CBSE Class 10 Maths Question Paper Solution 2020 Set 30/4/1

QUESTION PAPER CODE 30/4/1

EXPECTED ANSWER/VALUE POINTS

SECTION A

Question numers 1 to 20 carry 1 mark each.

Question numbers 1 to 10 are multiple choice questions. Choose the correct option.

1. **The number of zeroes for a polynomial p(x) where graph of y = p(x) is given in Figure-1, is**

(A) 3 **(B) 4** **(C) 0** **(D) 5**

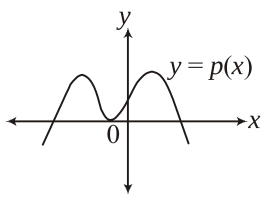

Fig. 1

Sol. (A) 3 1

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2. **The first term of an A.P. is 5 and the last term is 45. If the sum of all the terms is 400, the number of terms is**

(A) 20 **(B) 8** **(C) 10** **(D) 16**

Sol. (D) 16 1

OR

The 9th term of the A.P. – 15, –11, –7, ..., 49 is

(A) 32 **(B) 0** **(C) 17** **(D) 13**

Sol. (C) 17 1

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3. **It is being given that the points A(l, 2), B(0, 0) and C(a, b) are collinear. Which of the following relations between a and b is true?**

(A) a = 2b **(B) 2a = b** **(C) a + b = 0** **(D) a – b = 0**

Sol. (B) 2a = b 1

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4. **In Figure-2, TP and TQ are tangents drawn to the circle with centre at O. If ∠POQ = 115° then ∠PTQ is**

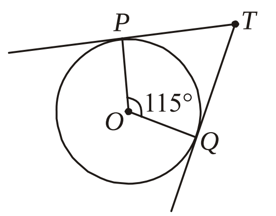

Fig. 2

(A) 115° **(B) 57.5°** **(C) 55°** **(D) 65°**

Sol. (D) 65° 1

OR

From an external point Q, the length of the tangent to a circle is 5 cm and the distance of Q from the centre is 8 cm. The radius of the circle is

(A) 39 cm **(B) 3 cm** **(C) $\sqrt{39}$ cm** **(D) 7 cm**

Sol. (C) $\sqrt{39}$ cm 1

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5. **The value of θ for which $\cos(10° + \theta) = \sin 30°$, is**

(A) 50° **(B) 40°** **(C) 80°** **(D) 20°**

Sol. (A) 50° 1

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6. **A bag contains 3 red, 5 black and 7 white balls. A ball is drawn from the bag at random. The probability that the drawn is not black, is**

(A) $\frac{1}{3}$ **(B) $\frac{9}{15}$** **(C) $\frac{5}{10}$** **(D) $\frac{2}{3}$**

Sol. (D) 2/3 1

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7. **The pair of linear equations y = 0 and y = –6 has**

(A) a unique solution **(B) no solution**

(C) infinetly many solutions **(D) only solution (0, 0)**

Sol. (B) No solution 1

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8. **The mean and median of a distribution are 14 and 15 respectively. The value of mode is**

(A) 16 **(B) 17** **(C) 18** **(D) 13**

Sol. (B) 17 1

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9. **The quadratic equation $x^2 - 4x + k = 0$ has distinct real roots if**

(A) k = 4 **(B) k > 4** **(C) k =16** **(D) k < 4**

Sol. (D) K < 4 1

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10. **Point $P\left(\frac{a}{8}, 4\right)$ is the mid-point of the line segment joining the points A(– 5, 2) and B(4, 6). The value of 'a' is**

(A) –4 **(B) 4** **(C) –8** **(D) –2**

Sol. (A) –4 1

Fill in the blanks in question numbers 11 to 15.

11. $\left(\frac{2+\sqrt{5}}{3}\right)$ **is _______ number.**

Sol. irrational 1

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12. **Let $\Delta ABC \sim \Delta DEF$ and their areas be respectively 81 cm^2 and 144 cm^2. If EF = 24 cm, then length of side BC is _______ cm.**

Sol. 18 1

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13. **The distance between the points (a, b) and (– a, – b) is _______.**

Sol. $2\sqrt{a^2+b^2}$ 1

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14. **If tan A = 1, then 2 sin A cos A = _______.**

Sol. 1 1

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15. **A spherical metal ball of radius 8 cm is melted to make 8 smaller identical balls. The radius of each new ball is _______ cm.**

Sol. 4 1

Answer the following question numbers 16 to 20.

