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Secondary School Examination

March - 2015

Marking Scheme--- Mathematics (Delhi) 30/1/1, 30/1/2, 30/1/3

General Instructions

1. The Marking Scheme provides general guidelines to reduce subjectivity and maintain uniformity among large number of examiners involved in the marking. The answers given in the marking scheme are the best suggested answers.
2. Marking is to be done as per the instructions provided in the marking scheme. (It should not be done according to one's own interpretation or any other consideration.)Marking Scheme should be strictly adhered to and religiously followed.
3. Alternative methods are accepted. Proportional marks are to be awarded.
4. The Head-Examiners have to go through the first five answer-scripts evaluated by each evaluator to ensure that the evaluation has been done as per instructions given in the marking scheme. The remaining answer scripts meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.
5. If a question is attempted twice and the candidate has not crossed any answer, only first attempt is to be evaluated. Write 'EXTRA' with second attempt.
6. A full scale of marks 0 to 90 has to be used. Please do not hesitate to award full marks if the answer deserves it.
7. Separate Marking Scheme for all the three sets has been given.
8. The Examiners should acquaint themselves with the guidelines given in the Guidelines for Spot Evaluation before starting the actual evaluation.
9. Every Examiner should stay upto sufficiently reasonable time normally 5-6 hours every day and evaluate 20-25 answer books and should devote minimum 15-20 minutes to evaluate each answer book.
10. Every Examiner should acquaint himself/herself with the marking schemes of all the sets.

QUESTION PAPER CODE 30/1/1

EXPECTED ANSWERS/VALUE POINTS

SECTION - A

Q.No. Marks

1. $\frac{-9}{4}$ 2. 1 : 3 3. $\frac{21}{26}$ 4. 25° $1\times4=4$ m

SECTION - B

5. $\angle ABQ = \frac{1}{2}\angle AOQ = 29^{\circ}$ 1 m

$\angle ATQ = 180^{\circ} - (\angle ABQ + \angle BAT) = 180^{\circ} - 119^{\circ} = 61^{\circ}$ 1 m

6. The given quadratic equation can be written as

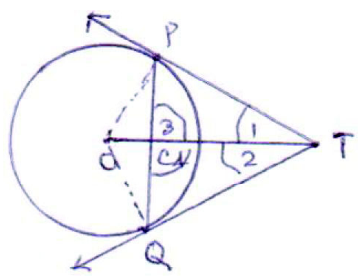
$\left(4x^2 - 4a^2x + a^2\right) - b^4 = 0$ ½ m

or $\left(2x - a^2\right)^2 - \left(b^2\right)^2 = 0$ 1 m

$\therefore \left(2x - a^2 + b^2\right)\left(2x - a^2 - b^2\right)^2 = 0$

$\Rightarrow x = \frac{a^2 - b^2}{2}, \frac{a^2 + b^2}{2}$ ½ m

7.



In $\Delta s'$ TPC and TQC

TP = TQ

TC = TC

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

$\therefore \Delta$ TPC $\cong \Delta$ TQC

$\therefore$ PC = QC and $\angle 3 = \angle 4$ ½ m

$$\left.\begin{array}{l}\text{But} \quad \angle 3 + \angle 4 = 180^\circ \;\Rightarrow\; \angle 3 = \angle 4 = 90^\circ \\ \therefore \quad \text{OT is the right bisector of PQ}\end{array}\right\}$$ ½ m

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

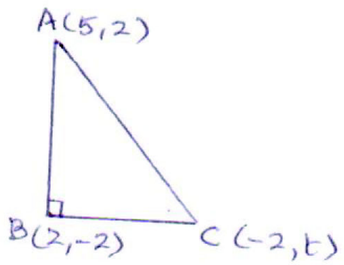
Let n be the number of terms, d = 7, a = 6 ½ m

$\therefore \quad 216 = 6 + (n-1).7 \;\Rightarrow\; n = 31$ ½ m

$\therefore$ Middle term is 16th ½ m

$\therefore \quad a_{16} = 6 + 15 \times 7 = 111$ ½ m

9.



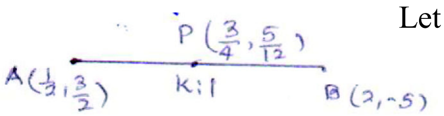
ABC is right triangle

$$\therefore \quad AC^2 = BC^2 + AB^2$$

$$\left.\begin{array}{l}AB^2 = (5-2)^2 + (2+2)^2 = 25 \;\Rightarrow\; AB = 5 \\ BC^2 = (2+2)^2 + (t+2)^2 = 16 + (t+2)^2 \\ AC^2 = (5+2)^2 + (2-t)^2 = 49 + (2-t)^2\end{array}\right\}$$ 1 m

$$\left.\begin{array}{l}\therefore \quad 49 + (2-t)^2 = 41 + (t+2)^2 \\ (t+2)^2 - (2-t)^2 = 8 \\ 4 \times 2t = 8 \;\Rightarrow\; t = 1\end{array}\right\}$$ 1 m

10.

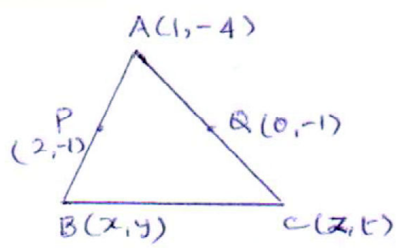


Let P divide AB in the ratio of k : 1 ½ m

$$\left.\begin{array}{l}\therefore \quad \dfrac{2K + \frac{1}{2}}{K+1} = \dfrac{3}{4} \;\Rightarrow\; 8K + 2 = 3K + 3 \\ \qquad\qquad\qquad\qquad \Rightarrow\; K = \tfrac{1}{5}\end{array}\right\}$$ 1 m

$\therefore$ Required ratio = 1 : 5 ½ m

SECTION - C

11. 

P is the mid-point of AB

$\therefore \quad x + 1 = 4 \quad \Rightarrow \quad x = 3$

similarly $y = 2 \quad \Rightarrow \quad B(3, 2)$ 1 m

similarly finding C (–1, 2) ½ m

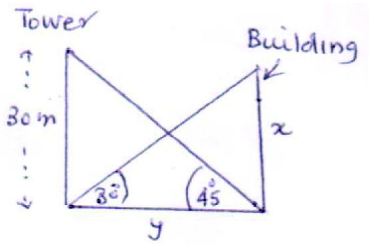
$\therefore \quad \text{Area } \Delta \text{ ABC} = \frac{1}{2}\left[1(2-2)+3(2+4)-1(-4-2)\right] = \frac{1}{2} \times 24 = 12 \text{ sq.u.}$ 1½ m

12. The given quadratic eqn. can be written as

$(k+1)x^2 - 2(k-1)x + 1 = 0$ 1 m

For qual roots $4(k-1)^2 - 4(k+1) = 0$ or $k^2 - 3k = 0$
$\Rightarrow k = 0, 3$ 1 m

$\therefore$ Non-zero value of $k = 3$: Roots are $\frac{1}{2}, \frac{1}{2}$ ½+½ m

13. 

