CBSE Class 10 Maths Solutions

QUESTION PAPER CODE 30/1/1
EXPECTED ANSWERS/VALUE POINTS

Q.No. 

SECTION - A 

 Marks

1. \( -\frac{9}{4} \) 
2. 1 : 3 
3. \( \frac{21}{26} \) 
4. 25° 

1\times4=4\text{ m}

SECTION - B 

5. \( \angle ABQ = \frac{1}{2} \angle AOQ = 29° \) 

1\text{ m}

\( \angle ATQ = 180° - (\angle ABQ + \angle BAT) = 180° - 119° = 61° \)

1\text{ m}

6. The given quadratic equation can be written as 

\[(4x^2 - 4a^2x + a^4) - b^4 = 0\]

\[\text{or } (2x-a^2)^2 - (b^2)^2 = 0\]

\[\therefore (2x-a^2+b^2)(2x-a^2-b^2) = 0\]

\[\Rightarrow x = \frac{a^2-b^2}{2}, \frac{a^2+b^2}{2}\]

\[\frac{1}{2}\text{ m}\]

7. In \( \triangle TPC \) and \( \triangle TQC \)

\( TP = TQ \)

\( TC = TC \)

\( \angle 1 = \angle 2 \) (TP and TQ are equally inclined to OT)

\[\therefore \triangle TPC \cong \triangle TQC\]

\[\therefore PC = QC \text{ and } \angle 3 = \angle 4 \]

\[\frac{1}{2}\text{ m}\]
But \( \angle 3 + \angle 4 = 180^\circ \Rightarrow \angle 3 = \angle 4 = 90^\circ \) 
\[ \therefore \] OT is the right bisector of PQ

8. The given A.P. is 6, 13, 20, ---, 216

Let \( n \) be the number of terms, \( d = 7, a = 6 \)
\[ \therefore 216 = 6 + (n - 1) \cdot 7 \Rightarrow n = 31 \]
\[ \therefore \text{Middle term is 16th} \]
\[ \therefore a_{16} = 6 + 15 \times 7 = 111 \]

9. ABC is right triangle
\[ \therefore AC^2 = BC^2 + AB^2 \]
\[ AB^2 = (5 - 2)^2 + (2 + 2)^2 = 25 \Rightarrow AB = 5 \]
\[ BC^2 = (2 + 2)^2 + (t + 2)^2 = 16 + (t + 2)^2 \]
\[ AC^2 = (5 + 2)^2 + (2 - t)^2 = 49 + (2 - t)^2 \]
\[ \therefore 49 + (2 - t)^2 = 41 + (t + 2)^2 \]
\[ (t + 2)^2 - (2 - t)^2 = 8 \]
\[ 4 \times 2t = 8 \Rightarrow t = 1 \]

10. Let P divide AB in the ratio of \( k : 1 \)
\[ \therefore \frac{2k + \frac{1}{2}}{k + 1} = \frac{3}{4} \Rightarrow 8k + 2 = 3k + 3 \]
\[ \Rightarrow k = \frac{1}{5} \]
\[ \therefore \text{Required ratio = 1 : 5} \]
SECTION - C

11. P is the mid-point of AB

\[ \therefore x + 1 = 4 \Rightarrow x = 3 \]

similarly \( y = 2 \) \( \Rightarrow \) B \((3, 2)\)

\[ \therefore \text{Area } \triangle ABC = \frac{1}{2} \left[ (2 - 2) + 3 (2 + 4) - 1 (-4 - 2) \right] = \frac{1}{2} \times 24 = 12 \text{ sq.u.} \]

12. The given quadratic eqn. can be written as

\[ (k + 1)x^2 - 2(k - 1)x + 1 = 0 \]

For equal roots \(4(k - 1)^2 - 4(k + 1) = 0\) or \(k^2 - 3k = 0\)

\[ \Rightarrow k = 0, 3 \]

\[ \therefore \text{Non-zero value of } k = 3 : \text{Roots are } \frac{1}{2}, \frac{1}{2} \]

