QUESTION PAPER CODE 30/5/2
EXPECTED ANSWER/VALUE POINTS

SECTION A

1. 5 : 11 — 1

2. $6 - 3a = 5$ — $\frac{1}{2}$

$a = \frac{1}{3}$ — $\frac{1}{2}$

3. a.b = 1000 — 1

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

$k = -\frac{1}{4}$ — $\frac{1}{2}$

OR

For real and equal roots

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

$k = \pm 6$ — $\frac{1}{2}$

5. $\sin 30° + \cos y = 1$

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

$\Rightarrow y = 60°$ — $\frac{1}{2}$

OR

$\cos 48° - \sin 42°$

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

$= 0$ — $\frac{1}{2}$

6. $a_1 = \sqrt{3}$

$a_2 = \sqrt{12} = 2\sqrt{3}$ — $\frac{1}{2}$

$d = \sqrt{3}$ — $\frac{1}{2}$

SECTION B

7. Total cards = 46 $\frac{1}{2}$

(i) P [Prime number less than 10(5, 7)] = $\frac{2}{46}$ or $\frac{1}{23}$ $\frac{1}{2}$

(ii) P [A number which is perfect square (9, 16, 25, 36, 49)] = $\frac{5}{46}$ 1

8. For infinitely many solutions

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

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

$k = 7$ $k = 7$

Hence $k = 7$ 1

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

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

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

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

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

11. $612 = 2^2 \times 3^2 \times 17$ $\frac{1}{2}$

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

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

OR

Let a be any +ve integer

and b = 6

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

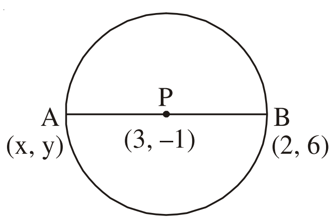
Possible forms of 'a' are

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 $\frac{1}{2}$

12.



$\frac{x+2}{2} = 3 \Rightarrow x = 4$ 1

$\frac{y+6}{2} = -1 \Rightarrow y = -8$ $\frac{1}{2}$

$\Rightarrow$ A(4, –8) $\frac{1}{2}$

SECTION C

13. LHS $= \frac{\tan\theta}{1-\tan\theta} - \frac{\cot\theta}{1-\cot\theta}$

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

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

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

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

14. Let the fixed charges per student = ₹ x

Cost of food per day per student = ₹ y

$x + 25y = 4500$ 1

$x + 30y = 5200$ 1

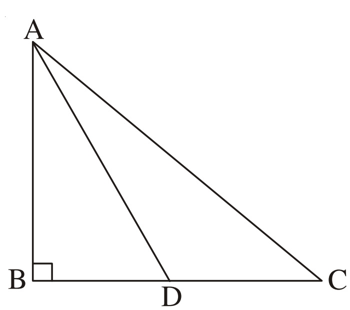
On solving $5y = 700$

$\therefore y = 140$

$x = 1000$ 1

$\therefore$ Fixed charges = ₹ 1000 & cost of food per day ₹ 140

15. 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

16. 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

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

17. 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

18. Let $\sqrt{5}$ be rational.

$\therefore\ \sqrt{5} = \frac{a}{b}$, b ≠ 0. a, b are positive integers, HCF (a, b) = 1 $\frac{1}{2}$

On squaring,

$$5 = \frac{a^2}{b^2}$$

$$b^2 = \frac{a^2}{5}$$

⇒ 5 divides a^2

⇒ 5 divides a also.

a = 5m, for some +ve integer m. 1

$$b^2 = \frac{25m^2}{5}$$

$$b^2 = 5m^2$$

⇒ 5 divides b^2

⇒ 5 divides b also

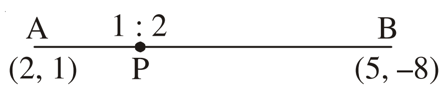
⇒ 5 divides a and b both. 1

Which is the contradiction to the fact that HCF (a, b) = 1

Hence our assumption is wrong. $\frac{1}{2}$

$\sqrt{5}$ is irrational.

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

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

$\Rightarrow\ k = -8$ 1

OR

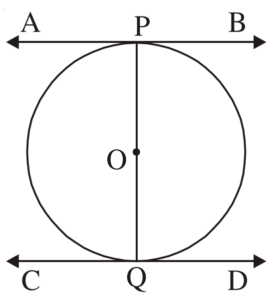
Three points are collinear ⇒ area of Δ formed by these points is zero. 1

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

$-8 + 2p - 2 = 0$

$p = 5$ 1

20.