16. **Given that HCF (135, 225) = 45, find the LCM (135, 225).**

Sol. $LCM = \frac{135 \times 225}{45}$ $\frac{1}{2}$

$= 675$ $\frac{1}{2}$

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17. **In Figure-3, a tightly stretched rope of length 20 m is tied from the top of a vertical pole to the ground. Find the height of the pole if the angle made by the rope with the ground is 30°.**

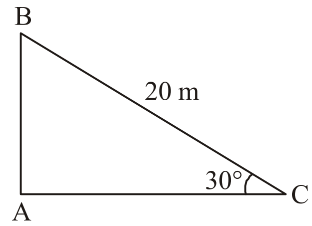

Fig. 3

Sol. $\sin 30° = \frac{AB}{20}$ $\frac{1}{2}$

$AB = 10$ m $\frac{1}{2}$

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18. Two dice are thrown simultaneously. What is the probability that the sum of the two numbers appearing on the top is 13?

Sol. P(E) = 0 1

19. After how many decimal places will the decimal representation of the rational number $\frac{229}{2^2 \times 5^7}$ terminate?

Sol. After 7 decimal places 1

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20. In Figure-4, AB and CD are common tangents to circle which touch each other at D. If AB = 8 cm, then find the length of CD.

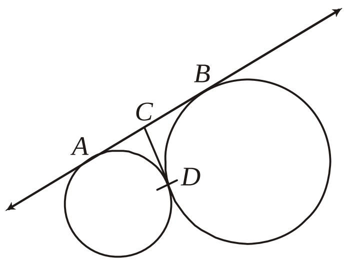

Fig. 4

Sol. AC = CD = BC $\frac{1}{2}$

CD = 4 cm $\frac{1}{2}$

SECTION B

Question numbers 21 to 26 carry 2 marks each.

21. Solve for x:

$\mathbf{6x^2 + 11x + 3 = 0}$

Sol. $6x^2 + 11x + 3 = 0$

$6x^2 + 9x + 2x + 3 = 0$ 1

$(2x + 3)(3x + 1) = 0$ $\frac{1}{2}$

$x = -3/2,\ x = -1/3$ $\frac{1}{2}$

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22. The perimeters of two similar triangles are 30 cm and 20 cm respectively. If one side of the first triangle is 9 cm long, find the length of the corresponding side of the second triangle.

Sol. Let the side of other triangle be x cm

$\because$ Ratio of perimeters of two similar triangles is equal to ratio of their corresponding sides $\frac{1}{2}$

$\therefore \quad \frac{9}{x} = \frac{30}{20}$ 1

$x = 6$ cm $\frac{1}{2}$

OR

In Figure-5, ΔPQR is right-angled at P. M is a point on QR such that PM is perpendicular to QR. Show that $PQ^2 = QM \times QR$.

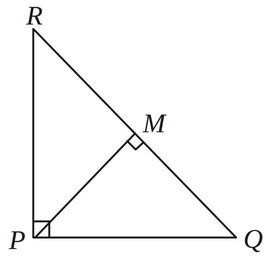

Fig. 5

Sol. $\Delta PQM \sim \Delta RQP$ [By AA similarity] 1

$\therefore \quad \frac{PQ}{RQ} = \frac{QM}{PQ}$

$\Rightarrow \quad PQ^2 = QM \times QR$ 1

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23. Evaluate:

$$\left(\frac{\sin 47^\circ}{\cos 43^\circ}\right)^2 + \left(\frac{\cos 30^\circ}{\cot 30^\circ}\right)^2 - (\sin 60^\circ)^2$$

Sol. $\left[\frac{\cos(90^\circ - 47^\circ)}{\cos 43^\circ}\right]^2 + \left(\frac{\sqrt{3}/2}{\sqrt{3}}\right)^2 - \left(\frac{\sqrt{3}}{2}\right)^2$ 1

