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Secondary School Certificate Examination

March 2017

Marking Scheme — Mathematics 530/1 (Vocational)

General Instructions:

1. The Marking Scheme provides general guidelines to reduce subjectivity in the marking. The answers given in the Marking Scheme are suggested answers. The content is thus indicative. If a student has given any other answer which is different from the one given in the Marking Scheme, but conveys the meaning, such answers should be given full weightage

2. Evaluation is to be done as per 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. If a candidate has attempted an extra question, marks obtained in the question attempted first should be retained and the other answer should be scored out.

5. 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.

6. Separate Marking Scheme for all the three sets has been given.

7. As per orders of the Hon'ble Supreme Court. The candidates would now be permitted to obtain photocopy of the Answer book on request on payment of the prescribed fee. All examiners/Head Examiners are once again reminded that they must ensure that evaluation is carried out strictly as per value points for each answer as given in the Marking Scheme.

QUESTION PAPER CODE 530/1

EXPECTED ANSWER/VALUE POINTS

SECTION A

1. For non real roots, $D < 0 \Rightarrow k^2 - 36 < 0$ $\frac{1}{2}$

$k < 6$ $\frac{1}{2}$

2. Prime numbers from 1 to 20 are 2, 3, 5, 7, 11, 13, 17, 19 $\frac{1}{2}$

$\therefore$ P(prime number) $= \frac{8}{20}$ or $\frac{2}{5}$ $\frac{1}{2}$

3. $\frac{h}{50} = \tan 60°$, h is height of tower $\frac{1}{2}$

$\Rightarrow h = 50\sqrt{3}m$ $\frac{1}{2}$

4. $\angle OPQ = \frac{110°}{2} = 55°$ $\frac{1}{2}$

$\angle TPQ = 90° - 55 = 35°$ $\frac{1}{2}$

SECTION B

5. $6a^2x^2 - 7abx - 3b^2 = 0$

$6a^2x^2 - 9abx + 2abx - 3b^2 = 0$ 1

$\Rightarrow (2ax - 3b)(3ax + b) = 0$

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

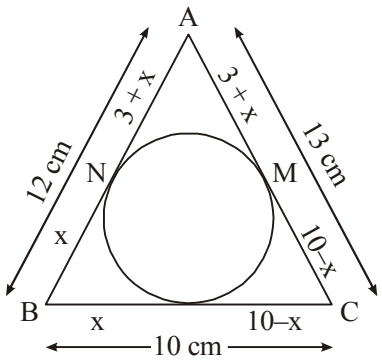
6. 2-digit numbers divisible by 3 are

12, 15, 18, ..., 99 1

$12 + (n - 1) \times 3 = 99$ $\frac{1}{2}$

$\Rightarrow n = 30$ $\frac{1}{2}$

7.



Let BL = x

$3 + x + x = 12$

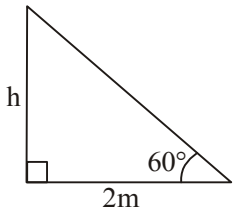
$\Rightarrow x = \frac{9}{2}$ 1

$\therefore BL = \frac{9}{2}\text{cm},\ CM = 10 - \frac{9}{2}$

$= \frac{11}{2}\text{ cm}$ $\frac{1}{2}$

$AN = 3 + \frac{9}{2} = \frac{15}{3}\text{cm}$ $\frac{1}{2}$

8.



$\frac{h}{2} = \tan 60°$ 1

$\Rightarrow h = 2\sqrt{3}$ 1

$\therefore$ height of tower $= 2\sqrt{3}$m

9. Total number of outcomes = 20 $\frac{1}{2}$

Favourable outcomes are 11, 13, 17, 19, 23, 29 i.e., 6 $\frac{1}{2}$

$\therefore$ P(prime number) $= \frac{6}{20}$ or $\frac{3}{10}$ 1

10. Area of shaded region

= Area of quadrant OABC – Area of ΔODB $\frac{1}{2}$

$= \left(\frac{22}{7} \times \frac{7 \times 7}{4} - \frac{1}{2} \times 5 \times 7\right)\text{cm}^2$ 1

$= 21\text{ cm}^2$ $\frac{1}{2}$

SECTION C

11. $\frac{x+3}{x+2} = \frac{3x-7}{2x-3}$

By cross multiplying, we get

$x^2 - 4x - 5 = 0$ 1

$\Rightarrow (x-5)(x+1) = 0$ 1

$x = 5, -1$ 1

12. Let $AC = x \Rightarrow CB = 2 - x$ $\frac{1}{2}$

$AC^2 = AB \times CB$

$\Rightarrow x^2 = 2(2-x)$

$\Rightarrow x^2 + 2x - 4 = 0$ 1

$\Rightarrow x = -1 \pm \sqrt{5}$ 1

$CB = 2 + 1 - \sqrt{5}$ (Rejecting –ve value)

$= (3 - \sqrt{5})\,m$ $\frac{1}{2}$

13. $PQ = PR \Rightarrow \angle PRQ = \angle PQR = 70°$ 1

$\Rightarrow \angle QPR = 180° - (70° + 70°)$

$= 40°$ 1

$\angle OQR = 90° - 70°$

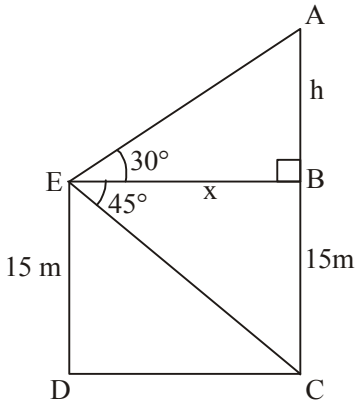
$= 20°$ 1

14. Total number of cards $= 52 - 19 = 33$ 1

(i) P(face card) $= \frac{3}{33}$ or $\frac{1}{11}$ 1

(ii) P(black card) $= \frac{22}{33}$ or $\frac{2}{3}$ 1

15.