13. Figure

(i) \( \frac{30}{y} = \tan 45^\circ = 1 \Rightarrow y = 30 \)

(ii) \( \frac{x}{y} = \tan 30^\circ = \frac{1}{\sqrt{3}} \Rightarrow x = \frac{y}{\sqrt{3}} = \frac{30}{\sqrt{3}} = 10\sqrt{3} \)

\[ \therefore \text{Height of building is } 10\sqrt{3} \text{ m} \]

14. Total possible outcomes = 36

(i) The possible outcomes are (2, 3), (3, 2), (1, 4), (4, 1) : Number : 4

\[ \therefore \text{Required Probability } y = \frac{4}{36} = \frac{1}{9} \]
15. Let \( a \) be the first term and \( d \) the common difference

\[
S_{12} = 6 [2a + 11d] = 12a + 66d \quad 1 \text{ m}
\]
\[
S_8 = 4 [2a + 7d] = 8a + 28d \quad \frac{1}{2} \text{ m}
\]
\[
S_4 = 2 [2a + 3d] = 4a + 6d \quad \frac{1}{2} \text{ m}
\]

\[
3 (S_8 - S_4) = 3 (4a + 22d) = 12a + 66d = S_{12} \quad 1 \text{ m}
\]

16. Let \( OA = OB = r \)

\[
\therefore \quad 40 = \frac{22}{7} \times \frac{r}{2} + \frac{22}{7} \times r + r \quad \Rightarrow \quad 280 = 40r \quad \left\{ \begin{array}{l}
\frac{22}{7} \times \frac{r}{2} + \frac{22}{7} \times r + r \\
\end{array} \right. \quad 1 \text{ m}
\]

\[
\therefore \quad \text{shaded area} = \left( \frac{1}{2} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} + \frac{1}{2} \times \frac{22}{7} \times 7 \times 7 \right) \quad \text{cm}^2 \quad 1 \text{ m}
\]

\[
= \left( \frac{77 \times 5}{4} \right) \text{ or } \frac{385}{4} \text{ cm}^2 = 96 \frac{1}{4} \text{ cm}^2 \quad 1 \text{ m}
\]

17. \( \triangle ARQ \sim \triangle ADC \) \quad \frac{1}{2} \text{ m}

\[
\therefore \quad \frac{x}{6} = \frac{4}{12} \quad \Rightarrow \quad x = 2 \quad \frac{1}{2} \text{ m}
\]

\[
QC = \sqrt{8^2 + 4^2} = 4\sqrt{5} \quad \frac{1}{2} \text{ m}
\]
Total surface area of frustum PQCB = 1 m

\[ = \pi \left[ (6 + 2) \times 4\sqrt{5} + (6)^2 + (2)^2 \right] \]

\[ = \frac{22}{7} \left[ 32 \times 2.236 + 40 \right] = \frac{22}{7} (111.552) = 22 \times 15.936 \]

\[ = 350.592 \] 1 m

18. Volume of solid wooden toy

\[ \frac{166}{6} = \frac{2}{3} \times \frac{22}{7} \times 7^2 \times 2^2 + \frac{1}{3} \times \frac{22}{7} \times 7 \times 2 \times h \]

or \[ \frac{1001}{2} = \frac{11}{2} \times \frac{7}{2} \times [7 + h] \]

\[ \Rightarrow 7 + h = \frac{1001 \times 2}{22 \times 7} = 13 \Rightarrow h = 6 \text{ cm} \]

\[ \frac{1}{2} + \frac{1}{2} \text{ m} \]

Area of hemispherical part of toy = \( \left( \frac{2}{7} \times \frac{7}{2} \times \frac{7}{2} \right) \text{ cm}^2 \)

\[ = 77 \text{ cm}^2 \]

\[ \therefore \text{ Cost of Painting } = \text{ Rs.} \left( 77 \times 10 \right) = \text{ Rs.} 770 \]

\[ \frac{1}{2} \text{ m} \]