$= 1 + \frac{1}{4} - \frac{3}{4} = \frac{1}{2}$ 1

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24. Find the mode of the following distribution:

Classes:	10 – 20	20 – 40	40 – 60	60 – 80	80 – 100
Frequency:	10	8	12	16	4

Sol. Modal class = 60 – 80 $\frac{1}{2}$

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h = 60 + \left(\frac{16-12}{32-12-4}\right) \times 20 \quad 1$$

$$= 65 \quad \frac{1}{2}$$

OR

From the following distribution, find the median:

Classes:	500 – 600	600 – 700	700 – 800	800 –900	900 – 1000
Frequency:	36	32	32	20	30

Sol. Median class: 700 – 800 $\frac{1}{2}$

$$\text{Median} = l + \frac{\left(\frac{N}{2} - cf\right)}{f} \times h$$

$$= 700 + \frac{75-68}{32} \times 100 \quad 1$$

$$= 721.88 \quad \frac{1}{2}$$

25. In Figure-6, a tent is in the shape of a cylinder surmounted by a conical top. The cylindrical part is 2.1 m high and conical part has slant height 2.8 m. Both the parts have same radius 2 m. Find the area of the canvas used to make the tent. (Use $\pi = \frac{22}{7}$)

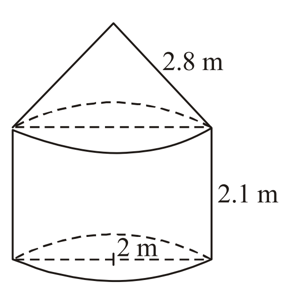

Fig. 6

Sol. Area of canvas = $\pi r(2h + l)$

$$= \frac{22}{7} \times 2\,(2 \times 2.1 + 2.8)$$ 1

$$= 44 \text{ m}^2$$ 1

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26. Tree Plantation Drive

A group Housing Society has 600 members, who have their houses in the campus and decided to hold a Tree Plantation Drive on the occasion of New Year. Each household was given he choice of planting a sampling of its choice. The number of different types of sampings planted were:

(i) Neem – 125

(ii) Peepal – 165

(iii) Creepers – 50

(iv) Fruit plants – 150

(v) Flowering plants – 110

On the opening ceremony, one of the plants is selected randomly for a prize. After reading the above passage, answer the following questions.

What is the probability that the selected plant is

(i) A fruit plant or a flowering plant?

(ii) Either a Neem plant or a Peepal plant?

Sol. Total outcomes = 600

(i) P(Fruit plant or a flowering plant) = $\frac{260}{600}$ or $\frac{13}{30}$ 1

(ii) P(either neem plant or a peepal plant) = $\frac{290}{600}$ or $\frac{29}{60}$ 1

SECTION C

Question numbers 27 to 34 carry 3 marks each.

27. Prove that $\sqrt{5}$ is an irrational number.

Sol. Let $\sqrt{5}$ be a rational number

$$\sqrt{5} = \frac{a}{b} \quad b \neq 0 \quad \text{HCF } (a, b) = 1$$ $\frac{1}{2}$

$\Rightarrow \; 5 = \dfrac{a^2}{b^2}, \; a^2 = 5b^2$

5 divides a 1

Put a = 5c (for some integer c)

$\Rightarrow \; 25c^2 = 5b^2 \Rightarrow b^2 = 5c^2$

then we get, 5 divides b $\frac{1}{2}$

Contradiction arises as HCF (a, b) = 1

$\therefore$ Our assumption is wrong

$\therefore$ $\sqrt{5}$ is irrational number 1

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28. The sum of the First 30 terms of an A.P. is 1920. If the fourth term is 18, find its 11th term.

Sol. $\dfrac{30}{2}[2a + 29d] = 1920$

$\Rightarrow \; 2a + 29d = 128$ ...(i) 1

Also, $a_4 = 18 \Rightarrow a + 3d = 18$ ...(ii) $\frac{1}{2}$

From equation (i) & (ii)

$\boxed{a = 6}$ $\boxed{d = 4}$ 1

$\therefore \; a_{11} = a + 10d = 46$ $\frac{1}{2}$

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29. Find the co-ordinates of the points of trisection of the line segment joining the points (3, – 1) and (6,8).

Sol.

