Class IX Session 2024-25
Subject - Mathematics
Sample Question Paper - 10

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. $(125)^{-1/3} = ?$ **[1]**

a) $-\frac{1}{5}$ b) -5

c) $\frac{1}{5}$ d) 5

2. If the line represented by the equation 3x + ky = 9 passes through the points (2, 3), then the value of k is **[1]**

a) 2 b) 1

c) 3 d) 4

3. In which quadrant does the point (-7, -4) lie? **[1]**

a) IV b) I

c) II d) III

4. A histogram is a pictorial representation of the grouped data in which class intervals and frequency are respectively taken along **[1]**

a) horizontal axis only b) horizontal axis and vertical axis

c) vertical axis and horizontal axis d) vertical axis only

5. The equation x - 2 = 0 on number line is represented by **[1]**

a) infinitely many lines b) two lines

c) a point d) a line

6. The basic facts which are taken for granted, without proof, are called **[1]**

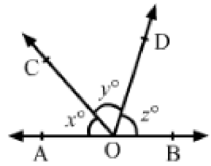
a) theorems

b) axioms

c) propositions

d) lemmas

7. In the adjoining figure, AOB is a straight line. If x : y : z = 4 : 5 : 6, then y = ? **[1]**



a) 72°

b) 48°

c) 60°

d) 80°

8. In Triangle ABC which is right angled at B. Given that AB = 9cm, AC = 15cm and D, E are the mid-points of the sides AB and AC respectively. Find the length of BC? **[1]**

a) 13cm

b) 13.5cm

c) 12cm

d) 15cm

9. $(x^2 - 4x - 21) = ?$ **[1]**

a) (x - 7) (x + 3)

b) (x - 7) (x - 3)

c) (x + 7) (x + 3)

d) (x + 7) (x - 3)

10. Any solution of the linear equation 2x + 0y + 9 = 0 in two variables is of the form **[1]**

a) $\left(-\frac{9}{2}, m\right)$

b) (-9 , 0)

c) $\left(0, -\frac{9}{2}\right)$

d) $\left(n, -\frac{9}{2}\right)$

11. ABCD is a parallelogram in which diagonal AC bisects ∠BAD. If ∠BAC = 35^o, then ∠ABC = **[1]**

a) 70^o

b) 120^o

c) 110^o

d) 90^o

12. If bisector of $\angle A$ and $\angle B$ of a quadrilateral ABCD intersect each other at p , $\angle B$ and $\angle C$ at Q , $\angle C$ and $\angle D$ at R and, $\angle D$ and $\angle A$ at S then PQRS is a **[1]**

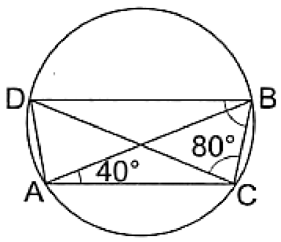
a) Rectangle

b) Parallelogram

c) Rhombus

d) Quadrilateral whose opposite angles are supplementary

13. In the given figure, AB and CD are two intersecting chords of a circle. If ∠CAB = 40° and ∠BCD = 80°, then ∠CBD = ? **[1]**



a) 60°

b) 50°

c) 70°

d) 80°

14. The simplest rationalising factor of $\sqrt[3]{500}$, is **[1]**

a) $\sqrt{3}$

b) $\sqrt[3]{2}$

c) $2\sqrt{3}$

d) $\sqrt[3]{5}$

15. 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

16. Line sgements AB and CD intersect at O such that AC||DB. If ∠CAB = 45° and ∠CDB = 55°, then ∠BOD = **[1]**

a) 135°

b) 80°

c) 100°

d) 90°

17. To draw a histogram to represent the following frequency distribution : **[1]**

Class interval	5-10	10-15	15-25	25-45	45-75
Frequency	6	12	10	8	15

The adjusted frequency for the class 25-45 is

a) 6

b) 5

c) 2

d) 3

18. The number of spherical bullets each 5 dm in diameter which can be cast from a rectangular block of lead 11 m long, 10 m broad and 5 high is **[1]**

a) 8400.

b) 5600.

c) 6300.

d) 4200.

19. **Assertion (A):** The side of an equilateral triangle is 6 cm then the height of the triangle is 9 cm. **[1]**

Reason (R): The height of an equilateral triangle is $\frac{\sqrt{3}}{2}$a.

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 (1, 1) is the solution of x + y = 2. **[1]**

Reason (R): Every point which satisfy the linear equation is a solution of the equation.

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.

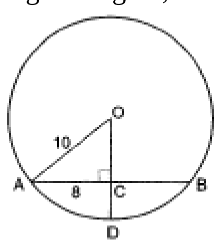
c) A is true but R is false.

d) A is false but R is true.

