QUESTION PAPER CODE 30/5/3
EXPECTED ANSWER/VALUE POINTS
SECTION A

1. $15 + (n - 1)(-3) = 0$ $\frac{1}{2}$

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

2. $\sin 30° + \cos y = 1$

$\cos y = \frac{1}{2}$ $\frac{1}{2}$

$\Rightarrow y = 60°$ $\frac{1}{2}$

OR

$\cos 48° - \sin 42°$

$= \cos 48° - \cos (90° - 42°)$ $\frac{1}{2}$

$= 0$ $\frac{1}{2}$

3. 5 : 11 1

4. a.b = 1000 1

5. $k(2)^2 + 2(2) - 3 = 0$ $\frac{1}{2}$

$k = -\frac{1}{4}$ $\frac{1}{2}$

OR

For real and equal roots

$k^2 - 4 \times 3 \times 3 = 0$ $\frac{1}{2}$

$k = \pm 6$ $\frac{1}{2}$

6. $(x - 9)^2 + (2 - 8)^2 = 100$ $\frac{1}{2}$

$(x - 9)^2 = 64$

$x - 9 = \pm 8$

$x = 17, \quad x = 1$ $\frac{1}{2}$

SECTION B

7. (i) P (getting A) = $\frac{3}{6}$ or $\frac{1}{2}$ 1

(ii) P (getting B) = $\frac{2}{6}$ or $\frac{1}{3}$ 1

8. $612 = 2^2 \times 3^2 \times 17$ $\frac{1}{2}$

$1314 = 2 \times 3^2 \times 73$ $\frac{1}{2}$

HCF (612, 1314) = $2 \times 3^2 = 18$ 1

OR

Let a be any +ve integer

and b = 6

$\Rightarrow a = 6m + r \quad 0 \le r < 6$, for any +ve integer m 1

Possible forms of 'a' are

6m, 6m + 1, 6m + 2, 6m + 3, 6m + 4, 6m + 5 $\frac{1}{2}$

Out of which 6m, 6m + 2 and 6m + 4 are even.

Hence, any +ve odd integer can be 6m + 1, 6m + 3 or 6m + 5 $\frac{1}{2}$

9. For infinitely many solutions

$\frac{2}{k-1} = \frac{3}{k+2} = \frac{7}{3k}$ 1

$2k + 4 = 3k - 3; \quad 9k = 7k + 14$

$k = 7 \quad\quad k = 7$

Hence k = 7 1

10. $a_1 = S_1 = 2(1)^2 + 1 = 3$ $\frac{1}{2}$

$a_2 = S_2 - S_1 = 10 - 3 = 7$ $\frac{1}{2}$

AP 3, 7 ..., $\Rightarrow d = 4$

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

OR

$a_{17} = a_{10} + 7$ $\frac{1}{2}$

$a + 16d = a + 9d + 7$ $\frac{1}{2}$

$d = 1$ 1

11. $\frac{2a - 2}{2} = 1$

$\Rightarrow\ a = 2$ 1

$\frac{4 + 3b}{2} = 2a + 1$

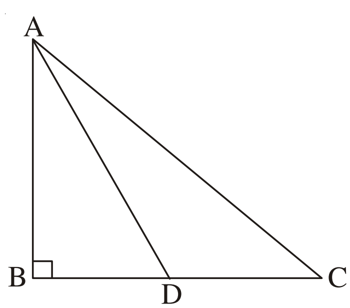
$\Rightarrow\ b = 2$ 1

12. Mean $= \frac{50}{10} = 5$ 1

$P(5) = \frac{2}{10} = \frac{1}{5}$ 1

SECTION C

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



ΔABC is right angled at B

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

$AC^2 = AB^2 + (2CD)^2$

$AC^2 - 4CD^2 = AB^2$ ...(1) 1

ΔABD is right angled at B,

$\therefore\ AD^2 - BD^2 = AB^2$ ...(2) $\frac{1}{2}$

By (1) & (2) $AC^2 - 4CD^2 = AD^2 - BD^2$ $\frac{1}{2}$

$AC^2 = AD^2 - CD^2 + 4CD^2 = AD^2 + 3CD^2$ ($\because$ BD = CD) $\frac{1}{2}$

OR

$AB = AC \Rightarrow \angle C = \angle B$ ...(1) 1

In ΔABD & ΔECF,

$\angle ADB = \angle EFC$ (each 90°)

$\angle ABD = \angle ECF$ (by (1)) 1

By AA similarity

$\Delta ABD \sim \Delta ECF$ 1

14. Area of shaded region $= \frac{80°}{360°}\pi(7)^2 + \frac{40°}{360°}\pi(7)^2 + \frac{60°}{360°}\pi(7)^2$ $1\frac{1}{2}$

