QUESTION PAPER CODE 30/2/1

EXPECTED ANSWER/VALUE POINTS

SECTION A

1. LCM (336, 54) = $\dfrac{336 \times 54}{6}$ $\frac{1}{2}$

= 336 × 9 = 3024 $\frac{1}{2}$

2. $\dfrac{3-a}{3a} - \dfrac{1}{a} = \dfrac{3-a-3}{3a} = -\dfrac{1}{3}$ 1

3. $2x^2 - 4x + 3 = 0 \Rightarrow D = 16 - 24 = -8$ $\frac{1}{2}$

∴ Equation has NO real roots $\frac{1}{2}$

4. $\sin^2 60° + 2\tan 45° - \cos^2 30 = \left(\dfrac{\sqrt{3}}{2}\right)^2 + 2(1) - \left(\dfrac{\sqrt{3}}{2}\right)^2$ [For any two correct values] $\frac{1}{2}$

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

OR

$\sin A = \dfrac{3}{4} \Rightarrow \cos A = \sqrt{1 - \dfrac{9}{16}} = \dfrac{\sqrt{7}}{4}$ $\frac{1}{2}$

$\sec A = \dfrac{4}{\sqrt{7}}$ $\frac{1}{2}$

5. Point on x-axis is (2, 0) 1

6. ΔABC: Isosceles Δ ⇒ AC = BC = 4 cm. $\frac{1}{2}$

$AB = \sqrt{4^2 + 4^2} = 4\sqrt{2}$ cm $\frac{1}{2}$

OR

$\dfrac{AD}{BD} = \dfrac{AE}{CE} \Rightarrow \dfrac{AD}{7.2} = \dfrac{1.8}{5.4}$ $\frac{1}{2}$

∴ $AD = \dfrac{7.2 \times 1.8}{5.4} = 2.4$ cm. $\frac{1}{2}$

SECTION B

7. Smallest number divisible by 306 and 657 = LCM (306, 657) 1

LCM (306, 657) = 22338 1

8. A, B, C are collinear ⇒ ar. (ΔABC) = 0 $\frac{1}{2}$

$\therefore \quad \frac{1}{2}[x(6-3) - 4(3-y) - 2(y-6)] = 0$ 1

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

OR

Area of triangle = $\frac{1}{2}[1(6+5) - 4(-5+1) - 3(-1-6)]$ 1

$= \frac{1}{2}[11+16+21] = \frac{48}{2} = 24$ sq. units. 1

9. P(blue marble) = $\frac{1}{5}$, P(black marble) = $\frac{1}{4}$

$\therefore$ P(green marble) = $1 - \left(\frac{1}{5} + \frac{1}{4}\right) = \frac{11}{20}$ 1

Let total number of marbles be x

then $\frac{11}{20} \times x = 11 \Rightarrow x = 20$ 1

10. For unique solution $\frac{1}{3} \neq \frac{2}{k}$ 1

$\Rightarrow \quad k \neq 6$ 1

11. Let larger angle be x°

$\therefore$ Smaller angle = 180° – x° $\frac{1}{2}$

$\therefore \quad (x) - (180 - x) = 18$ $\frac{1}{2}$

$2x = 180 + 18 = 198 \Rightarrow x = 99$ $\frac{1}{2}$

$\therefore$ The two angles are 99°, 81° $\frac{1}{2}$

OR

Let Son's present age be x years

Then Sumit's present age = 3x years. $\frac{1}{2}$

$\therefore$ 5 Years later, we have, $3x + 5 = \frac{5}{2}(x+5)$ $\frac{1}{2}$

$6x + 10 = 5x + 25 \Rightarrow x = 15$ $\frac{1}{2}$

$\therefore$ Sumit's present age = 45 years $\frac{1}{2}$

12. Maximum frequency = 50, class (modal) = 35 – 40. $\frac{1}{2}$

$$\text{Mode} = L + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$$

$$= 35 + \frac{50-34}{100-34-42} \times 5$$ 1

$$= 35 + \frac{16}{24} \times 5 = 38.33$$ $\frac{1}{2}$

SECTION C

13. Let $2+5\sqrt{3} = a$, where 'a' is a rational number. $\frac{1}{2}$

than $\sqrt{3} = \frac{a-2}{5}$ 1

Which is a contradiction as LHS is irrational and RHS is rational 1

$\therefore$ $2+5\sqrt{3}$ can not be rational $\frac{1}{2}$

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

Alternate method:

Let $2+5\sqrt{3}$ be rational $\frac{1}{2}$

$\therefore$ $2+5\sqrt{3} = \frac{p}{q}$, p, q are integers, $q \neq 0$

$\Rightarrow \sqrt{3} = \left(\frac{p}{q} - 2\right) \div 5 = \frac{p-2q}{5q}$ 1

LHS is irrational and RHS is rational

which is a contradiction. 1

$\therefore\ 2 + 5\sqrt{3}$ is irrational. $\frac{1}{2}$

OR

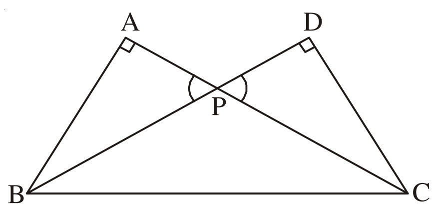
$2048 = 960 \times 2 + 128$

$960 = 128 \times 7 + 64$ 2

$128 = 64 \times 2 + 0$

$\therefore$ HCF (2048, 960) = 64 1

14.



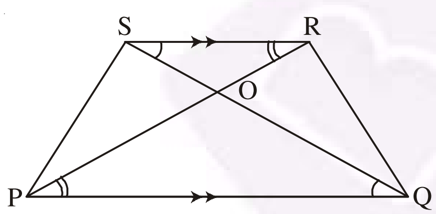
Correct Figure $\frac{1}{2}$

$\Delta APB \sim \Delta DPC$ [AA similarity] 1

$\frac{AP}{DP} = \frac{BP}{PC}$ 1

$\Rightarrow AP \times PC = BP \times DP$ $\frac{1}{2}$

OR



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

In ΔPOQ and ΔROS

$\left.\begin{array}{l}\angle P = \angle R \\ \angle Q = \angle S\end{array}\right\}$ alt. $\angle$s

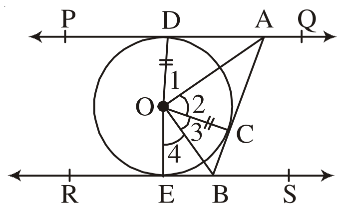
$\therefore\ \Delta POQ \sim \Delta ROS$ [AA similarity] 1

$\therefore\ \frac{ar(\Delta POQ)}{ar(\Delta ROS)} = \left(\frac{PQ}{RS}\right)^2$ 1

$= \left(\frac{3}{1}\right)^2 = \frac{9}{1}$ $\frac{1}{2}$

$\therefore$ ar(ΔPOQ) : ar(ΔROS) = 9 : 1

15.



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

$\Delta AOD \cong AOC$ [SAS] 1

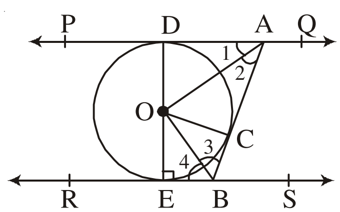
$\Rightarrow \angle 1 = \angle 2$ $\frac{1}{2}$

Similarly $\angle 4 = \angle 3$ $\frac{1}{2}$

$\Rightarrow \angle 1 + \angle 4 = \angle 2 + \angle 3 = \frac{1}{2}(180°)$

$\Rightarrow \angle 2 + \angle 3 = 90°$ or $\angle AOB = 90°$ $\frac{1}{2}$

Alternate method:



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

$\Delta OAD \cong \Delta AOC$ [SAS]

$\Rightarrow \angle 1 = \angle 2$ 1

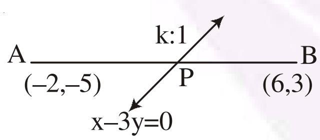
Similarly $\angle 4 = \angle 3$ $\frac{1}{2}$

But $\angle 1 + \angle 2 + \angle 3 + \angle 4 = 180°$ [$\because$ PQ $\parallel$ RS]

$\Rightarrow \angle 2 + \angle 3 = \angle 1 + \angle 4 = \frac{1}{2}(180°) = 90°$ $\frac{1}{2}$

$\therefore$ In ΔAOB, $\angle AOB = 180° - (\angle 2 + \angle 3) = 90°$ $\frac{1}{2}$

16.