Section B

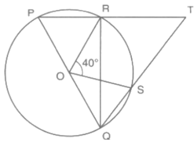
21. The perimeter of an isosceles triangle is 42 cm and its base is $1\frac{1}{2}$ times each of the equal sides. Find the height of the triangle. (Given, $\sqrt{7}$ = 2.64.) **[2]**

22. In given figure, if OA = 10, AB = 16 and OD ⊥ to AB. Find the value of the CD. **[2]**



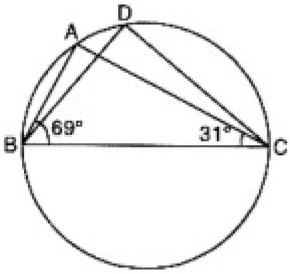
23. The surface areas of two spheres are in the ratio of 4 : 25. Find the ratio of their volumes. **[2]**

24. In a given figure, O is the centre of a circle and PQ is a diameter. If ∠ROS = 40°, find ∠RTS. **[2]**



OR

In given figure, ∠ABC = 69°, ∠ACB = 31°, find ∠BDC.



25. A three-wheeler scooter charges ₹ 15 for first kilometer and ₹ 8 each for every subsequent kilometer. For a distance of x km, an amount of y is paid. Write the linear equation representing the above information. **[2]**

OR

The cost of a notebook is twice the cost of a pen. Write a linear equation in two variables to represent this statement. (Take the cost of a notebook to be ₹ x and that of a pen to be ₹ y).

Section C

26. Find the values of a and b in each of $\frac{5+2\sqrt{3}}{7+4\sqrt{3}} = a - b\sqrt{3}$ **[3]**

27. If x + y + z = 0, show that $x^3 + y^3 + z^3 = 3xyz$. **[3]**

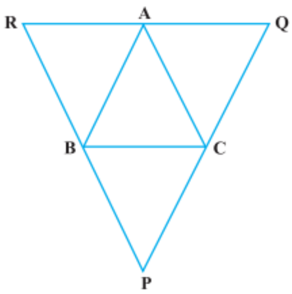
28. One side of an equilateral triangle is 8 cm. Find its area by using Heron's Formula. Find its altitude also. **[3]**

OR

The triangular side walls of a flyover have been used for advertisements. The sides of the walls are 13 m, 14 m and 15 m. The advertisements yield an earning of Rs2000 per m^2 a year. A company hired one of its walls for 6 months. How much rent did it pay?

29. Write linear equation 3x + 2y =18 in the form of ax + by + c = 0. Also write the values of a, b and c. Are (4, 3) and (1, 2) solution of this equation? **[3]**

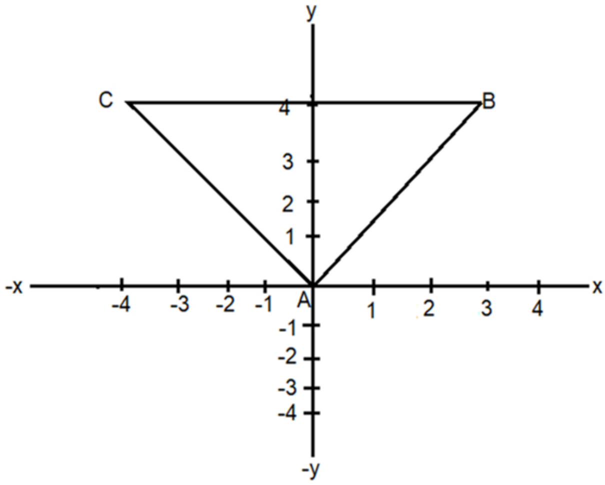
30. Through A, B and C, lines RQ, PR and QP have been drawn, respectively parallel to sides BC, CA and AB of a △ABC as shown in Fig., Show that $BC = \frac{1}{2}QR$ **[3]**



OR

Prove that the line segment joining the mid-points of two sides of a triangle is parallel to the third side.

31. In fig find the vertices' co-ordinates of △ABC **[3]**



Section D

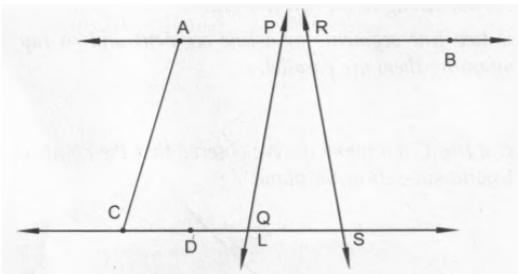
32. If x is a positive real number and exponents are rational numbers, simplify **[5]**

$\left(\frac{x^b}{x^c}\right)^{b+c-a} \cdot \left(\frac{x^c}{x^a}\right)^{c+a-b} \cdot \left(\frac{x^a}{x^b}\right)^{a+b-c}$.