Case I: If C and D trisect AB

then C divides AB in the ratio 1 : 2 $\frac{1}{2}$

Co-ordinates of C: $x = \dfrac{1 \times 6 + 2 \times 3}{3} = 4$ $\frac{1}{2}$

and $y = \dfrac{1 \times 8 + 2(-1)}{3} = 2$ $\frac{1}{2}$

$\therefore$ Co-ordinates of C(4, 2)

Case II: Coordinates of D if D divides AB in the ratio 2 : 1 $\frac{1}{2}$

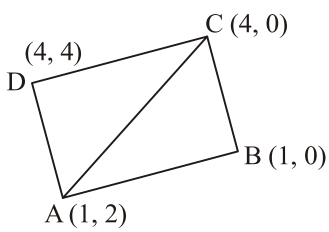
Co-ordinates of D: $x' = \dfrac{2\times 6 + 1\times 3}{3} = 5$ $\frac{1}{2}$

$y' = \dfrac{2\times 8 + 1\times(-1)}{3} = 5$ $\frac{1}{2}$

Coordinates of D = (5, 5)

OR

Find the area of a quadrilateral ABCD having vertices at A(l, 2), B(l, 0), C(4, 0) and D(4, 4).



ar (ΔABC) $= \dfrac{1}{2}[1(0-0)+1(0-2)+4(2-0)]$

$= 3$ sq. units $1\frac{1}{2}$

ar (ΔACD) $= \dfrac{1}{2}[1(0-4)+4(4-2)+4(2-0)]$

$= 6$ sq. units 1

$\therefore$ Area of quadrialteral = 3 + 6 = 9 sq. units $\frac{1}{2}$

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30. In Figure-7, XY and MN are two parallel tangents to a circle with centre O and another tangent AB with point of contact C intersecting XY at A and MN at B. Prove that $\angle$AOB = 90°.

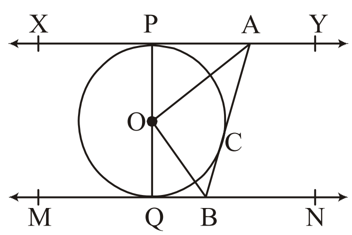
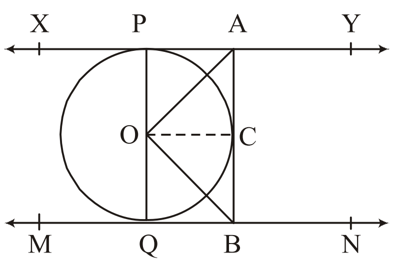


Fig. 7

Sol.



Join OC (In given figure)

$\Delta APO \cong \Delta ACO$ [By RHS congruence] 1

$\therefore \angle OAP = \angle OAC = x$ (let) $\frac{1}{2}$

Similarily, $\Delta OQB \cong \Delta OCB$

$\therefore$ $\angle OBC = \angle OBQ = y$ (let)

$\because$ $XY \parallel MN$

$\therefore$ $\angle PAB + \angle ABQ = 180°$ 1

$\Rightarrow$ $x + y = 90°$

$\therefore$ $\angle AOB = 180° - (x + y) = 90°$

$\therefore$ $\boxed{\angle AOB = 90°}$ $\frac{1}{2}$

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31. Solve the pair of equations:

$$\frac{2}{x} + \frac{3}{y} = 11, \quad \frac{5}{x} - \frac{4}{y} = -7$$

Hence, find the value of 5x – 3y.

Sol. $\frac{2}{x} + \frac{3}{y} = 11$ ...(i)

$\frac{5}{x} - \frac{4}{y} = -7$ ...(ii)

On solving equation (i) & (ii)

$x = 1$ 1+1

& $y = 1/3$

$\therefore$ $5x - 3y = 4$ 1

OR

Taxi charges in a city consist of fixed charges and the remainings charges depend upon the distance travelled. For a journey of 10 km, the charge paid is ₹ 75 and for a journey of 15 km, the charge paid is ₹ 110. Find the fixed charge and charges per km. Hence, find the charge of covering a distance of 35 km.