Correct Figure $\frac{1}{2}$

$\frac{h}{x} = \tan 30°$

$\Rightarrow x = h\sqrt{3}$ $\frac{1}{2}$

$\frac{15}{x} = \tan 45°$

$\Rightarrow x = 15$ $\frac{1}{2}$

$\therefore h = \frac{15}{\sqrt{3}} = 5\sqrt{3}$ $\frac{1}{2}$

height of opposite house $= 5\sqrt{3} + 15$

$= 5 \times 1.732 + 15$

$= 23.66$m 1

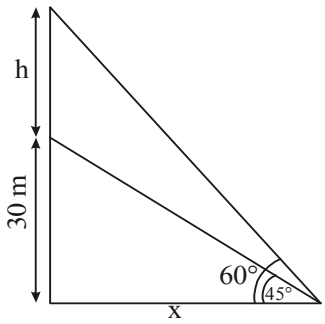
16. Let number of white balls be x

$\therefore$ Number of red balls $= 12 - x$ 1

$\frac{x}{12} = \frac{2}{3} \Rightarrow x = 8$ 1

$\therefore$ Number of Red balls $= 12 - 8 = 4$ 1

17.



Correct Figure $\frac{1}{2}$

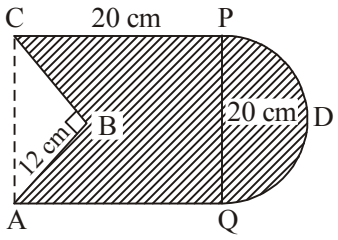
$\frac{30}{x} = \tan 45° \Rightarrow x = 30$ 1

$\frac{30 + h}{x} = \tan 60°$

$\Rightarrow h = 30(\sqrt{3} - 1)$ 1

$= 21.96$ m $\frac{1}{2}$

18.



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

$\Rightarrow 20^2 = 12^2 + BC^2$

$\Rightarrow BC = 16$ cm 1

Area of shaded region

= Area of square AQPC – Area of ΔABC + Area of semicircle PQD $\frac{1}{2}$

$= \left(20 \times 20 - \frac{1}{2} \times 16 \times 12 + \frac{3.14 \times 10 \times 10}{2}\right) cm^2$ 1

$= 461\ cm^2$ $\frac{1}{2}$

19. Total surface area of remaining solid

= CSA of cylinder + CSA of cone + Base area of cylinder 1

$= 2\pi rh + \pi rl + \pi r^2$

$l = \sqrt{(2.4)^2 + (0.7)^2}$

$= 2.5$ cm $\frac{1}{2}$

$= \frac{22}{7} \times 0.7[2 \times 2.4 + 2.5 + 0.7] cm^2$

$= 17.6\ cm^2$ $\frac{1}{2}$

20. Let number of bullets be n

Volume of cube = Volume of n spherical bullets $\frac{1}{2}$

$\Rightarrow 44 \times 44 \times 44 = n \times \frac{4}{3} \times \frac{22}{7} \times 2 \times 2 \times 2$ $1\frac{1}{2}$

$\Rightarrow n = \frac{44 \times 44 \times 44}{\frac{4}{3} \times \frac{22}{7} \times 2 \times 2 \times 2}$

$= 2541$ 1

SECTION D

21. Let the value of prizes be ₹ a, ₹ (a – 50), ₹ (a – 100),... $\frac{1}{2}$

$S_{10} = 4250$

$\frac{10}{2}[2a + a(-50)] = 4250$ $\frac{1}{2}$

$\Rightarrow a = 650$ 1

$\therefore$ Values of prizes (in ₹) are

650, 600, 550, 500, 450, 400, 350, 300, 250, 200 1

Value: Motivating the students or any other relevant value 1

22. Let base be x cm $\Rightarrow$ Altitude = (x – 7) cm $\frac{1}{2}$

$x^2 + (x - 7)^2 = 13^2$ 1

$\Rightarrow x^2 - 7x - 60 = 0$

$(x - 12)(x + 5) = 0$ 1

$x = 12$ (Rejecting – 5) $\frac{1}{2}$

$\therefore$ Base = 12 cm, Altitude = 50 cm 1

23. $a_4 + a_8 = 24 \Rightarrow a + 5d = 12$ ...(i) 1

$a_6 + a_{10} = 44 \Rightarrow a + 7d = 22$ ...(ii) 1

Solving (i) and (ii) we get $a = -13$, $d = 5$ 1

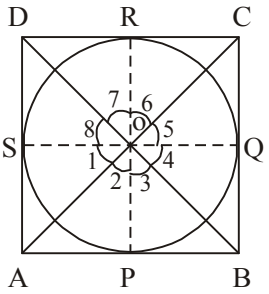
$S_{10} = \frac{10}{2}[-26 + 9 \times 5]$

$= 95$ 1

24. Correct figure, given, to prove, construction $\frac{1}{2} \times 4 = 2$

Correct Proof 2

25.