19. Total surface area of solid cuboidal block

\[ = 2 \left( 15 \times 10 + 10 \times 5 + 15 \times 5 \right) \text{ cm}^2 = 550 \text{ cm}^2 \]

\[ \frac{1}{2} \text{ m} \]

Area of two circular bases = \(2 \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} = 77 \text{ cm}^2 \)

\[ \frac{1}{2} \text{ m} \]

Area of curved surface of cylinder = \(2\pi rh = 2 \times \frac{22}{7} \times \frac{7}{2} \times 5 = 110 \text{ cm}^2 \)

\[ \frac{1}{2} \text{ m} \]

Reqd area = \((550 + 110 - 77) \text{ cm}^2 = 583 \text{ cm}^2\)
20.

Area of Sq. ABCD = $14^2$ or $196 \text{ cm}^2$

Area of Small Sq. = $4^2$ or $16 \text{ cm}^2$

Area of 4 semi circles = \[4 \times \frac{1}{2} \times 3.14 \times (2)^2 \text{ cm}^2\]  

\[= 25.12 \text{ cm}^2\]

\[\therefore \text{ Reqd. area} = (196 - 16 - 25.12) \text{ cm}^2\]

\[= 154.88 \text{ cm}^2\]

\[\text{SECTION - D}\]

21. Let the fraction be \(\frac{x - 3}{x}\)

By the given condition, new fraction \(\frac{x - 3 + 2}{x + 2} = \frac{x - 1}{x + 2}\)

\[\therefore \frac{x - 3}{x} + \frac{x - 1}{x + 2} = \frac{29}{20}\]

\[\Rightarrow 20[(x - 3)(x + 2) + x(x - 1)] = 29(x^2 + 2x)\]

\[= 20(x^2 - x - 6 + x^2 - x) = 29x^2 + 58x\]

or \(11x^2 - 98x - 120 = 0\)

or \(11x^2 - 110x + 12x - 120 = 0\)

\((11x + 12)(x - 10) = 0\)  \(\Rightarrow x = 10\)

\[\therefore \text{ The Fraction is} \frac{7}{10}\]

22. Money required for Ramkali for admission of daughter = Rs. 2500

A.P. formed by saving

1 m
(i) \[= 100, 120, 140, \ldots \text{upto 12 terms}\]

Sum of AP (i) \[= \frac{12}{2} [2\times100 + 11\times20] = 6 [420]\]
\[= \text{Rs. 2520}\]

\[\therefore\] She can get her daughter admitted

Value: Small saving can fulfill your big desires or any else

23. \[
\frac{2}{x+1} + \frac{3}{2(x-2)} = \frac{23}{5x}
\]

or \[5x [4(x-2) + 3x + 3] = 46(x + 1)(x - 2)\]

\[5x (7x - 5) = 46(x^2 - x - 2) \Rightarrow 11x^2 - 21x - 92 = 0\]

\[\Rightarrow x = \frac{21 \pm \sqrt{441 + 4048}}{22} = \frac{21 \pm 67}{22}\]

\[= 4, \frac{-23}{11}\]

24. Correctly stated

Given, to Prove, Construction and correct figure

Correct Proof

25. \[\text{PR} = \text{PQ} \Rightarrow \angle PRQ = \angle PQR = \frac{(180 - 30)^\circ}{2} = 75^\circ\]

\[\text{SR} \parallel \text{QP and QR is a transversal} \Rightarrow \angle SRQ = 75^\circ\]

\[\therefore \angle ORQ = \angle RQO = 90^\circ - 75^\circ = 15^\circ\]
\[
\angle QOR = (180 - 2 \times 15)^\circ = 150^\circ \Rightarrow \angle QSR = 75^\circ \\
\angle RQS = 180^\circ - (\angle SRQ + \angle SQR) = 30^\circ
\]