$= \frac{22}{7} \times 7 \times 7 \left[\frac{180°}{360°}\right]$ 1

$= 77 \text{ cm}^2$ $\frac{1}{2}$

15. Apparent capacity $= \pi r^2 h$

$= 3.14 \times \frac{5}{2} \times \frac{5}{2} \times 10$ 1

$= 196.25 \text{ cm}^3$ $\frac{1}{2}$

Actual capacity $= 196.25 - \frac{2}{3} \times 3.14 \times \frac{5}{2} \times \frac{5}{2} \times \frac{5}{2}$ 1

$= 196.25 - 32.71$

$= 163.54 \text{ cm}^3$ $\frac{1}{2}$

OR

$\pi(18)^2 \times 32 = \frac{1}{3}\pi r^2 \times 24$ 1

$r^2 = (18)^2 \times 4$

$r = 36$ cm 1

$l^2 = (36)^2 + (24)^2$

$l^2 = 1872$

$l = 43.2$ cm 1

16. Given $\sqrt{2}$ and $-\sqrt{2}$ are zeroes of given polynomial.

$\therefore$ $(x-\sqrt{2})$ and $(x+\sqrt{2})$ are two factors i.e. $x^2 - 2$ is a factor $\frac{1}{2}$

$$
\begin{array}{r|l}
x^2-2 & x^4 + x^3 - 14x^2 - 2x + 24 \;\; (x^2 + x - 12 \\
 & x^4 \qquad\quad -2x^2 \\
 & - \qquad\qquad + \\
\hline
 & x^3 - 12x^2 - 2x + 24 \\
 & x^3 \qquad\quad -2x \\
 & - \qquad\qquad + \\
\hline
 & -12x^2 + 24 \\
 & -12x^2 + 24 \\
 & + \qquad - \\
\hline
 & 0
\end{array}
$$

$1\frac{1}{2}$

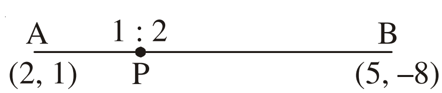
$x^2 + x - 12 = x^2 + 4x - 3x - 12$

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

$\therefore$ $-4, 3$ are the zeroes.

Hence, all zeroes are $-4, 3, \sqrt{2}, -\sqrt{2}$ $\frac{1}{2}$

17. $\frac{AP}{AB} = \frac{1}{3} \Rightarrow \frac{AP}{PB} = \frac{1}{2}$ 1



Coordinates of P are $\left(\frac{5+4}{3}, \frac{-8+2}{3}\right) = (3, -2)$ 1

Now, P lies on $2x - y + k = 0$

$\therefore \quad 2(3) - (-2) + k = 0$

$\Rightarrow \quad k = -8$ 1

OR

Three points are collinear $\Rightarrow$ area of Δ formed by these points is zero. 1

$\therefore \; \frac{1}{2}[2(-1-3) + p(3-1) - (1+1)] = 0$ 1

$-8 + 2p - 2 = 0$

$p = 5$ 1

18. LHS $= \dfrac{\tan\theta}{1-\tan\theta} - \dfrac{\cot\theta}{1-\cot\theta}$

$$= \dfrac{\frac{\sin\theta}{\cos\theta}}{1-\frac{\sin\theta}{\cos\theta}} - \dfrac{\frac{\cos\theta}{\sin\theta}}{1-\frac{\cos\theta}{\sin\theta}} \qquad 1$$

$$= \dfrac{\sin\theta}{\cos\theta-\sin\theta} + \dfrac{\cos\theta}{\cos\theta-\sin\theta} \qquad 1\frac{1}{2}$$

$$= \dfrac{\sin\theta+\cos\theta}{\cos\theta-\sin\theta} = \text{RHS} \qquad \frac{1}{2}$$

