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Secondary School Certificate Examination

March 2016

Marking Scheme — Mathematics 30/1/1, 30/1/2, 30/1/3

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. In question (s) on differential equations, constant of integration has to be written.

5. 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.

6. A full scale of marks - 0 to 100 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. 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 30/1/1

EXPECTED ANSWER/VALUE POINTS

SECTION A

1. $\angle APB = 80^\circ$ $\frac{1}{2}$

$\therefore \quad \angle AOB = 100^\circ$ $\frac{1}{2}$

2. DB = 3.46 m $\frac{1}{2}$

$\therefore \quad$ DC = 4 m $\frac{1}{2}$

3. $l = 185$, d = –4 $\frac{1}{2}$

$l_9 = 153$ $\frac{1}{2}$

4. Possible outcomes are 4, 9, 16, 25, 36, 49, i.e. 6. $\frac{1}{2}$

$\therefore \quad$ P(perfect square number) = $\frac{6}{48}$ or $\frac{1}{8}$ $\frac{1}{2}$

SECTION B

5. $\frac{-7}{a} = \frac{2}{3} - 3$

$\Rightarrow \quad a = 3$ 1

and $\frac{b}{a} = \frac{2}{3} \times (-3)$

$\Rightarrow \quad b = -6$ 1

6. Let the point on y-axis be (0, y) and AP: PB = K : 1 $\frac{1}{2}$

Therefore $\frac{5-k}{k+1} = 0$ gives k = 5

Hence required ratio is 5 : 1. $\frac{1}{2}$

$y = \frac{-4(5)-6}{6} = \frac{-13}{3}$ $\frac{1}{2}$

Hence point on y-axis is $\left(0, \frac{-13}{3}\right)$. $\frac{1}{2}$

7. Let AD = AF = x

$\therefore$ DB = BE = 12 – x

and CF = CE = 10 – x

BC = BE + EC $\Rightarrow$ 8 = 12 – x + 10 – x

$\Rightarrow$ x = 7 1

$\therefore$ AD = 7 cm, BE = 5 cm, CF = 3 cm 1

8. Let the point P be (2y, y) $\frac{1}{2}$

PQ = PR $\Rightarrow \sqrt{(2y-2)^2+(y+5)^2} = \sqrt{(2y+3)^2+(y-6)^2}$ $\frac{1}{2}$

Solving to get y = 8 $\frac{1}{2}$

Hence coordinates of point P are (16, 8). $\frac{1}{2}$

9. Here a = 18, d = –2, Sn = 0 $\frac{1}{2}$

Therefore $\frac{n}{2}[36+(n-1)(-2)] = 0$ 1

$\Rightarrow$ n = 19 $\frac{1}{2}$

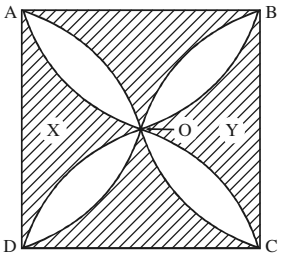
10. PA = PB $\frac{1}{2}$

$\Rightarrow$ $\angle PAB = \angle PBA = 60°$ $\frac{1}{2}$

$\therefore$ ΔPAB is an equilateral triangle. $\frac{1}{2}$

Hence AB = PA = 5 cm. $\frac{1}{2}$

SECTION C

11. 

Area of square = 196 cm^2 $\frac{1}{2}$

Area of semicircles AOB + DOC = $\frac{22}{7}\times 49 = 154\ cm^2$ $\frac{1}{2}$

Hence area of two shaded parts (X + Y) = 196 – 154 = 42 cm^2 1

Therefore area of four shaded parts = 84 cm^2. 1

12. Surface area of block = $216-\frac{22}{7}\times\frac{3.5}{2}\times\frac{3.5}{2}+2\times\frac{22}{7}\times\frac{3.5}{2}\times\frac{3.5}{2}$ $1+\frac{1}{2}+\frac{1}{2}$

= 225.42 cm^2. 1

13. Using Mid Point formula

coordinates of point B are (2, 1) $\frac{1}{2}$

and coordinates of point C are (0, 3). $\frac{1}{2}$

Area $\Delta ABC = \frac{1}{2}[0+2(3+1)+0] = 4$ sq u. 1

Coordinates of point F are (1, 2)

Area of $\Delta DEF = \frac{1}{2}|1(1-2)+0+1(0-1)| = 1$ sq u. 1

14. $\angle POQ = 60^\circ$ $\frac{1}{2}$

Area of segment PAQM = $\left(\frac{100\pi}{6}-\frac{100\sqrt{3}}{4}\right)cm^2$. 1

Area of semicircle = $\frac{25\pi}{2}cm^2$ $\frac{1}{2}$

Area of shaded region = $\frac{25\pi}{2}-\left(\frac{50\pi}{3}-25\sqrt{3}\right)$.