OR

If x = 2 - $\sqrt{3}$, find the value of $\left(x - \frac{1}{x}\right)^3$.

33. In Fig, name the following: **[5]**



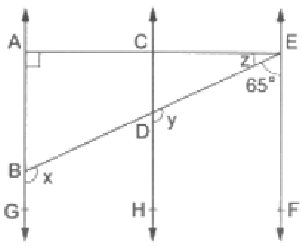
i. Five line segments

ii. Five rays

iii. Four collinear points

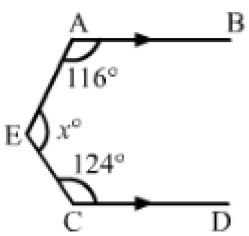
iv. Two pairs of non-intersecting line segments

34. In the given figure, AB || CD || EF, $\angle DBG = x, \angle EDH = y$, $\angle AEB = z$, $\angle EAB = 90^\circ$ and $\angle BEF = 65^\circ$. Find the values of x, y and z. **[5]**



OR

In each of the figures given below, AB $\parallel$ CD. Find the value of x$^\circ$ in each other case.

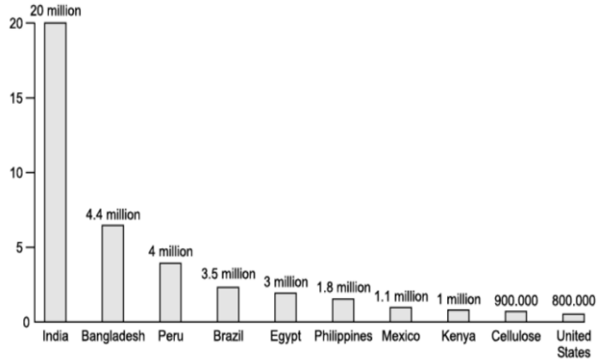


35. Using factor theorem, factorize the polynomial: $x^3 - 6x^2 + 3x + 10$ **[5]**

Section E

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

Child labour refers to any work or activity that deprives children of their childhood. It is a violation of children's rights. This can them mentally or physically. It also exposes them to hazardous situations or stops them from going to school. Naman got data on the number of child labors (in million) in different country that is given below.



i. What is the difference between highest no child labor and the minimum no of child labor? (1)

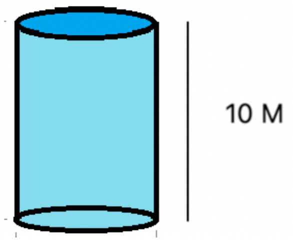
ii. What is the percentage of no. of child labor in Peru over the no. of child labor in India? (1)

iii. What is the total no. of child labor in the countries having child labor more than 2 million? (2)

OR

How many countries are having child labor more than Mexico? (2)

37. A construction company purchased a big cylindrical vessel to keep some liquid on it. Before using this vessel, the company decided to paint it properly. It costed ₹3300 to paint the inner curved surface of this 10 m deep cylindrical vessel at the rate of ₹ 30 per m^2. **[4]**



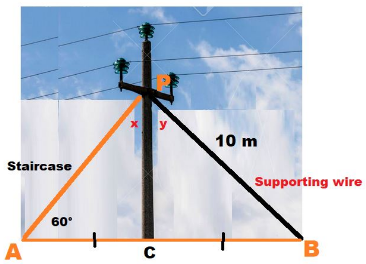
i. Find the inner curved surface area of the vessel,

ii. Find the inner radius of the base and capacity of the vessel.

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

As shown In the village of Surya there was a big pole PC. This pole was tied with a strong wire of 10 m length. Once there was a big spark on this pole, thus wires got damaged very badly. Any small fault was usually repaired with the help of a rope which normal board electricians were carrying on bicycles.

This time electricians need a staircase of 10 m so that it can reach at point P on the pole and this should make 60° with line AC.



i. Show that ΔAPC and ΔBPC are congruent. (1)

ii. Find the value of $\angle$x. (1)

iii. What is the value of ∠PBC? (2)

OR

Find the value of ∠y. (2)

Solution

Section A

1.

(c) $\frac{1}{5}$

Explanation: $(125)^{-1/3}$

$=(5^3)^{-1/3}$

$= 5^{-1}$

$\frac{1}{5}$

2.

(b) 1

Explanation: If the line represented by the equation 3x + ky = 9 passes through the points (2, 3) then (2, 3) will satisy the equation 3x + ky = 9

3 (2) + 3k = 9

⇒ 6 + 3k = 9

⇒ 3k = 9 - 6

⇒ 3k = 3

⇒ k = 1

3.