Fiqure ½ m

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

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

$\therefore$ Height of building is $10\sqrt{3}$ m ½ m

14. Total possible out comes = 36

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

$\therefore \quad \text{Required Probability} = \frac{4}{36} = \frac{1}{9}$ ½ m

(ii) The possible outcomes are

(2, 2), (2, 4), (2, 6), (4, 2), (4, 4), (4, 6), (6, 2), (6, 4), (6, 6)

their number is 9 — 1 m

$\therefore$ Required Probability $= \frac{9}{36} = \frac{1}{4}$ — ½ m

15. Let a be the first term and d the common difference

$S_{12} = 6\,[2a + 11d] = 12a + 66d$ — 1 m

$S_8 = 4\,[2a + 7d] = 8a + 28d$ — ½ m

$S_4 = 2\,[2a + 3d] = 4a + 6d$ — ½ m

$3\,(S_8 - 3_4) = 3\,(4a + 22d) = 12a + 66d = S_{12}$ — 1 m

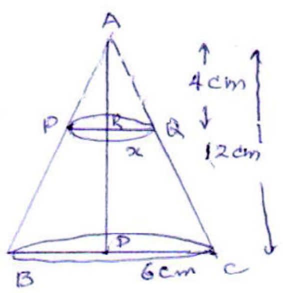
16. Let OA = OB = r

$$\left.\begin{aligned}\therefore\quad 40 = \frac{22}{7}\times\frac{r}{2} + \frac{22}{7}\times r + r \;\Rightarrow\; 280 = 40r\\ r = 7\end{aligned}\right\}$$ — 1 m

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

$$= \left(77\times\frac{5}{4}\right) \; or \; \frac{385}{4}\,\text{cm}^2 = 96\frac{1}{4}\,\text{cm}^2$$ — 1 m

17.



$\Delta\, ARQ \sim \Delta\, ADC$ — ½ m

$\therefore\quad \frac{x}{6} = \frac{4}{12} \Rightarrow x = 2$ — ½ m

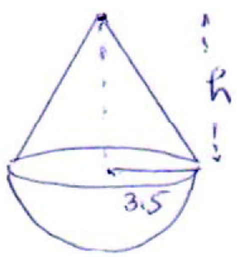
$QC = \sqrt{8^2 + 4^2} = 4\sqrt{5}$ — ½ m

Total surface area of frustum PQCB — 1 m

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

$$\left. \begin{aligned} &= \frac{22}{7} \left[32 \times 2.236 + 40\right] = \frac{22}{7} (111.552) = 22 \times 15.936 \\ &\qquad\qquad\qquad\qquad\qquad\qquad\qquad = 350.592 \end{aligned} \right\} \quad 1\text{ m}$$

18.



Volume of solid wooden toy

$$\left. \begin{aligned} &166\frac{5}{6} = \frac{2}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times \frac{7}{2} + \frac{1}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times h \\ &\text{or } \frac{1001}{6} = \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \left[7 + h\right] \end{aligned} \right\} \quad 1\text{ m}$$

$$\Rightarrow \quad 7 + h = \frac{1001 \times 7}{22 \times 7} = 13 \quad \Rightarrow \quad h = 6\text{ cm} \qquad \tfrac{1}{2}+\tfrac{1}{2}\text{ m}$$

$$\left. \begin{aligned} \text{Area of hemispherical part of toy} &= \left(2 \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}\right) \text{cm}^2 \\ &= 77\text{ cm}^2 \end{aligned} \right\} \quad \tfrac{1}{2}\text{ m}$$

$\therefore$ Cost of Paenting = Rs. (77×10) = Rs. 770 — ½ m

19. Total surfacearea of solid cuboidal block

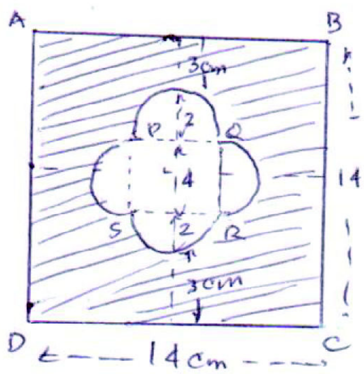
$$= 2\,(15 \times 10 + 10 \times 5 + 15 \times 5)\text{ cm}^2 = 550\text{ cm}^2 \qquad 1\text{ m}$$

Area of two circular bases $= 2 \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} = 77\text{ cm}^2$ — ½ m

Area of curved surface of cylinder $= 2\pi rh = 2 \times \frac{22}{7} \times \frac{7}{2} \times 5 = 110\text{ cm}^2$ — 1 m

Reqd - area $= (550 + 110 - 77)\text{ cm}^2 = 583\text{ cm}^2$ — ½ m

20.



Area of Sq. ABCD = 14^2 or 196 cm^2 ½ m

Area of Small Sq. = 4^2 or 16 cm^2 ½ m

Area of 4 semi circles $= \left[4.\frac{1}{2}\,3.14\,(2)^2\right] cm^2$

$= 25.12\ cm^2$ 1 m

$\therefore$ Reqd. area = (196 – 16 – 25.12) cm^2

$= 154.88\ cm^2$ 1 m

SECTION - D

21. Let the fraction be $\frac{x-3}{x}$ ½ m

By the given condition, new fraction $\frac{x-3+2}{x+2} = \frac{x-1}{x+2}$ ½ m

$$\therefore \quad \frac{x-3}{x} + \frac{x-1}{x+2} = \frac{29}{20}$$
$$\Rightarrow \quad 20\left[(x-3)(x+2) + x(x-1)\right] = 29\left(x^2+2x\right)$$
$$= \quad 20\left(x^2 - x - 6 + x^2 - x\right) = 29x^2 + 58x$$
1 m

or $11x^2 - 98x - 120 = 0$

or $11x^2 - 110x - 12x - 120 = 0$ 1 m

$(11x + 12)(x - 10) = 0 \quad \Rightarrow \quad x = 10$ 1 m

$\therefore$ The Fraction is $\frac{7}{10}$ 1 m

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

A.P. formed by saving 1 m

(i) = 100, 120, 140, --- upto 12 terms

$$\left.\begin{aligned}\text{Sum of AP (i)} &= \frac{12}{2}\left[2\times100+11\times20\right]=6\left[420\right]\\ &= \text{Rs. } 2520\end{aligned}\right\}$$ 1½ m