= $25\left(\sqrt{3}-\frac{\pi}{6}\right)cm^2$. 1

15. $S_7 = 49 \Rightarrow 2a + 6d = 14$ $\frac{1}{2}$

$S_{17} = 289 \Rightarrow 2a + 16d = 34$ $\frac{1}{2}$

Solving equations to get a = 1 and d = 2 1

Hence $Sn = \frac{n}{2}[2+(n-1)2] = n^2$. 1

16. $2x(2x + 3) + (x - 3) + (3x + 9) = 0$ 1

$\Rightarrow \quad 2x^2 + 5x + 3 = 0$ 1

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

$\Rightarrow \quad x = -1, \; x = -\frac{3}{2}$ $\frac{1}{2}$

17. Volume of earth dug out = $\pi \times 2 \times 2 \times 21 = 264 \text{ m}^3$ 1

Volume of embankment = $\pi (25 - 4) \times h = 66 \text{ h m}^3$ 1

$\therefore \quad 66h = 264$ $\frac{1}{2}$

$\Rightarrow \quad h = 4 \text{ m}$ $\frac{1}{2}$

18. Here $r + h = 37$ and $2\pi r(r + h) = 1628$ $\frac{1}{2}+\frac{1}{2}$

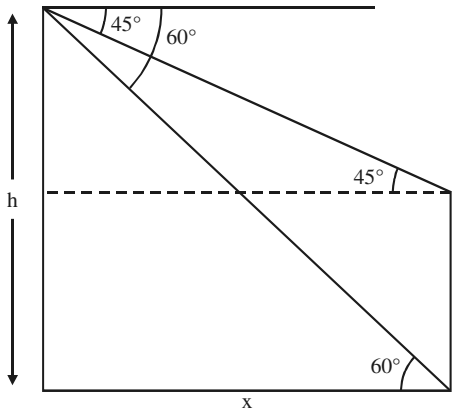
$\Rightarrow \quad 2\pi r = \frac{1628}{37}$

$\Rightarrow \quad r = 7 \text{ cm}$ $\frac{1}{2}$

and $h = 30 \text{ cm}$. $\frac{1}{2}$

Hence volume of cylinder = $\frac{22}{7}\times 7\times 7\times 30 = 4620 \text{ cm}^3$ 1

19.



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

$\tan 45° = \frac{h-50}{x} \Rightarrow x = h - 50$ $\frac{1}{2}$

$\tan 60° = \frac{h}{x} \Rightarrow x = \frac{h}{\sqrt{3}}$ $\frac{1}{2}$

Hence $h - 50 = \frac{h}{\sqrt{3}}$ $\frac{1}{2}$

$\Rightarrow h = 75 + 25\sqrt{3} = 118.25$ m. 1

20. (i) Favourable outcomes are (2, 2) (2, 3) (2, 5) (3, 2) (3, 3) (3, 5) (5, 2) (5, 3) (5, 5)

i.e. 9 outcomes. 1

P(a prime number on each die) = $\frac{9}{36}$ or $\frac{1}{4}$ $\frac{1}{2}$

(ii) Favourable outcomes are (3, 6) (4, 5) (5, 4) (6, 3) (5, 6) (6, 5)

i.e. 6 outcomes 1

P(a total of 9 or 11) = $\frac{6}{36}$ or $\frac{1}{6}$ $\frac{1}{2}$

SECTION D

21. Let the usual speed of plane be x km/h.

$\therefore \quad \frac{1500}{x} - \frac{1500}{x+250} = \frac{1}{2}$ 2

$\Rightarrow \quad x^2 + 250x - 750000 = 0$

$(x + 1000)(x - 750) = 0 \Rightarrow x = 750$

Speed of plane = 750 km/h. 1

For writing value 1

22. For correct Given, To prove, construction and figure $\frac{1}{2} \times 4 = 2$

Correct proof 2

23. Construction of tangent 3

Length of tangent 1

24. $PT = \sqrt{169 - 25} = 12\text{cm}$ and TE = 8 cm $\frac{1}{2} + \frac{1}{2}$

Let PA = AE = x

$PA^2 = TE^2 + EA^2$ 1

$\Rightarrow \quad (12 - x)^2 = 64 + x^2$

$\Rightarrow \quad x = 3.3$ cm. 1

Thus AB = 6.6 cm. 1

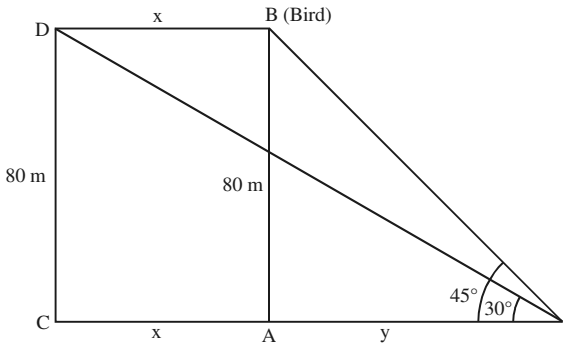
25. $a(x - b)(x - c) + b(x - a)(x - c) = 2c(x - a)(x - b)$ $1\frac{1}{2}$

$x^2(a + b - 2c) + x(-ab - ac - ab - bc + 2ac + 2bc) = 0$

$x^2(a + b - 2c) + x(-2ab + ac + bc) = 0$ $1\frac{1}{2}$

$x = \frac{ac + bc - 2ab}{a + b - 2c}$ 1

26.