(d) III

Explanation: Recall that (+, +) lies in I quadrant, (-, +) lies in II quadrant, (-, -) lies in III quadrant, (+, -) lies in IV quadrant. Since, both the coordinates of given point are negative, it lies in Quadrant III.

4.

(b) horizontal axis and vertical axis

Explanation: In a histogram the class limits are marked on the horizontal axis and the frequency is marked on the vertical axis. Thus, a rectangle is constructed on each class interval.

5.

(c) a point

Explanation: x – 2 = 0

x = 2 is a point on the number line

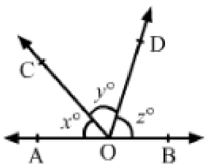
6.

(b) axioms

Explanation: An axiom is a proposition regarded as self-evidently true without proof

7.

(c) 60°

Explanation: 

Let

$\angle AOC = x^\circ = (4a)^\circ$, $\angle COD = y^\circ = (5a)^\circ$ and $\angle BOD = z^\circ = (6a)^\circ$

Then, we have

$\angle AOC + \angle COD + \angle BOD = 180^\circ$ [Since AOB is a straight line]

⇒ 4a + 5a + 6a= 180°

⇒ 15a = 180°

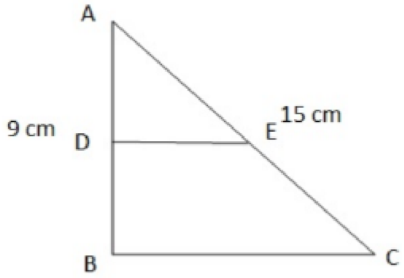
⇒ a = 12°

$\therefore y = 5 \times a = 5 \times 12^\circ = 60^\circ$

8.

(c) 12cm

Explanation:



Applying pythagoras theorem in $\triangle ABC$

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

$15^2 = 9^2 + BC^2$

$225 = 81 + BC^2$

$225 - 81 = BC^2$

$BC^2 = 144$

BC = 12 cm

9. **(a)** (x - 7) (x + 3)

Explanation: $(x^2 - 4x - 21) = x^2 - 7x + 3x - 21$

= x(x - 7) + 3 (x - 7)

= (x - 7) (x + 3)

10. **(a)** $\left(-\frac{9}{2}, m\right)$

Explanation: 2x + 9 = 0

$\Rightarrow x = \frac{-9}{2}$ and y = m, where m is any real number

Hence, $\left(-\frac{9}{2}, m\right)$ is the solution of the given equation.

11.

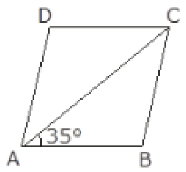
(c) 110^o

Explanation:

Given,

ABCD is a parallelogram

Diagonal AC bisects $\angle BAD$



$\angle BAC = 35^o$

$\because \angle A + \angle B = 180^o$ ...(i) [angle sum property of quadrilateral]

$\angle A = 2\angle BAC = 2 \times 35^o = 70^o$

Putting value of $\angle A$ in equation (i)

$70^o + \angle B = 180^o$

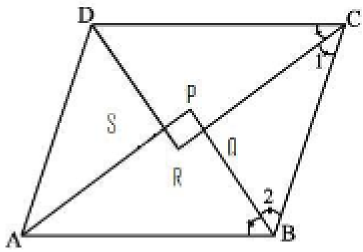
$\angle B = 180^o - 70^o = 110^o$

$\angle ABC = 110^o$

12. **(a)** Rectangle

Explanation:

Let's assume our quadrilateral ABCD as a parallelogram :



we know

$\angle DCB + \angle ABC = 180°$ (Co-interior angles of parallelogram are supplementary)

$\Rightarrow \frac{1}{2}\angle DCB + \frac{1}{2}\angle ABC = 90°$ (Both sides divide by 2)

$\Rightarrow \angle 1 + \angle 2 = 90°$... (1)

In, ΔCQB we know

$\Rightarrow \angle 1 + \angle 2 + \angle CQB = 180°$ ... (2)

From eq(1) and eq(2), We get

$\Rightarrow \angle CQB = 180° - 90°$

$\Rightarrow \angle CQB = 90°$

$\Rightarrow \angle PQR = 90°$ (because $\angle CQB = \angle PQR$, vertically opposite angles)

Similarly, it can be shown

$\angle QPS = \angle PSR = \angle SRQ = 90°$

So, quadrilateral PQRS is a rectangle.

13. **(a)** 60°

Explanation: We have:

$\angle CDB = \angle CAB = 40°$ (Angles in the same segment of a circle)

In $\triangle CBD$, we have:

$\angle CDB + \angle BCD + \angle CBD = 180°$ (Angle sum property of a triangle)

$\Rightarrow 40° + 80° + \angle CBD = 180°$

$\Rightarrow \angle CBD = (180° - 120°) = 60°$

$\Rightarrow \angle CBD = 60°$

14.