$\therefore$ She can get her doughter admitied ½ m

Value : Small saving can fulfill your big desires or any else 1 m

23. $\dfrac{2}{x+1}+\dfrac{3}{2(x-2)} = \dfrac{23}{5x}$

or $5x\left[4\left(x-2\right)+3x+3\right]=46\left(x+1\right)\left(x-2\right)$ 1½ m

$5x\left(7x-5\right)=46\left(x^2-x-2\right) \Rightarrow 11x^2-21x-92=0$ 1 m

$\Rightarrow \quad x=\dfrac{21\pm\sqrt{441+4048}}{22} = \dfrac{21\pm67}{22}$ 1 m

$= 4, \dfrac{-23}{11}$ ½ m

24. Correctly stated

Given, to Prove, Construction and correct figure 2 m

correct Proof 2 m

25. $PR = PQ \Rightarrow \angle PRQ = \angle PQR = \dfrac{(180-30)^\circ}{2} = 75^\circ$ 1 m

$$\left.\begin{aligned}&SR \,||\, QP \text{ and } QR \text{ is a transversal} \Rightarrow \angle SRQ = 75^\circ\\ &\therefore \angle ORQ = \angle RQO = 90^\circ - 75^\circ = 15^\circ\end{aligned}\right\}$$ 1 m

$\therefore \quad \angle QOR = (180 - 2 \times 15)^{\circ} = 150^{\circ} \Rightarrow \quad \angle QSR = \ 75^{\circ}$ 1 m

$\angle RQS = 180^{\circ} - (\angle SRQ + \angle SQR) = 30^{\circ}$ 1 m

26. Correctly drawn Δ ABC 1½ m

Correctly drawn a triangle similar to Δ ABC of given scale factor 2½ m

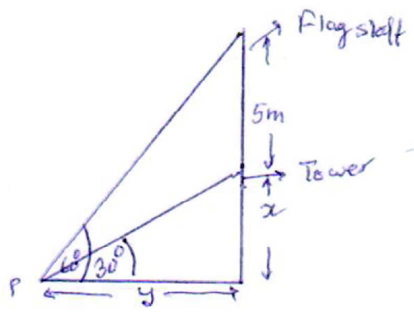
27. 

figure 1 m

Writing the trigonometric equations

(i) $\dfrac{x}{y} = \tan 30^{\circ} = \dfrac{1}{\sqrt{3}} \quad \Rightarrow \quad y = \sqrt{3}\, x$ 1 m

(ii) $\dfrac{x+5}{y} = \tan 60^{\circ} = \sqrt{3} \ \ or \ \ \dfrac{x+5}{\sqrt{3x}} = \sqrt{3}$ 1½ m

$$\left.\begin{aligned} &\Rightarrow \quad 3x = x + 5 \\ &\qquad\ \ \text{or } x = 2.5 \\ &\therefore \quad \text{Height of Tower} = 2.5 \text{ m} \end{aligned}\right\}$$ ½ m

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 Their number is 13 1 m

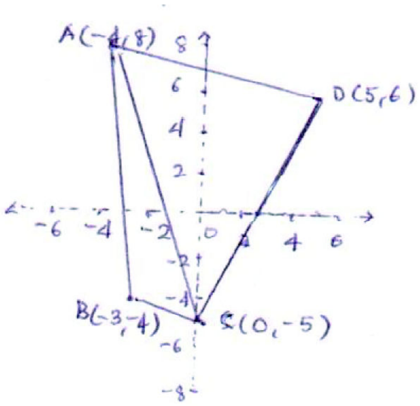
$\therefore \quad \text{Required Probability} = \dfrac{13}{20}$ 1 m

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

$\therefore \quad \text{Required Probability} = \dfrac{8}{20} \ \text{ or } \ \dfrac{2}{5}$ 1 m

29. Area Δ ABC

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



$$= \frac{1}{2}\left|-4+39\right| = \frac{35}{2}$$ 1½ m

Area of Δ ACD

$$= \frac{1}{2}\left[-4(-5-6)+0(6-8)+5(8+5)\right]$$

$$= \frac{109}{2}$$ 1½ m

$\therefore$ Area of Qurd. ABCD $= \frac{35}{2} + \frac{109}{2} = 72$ sq.u. 1 m.

30. Volume of earth taken out after digging the well

$$= \left(\frac{22}{7} \times 2 \times 2 \times 14\right) \text{cu.m} = 176 \text{ cu.m} \ldots\ldots\ldots\ldots\ldots\ldots \text{(i)}$$ 1 m

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

Volume of embankment $= \frac{22}{7}\left[(2+x)^2 - (2)^2\right] \times \frac{40}{100} = 176$ 1½ m

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

$\Rightarrow \quad x = 10$ 1½ m

$\therefore$ Width of embankment = 10 m

31. Let x m be the internal radius of the pipe

Radius of base of tank = 40 cm = $\frac{2}{5}$ m

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

2.52 km/hour $\Rightarrow$ 1.26 km in half hour = 1260 m 1 m

$\therefore$ Getting the equation

$$\pi \;\; x^2 . 1260 = \pi . \frac{2}{5} . \frac{2}{5} \times \frac{315}{100}$$ 1 m

$$\left.\begin{aligned} &\Rightarrow x^2 = \frac{4}{25} . \frac{315}{100} \times \frac{1}{1260} = \frac{1}{2500} \\ &\quad \Rightarrow x = \frac{1}{50} \text{ m} = 2 \text{ cm} \end{aligned}\right\}$$ 1½

$\therefore$ Internal diameter of pipe = 4 cm ½ m

QUESTION PAPER CODE 30/1/2

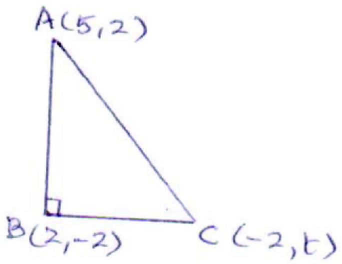
EXPECTED ANSWERS/VALUE POINTS

SECTION - A

Q.No.					Marks
1. $\frac{21}{26}$	2. 25^{o}	3. 1 : 3	4. $\frac{-9}{4}$		$1\times4 = 4$ m

SECTION - B

5.