Correct Figure 1

$\tan 45° = \frac{80}{y} \Rightarrow y = 80$ $\frac{1}{2}$

$\tan 30° = \frac{80}{x + y} \Rightarrow x + y = 80\sqrt{3}$ $\frac{1}{2}$

$\therefore \quad x = 80(\sqrt{3} - 1) = 58.4$ m. 1

Hence speed of bird = $\frac{58.4}{2} = 29.2$ m/s. 1

27. Let total time be n minutes

Total distance convered by thief = (100 n) metres $\frac{1}{2}$

Total distance covered by policeman = 100 + 110 + 120 + ... + (n – 1) terms $\frac{1}{2}$

$\therefore \quad 100n = \frac{n - 1}{2}[200 + (n - 2)10]$ 1

$n^2 - 3n - 18 = 0$ $\frac{1}{2}$

$(n - 6)(n + 3) = 0$ $\frac{1}{2}$

$\Rightarrow \quad n = 6$ $\frac{1}{2}$

Policeman took 5 minutes to catch the thief. $\frac{1}{2}$

28. Area of the triangle $= \frac{1}{2}\left|t(t+2-t)+(t+2)(t-t+2)+(t+3)(t-2-t-2)\right|$ 2

$= \frac{1}{2}[2t+2t+4-4t-12]$ 1

$= 4$ sq. units

which is independent of t. 1

29. (i) Favourable outcomes are 1, 3, 5, 7 i.e. 4 outcomes. 1

$\therefore$ P(an odd number) $= \frac{4}{8}$ or $\frac{1}{2}$ $\frac{1}{2}$

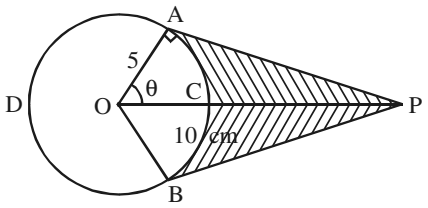
(ii) Favourable outcomes are 4, 5, 6, 7, 8 i.e. 5 outcomes 1

P(a number greater than 3) $= \frac{5}{8}$ $\frac{1}{2}$

(iii) Favarouble outcomes are 1, 2, 3...8

P(a number less than 9) $= \frac{8}{8} = 1$ 1

30.



$\cos\theta = \frac{1}{2} \Rightarrow \theta = 60°$ $\frac{1}{2}$

Reflex $\angle AOB = 240°$ $\frac{1}{2}$

$\therefore \quad \overset{\frown}{ADB} = \frac{2\times 3.14\times 5\times 240}{360} = 20.93$ cm 1

Hence length of elastic in contact = 20.93 cm

Now, AP = $5\sqrt{3}$ cm

Area $(\Delta OAP + \Delta OBP) = 25\sqrt{3} = 43.25$ cm^2 $\frac{1}{2}$

Area of sector OACB = $\frac{25\times 3.14\times 120}{360} = 26.16$ cm^2 $\frac{1}{2}$

Shaded Area = 43.25 – 26.16 = 17.09 cm^2 1

31. Here R = 20, r = 12, V = 12308.8

Therefore $12308.8 = \frac{1}{3} \times 3.14(400 + 240 + 144)h$ 1

$\Rightarrow$ h = 15 cm $\frac{1}{2}$

$l = \sqrt{(20-12)^2 + 15^2} = 17$ cm $\frac{1}{2}$

Total area of metal sheet used = CSA + base area

$= \pi[(20 + 12) \times 17 + 12 \times 12]$ 1

$= 2160.32$ cm^2 1

QUESTION PAPER CODE 30/1/2

EXPECTED ANSWER/VALUE POINTS

SECTION A

1. Possible outcomes are 4, 9, 16, 25, 36, 49, i.e. 6. $\frac{1}{2}$

$\therefore$ P(perfect square number) = $\frac{6}{48}$ or $\frac{1}{8}$ $\frac{1}{2}$

2. DB = 3.46 m $\frac{1}{2}$

$\therefore$ DC = 4 m $\frac{1}{2}$

3. l = 185, d = –4 $\frac{1}{2}$

l_9 = 153 $\frac{1}{2}$

4. $\angle APB = 80^\circ$ $\frac{1}{2}$

$\therefore$ $\angle AOB = 100^\circ$ $\frac{1}{2}$

SECTION B

5. Let the point P be (2y, y) $\frac{1}{2}$

PQ = PR $\Rightarrow$ $\sqrt{(2y-2)^2+(y+5)^2} = \sqrt{(2y+3)^2+(y-6)^2}$ $\frac{1}{2}$