Let fixed charge be ₹ x and charges per km be ₹ y $\frac{1}{2}$

$x + 10y = 75$ ...(i)

$x + 15y = 110$ ...(ii) 1

Solve equation (i) & (ii)

$x = 5$

& $y = 7$ $\frac{1}{2}+\frac{1}{2}$

$\therefore$ Total charge for 35 km = x + 35y = ₹ 250 $\frac{1}{2}$

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32. Prove that:

$$\frac{\sin\theta - \cos\theta + 1}{\cos\theta + \sin\theta - 1} = \frac{1}{\sec\theta - \tan\theta}$$

Sol. L.H.S $= \dfrac{\sin\theta - \cos\theta + 1}{\cos\theta + \sin\theta - 1}$

Dividing N^r and D^r by $\cos\theta$

$$= \frac{\tan\theta - 1 + \sec\theta}{1 + \tan\theta - \sec\theta}$$ 1

$$= \frac{\tan\theta + \sec\theta - 1}{(\sec^2\theta - \tan^2\theta) + \tan\theta - \sec\theta}$$ 1

$$= \frac{\tan\theta + \sec\theta - 1}{(\sec\theta - \tan\theta)(\sec\theta + \tan\theta - 1)}$$

$$= \frac{1}{\sec\theta - \tan\theta} = \text{R.H.S}$$ 1

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33. In Figure-8, find the area of the shaded region where a circular arc of radius 7 cm has been drawn with vertex O of an equilateral traiangle OAB of side 14 cm as centre. (Use $\pi = \frac{22}{7}$ and $\sqrt{3} = 1.73$)

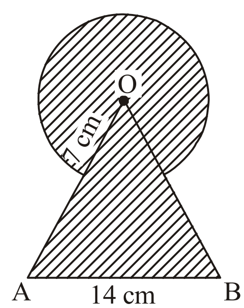

Fig. 8

Sol. Area of shaded ragion $= \dfrac{\pi r^2\theta}{360°} + \dfrac{\sqrt{3}}{4}a^2$ 1

$$= \frac{\pi \times 7^2 \times 300°}{360°} + \frac{\sqrt{3}}{4} \times 14^2$$ 1

$= 213.1 \text{ cm}^2$ 1

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34. Construct a triangle with sides 5 cm, 6 cm and 7 cm. Now construct another triangle whose sides are $\frac{2}{3}$ times the corresponding sides of the first triangle.

Sol. Correct construction of given triangle 1

Correct constriction of similar triangle with scale 2/3. 2

OR

Draw a pair of tangents to a circle of radius 3 cm which are inclined to each other at an angle of 60°.

Sol. Correct construction of circle with radius 3 cm. 1

Correct constrcution of two tangents. 2

SECTION D

Question numbers 35 to 40 carry 4 marks each.

35. In a flight of 600 km, the speed of the aircraft was slowed down due to bad weather. The average speed of the trip was decreased by 200 km/hr and thus the time of flight increased by 30 minutes. Find the average speed of the aircraft originally.

Sol. Let average speed of aircraft be x km/h

$$\frac{600}{x-200}-\frac{600}{x}=\frac{1}{2}$$ 2

$x^2 - 200x - 240000 = 0$ 1

$(x - 600)(x + 400) = 0$

$x = 600$ km/h 1

$\therefore$ Original speed = 600 km/h

OR

₹ 9,000 were divided equally among a certain number of persons. Had there been 20 more persons, each would have got ₹ 160 less. Find the original number of persons.

Let original number of persons be x

$$\frac{9000}{x}-\frac{9000}{x+20}=160$$ 2

$x^2 + 20x - 1125 = 0$ 1

$(x + 45)(x - 25) = 0$

$x = 25$

$\therefore$ Number of persons = 25 1

36. Draw a 'more than' cumulative frequency curve for the following distribution. Also, find the median from the graph.

Weight (in kg):	40 – 44	44 – 48	48 – 52	52 – 56	56 – 60	60 – 64	64 – 68
Number of Students:	7	12	33	47	20	11	5

Sol. Points to be plotted for more than ogive are

(40, 135), (44, 128), (48, 116), (52, 83), (56, 36), (60, 16), (64, 5) 2

For drawing correct ogive $1\frac{1}{2}$

For correct median = 53.3 (Approx.) $\frac{1}{2}$

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37. If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then prove that the other two sides are divided in the same ratio.