(b) $\sqrt[3]{2}$

Explanation: $\sqrt[3]{500}$

$= \sqrt[3]{5 \times 2 \times 5 \times 2 \times 5}$

$= \sqrt[3]{5 \times 5 \times 5 \times 2 \times 2}$

$=5\sqrt[3]{2 \times 2}$

$=5\sqrt[3]{4}$

The simplest rationalising factor of $\sqrt[3]{500}$, is $\sqrt[3]{2}$

15. **(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

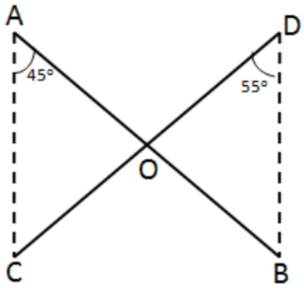
-7 = -7

Hence (0, -7) is a solution.

16.

(b) 80°

Explanation:



AC||BD

And, AB is transverse to these parallel lines

So ∠CAB = ∠ABD (Alternate angles)

⇒ ∠ABD = 45°

Now In △BOD

∠BOD + ∠ODB + ∠DBA = 180°

∠DBA = ∠ABD = 45°, ∠ODB = 55°

So ∠BOD = 180° - 45° - 55°

= 80°

17.

(c) 2

Explanation: Adjusted frequency = $\left(\frac{\text{frequency of the class}}{\text{width of the class}}\right) \times 5$

Therefore, Adjusted frequency of 25 - 45 = $\frac{8}{20} \times 5 = 2$

18. **(a)** 8400.

Explanation: Here, radius of spherical bullets = 2.5 dm or 0.25m(1 dm = 0.1 m)

Let the number of bullets be n

Now, volume of n number of bullets = volume of rectangular block

$n\times \frac{4}{3}\pi r^3 = l\times b\times h$

$n\times\frac{4}{3}\times\frac{22}{7}\times 0.25\times0.25\times0.25=11\times10\times5$

$n = \frac{11\times10\times5\times21}{88\times0.25\times0.25\times0.25}$

n = 8400

19.

(d) A is false but R is true.

Explanation: The height of the triangle,

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

$9 = \frac{\sqrt{3}}{2}a$

$a = \frac{9\times2}{\sqrt{3}} = \frac{18}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

$= \frac{18\sqrt{3}}{3} = 6\sqrt{3}$ cm

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

Explanation: Putting (1, 1) in the given equation, we have

L.H.S = 1 + 1 = 2 = R.H.S

L.H.S = R.H.S

Hence (1, 1) satisfy the x + y = 2. So it is the solution of x + y = 2.

Section B

21. Let the equal sides of the isosceles triangle be *a* cm each.

$\therefore$ Base of the triangle, $b = \frac{3}{2}a$ cm

Perimeter of triangle = 42 cm

$\Rightarrow$ a + a + $\frac{3}{2}$a = 42

$\Rightarrow$ $\frac{7}{2}$a = 42 $\Rightarrow$ a = 12 cm

and $b = \frac{3}{2}(12)\text{cm}$ = 18 cm

Area of triangle = 71.42 cm^2

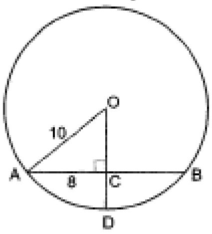
$\Rightarrow$ $\frac{1}{2}\times$ Base $\times$ Height = 71.42

$\Rightarrow$ Height $= \frac{71.42\times 2}{18}$

= 7.94 cm

22. Given : In given figure OA=10cm and Ab=16 cm

To find : Length of CD



Solution : As OD $\perp$AB

$\Rightarrow$ AC = CB

($\perp$ from the centre to the chord bisects the chord)

$\therefore$AC = $\frac{AB}{2}$ = 8

In right $\triangle$OCA,

$OA^2 = AC^2 + OC^2$

$(10)^2 = 8^2 + OC^2$

OC^2 = 100 - 64

OC^2 = 36

$\therefore$OC = $\sqrt{36}$

OC = 6 cm

CD = OD - OC = 10 - 6 = 4 cm.