Solving to get y = 8 $\frac{1}{2}$

Hence coordinates of point P are (16, 8). $\frac{1}{2}$

6. Let AD = AF = x

$\therefore$ DB = BE = 12 – x

and CF = CE = 10 – x

BC = BE + EC $\Rightarrow$ 8 = 12 – x + 10 – x

$\Rightarrow$ x = 7 1

$\therefore$ AD = 7 cm, BE = 5 cm, CF = 3 cm 1

7. PA = PB $\frac{1}{2}$

$\Rightarrow$ $\angle PAB = \angle PBA = 60°$ $\frac{1}{2}$

$\therefore$ ΔPAB is an equilateral triangle. $\frac{1}{2}$

Hence AB = PA = 5 cm. $\frac{1}{2}$

8. $\frac{-7}{a} = \frac{2}{3} - 3$

$\Rightarrow$ a = 3 1

and $\frac{b}{a} = \frac{2}{3} \times (-3)$

$\Rightarrow$ b = – 6 1

9. Let the point on y-axis be (0, y) and AP: PB = K : 1 $\frac{1}{2}$

Therefore $\frac{5-k}{k+1} = 0$ gives k = 5

Hence required ratio is 5 : 1. $\frac{1}{2}$

$y = \frac{-4(5)-6}{6} = \frac{-13}{3}$ $\frac{1}{2}$

Hence point on y-axis is $\left(0, \frac{-13}{3}\right)$. $\frac{1}{2}$

10. Here a = 27, d = – 3, Sn = 0 $\frac{1}{2}$

$\therefore$ 54 + (n – 1) (–3) = 0 1

$\Rightarrow$ n = 19 $\frac{1}{2}$

SECTION C

11. $S_7 = 49 \Rightarrow 2a + 6d = 14$ $\frac{1}{2}$

$S_{17} = 289 \Rightarrow 2a + 16d = 34$ $\frac{1}{2}$

Solving equations to get a = 1 and d = 2 1

Hence $Sn = \frac{n}{2}[2+(n-1)2] = n^2$. 1

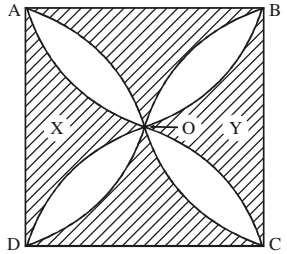
12. Volume of earth dug out = $\pi \times 2 \times 2 \times 21 = 264\ m^3$ 1

Volume of embankment = $\pi\ (25 - 4) \times h = 66\ h\ m^3$ 1

$\therefore \quad 66h = 264$ $\frac{1}{2}$

$\Rightarrow \quad h = 4\ m$ $\frac{1}{2}$

13.



Area of square = $196\ cm^2$ $\frac{1}{2}$

Area of semicircles AOB + DOC = $\frac{22}{7}\times 49 = 154\ cm^2$ $\frac{1}{2}$

Hence area of two shaded parts (X + Y) = 196 – 154 = $42\ cm^2$ 1

Therefore area of four shaded parts = $84\ cm^2$. 1

14. Surface area of block = $216 - \frac{22}{7}\times\frac{3.5}{2}\times\frac{3.5}{2} + 2\times\frac{22}{7}\times\frac{3.5}{2}\times\frac{3.5}{2}$ $1+\frac{1}{2}+\frac{1}{2}$

$= 225.42\ cm^2$. 1

15. Using Mid Point formula

coordinates of point B are (2, 1) $\frac{1}{2}$

and coordinates of point C are (0, 3). $\frac{1}{2}$

Area $\Delta ABC = \frac{1}{2}[0 + 2(3+1) + 0] = 4$ sq u. 1

Coordinates of point F are (1, 2)

Area of $\Delta DEF = \frac{1}{2}|1(1-2) + 0 + 1(0-1)| = 1$ sq u. 1

16. $\angle POQ = 60^\circ$ $\frac{1}{2}$

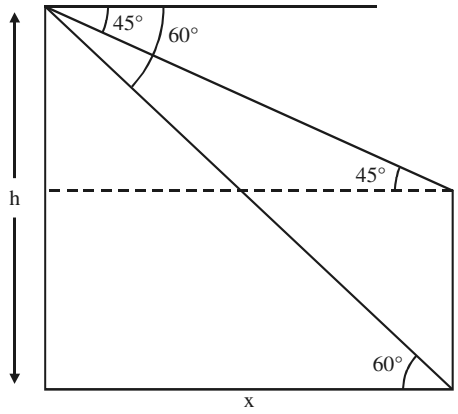
Area of segment PAQM = $\left(\frac{100\pi}{6} - \frac{100\sqrt{3}}{4}\right)\text{cm}^2$. 1

Area of semicircle = $\frac{25\pi}{2}\text{cm}^2$ $\frac{1}{2}$

Area of shaded region = $\frac{25\pi}{2} - \left(\frac{50\pi}{3} - 25\sqrt{3}\right)$.

$= 25\left(\sqrt{3} - \frac{\pi}{6}\right)\text{cm}^2$. 1

17.