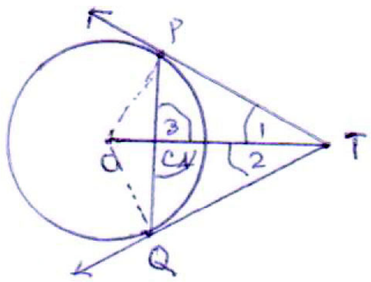
ABC is right triangle

$\therefore \quad AC^2 = BC^2 + AB^2$

$$\left.\begin{aligned} AB^2 &= (5-2)^2 + (2+2)^2 = 25 \Rightarrow AB = 5 \\ BC^2 &= (2+2)^2 + (t+2)^2 = 16 + (t+2)^2 \\ AC^2 &= (5+2)^2 + (2-t)^2 = 49 + (2-t)^2 \end{aligned}\right\} \quad 1\text{ m}$$

$$\left.\begin{aligned} \therefore \quad & 49 + (2-t)^2 = 41 + (t+2)^2 \\ & (t+2)^2 - (2-t)^2 = 8 \\ & 4 \times 2t = 8 \Rightarrow t = 1 \end{aligned}\right\} \quad 1\text{ m}$$

6.



$$\left.\begin{aligned} &\text{In } \Delta s' \text{ TPC and TQC} \\ &\quad TP = TQ \\ &\quad TC = TC \\ &\quad \angle 1 = \angle 2 \text{ (TP and TQ are equally} \\ &\qquad\qquad \text{inclined to OT)} \end{aligned}\right\} \quad 1\text{ m}$$

$\therefore \quad \Delta \text{ TPC} \cong \Delta \text{ TQC}$

$\therefore \quad PC = QC$ and $\angle 3 = \angle 4$ ½ m

$$\left.\begin{aligned} &\text{But } \quad \angle 3 + \angle 4 = 180^{o} \Rightarrow \angle 3 = \angle 4 = 90^{o} \\ &\therefore \quad \text{OT is the right bisector of PQ} \end{aligned}\right\} \quad ½\text{ m}$$

7. $\angle ABQ = \frac{1}{2} \angle AOQ = 29^{o}$ 1 m

$$\angle ATQ = 180^{o} - (\angle ABQ + \angle BAT) = 180^{o} - 119^{o} = 61^{o}$$ 1 m

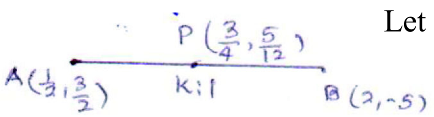
8. The given quadratic equation can be written as

$(4x^2 - 4a^2x + a^2) - b^4 = 0$ ½ m

or $(2x - a^2)^2 - (b^2)^2 = 0$ 1 m

$\therefore \; (2x - a^2 + b^2)\,(2x - a^2 - b^2)^2 = 0$

$\Rightarrow \; x = \frac{a^2 - b^2}{2}, \; \frac{a^2 + b^2}{2}$ ½ m

9. 

Let P divide AB in the ratio of k : 1 ½ m

$\therefore \; \frac{2K + \frac{1}{2}}{K + 1} = \frac{3}{4} \Rightarrow 8K + 2 = 3K + 3$

$\Rightarrow K = \frac{1}{5}$ 1 m

$\therefore$ Required ratio = 1 : 5 ½ m

10. Here a = 213, d = – 8, a_n = 37, where n is the number of terms

$\therefore \; 37 = 213 + (n-1)(-8)$

$\frac{-176}{-8} = n - 1 \Rightarrow n = 23$ 1 m

$\therefore$ Middle term = a_{12} = 213 + 11 (– 8) = 125 1 m

SECTION - C

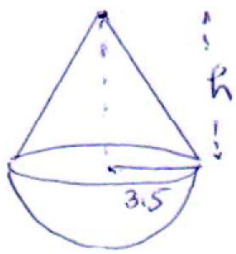
11. Let OA = OB = r

$$\therefore \quad 40 = \frac{22}{7} \times \frac{r}{2} + \frac{22}{7} \times r + r \quad \Rightarrow \quad 280 = 40r$$
$$r = 7 \qquad \text{1 m}$$

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

$$= \left(77 \times \frac{5}{4}\right) \; or \; \frac{385}{4} \text{cm}^2 = 96\frac{1}{4} \text{cm}^2 \qquad \text{1 m}$$

12.



Volume of solid wooden toy

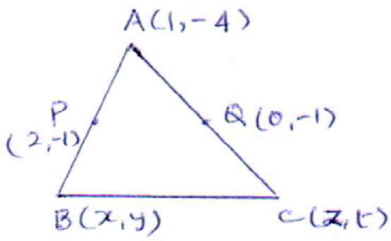
$$166\frac{5}{6} = \frac{2}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times \frac{7}{2} + \frac{1}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times h$$
$$\text{or} \quad \frac{1001}{6} = \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} [7 + h] \qquad \text{1 m}$$

$$\Rightarrow \quad 7 + h = \frac{1001 \times 7}{22 \times 7} = 13 \quad \Rightarrow \quad h = 6 \text{ cm} \qquad \text{½+½ m}$$

$$\text{Area of hemispherical part of toy} = \left(2 \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}\right) \text{cm}^2$$
$$= 77 \text{ cm}^2 \qquad \text{½ m}$$

$\therefore$ Cost of Paenting = Rs. (77 × 10) = Rs. 770 ½ m

13.



P is the mid-point of AB

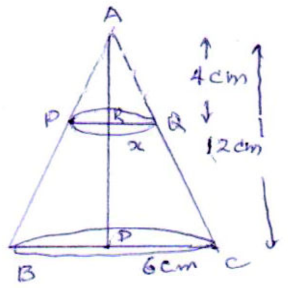
$\therefore \quad x + 1 = 4 \quad \Rightarrow \quad x = 3$

similarly $y = 2 \quad \Rightarrow \quad B(3, 2)$ 1 m

similarly finding C (–1, 2) ½ m

$\therefore$ Area Δ ABC $= \frac{1}{2}[1(2-2)+3(2+4)-1(-4-2)] = \frac{1}{2}\times 24 = 12$ sq.u. 1½ m

14.