Let the line $x - 3y = 0$ intersect the segment

joining A(–2, –5) and B(6, 3) in the ratio k : 1 $\frac{1}{2}$

$\therefore$ Coordinates of P are $\left(\frac{6k-2}{k+1}, \frac{3k-5}{k+1}\right)$ 1

P lies on $x - 3y = 0 \Rightarrow \frac{6k-2}{k+1} = 3\left(\frac{3k-5}{k+1}\right) \Rightarrow k = \frac{13}{3}$

$\therefore$ Ratio is 13 : 3 1

$\Rightarrow$ Coordinates of P are $\left(\frac{9}{2}, \frac{3}{2}\right)$ $\frac{1}{2}$

17. $\left(\frac{3\sin 43°}{\cos 47°}\right)^2 - \frac{\cos 37° \operatorname{cosec} 53°}{\tan 5° \tan 25° \tan 45° \tan 65° \tan 85°}$

$= \left(\frac{3\sin 43°}{\cos(90° - 43°)}\right)^2 - \frac{\cos 37° . \operatorname{cosec}(90° - 37°)}{\tan 5° \tan 25°(1) \tan(90° - 25°) \tan(90° - 5°)}$ 1

$= \left(\frac{3\sin 43°}{\sin 43°}\right)^2 - \frac{\cos 37° . \sec 37°}{\tan 5° . \tan 25°(1) \cot 25° \cot 5°}$ 1

$= 9 - \frac{1}{1} = 8$ 1

18. Radius of quadrant = $OB = \sqrt{15^2 + 15^2} = 15\sqrt{2}$ cm. 1

Shaded area = Area of quadrant – Area of square $\frac{1}{2}$

$= \frac{1}{4}(3.14)[(15\sqrt{2})^2 - (15)^2]$ 1

$= (15)^2 (1.57 - 1) = 128.25 \text{ cm}^2$ $\frac{1}{2}$

OR

$BD = \sqrt{(2\sqrt{2})^2 + (2\sqrt{2})^2} = \sqrt{16} = 4$ cm 1

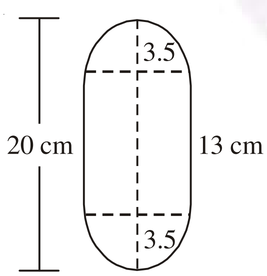
∴ Radius of circle = 2 cm $\frac{1}{2}$

∴ Shaded area = Area of circle – Area of square $\frac{1}{2}$

$= 3.14 \times 2^2 - (2\sqrt{2})^2$

$= 12.56 - 8 = 4.56 \text{ cm}^2$ 1

19.



Height of cylinder = 20 – 7 = 13 cm. 1

Total volume $= \pi\left(\frac{7}{2}\right)^2 \cdot 13 + \frac{4}{3}\pi\left(\frac{7}{2}\right)^3 \text{ cm}^3$ 1

$= \frac{22}{7} \times \frac{49}{4}\left(13 + \frac{4}{3} \cdot \frac{7}{2}\right) \text{cm}^3$

$= \frac{77 \times 53}{6} = 680.17 \text{ cm}^3$ 1

20.

x_i :	32.5	37.5	42.5	47.5	52.5	57.5	62.5		$\frac{1}{2}$
f_i :	14	16	28	23	18	8	3	$\Sigma f_i = 110$	$\frac{1}{2}$
u_i :	–3	–2	–1	0	1	2	3		
$f_i u_i$:	–42	–32	–28	0	18	16	9,	$\Sigma f_i u_i = -59$	1

Mean = $47.5 - \dfrac{59 \times 5}{110} = 47.5 - 2.68 = 44.82$ 1

Note: If N is taken as 100, Ans. 44.55 Accept.