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

$\tan 45^\circ = \frac{h-50}{x} \Rightarrow x = h - 50$ $\frac{1}{2}$

$\tan 60^\circ = \frac{h}{x} \Rightarrow x = \frac{h}{\sqrt{3}}$ $\frac{1}{2}$

Hence $h - 50 = \frac{h}{\sqrt{3}}$ $\frac{1}{2}$

$\Rightarrow h = 75 + 25\sqrt{3} = 118.25$ m. 1

18. $\frac{x^2+3x+2+x^2-3x+2}{x^2+x-2} = \frac{4x-8-2x-3}{x-2}$ 1

$(2x^2 + 4)(x - 2) = (2x - 11)(x^2 + x - 2)$

$\Rightarrow \quad 5x^2 + 19x - 30 = 0$ 1

$\Rightarrow \quad (5x - 6)(x + 5) = 0$ $\frac{1}{2}$

$\Rightarrow \quad x = -5, 6/5$ $\frac{1}{2}$

19. (i) Favourable outcomes are (4, 5)(4, 4)(4, 6)(5, 4)(5, 5)(5, 5)(5, 6)(6, 4)(6, 5)(6, 6)

i.e., 9 outcomes 1

P(a number > 3 on each die) = $\frac{9}{36}$ or $\frac{1}{4}$ $\frac{1}{2}$

(ii) Favourable outcomes are (1, 5)(2, 4)(3, 3)(4, 2)(5, 1)(1, 6)(2, 5)(3, 4)(4, 3)(5, 2)(6, 1)

i.e. 11 outcomes 1

P(a total of 6 to 7) = $\frac{11}{36}$ $\frac{1}{2}$

20. Here r = 3, $\pi r l = 47.1$

$\therefore \quad l = \frac{47.1}{3 \times 3.14} = 5\text{ cm}$ 1

$h = \sqrt{5^2 - 3^2} = 4\text{ cm}$ $\frac{1}{2}$

Volume of cone = $\frac{1}{3} \times 3.14 \times 3 \times 3 \times 4$ $\frac{1}{2}$

$= 37.68\ \text{cm}^3$ 1

SECTION D

21. Let the usual speed of plane be x km/h.

$\therefore \quad \frac{1500}{x} - \frac{1500}{x+250} = \frac{1}{2}$ 2

$\Rightarrow \quad x^2 + 250x - 750000 = 0$

$(x + 1000)(x - 750) = 0 \Rightarrow x = 750$

Speed of plane = 750 km/h. 1

For writing value 1

22. $PT = \sqrt{169 - 25} = 12\text{cm}$ and TE = 8 cm $\frac{1}{2} + \frac{1}{2}$

Let PA = AE = x

$TA^2 = TE^2 + EA^2$ 1

$\Rightarrow \quad (12 - x)^2 = 64 + x^2$

$\Rightarrow \quad x = 3.3$ cm. 1

Thus AB = 6.6 cm. 1

23. For correct Given, To prove, construction and figure $\frac{1}{2} \times 4 = 2$

Correct proof 2

24. Area of the triangle $= \frac{1}{2}\left|t(t+2-t)+(t+2)(t-t+2)+(t+3)(t-2-t-2)\right|$ 2

$= \frac{1}{2}[2t+2t+4-4t-12]$ 1

$= 4$ sq. units

which is independent of t. 1

25. (i) Favourable outcomes are 1, 3, 5, 7 i.e. 4 outcomes. 1

$\therefore$ P(an odd number) $= \frac{4}{8}$ or $\frac{1}{2}$ $\frac{1}{2}$

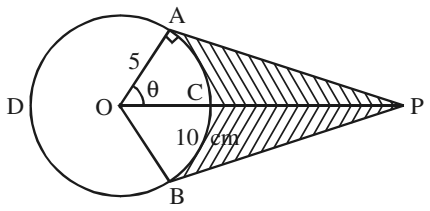
(ii) Favourable outcomes are 4, 5, 6, 7, 8 i.e. 5 outcomes 1

P(a number greater than 3) $= \frac{5}{8}$ $\frac{1}{2}$

(iii) Favarouble outcomes are 1, 2, 3...8

P(a number less than 9) $= \frac{8}{8} = 1$ 1

26.



$\cos\theta = \frac{1}{2} \Rightarrow \theta = 60°$ $\frac{1}{2}$

Reflex $\angle AOB = 240°$ $\frac{1}{2}$

$\therefore \quad \overset{\frown}{ADB} = \frac{2\times 3.14\times 5\times 240}{360} = 20.93$ cm 1

Hence length of elastic in contact = 20.93 cm

Now, AP $= 5\sqrt{3}$ cm

Area $(\Delta OAP + \Delta OBP) = 25\sqrt{3} = 43.25\ \text{cm}^2$ $\frac{1}{2}$

Area of sector OACB $= \frac{25\times 3.14\times 120}{360} = 26.16\ \text{cm}^2$ $\frac{1}{2}$

Shaded Area = 43.25 – 26.16 = 17.09 cm^2 1

27. Here R = 20, r = 12, V = 12308.8

Therefore $12308.8 = \frac{1}{3}\times 3.14(400+240+144)h$ 1

$\Rightarrow$ h = 15 cm $\frac{1}{2}$

$l = \sqrt{(20-12)^2 + 15^2} = 17 \text{ cm}$ $\frac{1}{2}$

Total area of metal sheet used = CSA + base area

$= \pi[(20 + 12) \times 17 + 12 \times 12]$ 1

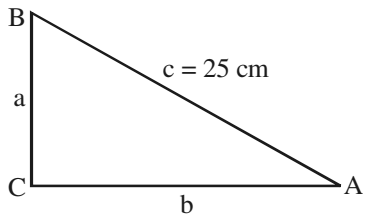
$= 2160.32 \text{ cm}^2$ 1

28. This question contains surplus data which does not lead to a unique solution.

Hence 4 marks should be given to every student. 4

29. Correct contruction

30.