OR

$\sin\theta = (\sqrt{2}-1)\cos\theta$ 1

$(\sqrt{2}+1)\sin\theta = (\sqrt{2}-1)(\sqrt{2}+1)\cos\theta$ 1

$(\sqrt{2}+1)\sin\theta = \cos\theta$

$\Rightarrow \sqrt{2}\sin\theta = \cos\theta - \sin\theta$ 1

Alternate method

$\cos\theta + \sin\theta = \sqrt{2}\cos\theta$

On squaring

$\cos^2\theta + \sin^2\theta + 2\cos\theta\sin\theta = 2\cos^2\theta$ 1

$\sin^2\theta + 2\cos\theta\sin\theta = \cos^2\theta$

$2\cos\theta\sin\theta = \cos^2\theta - \sin^2\theta$ 1

$2\cos\theta\sin\theta = (\cos\theta - \sin\theta)(\cos\theta + \sin\theta)$

$2\cos\theta\sin\theta = (\cos\theta-\sin\theta)(\sqrt{2}\cos\theta)$

$\sqrt{2}\sin\theta = \cos\theta - \sin\theta$ 1

19. Let the fixed charges per student = ₹ x

Cost of food per day per student = ₹ y

$x + 25y = 4500$ 1

x + 30y = 5200 1

On solving 5y = 700

∴ y = 140

x = 1000 1

∴ Fixed charges = ₹ 1000 & cost of food per day ₹ 140

20. Modal class: 26 – 30 $\frac{1}{2}$

$f_1 = 25,\ f_0 = 20,\ f_2 = 22,\ l = 26,\ h = 4$

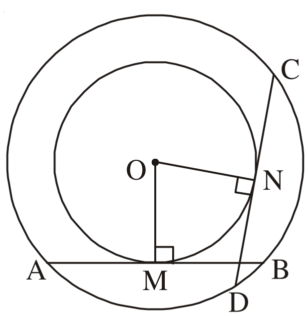
$$\text{Mode} = 26 + \left(\frac{25-20}{50-20-22}\right) \times 4$$ $1\frac{1}{2}$

$$= 26 + \frac{5}{\cancel{8}_2} \times \cancel{4}$$

= 26 + 2.5

= 28.5 1

21.



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

OM = ON (radii of same circle) $\frac{1}{2}$

& OM ⊥ AB
(tangent ⊥ radius)
& ON ⊥ CD 1

Chords equidistant from centre of circle are equal in length

⇒ AB = CD $\frac{1}{2}$

Hence, all chords are equal. $\frac{1}{2}$

22. Let $5-3\sqrt{2}$ be rational

∴ $5-3\sqrt{2} = \frac{p}{q}$, p & q are integers, q ≠ 0, HCF (p, q) = 1 1

$$5-\frac{p}{q} = 3\sqrt{2}$$

$$\frac{15q-p}{3q} = \sqrt{2}$$

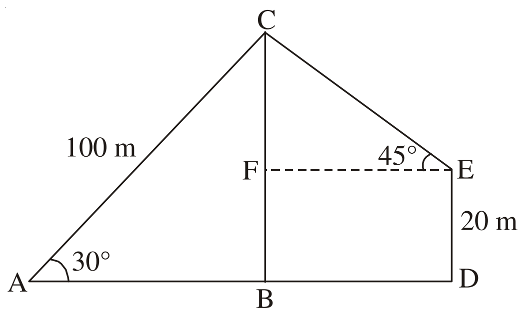
Rational = Irrational $1\frac{1}{2}$

which is a contradiction. $\frac{1}{2}$

Hence, $5-3\sqrt{2}$ is irrational.

SECTION D

23.



Correct Figure 1

In ΔABC

$\sin 30° = \frac{BC}{100}$

$\Rightarrow BC = 50 \text{ m}$ 1

$CF = 50 - 20 = 30 \text{ m}$ $\frac{1}{2}$

In ΔCFE

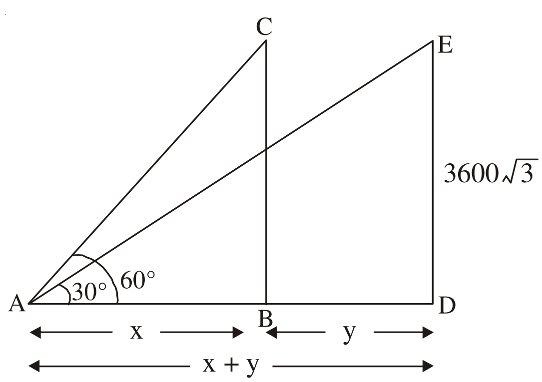
$\sin 45° = \frac{30}{CE}$

$CE = 30\sqrt{2}$ 1

$= 30 \times 1.414$

$= 42.42 \text{ m}$ $\frac{1}{2}$

OR



Correct Figure 1

In ΔABC, $\tan 60° = \frac{3600\sqrt{3}}{x}$

$x = 3600$ 1

In ΔADE, $\tan 30° = \frac{3600\sqrt{3}}{x+y}$

$3600 + y = 3600 \times 3$

$y = 7200$ 1

Speed $= \frac{7200}{30} = 240 \text{ m/s}$ 1

24.