23. Surface areas of two spheres $= \frac{4}{25}$

$\Rightarrow \frac{4R^2}{4r^2} = \frac{4}{25}$

$\Rightarrow \frac{R^2}{r^2} = \frac{4}{25}$

$\Rightarrow \frac{R}{r} = \frac{2}{5}$

Ratio of their volumes $= \frac{\frac{4}{3}\pi R^3}{\frac{4}{3}\pi r^3}$

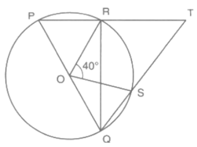
$= \left(\frac{R}{r}\right)^3$

$= \left(\frac{2}{5}\right)^3$

$= \frac{8}{125}$

Hence, the ratio of their volumes is 8:125

24. It is given that O is the center and $\angle$ROS = 40^{o}



We have $\angle$RQS = $\frac{1}{2}\angle$ROS = 20^{o}

In right angled triangle RQT we have

$\angle$RQT + $\angle$QTR + $\angle$TRQ = 180^{o}

$\Rightarrow$ 20^{o} + $\angle$QTR + 90^{o} = 180^{o}

=> $\angle QTR = 180^o - 20^o - 90^o$

$\Rightarrow \angle QTR = 70^o$

$\angle QTR = \angle RTS = 70^o$ [Same angles]

Hence, $\angle RTS = 70^o$

OR

From the given figure, in $\triangle ABC$, we can write

$\angle ABC + \angle ACB + \angle BAC = 180^o$ (by angle sum property)

$69^o + 31^o + \angle BAC = 180^o$

$\Rightarrow \angle BAC = 180° - 100° = 80°$

$\angle BDC = \angle BAC$ (Angles in the same segment)

$\therefore \angle BDC = 80°$

25. Given, a three-wheeler scooter charges Rs. 15 for first kilometre and Rs. 8 each for every subsequent kilometre. For a distance of *x* km, an amount of Rs. *y* is paid.

$= 15 \times 1 + (x - 1) \times 8 = y$

$= 8x - y + 7 = 0$

OR

Let the cost of a notebook be ₹ x.

Let the cost of a pen be ₹ y.

We need to write a linear equation in two variables to represent the statement, "Cost of a notebook is twice the cost of a pen".

Therefore, we can conclude that the required statement will be **x = 2y.**

Section C

26. LHS $= \frac{5+2\sqrt{3}}{7+4\sqrt{3}} = \frac{5+2\sqrt{3}}{7+4\sqrt{3}} \times \frac{7-4\sqrt{3}}{7-4\sqrt{3}}$

$= \frac{(5+2\sqrt{3})(7-4\sqrt{3})}{(7)^2-(4\sqrt{3})^2}$

$= \frac{35-20\sqrt{3}+14\sqrt{3}-24}{49-48}$

$= \frac{11-6\sqrt{3}}{1} = 11 - 6\sqrt{3}$

Now, $11 - 6\sqrt{3} = a - b\sqrt{3}$

$\Rightarrow$ a = 11 & b = 6

27. We know that

$x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)$

(Using Identity $a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$)

$= (0)(x^2 + y^2 + z^2 - xy - yz - zx)$ ($\because x + y + z = 0$)

$= 0$

$\Rightarrow x^3 + y^3 + z^3 = 3xyz$.

28. a = 8 cm, b = 8 cm, c = 8 cm.

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

$\therefore \frac{8+8+8}{2} \mathrm{m} = 12 \mathrm{~cm}$

$\therefore$ Area of the equilateral triangle

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

$= \sqrt{12(12-8)(12-8)(12-8)}$

$= \sqrt{12(4)(4)(4)}$

$= \sqrt{(4)(3)(4)(4)(4)}$

$= 16\sqrt{3}$ cm^2

Area = $\frac{1}{2}$ × Base × Altitude

$= 16\sqrt{3} = \frac{1}{2} \times 8 \times$ Altitude

$= 16\sqrt{3} = 4$ Altitude

Altitude $= \frac{16\sqrt{3}}{4} = 4\sqrt{3}$ cm.

OR

The sides of triangular side walls of flyover which have been used for advertisements are 13 m, 14 m, 15 m.

$s = \frac{13+14+15}{2} = \frac{42}{2} = 21m$

$= \sqrt{21(21-13)(21-14)(21-15)}$
$= \sqrt{21 \times 8 \times 7 \times 6}$
$= \sqrt{7 \times 3 \times 2 \times 2 \times 2 \times 7 \times 3 \times 2}$
$= 7 \times 3 \times 2 \times 2 = 84m^2$

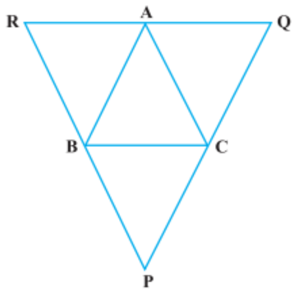
It is given that the advertisement yield an earning of Rs. 2,000 per m^2 a year.

$\therefore$ Rent for 1 m^2 for 1 year = Rs. 2000

So, rent for 1 m^2 for 6 months or $\frac{1}{2} year = Rs(\frac{1}{2} \times 2000)$ = Rs. 1,000.