Here a + b + c = 60, c = 25

$\therefore$ a + b = 35 1

Using Pythagorus theorem

$a^2 + b^2 = 625$

Using identity $(a + b)^2 = a^2 + b^2 + 2ab$ 1

$(35)^2 = 625 + 2ab$

$\Rightarrow$ ab = 300 1

Area of $\Delta ABC = 150 \text{ cm}^2$ 1

31. Let total time be n minutes

Total distance covered by thief = (50 n) metres $\frac{1}{2}$

Total distance covered by policeman = 60 + 65 + 70 + ... + (n – 2) terms $\frac{1}{2}$

$\therefore \quad 50n = \frac{n-2}{2}[120 + (n-3)5]$ 1

$\Rightarrow \quad n^2 - n - 42 = 0$ $\frac{1}{2}$

$(n - 7)(n + 6) = 0$ $\frac{1}{2}$

$\therefore \quad n = 7$ $\frac{1}{2}$

Policeman took 5 minutes to catch the thief. $\frac{1}{2}$

QUESTION PAPER CODE 30/1/3

EXPECTED ANSWER/VALUE POINTS

SECTION A

1. $l = 185$, d = –4 $\frac{1}{2}$

$l_9 = 153$ $\frac{1}{2}$

2. Possible outcomes are 4, 9, 16, 25, 36, 49, i.e. 6. $\frac{1}{2}$

$\therefore$ P(perfect square number) = $\frac{6}{48}$ or $\frac{1}{8}$ $\frac{1}{2}$

3. $\angle APB = 80^\circ$ $\frac{1}{2}$

$\therefore$ $\angle AOB = 100^\circ$ $\frac{1}{2}$

4. DB = 3.46 m $\frac{1}{2}$

$\therefore$ DC = 4 m $\frac{1}{2}$

SECTION B

5. Let the point on y-axis be (0, y) and AP: PB = K : 1 $\frac{1}{2}$

Therefore $\frac{5-k}{k+1} = 0$ gives k = 5

Hence required ratio is 5 : 1. $\frac{1}{2}$

$y = \frac{-4(5)-6}{6} = \frac{-13}{3}$ $\frac{1}{2}$

Hence point on y-axis is $\left(0, \frac{-13}{3}\right)$. $\frac{1}{2}$

6. $\frac{-7}{a} = \frac{2}{3} - 3$

$\Rightarrow$ a = 3 1

and $\frac{b}{a} = \frac{2}{3} \times (-3)$

$\Rightarrow$ b = – 6 1

7. Let the point P be (2y, y) $\frac{1}{2}$

PQ = PR $\Rightarrow \sqrt{(2y-2)^2 + (y+5)^2} = \sqrt{(2y+3)^2 + (y-6)^2}$ $\frac{1}{2}$

Solving to get y = 8 $\frac{1}{2}$

Hence coordinates of point P are (16, 8). $\frac{1}{2}$

8. Let AD = AF = x

$\therefore$ DB = BE = 12 – x

and CF = CE = 10 – x

BC = BE + EC $\Rightarrow$ 8 = 12 – x + 10 – x

$\Rightarrow$ x = 7 1

$\therefore$ AD = 7 cm, BE = 5 cm, CF = 3 cm 1

9. PA = PB $\frac{1}{2}$

$\Rightarrow$ $\angle$PAB = $\angle$PBA = 60° $\frac{1}{2}$

$\therefore$ ΔPAB is an equilateral triangle. $\frac{1}{2}$

Hence AB = PA = 5 cm. $\frac{1}{2}$

10. Here a = 65, d = –5, Sn = 0 $\frac{1}{2}$

130 + (n –1) (– 5) = 0 1

$\Rightarrow$ n = 27 $\frac{1}{2}$

SECTION C

11. Volume of earth dug out = $\pi \times 2 \times 2 \times 21 = 264\ m^3$ 1

Volume of embankment = $\pi\ (25 - 4) \times h = 66\ h\ m^3$ 1

$\therefore \quad 66h = 264$ $\frac{1}{2}$

$\Rightarrow \quad h = 4\ m$ $\frac{1}{2}$

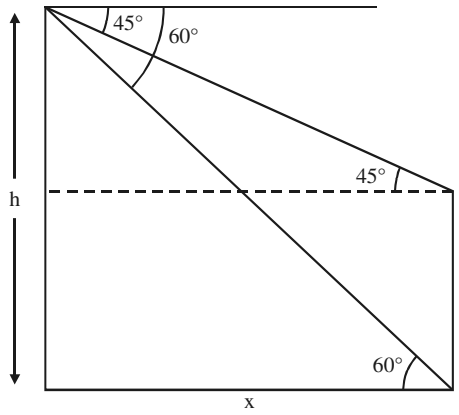
12. $S_7 = 49 \Rightarrow 2a + 6d = 14$ $\frac{1}{2}$

$S_{17} = 289 \Rightarrow 2a + 16d = 34$ $\frac{1}{2}$

Solving equations to get a = 1 and d = 2 1

Hence $Sn = \frac{n}{2}[2+(n-1)2] = n^2$. 1

13.