Δ ARQ ~ Δ ADC ½ m

$\therefore \quad \frac{x}{6} = \frac{4}{12} \Rightarrow x = 2$ ½ m

QC $= \sqrt{8^2+4^2} = 4\sqrt{5}$ ½ m

Total surface area of frustum PQCB 1 m

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

$$= \frac{22}{7}[32\times 2.236+40] = \frac{22}{7}(111.552) = 22\times 15.936 = 350.592$$ 1 m

15. Total surfacearea of solid cuboidal block

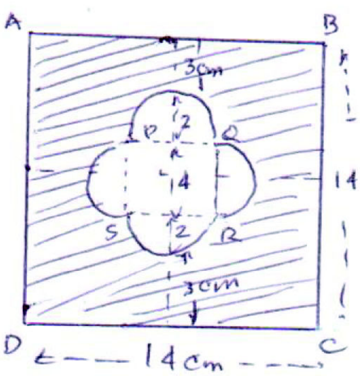
$= 2\ (15\times 10 + 10\times 5 + 15\times 5)\ cm^2 = 550\ cm^2$ 1 m

Area of two circular bases $= 2\times\frac{22}{7}\times\frac{7}{2}\times\frac{7}{2} = 77\ cm^2$ ½ m

Area of curved surface of cylinder $= 2\pi rh = 2\times\frac{22}{7}\times\frac{7}{2}\times 5 = 110\ cm^2$ 1 m

Reqd - area $= (550+110-77)\ cm^2 = 583\ cm^2$ ½ m

16.

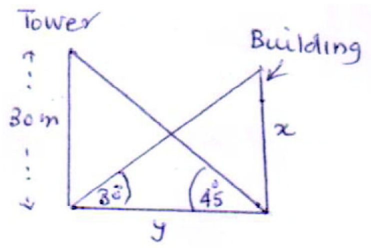


Area of Sq. ABCD $= 14^2$ or $196\ cm^2$ ½ m

Area of Small Sq. $= 4^2$ or $16\ cm^2$ ½ m

Area of 4 semi circles $= \left[4.\frac{1}{2}3.14\,(2)^2\right] cm^2 = 25.12\ cm^2$ 1 m

$\therefore$ Reqd. area $= (196 - 16 - 25.12)\ \text{cm}^2$
$= 154.88\ \text{cm}^2$ } 1 m

17. 

Fiqure ½ m

(i) $\dfrac{30}{y} = \tan 45^\circ = 1 \Rightarrow y = 30$ 1 m

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

$\therefore$ Height of building is $10\sqrt{3}$ m ½ m

18. $Sn = \dfrac{1}{2}\left(3n^2 + 7n\right) \Rightarrow S_1 = a_1 = \dfrac{1}{2}(10) = 5$

$S_2 = a_2 + a_1 = \dfrac{1}{2}(26) = 13 \Rightarrow a_2 = 8$ 1 m

$\therefore$ It is an A.P. with $a = 5$ and $d = 3$ ½ m

$\therefore$ $an = 5 + (n-1)3 = 3n + 2$ 1 m

$\therefore$ $t_{20} = 62$ ½ m

19. The total number of possible outcomes = 8 1 m

(i) P (at least two heads) = $\dfrac{4}{8} = \dfrac{1}{2}$ 1 m

(ii) P (at most two heads) = $\dfrac{7}{8}$ 1 m

20. For the given quadratic equation to have equal roots

$[6(p+1)]^2 - 4(p+1) . 3(p+9) = 0$ 1 m

or $36(p+1)^2 - 12(p+1)(p+9) = 0$
$12(p+1)[3p + 3 - p - 9] = 0$ } 1 m

As $p \neq -1, \quad 2p = 6 \quad$ or $\quad p = 3$ ½ m

Roots are 3, 3 ½ m

SECTION - D

21. $PR = PQ \quad \Rightarrow \quad \angle PRQ = \angle PQR = \frac{(180-30)^o}{2} = 75^o$ 1 m

SR || QP and QR is a transversal $\Rightarrow \quad \angle SRQ = 75^o$
$\therefore \quad \angle ORQ = \angle RQO = 90^o - 75^o = 15^o$ 1 m

$\therefore \quad \angle QOR = (180 - 2 \times 15)^o = 150^o \Rightarrow \quad \angle QSR = 75^o$ 1 m

$\angle RQS = 180^o - (\angle SRQ + \angle SQR) = 30^o$ 1 m

22.

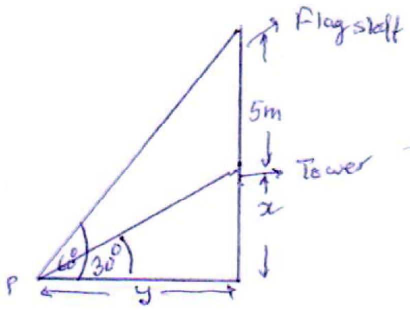


figure 1 m

Writing the trigonometric equations

(i) $\frac{x}{y} = \tan 30^o = \frac{1}{\sqrt{3}} \quad \Rightarrow \quad y = \sqrt{3}\,x$ 1 m

(ii) $\frac{x+5}{y} = \tan 60^o = \sqrt{3} \quad or \quad \frac{x+5}{\sqrt{3}x} = \sqrt{3}$ 1½ m

$\Rightarrow \quad 3x = x + 5$
$\quad$ or $x = 2.5$
$\therefore \quad$ Height of Tower $= 2.5$ m ½ m

23. Money required for Ramkate for admission of daughter = Rs. 2500

A.P. formed by saving 1 m

(i) = 100, 120, 140, --- upto 12 terms

$$\text{Sum of AP (i)} = \frac{12}{2}\left[2\times100+11\times20\right]=6\left[420\right] \\ = \text{Rs. } 2520 \quad \Bigg\} \quad 1\tfrac{1}{2}\text{ m}$$

$\therefore$ She can get her doughter admitied ½ m

Value : Small saving can fulfill your big desires or any else 1 m

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

2, 4, 6, 8, 10, 12, 14, 16, 18, 3, 9, 15 Their number is 13 1 m

$$\therefore \quad \text{Required Probability} = \frac{13}{20} \qquad 1\text{ m}$$

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

$$\therefore \quad \text{Required Probability} = \frac{8}{20} \text{ or } \frac{2}{5} \qquad 1\text{ m}$$

25. Let x m be the internal radius of the pipe

Radius of base of tank = 40 cm = $\frac{2}{5}$ m

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

2.52 km/hour $\Rightarrow$ 1.26 km in half hour = 1260 m 1 m

$\therefore$ Getting the equation

$$\pi \quad x^2 .1260 = \pi . \frac{2}{5} . \frac{2}{5} \times \frac{315}{100} \qquad 1\text{ m}$$

$$\left.\begin{aligned} &\Rightarrow x^2 = \frac{4}{25} . \frac{315}{100} \times \frac{1}{1260} = \frac{1}{2500} \\ &\Rightarrow x = \frac{1}{50}\text{ m} = 2\text{ cm} \end{aligned}\right\} \quad 1\tfrac{1}{2}$$

$\therefore$ Internal diameter of pipe = 4 cm ½ m

26. Volume of earth taken out after digging the well

$$= \left(\frac{22}{7} \times 2 \times 2 \times 14\right) \text{cu.m} \;=\; 176 \text{ cu.m} \; \ldots\ldots\ldots\ldots\ldots\; \text{(i)}$$ 1 m