$\Delta AOS \cong \Delta AOP$

$\Rightarrow \angle 1 = \angle 2$

Similarly $\angle 4 = \angle 3$, $\angle 5 = \angle 6$, $\angle 8 = \angle 7$ 1

$\Rightarrow \angle 1 + \angle 4 + \angle 5 + \angle 8 = \angle 2 + \angle 3 + \angle 6 + \angle 7$ 1

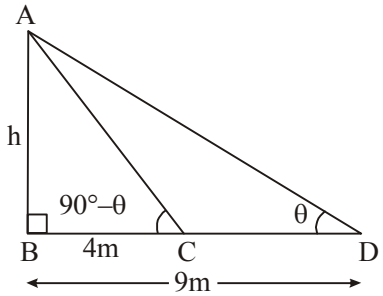
But $\angle 1 + \angle 2 + \angle 3 + \angle 4 + \angle 5 + \angle 6 + \angle 7 + \angle 8 = 360°$

$\Rightarrow \angle 1 + \angle 4 + \angle 5 + \angle 8 = \angle 2 + \angle 3 + \angle 6 + \angle 7 = 180°$ 1

$\Rightarrow \angle AOD + \angle BOC = 180°$ and $\angle AOB + \angle COD = 180°$ 1

26.

Correct Figure 1



Let the angles of elevation be θ and $90° - \theta$

$\frac{h}{4} = \tan\theta$ ...(i) 1

$\frac{h}{9} = \tan(90° - \theta)$

$= \cot\theta$ ...(ii) 1

$\Rightarrow \frac{h}{4} \times \frac{h}{9} = \tan\theta \times \cot\theta$

$\Rightarrow h = 6m$ 1

$\therefore$ height of tower = 6 m

27. Total number of outcomes = 36

(i) Favourable outcomes are

(2, 6) (3, 5) (4, 4) (5, 3) (6, 2) i.e., 5 1

$\therefore$ P(sum 8) = $\frac{5}{36}$ 1

(ii) Favourable outcomes are

(2, 1) (2, 3) (2, 5) (4, 1) (4, 3) (4, 5) (6, 1) (6, 3) (6, 5) i.e., 9 1

P(first even and second odd) = $\frac{9}{36}$ or $\frac{1}{4}$ 1

28. $PA = PC \Rightarrow \angle PAC = \angle PCA$
$PA = PB \Rightarrow \angle PAB = \angle PBA$] 1

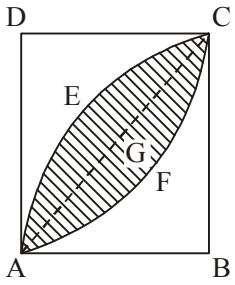
In ΔABC, $\angle CBA + \angle BAC + \angle ACB = 180°$

$\Rightarrow (\angle PBA + \angle BAP) + \angle PAC + \angle ACP = 180°$ 1

$\Rightarrow 2(\angle PAB + \angle PAC) = 180°$ 1

$\Rightarrow \angle BAC = 90°$ 1

29.



Area of shaded region

$= 2 \times$ Area of segment AECG 1

$= 2$(Area of sector ABCE – Area of ΔABC) 1

$= 2 \times \left(\frac{22}{7} \times \frac{14 \times 14}{4} - \frac{1}{2} \times 14 \times 14\right) cm^2$ 1

$= 2 \times 56$ 112 cm^2 1

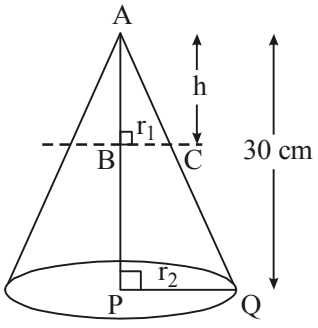
30. Volume of metallic sphere = Volume of 3 spherical balls $\frac{1}{2}$

$\Rightarrow \frac{4}{3}\pi(3)^3 = \frac{4}{3}\pi[(1.5)^3 + 2^3 + x^3]$ $1\frac{1}{2}$

$\Rightarrow x^3 = 15.625$ 1

$\Rightarrow x = 2.5$ cm 1

31.



$\Delta ABC \sim \Delta APQ$

$\Rightarrow \frac{h}{30} = \frac{r_1}{r_2}$ ...(i) 1

Volume of smaller cone $= \frac{1}{27} \times$ Volume of larger cone

$\Rightarrow \frac{1}{3}\pi r_1^2 \times h = \frac{1}{27} \times \frac{1}{3}\pi r_2^2 \times 30$ 1

$\Rightarrow \left(\frac{r_1}{r_2}\right)^2 \times \frac{h}{30} = \frac{1}{27}$

$\Rightarrow \left(\frac{h}{30}\right)^3 = \frac{1}{27}$ (using (i)) 1

$\therefore h = 10$ cm $\frac{1}{2}$

$\therefore$ Required height = (30 – 10) cm

= 20 cm $\frac{1}{2}$

QUESTION PAPER CODE 530/2

EXPECTED ANSWER/VALUE POINTS

SECTION A

1. $\angle OPQ = \frac{110°}{2} = 55°$ $\frac{1}{2}$

$\angle TPQ = 90° - 55 = 35°$ $\frac{1}{2}$

2. $\frac{h}{50} = \tan 60°$, h is height of tower $\frac{1}{2}$

$\Rightarrow h = 50\sqrt{3}m$ $\frac{1}{2}$

3. Prime numbers from 1 to 20 are 2, 3, 5, 7, 11, 13, 17, 19 $\frac{1}{2}$

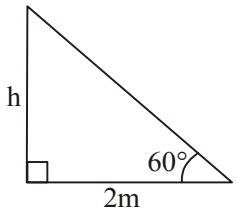
$\therefore$ P(prime number) $= \frac{8}{20}$ or $\frac{2}{5}$ $\frac{1}{2}$

4. For non real roots, $D < 0 \Rightarrow k^2 - 36 < 0$ $\frac{1}{2}$

$k < 6$ $\frac{1}{2}$

SECTION B

5.