$\therefore$ Rent for 84 m^2 for 6 months = Rs. (1000 × 84) = Rs. 84,000.

29. We have the equation as 3x + 2y = 18
In standard form
3x + 2y - 18 = 0
Or 3x + 2y + (-18) =0
But standard linear equation is
ax + by + c = 0
On comparison we get, a = 3, b = 2, c = -18
If (4, 3) lie on the line, i.e., solution of the equation LHS = RHS
$\therefore$ 3(4) + 2(3) = 18
12 + 6 = 18
18 = 18
As LHS = RHS, Hence (4, 3) is the solution of given equation.
Again for (1,2)
3x + 2y = 18
$\therefore$ 3(1)+2(2)=18
3 + 4 = 18
7 = 18
LHS $\neq$ RHS
Hence (1, 2) is not the solution of given equation.
Therefore (4,3) is the point where the equation of the line 3x + 2y = 18 passes through where as the line for the equation 3x + 2y =18 does not pass through the point (1,2).

30. 

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

OR

Given ΔABC in which E and F are mid points of side AB and AC respectively.

To prove: EF||BC

Construction: Produce EF to D such that EF = FD. Join CD

Proof: $In\ \Delta AEF\ and\ \Delta CDF$

AF=FC $[\because F\ is\ mid-po\text{int}\ of\ AC]$

$\angle 1 = \angle 2$ [vertically opposite angles]

EF=FD [By construction]

$\therefore \Delta AEF \cong \Delta CDF\ [By\ SAS]$

And $\therefore AE = CD\ \ [By\ CPCT]$

AE= BE [$\because E$ is the mid-point]

And $\therefore BE = cd$

$AB \parallel CD\ [\therefore \angle BAC = \angle ACD]$

$\therefore BCDE\ is\ a\ paralle\log ram$

$EF \parallel BC\ Henceproved$

31. (A) (0, 0) (B) (3, 4) (c) (-4, 4)

Section D

32. Given.

$$\left(\frac{x^b}{x^c}\right)^{b+c-a} \cdot \left(\frac{x^c}{x^a}\right)^{c+a-b} \cdot \left(\frac{x^a}{x^b}\right)^{a+b-c}$$

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

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

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

$$= x^{b^2-ab-c^2+ac+c^2-bc-a^2+ab+a^2-ac-b^2+bc}$$

= x^0

= 1

OR

Here $x = 2 - \sqrt{3}$

$\therefore\ \frac{1}{x} = \frac{1}{2-\sqrt{3}} \times \frac{2+\sqrt{3}}{2+\sqrt{3}} = \frac{2+\sqrt{3}}{2^2-\sqrt{3}^2} = \frac{2+\sqrt{3}}{4-3} = 2+\sqrt{3}$

$\Rightarrow\ x - \frac{1}{x}$

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

$= 2 - \sqrt{3} - 2 - \sqrt{3}$

$= -2\sqrt{3}$

Hence, $\left(x - \frac{1}{x}\right)^3 = (-2\sqrt{3})^3 = -24\sqrt{3}$

33. i. Five line segments are: $\overline{PQ}, \overline{PN}, \overline{RS}, \overline{ND}, \overline{TL}$

ii. Five rays are: $\underset{QC}{\longrightarrow}, \underset{PM}{\longrightarrow}, \underset{RB}{\longrightarrow}, \underset{DF}{\longrightarrow}, \underset{LH}{\longrightarrow}$

iii. Four Collinear points are: A, P, R, B

iv. Two pairs of non-intersecting line segments are: PN, RS and PQ, TL

34. EF $\parallel$ CD and ED is the transversal.

$\therefore\quad \angle FED + \angle EDH = 180^\circ$ [co-interior angles]

$\Rightarrow$ 65° + y = 180°

$\Rightarrow$ y = (180° - 65°) = 115°.

Now CH $\parallel$ AG and DB is the transversal

$\therefore$ x = y = 115° [corresponding angles]

Now, ABG is a straight line.

$\therefore \angle ABE + \angle EBG = 180^\circ$ [sum of linear pair of angles is 180°]

$\Rightarrow \angle ABE + x = 180^\circ$

$\Rightarrow \angle ABE + 115^\circ = 180^\circ$

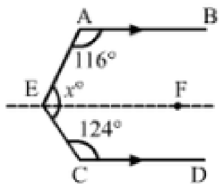
$\Rightarrow \angle ABE = (180^\circ - 115^\circ) = 65^\circ$

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

From $\triangle$EAB, we get

$\angle EAB + \angle ABE + \angle BEA = 180^\circ$
⇒ 90° + 65° + z = 180°
⇒ z = (180° - 155°) = 25°
∴ x = 115°, y = 115° and z = 25°