If some one write, data is wrong, give full 3 marks.

21. $3x^2 - 5 \overline{)3x^4 - 9x^3 + x^2 + 15x + k} (x^2 - 3x + 2$

$$\begin{array}{l} 3x^4 \quad\quad - 5x^2 \\ - \quad\quad\quad + \\ \hline -9x^3 + 6x^2 + 15x + k \\ -9x^3 \quad\quad + 15x \\ + \quad\quad\quad - \\ \hline 6x^2 + k \\ 6x^2 - 10 \\ - \quad + \\ \hline k + 10 \\ \hline \end{array}$$ 2

$\therefore$ $k + 10 = 0 \Rightarrow k = -10$ 1

OR

$p(y) = 7y^2 - \dfrac{11}{3}y - \dfrac{2}{3} = \dfrac{1}{3}(21y^2 - 11y - 2)$

$= \dfrac{1}{3}[(7y + 1)(3y - 2)]$ 1

$\therefore$ Zeroes are 2/3, –1/7 $\frac{1}{2}$

Sum of zeroes = $\dfrac{2}{3} - \dfrac{1}{7} = \dfrac{11}{21}$

$\dfrac{-b}{a} = \dfrac{11}{21}$ $\therefore$ sum of zeroes = $\dfrac{-b}{a}$ 1

Product of zeroes = $\left(\dfrac{2}{3}\right)\left(-\dfrac{1}{7}\right) = -\dfrac{2}{21}$

$\frac{c}{a} = -\frac{2}{3}\left(\frac{1}{7}\right) = -\frac{2}{21}$ $\therefore$ Product $= \frac{c}{a}$ $\frac{1}{2}$

22. $x^2 + px + 16 = 0$ have equal roots if $D = p^2 - 4(16)(1) = 0$ 1

$p^2 = 64 \Rightarrow p = \pm 8$ $\frac{1}{2}$

$\therefore$ $x^2 \pm 8x + 16 = 0 \Rightarrow (x \pm 4)^2 = 0$ 1

$x \pm 4 = 0$

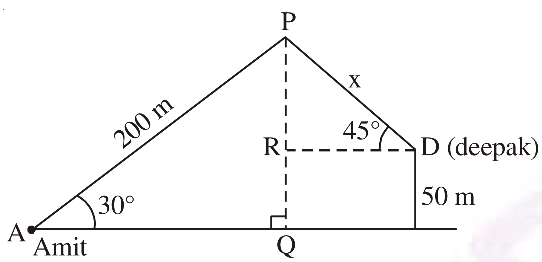
$\therefore$ Roots are $x = -4$ and $x = 4$ $\frac{1}{2}$

SECTION D

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

For correct proof. 2

24.



Correct Figure 1

In ΔAPQ

$\frac{PQ}{AP} = \sin 30° = \frac{1}{2}$ $\frac{1}{2}$

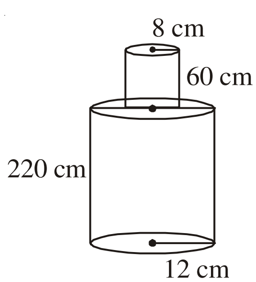
$PQ = (200)\left(\frac{1}{2}\right) = 100$ m 1

$PR = 100 - 50 = 50$ m $\frac{1}{2}$

In ΔPRD, $\frac{PR}{PD} = \sin 45° = \frac{1}{\sqrt{2}}$

$PD = (PR)(\sqrt{2}) = 50\sqrt{2}$ m 1

25.



Total volume $= 3.14\,(12)^2\,(220) + 3.14(8)^2(60)$ cm^3 1

$= 99475.2 + 12057.6 = 111532.8$ cm^3 1

Mass $= \frac{111532.8 \times 8}{1000}$ kg 1

$= 892.262$ kg 1

26. Constructing an equilateral triangle of side 5 cm — 1

Constructing another similar Δ with scale factor $\frac{2}{3}$ — 3

OR

Constructing two concentric circle of radii 2 cm and 5 cm — 1

Drawing two tangents PA and PB — 2

PA = 4.5 cm (approx) — 1

27.