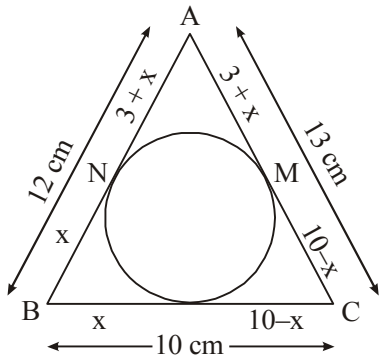


$\frac{h}{2} = \tan 60°$ 1

$\Rightarrow h = 2\sqrt{3}$ 1

$\therefore$ height of tower $= 2\sqrt{3}m$

6.



Let BL = x

$3 + x + x = 12$

$\Rightarrow x = \frac{9}{2}$ 1

$\therefore BL = \frac{9}{2}cm,\ CM = 10 - \frac{9}{2}$

$= \frac{11}{2}cm$ $\frac{1}{2}$

$AN = 3 + \frac{9}{2} = \frac{15}{3}cm$ $\frac{1}{2}$

7. Total number of outcomes = 20 $\frac{1}{2}$

Favourable outcomes are 11, 13, 17, 19, 23, 29 i.e., 6 $\frac{1}{2}$

$\therefore$ P(prime number) = $\frac{6}{20}$ or $\frac{3}{10}$ 1

8. Area of shaded region

= Area of quadrant OABC – Area of ΔODB $\frac{1}{2}$

$= \left(\frac{22}{7} \times \frac{7 \times 7}{4} - \frac{1}{2} \times 5 \times 7\right) \text{cm}^2$ 1

$= 21 \text{ cm}^2$ $\frac{1}{2}$

9. $6a^2x^2 - 7abx - 3b^2 = 0$

$6a^2x^2 - 9abx + 2abx - 3b^2 = 0$ 1

$\Rightarrow (2ax - 3b)(3ax + b) = 0$

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

10. Two digit numbers divisible by 5 are 1

10, 15, 20, ..., 95

$a_n = 95 \Rightarrow 10 + (n - 1) \times 5 = 95$ $\frac{1}{2}$

$\Rightarrow n = 18$ $\frac{1}{2}$

SECTION C

11. Total number of cards = 52 – 19 = 33 1

(i) P(face card) = $\frac{3}{33}$ or $\frac{1}{11}$ 1

(ii) P(black card) = $\frac{22}{33}$ or $\frac{2}{3}$ 1

12. PQ = PR $\Rightarrow$ $\angle$PRQ = $\angle$PQR = 70° 1

$\Rightarrow$ $\angle$QPR = 180° – (70° + 70°)

= 40° 1

$\angle$OQR = 90° – 70°

= 20° 1

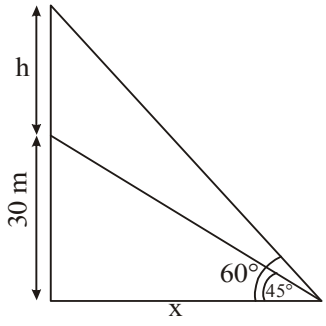
13. Let number of white balls be x

$\therefore$ Number of red balls = 12 – x 1

$\frac{x}{12} = \frac{2}{3} \Rightarrow x = 8$ 1

$\therefore$ Number of Red balls = 12 – 8 = 4 1

14. Correct Figure $\frac{1}{2}$



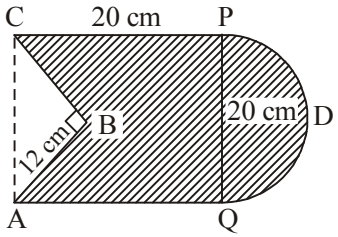
$\frac{30}{x} = \tan 45° \Rightarrow x = 30$ 1

$\frac{30 + h}{x} = \tan 60°$

$\Rightarrow h = 30(\sqrt{3} - 1)$ 1

= 21.96 m $\frac{1}{2}$

15.



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

$\Rightarrow 20^2 = 12^2 + BC^2$

$\Rightarrow BC = 16$ cm 1

Area of shaded region

= Area of square AQPC – Area of ΔABC + Area of semicircle PQD $\frac{1}{2}$

$= \left(20 \times 20 - \frac{1}{2} \times 16 \times 12 + \frac{3.14 \times 10 \times 10}{2}\right) cm^2$ 1

$= 461\ cm^2$ $\frac{1}{2}$

16. Let number of bullets be n

Volume of cube = Volume of n spherical bullets $\frac{1}{2}$

$\Rightarrow 44 \times 44 \times 44 = n \times \frac{4}{3} \times \frac{22}{7} \times 2 \times 2 \times 2$ $1\frac{1}{2}$

$\Rightarrow n = \frac{44 \times 44 \times 44}{\frac{4}{3} \times \frac{22}{7} \times 2 \times 2 \times 2}$

$= 2541$ 1

17. Let $AC = x \Rightarrow CB = 2 - x$ $\frac{1}{2}$

$AC^2 = AB \times CB$

$\Rightarrow x^2 = 2(2 - x)$

$\Rightarrow x^2 + 2x - 4 = 0$ 1

$\Rightarrow x = -1 \pm \sqrt{5}$ 1

$CB = 2 + 1 - \sqrt{5}$ (Rejecting –ve value)

$= (3 - \sqrt{5})$ m $\frac{1}{2}$

18. Total surface area of remaining solid

= CSA of cylinder + CSA of cone + Base area of cylinder 1

$= 2\pi rh + \pi rl + \pi r^2$

$l = \sqrt{12^2 + 5^2}$

$= 13$ cm $\frac{1}{2}$

$= \frac{22}{7} \times 5(2 \times 12 + 13 + 5)\ \text{cm}^2$ 1

$= 660\ \text{cm}^2$ $\frac{1}{2}$

19. $\frac{1}{x-2} + \frac{3}{x-1} = \frac{6}{x}$

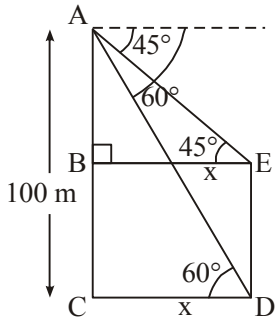
$\frac{x - 1 + 3(x-2)}{(x-2)(x-1)} = \frac{6}{x}$ 1