Marks	fi	cf
0–10	10	10
10–20	x	10 + x
20–30	25	35 + x
30–40	30	65 + x
40–50	y	65 + x + y
50–60	10	75 + x + y
Total	100	

Correct Table 1

Median class = 30 – 40 $\frac{1}{2}$

75 + x + y = 100

x + y = 25 $\frac{1}{2}$

$$32 = 30 + \left(\frac{50 - 35 - x}{30}\right) \times 10$$ 1

$$2 = \frac{15 - x}{3}$$

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

y = 16 $\frac{1}{2}$

OR

Class	cf
More than or equal to 0	100
More than or equal to 10	95
More than or equal to 20	80
More than or equal to 30	60
More than or equal to 40	37
More than or equal to 50	20
More than or equal to 60	9

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

Plotting of points (0, 100), (10, 95), (20, 80), (30, 60), (40, 37), (50, 20) and (60, 9) $1\frac{1}{2}$

Joining the points to get curve $\frac{1}{2}$

Median = 35 (approx.) $\frac{1}{2}$

25. LHS $= \dfrac{(1+\cot\theta+\tan\theta)(\sin\theta-\cos\theta)}{\sec^3\theta-\operatorname{cosec}^3\theta}$

$$= \frac{\left(1+\dfrac{\cos\theta}{\sin\theta}+\dfrac{\sin\theta}{\cos\theta}\right)(\sin\theta-\cos\theta)}{\dfrac{1}{\cos^3\theta}-\dfrac{1}{\sin^3\theta}}$$ 1

$$= \frac{\dfrac{(\cos\theta\sin\theta+\cos^2\theta+\sin^2\theta)(\sin\theta-\cos\theta)}{\cos\theta\sin\theta}}{\dfrac{\sin^3\theta-\cos^3\theta}{\cos^3\theta\sin^3\theta}}$$ 1

$$= \frac{\sin^3\theta-\cos^3\theta}{\sin\theta\cos\theta}\times\frac{\cos^3\theta\sin^3\theta}{\sin^3\theta-\cos^3\theta}$$ 1

$= \cos^2\theta\ \sin^2\theta =$ RHS 1

26. $l^2 = (24)^2 + \left(\frac{45}{2} - \frac{25}{2}\right)^2$

$l^2 = 576 + 100 = 676$

$l = 26$ cm 1

$\text{TSA} = \frac{22}{7} \times 26\left(\frac{25}{2} + \frac{45}{2}\right) + \frac{22}{7} \times \frac{25}{2} \times \frac{25}{2}$

$= 2860 + 491.07$

$= 3351.07 \text{ cm}^2$ $1\frac{1}{2}$

$\text{Volume} = \frac{1}{3} \times \frac{22}{7} \times 24\left(\frac{625}{4} + \frac{2025}{4} + \frac{1125}{4}\right)$

$= \frac{1}{\cancel{3}} \times \frac{22}{7} \times \cancel{6}^{2}\ \cancel{24} \times \frac{3775}{\cancel{4}}$

$= \frac{166100}{7} \text{ cm}^3$

or 23728.57 cm^3 $1\frac{1}{2}$

27. Let speed of train be x km/h

$\frac{360}{x} - \frac{360}{x+5} = 1$ 2

$360\left[\frac{x+5-x}{x(x+5)}\right] = 1$

$x^2 + 5x - 1800 = 0$ $\frac{1}{2}$

$(x + 45)(x - 40) = 0$ $\frac{1}{2}$

$x = -45$, $x = 40$ 1
(Rejected)

Hence, speed of train = 40 km/h

OR

$$\frac{1}{a+b+x} - \frac{1}{x} = \frac{1}{a} + \frac{1}{b}$$ 1

$$\frac{x-a-b-x}{x(a+b+x)} = \frac{b+a}{ab}$$

$-ab = x^2 + (a + b)x$

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

$(x + a)\ (x + b) = 0$ 1

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

28. $a_n = \frac{1}{m}$

$a + (n - 1)d = \frac{1}{m}$ $\frac{1}{2}$

$a_m = \frac{1}{n}$

$a + (m - 1)d = \frac{1}{n}$ $\frac{1}{2}$

On solving,

$a = \frac{1}{mn}$ $\frac{1}{2}$

$d = \frac{1}{mn}$ $\frac{1}{2}$

(i) $a_{mn} = \frac{1}{mn} + (mn-1) \times \frac{1}{mn}$

$= \frac{1+mn-1}{mn} = 1$ 1

(ii) $S_{mn} = \frac{mn}{2}\left(\frac{1}{mn} + 1\right)$

$= \frac{1+mn}{2}$ 1

29.	For Correct Given, To prove, Construction, Figure	$4 \times \frac{1}{2} = 2$
	For Correct Proof	2
30.	For Construction of Correct Circle	1
	For Construction of Correct Pair of Tangents	3