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

$\angle OPB = 90°$

{radius ⊥ tangent} 1

$\angle OQC = 90°$

But they are forming alternate interior angles. 1

⇒ AB ∥ CD $\frac{1}{2}$

21.

$$
\begin{array}{r|l|l}
x^2-3x+2 & x^4-2x^3-x+2 & x^2+x+1 \\
 & x^4-3x^3\qquad+2x^2 & \\
 & -\quad+\qquad\quad- & \\ \hline
 & x^3-2x^2-x+2 & \\
 & x^3-3x^2+2x & \\
 & -\quad+\qquad- & \\ \hline
 & x^2-3x+2 & \\
 & x^2-3x+2 & \\
 & -\quad+\quad- & \\ \hline
 & 0 &
\end{array}
$$

2

Yes, g(x) is factor of f(x) 1

22.

Class	fi	xi	di	ui	fiui
0 – 20	17	10	–40	–2	–34
20 – 40	28	30	–20	–1	–28
40 – 60	32	(50) A	0	0	0
60 – 80	24	70	20	1	24
80 – 100	19	90	40	2	38
Total	120				0

Correct Table 2

$$\text{Mean} = 50 + \frac{0}{120}$$

$$= 50$$ 1

SECTION D

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

$l^2 = 576 + 100 = 676$

$l = 26$ 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 $1\frac{1}{2}$

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

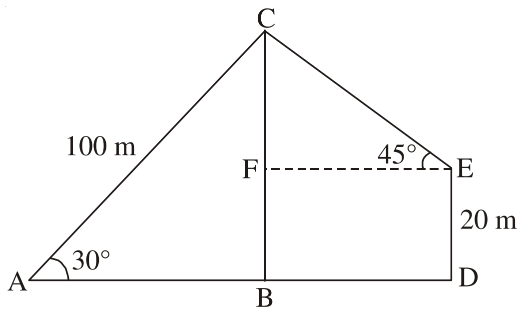
Correct Table $\frac{1}{2}$

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.



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

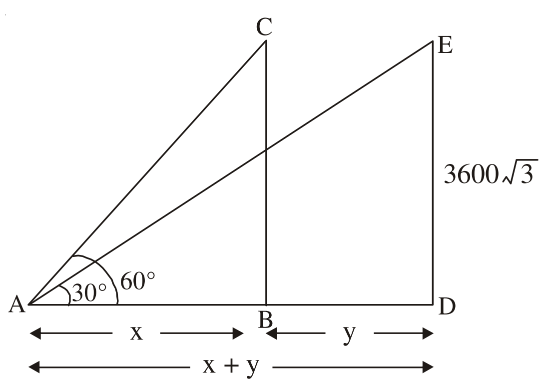
$\sin 45° = \frac{30}{CE}$

$CE = 30\sqrt{2}$ 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 $= \frac{7200}{30} = 240$ m/s 1

26. For Correct Given, To Prove, Construction, Figure $4 \times \frac{1}{2} = 2$

For Correct Proof 2

27. Let speed of train be x km/h

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

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

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

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

$x = -45,\quad x = 40$ 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. $$\frac{\operatorname{cosec}^2(90°-\theta)-\tan^2\theta}{2(\cos^2 37°+\cos^2(90°-37°))}-\frac{2\tan^2 30°\sec^2 37°\sin^2(90°-37°)}{\operatorname{cosec}^2(90°-27°)-\tan^2 27°}$$ 1

$$=\frac{\sec^2\theta-\tan^2\theta}{2(\cos^2 37°+\sin^2 37°)}-\frac{2\left(\frac{1}{\sqrt{3}}\right)^2\times\frac{1}{\cos^2 37°}\times\cos^2 37°}{\sec^2 27°-\tan^2 27°}$$ $1\frac{1}{2}$

$$=\frac{1}{2\times 1}-\frac{\frac{2}{3}\times 1}{1}$$ 1

$$=\frac{1}{2}-\frac{2}{3}=\frac{-1}{6}$$ $\frac{1}{2}$

29. For Correct Construction of Triangle 2

For Correct Construction of Similar triangle 2

30. Numbers are 12, 17, 22, ..., 97 1

$97 = 12 + (n - 1)5$

$85 = (n - 1)5$

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

$S_n = \frac{18}{2}(12+97)$

$= 981$ $1\frac{1}{2}$