$\Rightarrow 2x^2 - 11x + 12 = 0$ 1

$\Rightarrow (2x - 3)(x - 4) = 0$ $\frac{1}{2}$

$x = \frac{3}{2}, 4$ $\frac{1}{2}$

20. Correct Figure $\frac{1}{2}$



$\frac{100}{x} = \tan 60°$

$\Rightarrow x = \frac{100}{\sqrt{3}}$ 1

$\frac{100 - h}{x} = \tan 45°$

$\Rightarrow h = \frac{100(\sqrt{3} - 1)}{\sqrt{3}} = \frac{100(3 - \sqrt{3})}{3}$ 1

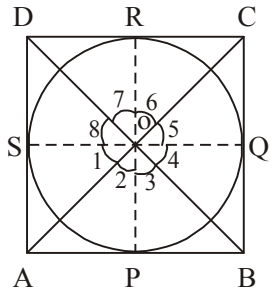
$= 100 \times 1.268\ \text{m} = 42.27\ \text{m}$ $\frac{1}{2}$

SECTION D

21. Correct figure, given, to prove, construction $\frac{1}{2}\times 4=2$

Correct Proof 2

22.



$\Delta AOS \cong \Delta AOP$

$\Rightarrow \angle 1 = \angle 2$

Similarly $\angle 4 = \angle 3$, $\angle 5 = \angle 6$, $\angle 8 = \angle 7$ 1

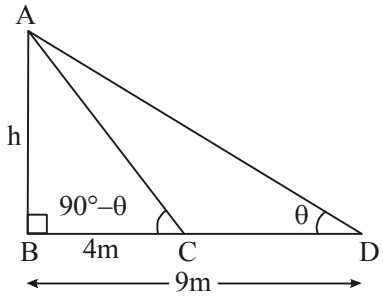
$\Rightarrow \angle 1 + \angle 4 + \angle 5 + \angle 8 = \angle 2 + \angle 3 + \angle 6 + \angle 7$ 1

But $\angle 1 + \angle 2 + \angle 3 + \angle 4 + \angle 5 + \angle 6 + \angle 7 + \angle 8 = 360°$

$\Rightarrow \angle 1 + \angle 4 + \angle 5 + \angle 8 = \angle 2 + \angle 3 + \angle 6 + \angle 7 = 180°$ 1

$\Rightarrow \angle AOD + \angle BOC = 180°$ and $\angle AOB + \angle COD = 180°$ 1

23. Correct Figure 1



Let the angles of elevation be θ and $90° - \theta$

$\frac{h}{4} = \tan\theta$ ...(i) 1

$\frac{h}{9} = \tan(90° - \theta)$

$= \cot\theta$ ...(ii) 1

$\Rightarrow \frac{h}{4}\times\frac{h}{9} = \tan\theta \times \cot\theta$

$\Rightarrow h = 6m$ 1

$\therefore$ height of tower = 6 m

24. $PA = PC \Rightarrow \angle PAC = \angle PCA$
$PA = PB \Rightarrow \angle PAB = \angle PBA$ 1

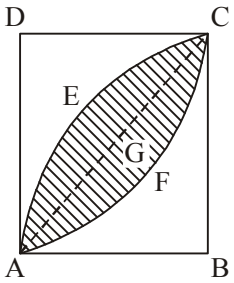
In ΔABC, $\angle CBA + \angle BAC + \angle ACB = 180°$

$\Rightarrow (\angle PBA + \angle BAP) + \angle PAC + \angle ACP = 180°$ 1

$\Rightarrow 2(\angle PAB + \angle PAC) = 180°$ 1

$\Rightarrow \angle BAC = 90°$ 1

25.



Area of shaded region

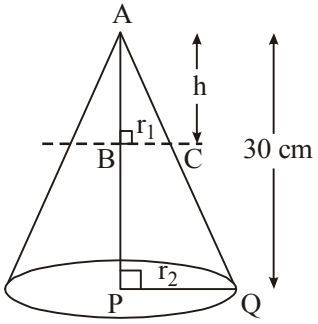
$= 2 \times$ Area of segment AECG 1

$= 2$(Area of sector ABCE – Area of ΔABC) 1

$= 2 \times \left(\frac{22}{7} \times \frac{14 \times 14}{4} - \frac{1}{2} \times 14 \times 14\right) \text{cm}^2$ 1

$= 2 \times 56$ 112 cm^2 1

26.



$\Delta ABC \sim \Delta APQ$

$\Rightarrow \frac{h}{30} = \frac{r_1}{r_2}$ ...(i) 1

Volume of smaller cone $= \frac{1}{27} \times$ Volume of larger cone

$\Rightarrow \frac{1}{3}\pi r_1^2 \times h = \frac{1}{27} \times \frac{1}{3}\pi r_2^2 \times 30$ 1

$\Rightarrow \left(\frac{r_1}{r_2}\right)^2 \times \frac{h}{30} = \frac{1}{27}$

$\Rightarrow \left(\frac{h}{30}\right)^3 = \frac{1}{27}$ (using (i)) 1

$\therefore$ h = 10 cm $\frac{1}{2}$

$\therefore$ Required height = (30 – 10) cm

= 20 cm $\frac{1}{2}$

27. Let the value of prizes be ₹ a, ₹ (a – 50), ₹ (a – 100),... $\frac{1}{2}$

$S_{10} = 4250$

$\frac{10}{2}[2a + a(-50)] = 4250$ $\frac{1}{2}$

$\Rightarrow a = 650$ 1

$\therefore$ Values of prizes (in ₹) are

650, 600, 550, 500, 450, 400, 350, 300, 250, 200 1

Value: Motivating the students or any other relevant value 1

28. Volume of cylinder = Volume of sphere $\frac{1}{2}$

$\pi \times 12 \times 12 \times 0.25 = \frac{4}{3}\pi \times r^3$, where r is radius of sphere formed $1\frac{1}{2}$