Sol. For correct given, To prove, Construction and figure $4\times\frac{1}{2}=2$

For correct proof 2

OR

In a right-angled triangle, prove that the square of the hypotenuse is equal to the sum of the squares of the other two sides.

Sol. For correct given, To prove, construction & figure $4\times\frac{1}{2}=2$

For correct proof 2

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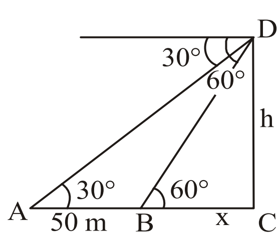
38. A straight highway leads to the foot of a tower. A man standing at the top of the tower observes a car at an angle of depression of 30°, which is approaching the foot of the tower with a uniform speed. After covering a distance of 50 m, the angle of depression of the car becomes 60°. Find the height of the tower. (Use $\sqrt{3}$ = 1-73).

Sol.



Let height of tower be h m and BC = x m Correct figure 1

$$\tan 60° = \frac{h}{x}$$

$$\Rightarrow h = \sqrt{3}x \quad \text{...(i)}$$ 1

$$\tan 30° = \frac{h}{x+50}$$

$$x + 50 = \sqrt{3}\,h \quad \text{...(ii)}$$ 1

From equation (i) & (ii)

$x = 25$ m, $h = 25\sqrt{3}$ m

$= 43.25$ m 1

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39. A bucket open at the top has top and bottom radii of circular ends as 40 cm and 20 cm respectively. Find the volume of the bucket if its depth is 21 cm. Also find the area of the tin sheet required for making the bucket. (Use $\pi = \frac{22}{7}$)

Sol. Volume $= \frac{\pi h}{3}[R^2 + r^2 + Rr]$

$= \frac{22}{7} \times \frac{21}{3}[40^2 + 20^2 + 40 \times 20]$ 1

$= 61600 \text{ cm}^3$ $\frac{1}{2}$

$l = \sqrt{h^2 + (R - r)^2} = 29 \text{ cm}$ 1

Area of tin $= \pi l(R + r) + \pi r^2$

$= \pi[29 \times 60 + 400]$ 1

$= 6725.7 \text{ cm}^2$ $\frac{1}{2}$

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40. Obtain other zeroes of the polynomial

$f(x) = 2x^4 + 3x^3 - 5x^2 - 9x - 3$

if two of its zeroes are $\sqrt{3}$ and $-\sqrt{3}$

Sol. $f(x) = 2x^4 + 3x^3 - 5x^2 - 9x - 3$

$\because$ $\sqrt{3}$ and $-\sqrt{3}$ and zeroes of f(x)

$\therefore$ $(x - \sqrt{3})$ and $(x + \sqrt{3})$ are factors of f(x) $\frac{1}{2}$

$\therefore$ $x^2 - 3$ is a factor of f(x) $\frac{1}{2}$

$q(x) = \frac{2x^4 + 3x^3 - 5x^2 - 9x - 3}{x^2 - 3}$ 2

$= 2x^2 + 3x + 1$

For zeroes q(x) = 0

$\therefore \quad 2x^2 + 3x + 1 = 0$

$(x + 1)(2x + 1) = 0$ $\frac{1}{2}$

$x = -1, -1/2$

$\therefore$ Remaining zeroes are –1 & –1/2 $\frac{1}{2}$

OR

Without actually calculating the zeroes, form a quadratic polynomial whose zeroes are reciprocals of the zeroes of the polynomial $5x^2 + 2x - 3$.

Let zeroes of given quadratic polynomial be α and β

$$\left.\begin{aligned} \alpha + \beta &= \frac{-2}{5} \\ \alpha\beta &= \frac{-3}{5} \end{aligned}\right]$$ 1

Now,

$$\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\beta + \alpha}{\alpha\beta} = \frac{\frac{-2}{5}}{\frac{-3}{5}} = \frac{2}{3}$$ 1

$$\frac{1}{\alpha\beta} = \frac{-5}{3}$$ 1

Required Polynomial is

$$x^2 - \frac{2}{3}x - \frac{5}{3}$$ 1

or

$$3x^2 - 2x - 5$$