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

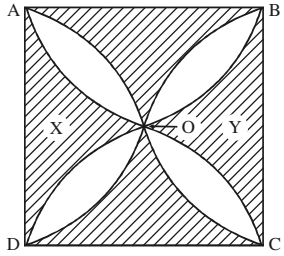
$\tan 45° = \frac{h-50}{x} \Rightarrow x = h - 50$ $\frac{1}{2}$

$\tan 60° = \frac{h}{x} \Rightarrow x = \frac{h}{\sqrt{3}}$ $\frac{1}{2}$

Hence $h - 50 = \frac{h}{\sqrt{3}}$ $\frac{1}{2}$

$\Rightarrow\ h = 75 + 25\sqrt{3} = 118.25$ m. 1

14.



Area of square = 196 cm^2 $\frac{1}{2}$

Area of semicircles AOB + DOC = $\frac{22}{7} \times 49 = 154\ cm^2$ $\frac{1}{2}$

Hence area of two shaded parts (X + Y) = 196 – 154 = 42 cm^2 1

Therefore area of four shaded parts = 84 cm^2. 1

15. Surface area of block = $216 - \frac{22}{7} \times \frac{3.5}{2} \times \frac{3.5}{2} + 2 \times \frac{22}{7} \times \frac{3.5}{2} \times \frac{3.5}{2}$ $1 + \frac{1}{2} + \frac{1}{2}$

= 225.42 cm^2. 1

16. Using Mid Point formula

coordinates of point B are (2, 1) $\frac{1}{2}$

and coordinates of point C are (0, 3). $\frac{1}{2}$

Area $\Delta ABC = \frac{1}{2}[0+2(3+1)+0] = 4$ sq u. 1

Coordinates of point F are (1, 2)

Area of $\Delta DEF = \frac{1}{2}|1(1-2)+0+1(0-1)| = 1$ sq u. 1

17. $\angle POQ = 60^\circ$ $\frac{1}{2}$

Area of segment PAQM $= \left(\frac{100\pi}{6} - \frac{100\sqrt{3}}{4}\right)\text{cm}^2$. 1

Area of semicircle $= \frac{25\pi}{2}\text{cm}^2$ $\frac{1}{2}$

Area of shaded region $= \frac{25\pi}{2} - \left(\frac{50\pi}{3} - 25\sqrt{3}\right)$.

$= 25\left(\sqrt{3} - \frac{\pi}{6}\right)\text{cm}^2$. 1

18. (i) Number of good shirts = 88 1

P(Ramesh buys the shirt) $= \frac{88}{100}$ or $\frac{22}{25}$ $\frac{1}{2}$

(ii) Number of shirts without Major defect = 96 1

P(Kewal buys a shirt) $= \frac{96}{100}$ or $\frac{24}{25}$ $\frac{1}{2}$

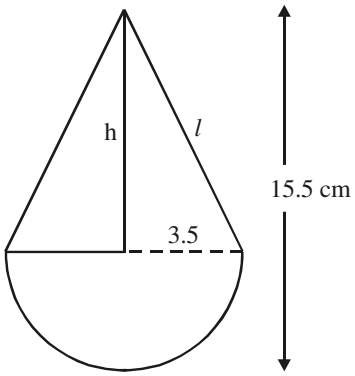
19. $x^2 + \frac{a}{a+b}x + \frac{a+b}{a}x + 1 = 0$

$x\left(x + \frac{a}{a+b}\right) + \frac{a+b}{a}\left(x + \frac{a}{a+b}\right) = 0$ 1

$\left(x + \frac{a}{a+b}\right)\left(x + \frac{a+b}{a}\right) = 0$ 1

$\Rightarrow x = \frac{-a}{a+b}, \frac{-(a+b)}{a}$ 1

20.



$h = 15.5 - 3.5 = 12$ cm $\frac{1}{2}$

$l = \sqrt{144 + 12.25} = 12.5$ cm $\frac{1}{2}$

TSA . $\pi rl + 2\pi r^2$

$= \frac{22}{7} \times 3.5 \times 12.5 + 2 \times \frac{22}{7} \times 3.5 \times 3.5$ 1

$= 137.5 + 77$

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

SECTION D

21. Let the usual speed of plane be x km/h.

$\therefore \quad \frac{1500}{x} - \frac{1500}{x+250} = \frac{1}{2}$ 2

$\Rightarrow \quad x^2 + 250x - 750000 = 0$

$(x + 1000)(x - 750) = 0 \Rightarrow x = 750$

Speed of plane = 750 km/h. 1

For writing value 1

22. $PT = \sqrt{169 - 25} = 12\text{cm}$ and TE = 8 cm $\frac{1}{2} + \frac{1}{2}$