$\Rightarrow r^3 = 27$ 1

$\Rightarrow r = 3$ cm 1

29. Total number of outcomes = 36

(i) Favourable outcomes are

(1, 5) (2,5) (3, 5) (4, 5) (5, 5) (6, 5) (5, 1) 1

(5, 2) (5, 3) (5, 4) (5, 6) i.e., 11 1

P(5 on at least one die) = $\frac{11}{36}$ 1

(ii) Favourable outcomes are

(1, 6) (2, 5) (3, 4) (4, 3) (5, 2) (6, 1) i.e., 6 1

P(Total of 7) = $\frac{6}{36}$ or $\frac{1}{6}$ 1

30. $a_{17} = 5 + 2a_8 \Rightarrow a - 2d = 5$ ...(1) 1

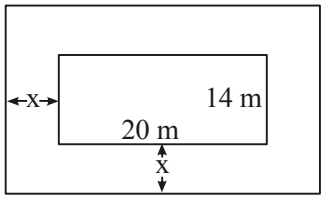
$a_{11} = 43 \Rightarrow a + 10d = 43$ ...(2) 1

Solving (1) and (2) we get, a = 3, d = 4 1

$a_n = 3 + (n - 1) \times 4$ 1

$= 4n - 1$ 1

31.



Let the width of road be x

Area of road

= Area of outer rectangle – Area of inner rectangle

$\Rightarrow 72 = (20 + 2x)(14 + 2x) - 20 \times 14$ 1

$\Rightarrow x^2 + 17x - 18 = 0$ 1

$(x + 18)(x - 1) = 0$

$x = 1$ (neglecting –18)

$\therefore$ Width of road = 1m 1

QUESTION PAPER CODE 530/3

EXPECTED ANSWER/VALUE POINTS

SECTION A

1. $\frac{h}{50} = \tan 60°$, h is height of tower $\frac{1}{2}$

$\Rightarrow h = 50\sqrt{3}m$ $\frac{1}{2}$

2. $\angle OPQ = \frac{110°}{2} = 55°$ $\frac{1}{2}$

$\angle TPQ = 90° - 55 = 35°$ $\frac{1}{2}$

3. For non real roots, $D < 0 \Rightarrow k^2 - 36 < 0$ $\frac{1}{2}$

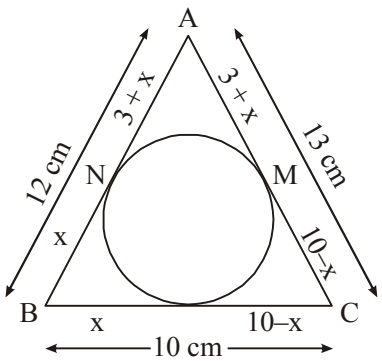
$k < 6$ $\frac{1}{2}$

4. Prime numbers from 1 to 20 are 2, 3, 5, 7, 11, 13, 17, 19 $\frac{1}{2}$

$\therefore$ P(prime number) $= \frac{8}{20}$ or $\frac{2}{5}$ $\frac{1}{2}$

SECTION B

5.



Let BL = x

$3 + x + x = 12$

$\Rightarrow x = \frac{9}{2}$ 1

$\therefore BL = \frac{9}{2}cm,\ CM = 10 - \frac{9}{2}$

$= \frac{11}{2}cm$ $\frac{1}{2}$

$AN = 3 + \frac{9}{2} = \frac{15}{3}cm$ $\frac{1}{2}$

6. Total number of outcomes = 20 $\frac{1}{2}$

Favourable outcomes are 11, 13, 17, 19, 23, 29 i.e., 6 $\frac{1}{2}$

$\therefore$ P(prime number) = $\frac{6}{20}$ or $\frac{3}{10}$ 1

7. Area of shaded region

= Area of quadrant OABC – Area of ΔODB $\frac{1}{2}$

$= \left(\frac{22}{7} \times \frac{7 \times 7}{4} - \frac{1}{2} \times 5 \times 7\right) \text{cm}^2$ 1

$= 21 \text{ cm}^2$ $\frac{1}{2}$

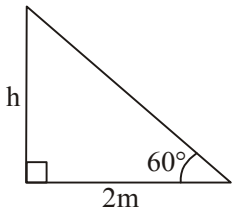
8. $6a^2x^2 - 7abx - 3b^2 = 0$

$6a^2x^2 - 9abx + 2abx - 3b^2 = 0$ 1

$\Rightarrow (2ax - 3b)(3ax + b) = 0$

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

9.



$\frac{h}{2} = \tan 60°$ 1

$\Rightarrow h = 2\sqrt{3}$ 1

$\therefore$ height of tower = $2\sqrt{3}$m

10. Two digit numbers divisible by 6 are

12, 18, 24, ..., 96 1

$a_n = 96 \Rightarrow 12 + (n - 1)6 = 96$ $\frac{1}{2}$

$\Rightarrow n = 15$ $\frac{1}{2}$

SECTION C

11. $PQ = PR \Rightarrow \angle PRQ = \angle PQR = 70°$ 1

$\Rightarrow \angle QPR = 180° - (70° + 70°)$

$= 40°$ 1

$\angle OQR = 90° - 70°$

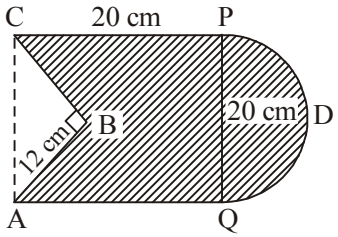
$= 20°$ 1

12. Total number of cards = 52 – 19 = 33 1

(i) P(face card) = $\frac{3}{33}$ or $\frac{1}{11}$ 1

(ii) P(black card) = $\frac{22}{33}$ or $\frac{2}{3}$ 1

13.