OR



Draw EF ∥ AB ∥ CD
Then, $\angle AEF + \angle CEF = x^\circ$
Now, EF ∥ AB and AE is the transversal
$\therefore \angle AEF + \angle BAE = 180^\circ$ [Consecutive Interior Angles]
$\Rightarrow \angle AEF + 116 = 180$
$\Rightarrow \angle AEF = 64^\circ$
Again, EF ∥ CD and CE is the transversal.
$\angle CEF + \angle ECD = 180^\circ$ [Consecutive Interior Angles]
$\Rightarrow \angle CEF + 124 = 180$
$\Rightarrow \angle CEF = 56^\circ$
Therefore,
$x^\circ = \angle AEF + \angle CEF$
x° = (64 + 56)°
x° = 120°

35. Let, f(x) = $x^3 - 6x^2 + 3x + 10$
The constant term in f(x) is 10
The factors of 10 are ± 1, ± 2, ± 5, ± 10
Let, x + 1 = 0
⇒ x = -1
Substitute the value of x in f(x)
f(-1) = $(-1)^3 - 6(-1)^2 + 3(-1) + 10$
= -1 – 6 – 3 + 10
= 0
Similarly, (x – 2) and (x – 5) are other factors of f(x)
Since, f(x) is a polynomial having a degree 3, it cannot have more than three linear factors.
∴ f(x) = k(x + 1)(x – 2)(x – 5)
Substitute x = 0 on both sides
⇒ $x^3 - 6x^2 + 3x + 10$ = k(x + 1)(x – 2)(x – 5)
⇒ 0 – 0 + 0 + 10 = k(1)(-2)(-5)
⇒ 10 = k(10)
⇒ k = 1
Substitute k = 1 in f(x) = k(x + 1)(x – 2)(x – 5)
f(x) = (1)(x + 1)(x – 2)(x – 5)
so, $x^3 - 6x^2 + 3x + 10$ = (x + 1)(x – 2)(x – 5)
This is the required factorisation of f(x)

Section E

36. i. The highest no child labor are in India and the lowest no child labor are in United states
No of child labor in India = 20,000,000
No of child labor in United states = 8,00,000
The difference = 20,000,000 - 8,00,000
= 19,200,000

ii. No. of child labor in Peru = 4,000,000

No. of child labor in India = 20,00,000

The percentage = $\frac{4000000}{20000000} \times 100$ = 20%

iii. The countries having child labor more than 2 million are

Egypt = 3 Million

Brazil = 3.5 million

Peru = 4 million

Bangladesh = 4.4 million

India = 20 million

Total no of these labor child = 3 + 3.5 + 4 + 4.4 + 20 = 34.9 Million.

OR

The countries having child labor more than Mexico are:

Philippines = 1.8 Million

Egypt = 3 Million

Brazil = 3.5 million

Peru = 4 million

Bangladesh = 4.4 million

India = 20 million

Thus 6 countries are having child labor more than Mexico.

37. i. cost of painting inner curved surface area of vessel

= cost of painting per $m^2 \times$ Inner curved surface of vessel

$\Rightarrow$Rs. 3300 = Rs. 30 $\times$ Inner curved surface of vessel

$\Rightarrow$ Inner curved surface of vessel = 110 m^2

ii. Let inner radius of the base =r

Depth, h = 10 m

Inner curved surface of vessel = 2πh

$\Rightarrow 110 = 2 \times \frac{22}{7} \times r \times 10$

$\Rightarrow r = \frac{110\times7}{2\times22\times10} = 1.75\text{m}$

iii. Capacity of the vessel = $\pi r^2 h$

$= \left(\frac{22}{7} \times 1.75 \times 1.75 \times 10\right) \text{m}^3$

= 96.25 m^3

38. i. In $\triangle$APC and $\triangle$BPC

AP = BP (Given)

CP = CP (common side)

$\angle$ACP = $\angle$BCP = 90^o

By RHS criteria $\triangle$APC $\cong$ $\triangle$BPC

ii. In $\triangle$ACP

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

$\Rightarrow$ x + 60^o + 90^o = 180^o (angle sum property of $\triangle$)

$\Rightarrow$ $\angle$x = 180^o − 150^o = 30^o

$\angle$x = 30^o

iii. In $\triangle$APC and $\triangle$BPC

Corresponding part of congruent triangle

$\angle$PAC = $\angle$PBC

$\Rightarrow$ $\angle$PBC = 60^o (given $\angle$PAC = 60^o)

OR

In $\triangle$APC and $\triangle$BPC

Corresponding part of congruent triangle

$\angle$X = $\angle$Y

$\Rightarrow$ $\angle$Y = 30^o (given $\angle$X = 30^o)