Let PA = AE = x

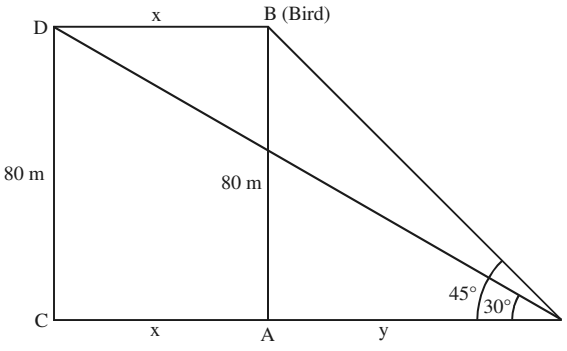
$TA^2 = TE^2 + EA^2$ 1

$\Rightarrow \quad (12 - x)^2 = 64 + x^2$

$\Rightarrow \quad x = 3.3$ cm. 1

Thus AB = 6.6 cm. 1

23.



Correct Figure 1

$\tan 45° = \frac{80}{y} \Rightarrow y = 80$ $\frac{1}{2}$

$\tan 30° = \frac{80}{x+y} \Rightarrow x + y = 80\sqrt{3}$ $\frac{1}{2}$

$\therefore \quad x = 80(\sqrt{3} - 1) = 58.4$ m. 1

Hence speed of bird = $\frac{58.4}{2} = 29.2$ m/s. 1

24. (i) Favourable outcomes are 1, 3, 5, 7 i.e. 4 outcomes. 1

$\therefore$ P(an odd number) = $\frac{4}{8}$ or $\frac{1}{2}$ $\frac{1}{2}$

(ii) Favourable outcomes are 4, 5, 6, 7, 8 i.e. 5 outcomes 1

P(a number greater than 3) = $\frac{5}{8}$ $\frac{1}{2}$

(iii) Favarouble outcomes are 1, 2, 3...8

P(a number less than 9) = $\frac{8}{8}=1$ 1

25. Area of the triangle $=\frac{1}{2}\left|t(t+2-t)+(t+2)(t-t+2)+(t+3)(t-2-t-2)\right|$ 2

$= \frac{1}{2}[2t+2t+4-4t-12]$ 1

= 4 sq. units

which is independent of t. 1

26. Here R = 20, r = 12, V = 12308.8

Therefore $12308.8 = \frac{1}{3}\times 3.14(400+240+144)h$ 1

$\Rightarrow$ h = 15 cm $\frac{1}{2}$

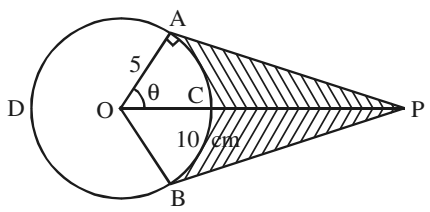
$l=\sqrt{(20-12)^2+15^2}=17$ cm $\frac{1}{2}$

Total area of metal sheet used = CSA + base area

$= \pi[(20 + 12) \times 17 + 12 \times 12]$ 1

= 2160.32 cm^2 1

27.



$\cos\theta=\frac{1}{2}\Rightarrow\theta=60°$ $\frac{1}{2}$

Reflex $\angle AOB = 240°$ $\frac{1}{2}$

$\therefore \quad \overset{\frown}{ADB}=\frac{2\times 3.14\times 5\times 240}{360}=20.93$ cm 1

Hence length of elastic in contact = 20.93 cm

Now, AP = $5\sqrt{3}$ cm

Area $(\Delta OAP + \Delta OBP) = 25\sqrt{3} = 43.25\ cm^2$ $\frac{1}{2}$

Area of sector OACB = $\frac{25 \times 3.14 \times 120}{360} = 26.16\ cm^2$ $\frac{1}{2}$

Shaded Area = 43.25 – 26.16 = 17.09 cm^2 1

28. Let the three numbers in A.P. be a – d, a, a + d.

$3a = 12 \Rightarrow a = 4$. 1

Also $(4 - d)^3 + 4^3 + (4 + d)^3 = 288$ 1

$\Rightarrow \quad 64 - 48d + 12d^2 - d^3 + 64 + 64 + 48d + 12d^2 + d^3 = 288$

$\Rightarrow \quad 24d^2 + 192 = 288$

$\Rightarrow \quad d^2 = 4$

$d = \pm 2$ 1

The numbers are 2, 4, 6, or 6, 4, 2. 1

29. For correct Given, To prove, construction, figure $4 \times \frac{1}{2} = 2$

Correct Proof 2

30. Let the speed while going be x km/h

Therefore $\frac{150}{x} - \frac{150}{x+10} = \frac{5}{2}$ 2

$\Rightarrow \quad x^2 + 10x - 600 = 0$

$\Rightarrow \quad (x + 30)(x - 20) = 0$

$\Rightarrow \quad x = 20$ 1

$\therefore$ Speed while going = 20 km/h $\frac{1}{2}$

and speed while returning = 30 km/hr $\frac{1}{2}$

31. Correct Construction 4