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

$\Rightarrow 20^2 = 12^2 + BC^2$

$\Rightarrow BC = 16$ cm 1

Area of shaded region

= Area of square AQPC – Area of ΔABC + Area of semicircle PQD $\frac{1}{2}$

$= \left(20 \times 20 - \frac{1}{2} \times 16 \times 12 + \frac{3.14 \times 10 \times 10}{2}\right) cm^2$ 1

$= 461\ cm^2$ $\frac{1}{2}$

14. Let number of bullets be n

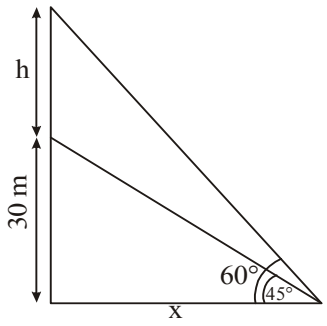
Volume of cube = Volume of n spherical bullets $\frac{1}{2}$

$\Rightarrow 44 \times 44 \times 44 = n \times \frac{4}{3} \times \frac{22}{7} \times 2 \times 2 \times 2$ $1\frac{1}{2}$

$\Rightarrow n = \frac{44 \times 44 \times 44}{\frac{4}{3} \times \frac{22}{7} \times 2 \times 2 \times 2}$

$= 2541$ 1

15. Correct Figure $\frac{1}{2}$



$\frac{30}{x} = \tan 45° \Rightarrow x = 30$ 1

$\frac{30 + h}{x} = \tan 60°$

$\Rightarrow h = 30(\sqrt{3} - 1)$ 1

$= 21.96$ m $\frac{1}{2}$

16. Let $AC = x \Rightarrow CB = 2 - x$ $\frac{1}{2}$

$AC^2 = AB \times CB$

$\Rightarrow x^2 = 2(2 - x)$

$\Rightarrow x^2 + 2x - 4 = 0$ 1

$\Rightarrow x = -1 \pm \sqrt{5}$ 1

$CB = 2 + 1 - \sqrt{5}$ (Rejecting –ve value)

$= (3 - \sqrt{5})$ m $\frac{1}{2}$

17. Let number of white balls be x

$\therefore$ Number of red balls $= 12 - x$ 1

$\frac{x}{12} = \frac{2}{3} \Rightarrow x = 8$ 1

$\therefore$ Number of Red balls $= 12 - 8 = 4$ 1

18. $\frac{x-1}{x-2} + \frac{x-3}{x-4} = \frac{10}{3}$

Cross multiplying and simplifying we get

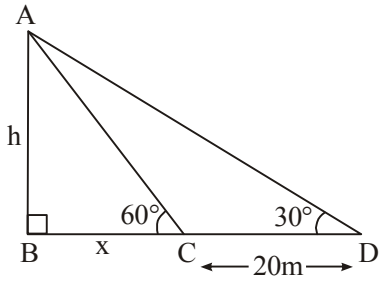
$2x^2 - 15x + 25 = 0$ 1

$\Rightarrow (2x - 5)(x - 5) = 0$ 1

$x = 5, \frac{5}{2}$ 1

19.

Correct Figure $\frac{1}{2}$



$\frac{h}{x} = \tan 60°$

$\Rightarrow h = x\sqrt{3}$ $\frac{1}{2}$

$\frac{h}{x+20} = \tan 30°$

$\Rightarrow h\sqrt{3} = x + 20$ 1

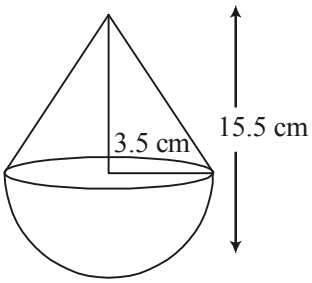
$\Rightarrow \quad x = 10$

$\therefore h = 10\sqrt{3}$

$\therefore$ height of tower $= 10\sqrt{3}$m

and required distance = 10 m 1

20.



height of cone = (15.5 – 3.5) cm

= 12 cm $\frac{1}{2}$

$l = \sqrt{h^2 + r^2}$

$= \sqrt{12^2 + (3.5)^2}$

= 12.5 cm 1

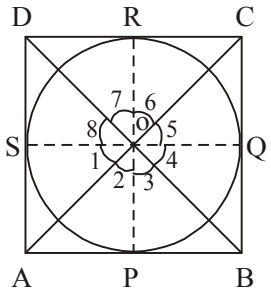
Total surface area of toy = CSA of cone + CSA of hemisphere

$= \frac{22}{7} \times 3.5\,(12.5 + 2 \times 3.5)\ \text{cm}^2$ 1

$= 214.5\ \text{cm}^2$ $\frac{1}{2}$

SECTION D

21.