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

$$\text{Volume of embankment} = \frac{22}{7}\left[(2+x)^2 - (2)^2\right] \times \frac{40}{100} = 176$$ 1½ m

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

1½ m

$$\Rightarrow \quad x = 10$$

$\therefore$ Width of embankment = 10 m

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

or $5x\,[4\,(x-2) + 3x + 3] = 46\,(x+1)(x-2)$ 1½ m

$5x\,(7x-5) = 46\,(x^2 - x - 2) \Rightarrow 11x^2 - 21x - 92 = 0$ 1 m

$$\Rightarrow \quad x = \frac{21 \pm \sqrt{441 + 4048}}{22} = \frac{21 \pm 67}{22}$$ 1 m

$$= 4, \frac{-23}{11}$$ ½ m

28. Let the bigger pipe fills the tank in x hours ½ m

$\Rightarrow$ the smaller pipe fills the tanks in (x + 10) hours

$$\therefore \quad \frac{4}{x} + \frac{9}{x+10} = \frac{1}{2}$$ 1½ m

$\Rightarrow$ 2 (13x + 40) = x^2 + 10x or $\quad x^2 - 16x - 80 = 0$

$\Rightarrow \quad (x - 20)(x + 4) = 0$ 1½ m

$\Rightarrow \quad x = 20$

the pipe with larger diameter fills the tank in 20 hours

and the pipe with smaller diameter fills the tank in 30 hour ½ m

29. Correctly state given. To prove & Construction and Correct figure 2 m

Correct proof 2 m

30. Correct

i) Construction of isoscetes triangle with base 6 cm and altitute 4 cm 1½

ii) Construction of a similar triangle to (i) with given scale factor 2½

31. i) Area of Δ PQC

$$= \frac{1}{2}\left[-5(-6+3) - 4(-3+3) + 2(-3+6)\right] = \frac{21}{2}$$ 1½ m

ii) Area of Δ PRS

$$= \frac{1}{2}\left[-5(-3-2) + 2(2+3) + 1(-3+3)\right] = \frac{35}{2}$$ 1½ m

$\therefore$ Area of Qurd. PQRS $= \frac{21}{2} + \frac{35}{2} = 28$ sq.u. 1 m.

QUESTION PAPER CODE 30/1/3

EXPECTED ANSWERS/VALUE POINTS

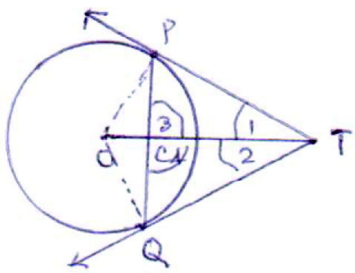
SECTION - A

Q.No. Marks

1. 25° 2. $\frac{-9}{4}$ 3. 1 : 3 4. $\frac{21}{26}$ $1 \times 4 = 4$ m

SECTION - B

5.



In $\Delta s'$ TPC and TQC

$\left.\begin{array}{l} TP = TQ \\ TC = TC \\ \angle 1 = \angle 2 \text{ (TP and TQ are equally inclined to OT)} \end{array}\right\}$ 1 m

$\therefore \quad \Delta\ TPC \cong \Delta\ TQC$

$\therefore \quad PC = QC$ and $\angle 3 = \angle 4$ ½ m

$\left.\begin{array}{l} \text{But } \angle 3 + \angle 4 = 180^{\circ} \Rightarrow \angle 3 = \angle 4 = 90^{\circ} \\ \therefore \text{ OT is the right bisector of PQ} \end{array}\right\}$ ½ m

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

Let n be the number of terms, d = 7, a = 6 ½ m

$\therefore \quad 216 = 6 + (n-1).7 \quad \Rightarrow \quad n = 31$ ½ m

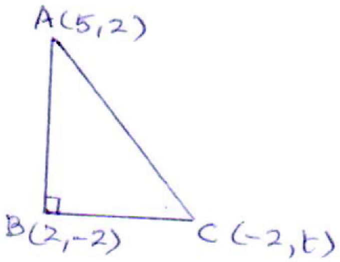
$\therefore$ Middle term is 16th ½ m

$\therefore \quad a_{16} = 6 + 15 \times 7 = 111$ ½ m

7. $\angle ABQ = \frac{1}{2} \angle AOQ = 29^{\circ}$ 1 m

$\angle ATQ = 180^{\circ} - (\angle ABQ + \angle BAT) = 180^{\circ} - 119^{\circ} = 61^{\circ}$ 1 m

8.



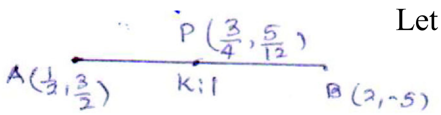
ABC is right triangle

$$\therefore \quad AC^2 = BC^2 + AB^2$$

$$\left.\begin{aligned} AB^2 &= (5-2)^2 + (2+2)^2 = 25 \Rightarrow AB = 5 \\ BC^2 &= (2+2)^2 + (t+2)^2 = 16 + (t+2)^2 \\ AC^2 &= (5+2)^2 + (2-t)^2 = 49 + (2-t)^2 \end{aligned}\right\}$$ 1 m

$$\left.\begin{aligned} \therefore \quad & 49 + (2-t)^2 = 41 + (t+2)^2 \\ & (t+2)^2 - (2-t)^2 = 8 \\ & 4 \times 2t = 8 \Rightarrow t = 1 \end{aligned}\right\}$$ 1 m

9.



Let P divide AB in the ratio of k : 1 ½ m

$$\left.\begin{aligned} \therefore \quad \frac{2K + \frac{1}{2}}{K+1} = \frac{3}{4} &\Rightarrow 8K + 2 = 3K + 3 \\ &\Rightarrow K = \tfrac{1}{5} \end{aligned}\right\}$$ 1 m

$\therefore$ Required ratio = 1 : 5 ½ m

10. The given quadratic equation can be written as

$(9x^2 - 6b^2x + b^4) - a^4 = 0$ ½ m

or $(3x - b^2)^2 - (a^2)^2 = 0$ or $(3x - b^2 + a^2)(3x - b^2 - a^2) = 0$ 1 m

$\Rightarrow \quad x = \dfrac{b^2 - a^2}{3}, \dfrac{b^2 + a^2}{3}$ ½ m

SECTION - C

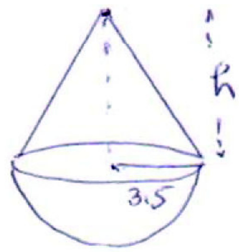
11. Let OA = OB = r

$$\left.\begin{aligned} \therefore \quad 40 = \frac{22}{7} \times \frac{r}{2} + \frac{22}{7} \times r + r &\Rightarrow 280 = 40r \\ r &= 7 \end{aligned}\right\}$$ 1 m

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

$= \left(77 \times \frac{5}{4}\right)$ *or* $\frac{385}{4}$ cm^2 = $96\frac{1}{4}$ cm^2 1 m

12.



