39.5 cm..

OR

As R and Q are mid-points of sides AB and AC of the triangle ABC. Similarly, P and Q are mid points of sides BC and AC by mid-point theorem, RQ || BC and PQ || AB. Therefore BRQP is parallelogram

(iii) As R and P are mid-points of sides AB and BC of the triangle ABC, by mid point theorem, RP || AC Similarly, RQ || BC and PQ || AB. Therefore ARPQ, BRQP and RQCP are all parallelograms. Now RQ is a diagonal of the parallelogram ARPQ, therefore, $\triangle$ARQ ≅ $\triangle$PQR Similarly $\triangle$CPQ ≅ $\triangle$RQP and $\triangle$BPR ≅ $\triangle$QRP So, all the four triangles are congruent.

Therefore Area of $\triangle$ARQ = Area of $\triangle$CPQ = Area of $\triangle$BPR = Area of $\triangle$PQR

Area $\triangle$ABC = Area of $\triangle$ARQ + Area of $\triangle$CPQ + Area of $\triangle$BPR + Area of $\triangle$PQR

Area of $\triangle$ ABC = 4 Area of $\triangle$PQR

$\triangle$PQR = $\frac{1}{4}$ar(ABC)