$\Delta AOS \cong \Delta AOP$

$\Rightarrow \angle 1 = \angle 2$

Similarly $\angle 4 = \angle 3$, $\angle 5 = \angle 6$, $\angle 8 = \angle 7$ 1

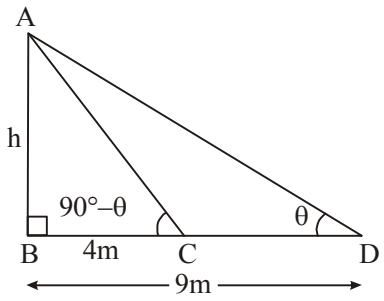
$\Rightarrow \angle 1 + \angle 4 + \angle 5 + \angle 8 = \angle 2 + \angle 3 + \angle 6 + \angle 7$ 1

But $\angle 1 + \angle 2 + \angle 3 + \angle 4 + \angle 5 + \angle 6 + \angle 7 + \angle 8 = 360°$

$\Rightarrow \angle 1 + \angle 4 + \angle 5 + \angle 8 = \angle 2 + \angle 3 + \angle 6 + \angle 7 = 180°$ 1

$\Rightarrow \angle AOD + \angle BOC = 180°$ and $\angle AOB + \angle COD = 180°$ 1

22. Correct Figure 1



Let the angles of elevation be θ and 90° – θ

$\frac{h}{4} = \tan\theta$ ...(i) 1

$\frac{h}{9} = \tan(90° - \theta)$

$= \cot\theta$ ...(ii) 1

$\Rightarrow \frac{h}{4} \times \frac{h}{9} = \tan\theta \times \cot\theta$

$\Rightarrow h = 6m$ 1

$\therefore$ height of tower = 6 m

23. Total number of outcomes = 36

(i) Favourable outcomes are

(2, 6) (3, 5) (4, 4) (5, 3) (6, 2) i.e., 5 1

$\therefore$ P(sum 8) = $\frac{5}{36}$ 1

(ii) Favourable outcomes are

(2, 1) (2, 3) (2, 5) (4, 1) (4, 3) (4, 5) (6, 1) (6, 3) (6, 5) i.e., 9 1

P(first even and second odd) = $\frac{9}{36}$ or $\frac{1}{4}$ 1

24. $PA = PC \Rightarrow \angle PAC = \angle PCA$
$PA = PB \Rightarrow \angle PAB = \angle PBA$ 1

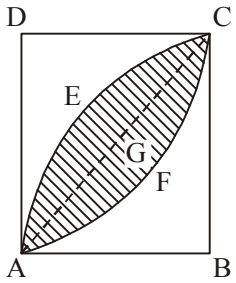
In ΔABC, $\angle CBA + \angle BAC + \angle ACB = 180°$

$\Rightarrow (\angle PBA + \angle BAP) + \angle PAC + \angle ACP = 180°$ 1

$\Rightarrow 2(\angle PAB + \angle PAC) = 180°$ 1

$\Rightarrow \angle BAC = 90°$ 1

25.



Area of shaded region

$= 2 \times$ Area of segment AECG 1

$= 2$(Area of sector ABCE – Area of ΔABC) 1

$= 2 \times \left(\frac{22}{7} \times \frac{14 \times 14}{4} - \frac{1}{2} \times 14 \times 14\right) cm^2$ 1

$= 2 \times 56\ 112\ cm^2$ 1

26. Let the value of prizes be ₹ a, ₹ (a – 50), ₹ (a – 100),... $\frac{1}{2}$

$S_{10} = 4250$

$\frac{10}{2}[2a + a(-50)] = 4250$ $\frac{1}{2}$

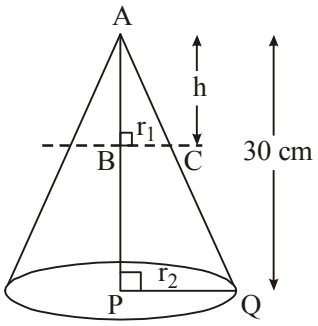
$\Rightarrow a = 650$ 1

$\therefore$ Values of prizes (in ₹) are

650, 600, 550, 500, 450, 400, 350, 300, 250, 200 1

Value: Motivating the students or any other relevant value 1

27.



$\Delta ABC \sim \Delta APQ$

$\Rightarrow \frac{h}{30} = \frac{r_1}{r_2}$ ...(i) 1

Volume of smaller cone $= \frac{1}{27} \times$ Volume of larger cone

$\Rightarrow \frac{1}{3}\pi r_1^2 \times h = \frac{1}{27} \times \frac{1}{3}\pi r_2^2 \times 30$ 1

$\Rightarrow \left(\frac{r_1}{r_2}\right)^2 \times \frac{h}{30} = \frac{1}{27}$

$\Rightarrow \left(\frac{h}{30}\right)^3 = \frac{1}{27}$ (using (i)) 1

$\therefore h = 10$ cm $\frac{1}{2}$

$\therefore$ Required height = (30 – 10) cm

= 20 cm $\frac{1}{2}$

28. Let the larger part be x

$\therefore$ Smaller part = 16 – x $\frac{1}{2}$

$2x^2 = (16 - x)^2 + 164$ 1

$(x + 42)(x - 10) = 0$

$x = 10$ (Rejecting – 42) $\frac{1}{2}$

$\therefore$ larger part = 10, smaller part = 6 1

29. Height of cylinder = 50×0.5 cm

= 25 cm 1

Total surface area of solid

$= 2 \times \frac{22}{7} \times 7\,(7 + 25)\ \text{cm}^2$

$= 1408\ \text{cm}^2$ $1\frac{1}{2}$

Volume of solid = $\pi r^2 h$

$= \frac{22}{7} \times 7 \times 7 \times 25\ \text{cm}^3$

$= 3850\ \text{cm}^3$ $1\frac{1}{2}$

30. $a = 17,\ a_n = 350,\ d = 9$

$17 + (n - 1) \times 9 = 350$

$\Rightarrow n = 38$ 2

$S_n = \frac{n}{2}(a + l)$

$= \frac{38}{2}(17 + 350) = 6973$ 2

31. Correct figure, given, to prove, construction $\frac{1}{2} \times 4 = 2$

Correct proof 2