Volume of solid wooden toy

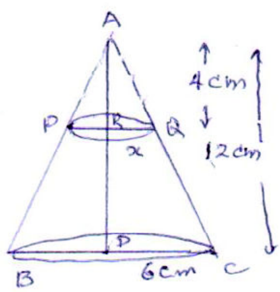
$$\left.\begin{aligned} 166\frac{5}{6} &= \frac{2}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times \frac{7}{2} + \frac{1}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times h \\ \text{or } \frac{1001}{6} &= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}[7 + h] \end{aligned}\right\}$$ 1 m

$\Rightarrow \quad 7 + h = \frac{1001 \times 7}{22 \times 7} = 13 \quad \Rightarrow \quad h = 6$ cm ½+½ m

$$\left.\begin{aligned} \text{Area of hemispherical part of toy } &= \left(2 \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}\right) \text{ cm}^2 \\ &= 77 \text{ cm}^2 \end{aligned}\right\}$$ ½ m

$\therefore$ Cost of Paenting = Rs. (77 × 10) = Rs. 770 ½ m

13.



Δ ARQ $\sim$ Δ ADC ½ m

$\therefore \quad \frac{x}{6} = \frac{4}{12} \Rightarrow x = 2$ ½ m

QC $= \sqrt{8^2 + 4^2} = 4\sqrt{5}$ ½ m

$$\left.\begin{aligned} &\text{Total surface area of frustum PQCB} \\ &= \pi \left[(6+2) \times 4\sqrt{5} + (6)^2 + (2)^2\right] \end{aligned}\right\}$$ 1 m

$$\left.\begin{aligned} = \frac{22}{7}[32 \times 2.236 + 40] = \frac{22}{7}(111.552) &= 22 \times 15.936 \\ &= 350.592 \end{aligned}\right\}$$ 1 m

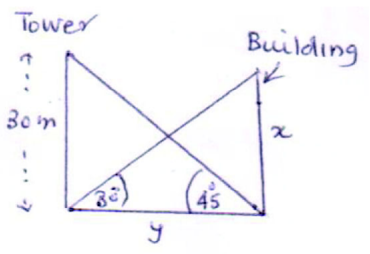
14. Total surfacearea of solid cuboidal block

$$= 2\,(15 \times 10 + 10 \times 5 + 15 \times 5)\ \text{cm}^2 = 550\ \text{cm}^2$$ 1 m

Area of two circular bases = $2 \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} = 77\ \text{cm}^2$ ½ m

Area of curved surface of cylinder $= 2\pi rh = 2 \times \frac{22}{7} \times \frac{7}{2} \times 5 = 110\ \text{cm}^2$ 1 m

Reqd - area = $(550 + 110 - 77)\ \text{cm}^2 = 583\ \text{cm}^2$ ½ m

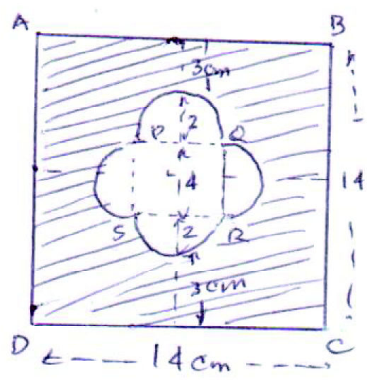
15. 

Fiqure ½ m

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

(ii) $\frac{x}{y} = \tan 30^\circ = \frac{1}{\sqrt{3}} \Rightarrow \left\} x = \frac{y}{\sqrt{3}} = \frac{30}{\sqrt{3}} = 10\sqrt{3} \right.$ 1 m

$\therefore$ Height of building is $10\sqrt{3}$ m ½ m

16. 

Area of Sq. ABCD = 14^2 or 196 cm^2 ½ m

Area of Small Sq. = 4^2 or 16 cm^2 ½ m

Area of 4 semi circles $= \left[4.\frac{1}{2}\,3.14\,(2)^2\right] \text{cm}^2$
$= 25.12\ \text{cm}^2$ 1 m

$\therefore$ Reqd. area = $(196 - 16 - 25.12)\ \text{cm}^2$
$= 154.88\ \text{cm}^2$ 1 m

17. The given quadratic eqn. can be written as

$(k + 1)x^2 - 2(k - 1)x + 1 = 0$ 1 m

For qual roots $4(k-1)^2 - 4(k+1) = 0$ or $k^2 - 3k = 0$

$\Rightarrow$ k = 0, 3 1 m

$\therefore$ Non-zero value of $k = 3$: Roots are $\frac{1}{2}, \frac{1}{2}$ ½+½ m

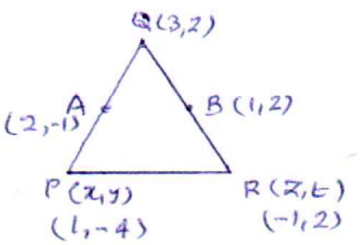
18. Number of redface cards removed = 6 1 m

$\therefore$ Remaining cards = 46

(i) P (a redcard) $= \frac{20}{46}$ or $\frac{10}{23}$ 1 m

(ii) P (a facecard) $= \frac{6}{46}$ or $\frac{3}{23}$ 1 m

(iii) P (a card of clubs) $= \frac{13}{46}$ 1 m

19. 

Getting $x = 1, y = -4 \Rightarrow P(1, -4)$ 1 m

$z = -1, t = 2 \Rightarrow R(-1, 2)$ ½ m

Area Δ PQR 1 m

$= \frac{1}{2} \left| \left[1(2-2) - 1(2+4) + 3(-4-2) \right] \right| = \frac{1}{2} \times 24$

$= 12$ sq.u. 1½ m

20. Let a be the first term and d the common difference of the A.P.

$S_{30} = 15\,[2a + 29d] = 30a + 435\,d$ 1 m

$S_{20} = 10\,[2a + 19d] = 20a + 190\,d$ ½ m

$S_{10} = 5\,[2a + 9d] = 10a + 45\,d$ ½ m

$3\,(S_{20} - S_{10}) = 3\,(10a + 145d) = 30a + 435d = S_{30}$ 1 m

SECTION - D

21. Correctly stated

Given, to Prove, Construction and correct figure — 2 m

correct Proof — 2 m

22. $PR = PQ \Rightarrow \angle PRQ = \angle PQR = \dfrac{(180-30)^o}{2} = 75^o$ — 1 m

$\left.\begin{array}{l} SR \,||\, QP \text{ and } QR \text{ is a transversal } \Rightarrow \angle SRQ = 75^o \\ \therefore \angle ORQ = \angle RQO = 90^o - 75^o = 15^o \end{array}\right\}$ — 1 m

$\therefore \angle QOR = (180 - 2\times 15)^o = 150^o \Rightarrow \angle QSR = 75^o$ — 1 m

$\angle RQS = 180^o - (\angle SRQ + \angle SQR) = 30^o$ — 1 m

23.