	Less than 40	less than 50	less than 60	less than 70	less than 80	less than 90	less than 100	$\frac{1}{2}$
cf.	7	12	20	30	36	42	50	1

Plotting of points (40, 7), (50, 12), (60, 20), (70, 30), (80, 36), (90, 42) and (100, 50) — $1\frac{1}{2}$

Joining the points to get the curve — 1

28. LHS $= \dfrac{\tan\theta}{1-\dfrac{1}{\tan\theta}} + \dfrac{\dfrac{1}{\tan\theta}}{1-\tan\theta} = \dfrac{\tan^2\theta}{\tan\theta - 1} - \dfrac{1}{\tan\theta(\tan\theta-1)}$ — 1

$= \dfrac{\tan^3\theta - 1}{\tan\theta(\tan\theta-1)} = \dfrac{(\tan\theta-1)(\tan^2\theta+\tan\theta+1)}{\tan\theta(\tan\theta-1)}$ — 1

$= \tan\theta + 1 + \cot\theta = 1 + \dfrac{\sin\theta}{\cos\theta} + \dfrac{\cos\theta}{\sin\theta} = 1 + \dfrac{\sin^2\theta+\cos^2\theta}{\sin\theta\cos\theta}$ — 1

$= 1 + \dfrac{1}{\sin\theta\cos\theta} = 1 + \operatorname{cosec}\theta\sec\theta = \text{RHS}$ — 1

OR

Consider

$\dfrac{\sin\theta}{\operatorname{cosec}\theta+\cot\theta} - \dfrac{\sin\theta}{\cot\theta-\operatorname{cosec}\theta} = \dfrac{\sin\theta}{\operatorname{cosec}\theta+\cot\theta} + \dfrac{\sin\theta}{\operatorname{cosec}\theta-\cot\theta}$ — 1+1

$= \dfrac{\sin\theta[\operatorname{cosec}\theta-\cot\theta+\operatorname{cosec}\theta+\cot\theta]}{\operatorname{cosec}^2\theta-\cot^2\theta} = \dfrac{\sin\theta(2\operatorname{cosec}\theta)}{1} = 2$ — $1\frac{1}{2}$

Hence $\dfrac{\sin\theta}{\operatorname{cosec}\theta+\cot\theta} = 2 + \dfrac{\sin\theta}{\cot\theta-\operatorname{cosec}\theta}$ — $\frac{1}{2}$

29. Let $-82 = a_n$ ∴ $-82 = -7 + (n-1)(-5)$ — 1

$\Rightarrow$ $15 = n - 1$ or $n = 16$ — 1

Again $-100 = a_m = -7 + (m - 1)(-5)$ 1

$\Rightarrow \quad (m - 1)(-5) = -93$

$m - 1 = \frac{93}{5}$ or $m = \frac{93}{5} + 1 \notin N$ 1

$\therefore \quad -100$ is not a term of the AP.

OR

$S_n = 180 = \frac{n}{2} \cdot [90 + (n - 1)(-6)]$ 1

$360 = 90n - 6n^2 + 6n \Rightarrow 6n^2 - 96n + 360 = 0$ 1

$\Rightarrow \quad 6[(n - 6)(n - 10)] = 0 \Rightarrow n = 6, n = 10$ 1

Sum of $a_7, a_8, a_9, a_{10} = 0 \therefore n = 6$ or $n = 10$ 1

30. Let marks in Hindi be x

Then marks in Eng = 30 – x $\frac{1}{2}$

$\therefore \quad (x + 2)(30 - x - 3) = 210$ 1

$\Rightarrow \quad x^2 - 25x + 156 = 0$ or $(x - 13)(x - 12) = 0$ 1

$\Rightarrow \quad x = 13$ or $x = 12$

$\therefore \quad 30 - 13 = 17$ or $30 - 12 = 18$ 1

$\therefore$ Marks in Hindi & English are

(13, 17) or (12, 18) $\frac{1}{2}$