26. Correctly drawn \(\triangle ABC\)

Correctly drawn a triangle similar to \(\triangle ABC\) of given scale factor

27. Writing the trigonometric equations

\[
\begin{align*}
(i) & \quad \frac{x}{y} = \tan 30^\circ = \frac{1}{\sqrt{3}} \Rightarrow y = \sqrt{3} x \\
(ii) & \quad \frac{x+5}{y} = \tan 60^\circ = \sqrt{3} \text{ or } \frac{x+5}{\sqrt{3}x} = \sqrt{3} \\
& \quad \Rightarrow 3x = x + 5 \\
& \quad \text{or } x = 2.5 \\
\therefore & \quad \text{Height of Tower} = 2.5 \text{ m}
\end{align*}
\]

28. (i) Numbers divisible by 2 or 3 from 1 to 20 are

\[2, 4, 6, 8, 10, 12, 14, 16, 18, 3, 9, 15, 20\] Their number is 13

\[\therefore \quad \text{Required Probability} = \frac{13}{20}\]

(ii) Prime numbers from 1 to 20 are 2, 3, 5, 7, 11, 13, 17, 19 : 8 in number

\[\therefore \quad \text{Required Probability} = \frac{8}{20} \text{ or } \frac{2}{5}\]

29. Area \(\triangle ABC\)

\[
= \frac{1}{2} \left[ -4 (-4+5) - 3 (-5-8) + 0 (8+4) \right]
\]

160
\[
\begin{align*}
\text{Area of } \Delta ACD &= \frac{1}{2} \left| -4 + 39 \right| = \frac{35}{2} \\
\text{Area of } \Delta ACD &= \frac{1}{2} \left[ -4 \left( -5 - 6 \right) + 0 \left( 6 - 8 \right) + 5 \left( 8 + 5 \right) \right] \\
\text{Area of } \Delta ACD &= \frac{109}{2} \\
\therefore \text{Area of Qurd. ABCD} &= \frac{35}{2} + \frac{109}{2} = 72 \text{ sq.u.} \\
\end{align*}
\]

30. Volume of earth taken out after digging the well

\[
= \left( \frac{22}{7} \times 2 \times 2 \times 14 \right) \text{ cu.m} = 176 \text{ cu.m} \quad \text{(i)}
\]

Let \(x\) be the width of embankment formed by using (i)

\[
\text{Volume of embankment} = \frac{22}{7} \left[ (2 + x)^2 - 2^2 \right] \times \frac{40}{100} = 176
\]

\[
\Rightarrow x^2 + 4x - 140 = 0 \quad \Rightarrow (x + 14)(x - 10) = 0
\]

\[
\Rightarrow x = 10
\]

\[
\therefore \text{Width of embankment} = 10 \text{ m}
\]

31. Let \(x\) m be the internal radius of the pipe

\[
\text{Radius of base of tank} = 40 \text{ cm} = \frac{2}{5} \text{ m}
\]

\[
\text{Level of water raised in the tank} = 3.15 \text{ or } \frac{315}{100}
\]

\[
2.52 \text{ km/hour} \quad \Rightarrow \text{1.26 km in half hour} = 1260 \text{ m}
\]

161
\[
\pi x^2 \cdot 1260 = \pi \cdot \frac{2}{5} \cdot \frac{2}{5} \times \frac{315}{100}
\]

\[
\Rightarrow x^2 = \frac{4}{25} \cdot \frac{315}{100} \times \frac{1}{1260} = \frac{1}{2500}
\]

\[
\Rightarrow x = \frac{1}{50} \text{ m} = 2 \text{ cm}
\]

\[
\therefore \text{ Internal diameter of pipe} = 4 \text{ cm}
\]

\[
\frac{1}{2} \text{ m}
\]