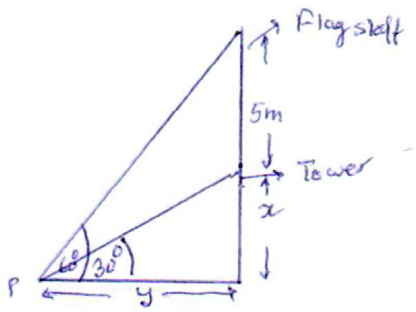


figure — 1 m

Writing the trigonometric equations

(i) $\dfrac{x}{y} = \tan 30^o = \dfrac{1}{\sqrt{3}} \Rightarrow y = \sqrt{3}\,x$ — 1 m

(ii) $\dfrac{x+5}{y} = \tan 60^o = \sqrt{3}$ *or* $\dfrac{x+5}{\sqrt{3}x} = \sqrt{3}$ — 1½ m

$\left.\begin{array}{l} \Rightarrow 3x = x + 5 \\ \text{or } x = 2.5 \\ \therefore \text{ Height of Tower} = 2.5 \text{ m} \end{array}\right\}$ — ½ m

24. Money required for Ramkate for admission of daughter = Rs. 2500

A.P. formed by saving — 1 m

(i) = 100, 120, 140, --- upto 12 terms

$$\left.\begin{aligned}\text{Sum of AP (i)} &= \frac{12}{2}\left[2\times100+11\times20\right]=6\left[420\right]\\ &= \text{Rs. } 2520\end{aligned}\right\}$$ 1½ m

$\therefore$ She can get her doughter admitied ½ m

Value : Small saving can fulfill your big desires or any else 1 m

25. Let the fraction be $\frac{x-3}{x}$ ½ m

By the given condition, new fraction $\frac{x-3+2}{x+2}=\frac{x-1}{x+2}$ ½ m

$$\left.\begin{aligned}&\therefore \quad \frac{x-3}{x}+\frac{x-1}{x+2}=\frac{29}{20}\\ &\Rightarrow \quad 20\left[(x-3)(x+2)+x\,(x-1)\right]=29\left(x^2+2x\right)\\ &= \quad 20\left(x^2-x-6+x^2-x\right)=29x^2+58x\end{aligned}\right\}$$ 1 m

or $11x^2-98x-120=0$

or $11x^2-110x-12x-120=0$ 1 m

$(11x+12)(x-10)=0 \quad \Rightarrow \quad x=10$ 1 m

$\therefore$ The Fraction is $\frac{7}{10}$ 1 m

26. Let x m be the internal radius of the pipe

Radius of base of tank = 40 cm = $\frac{2}{5}$ m

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

2.52 km/hour $\Rightarrow$ 1.26 km in half hour = 1260 m 1 m

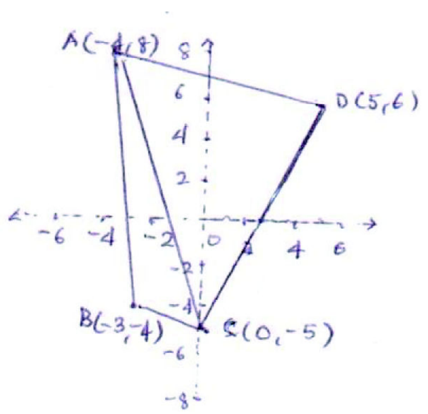
$\therefore$ Getting the equation

$$\pi \quad x^2 . 1260 = \pi . \frac{2}{5} . \frac{2}{5} \times \frac{315}{100}$$ 1 m

$$\left.\begin{aligned} &\Rightarrow x^2 = \frac{4}{25} . \frac{315}{100} \times \frac{1}{1260} = \frac{1}{2500} \\ &\quad \Rightarrow x = \frac{1}{50} \text{ m} = 2 \text{ cm} \end{aligned}\right\}$$ 1½

$\therefore$ Internal diameter of pipe = 4 cm ½ m

27.



Area Δ ABC

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

$$= \frac{1}{2} \left| -4+39 \right| = \frac{35}{2}$$ 1½ m

Area of Δ ACD

$$= \frac{1}{2}\left[-4(-5-6)+0(6-8)+5(8+5)\right]$$

$$= \frac{109}{2}$$ 1½ m

$\therefore$ Area of Qurd. ABCD $= \frac{35}{2} + \frac{109}{2} = 72$ sq.u. 1 m.

28. Volume of earth taken out after digging the well

$$= \left(\frac{22}{7} \times 3 \times 3 \times 21\right) \text{cu.m} = 59\,4 \text{ cu.m}$$ 1+1 m

Let h be the height of the platform

$\therefore \quad 27 \times 11 \times h = 594$ 1 m

$\Rightarrow \quad h = \dfrac{594}{27 \times h}$ 1 m

$\therefore$ Height of platform = 2 m

29. i) Number of numbers dividible by 3 or 5 in numbers 1 to 25

(3, 6, 9, 12, 15, 18, 21, 24, 5, 10, 20, 25) : their number is 12 1 m

P (divisible by 3 or 5) $= \dfrac{12}{25}$ 1 m

No. of favourable outcomes = 5

ii) P (a Perfect square number) $= \dfrac{5}{25} = \dfrac{1}{5}$ (1, 4, 9, 16, 25) 1 m

30. Correct Construction 4 m

31. $\dfrac{3}{x+1} + \dfrac{4}{x-1} = \dfrac{29}{4x-1}$

$[3(x-1) + 4(x+1)]\ [4x-1] = 29(x^2-1)$ 1 m

$(7x+1)(4x-1) = 29x^2 - 29$ 1 m

$28x^2 - 3x - 1 = 29x^2 - 29$ or $x^2 + 3x - 28 = 0$

1 m

$(x+7)(x-4) = 0$

$\Rightarrow \quad x = -7, 4$ 1 m