QUESTION PAPER CODE 30/2/3

EXPECTED ANSWER/VALUE POINTS

SECTION A

1. D = $(4\sqrt{3})^2 - 4(4)(3) = 0$ $\frac{1}{2}$

$\therefore$ Roots are real and equal. $\frac{1}{2}$

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

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

OR

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

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

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

4. ΔABC: Isosceles $\Delta \Rightarrow$ AC = BC = 4 cm. $\frac{1}{2}$

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

OR

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

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

5. $2x^2 - 4x + 3 = 0 \Rightarrow D = 16 - 24 = -8$ $\frac{1}{2}$

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

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

$= 336 \times 9 = 3024$ $\frac{1}{2}$

SECTION B

7. E_1 : {(1, 5), (2, 5), (3, 5), (4, 5), (5, 5), (6, 5), (5, 1), (5, 2), (5, 3), (5, 4), (5, 6)}

∴ P(5 will come at least once) = $P(E_1) = \frac{11}{36}$ 1

P(5 will not come either time) = $1 - \frac{11}{36} = \frac{25}{36}$ 1

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

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

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

9. Let larger angle be x°

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

∴ (x) – (180 – x) = 18 $\frac{1}{2}$

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

∴ 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. $\frac{1}{2}$

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

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

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

10. 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

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

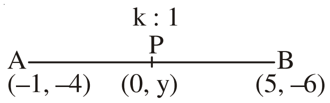
$\Rightarrow \quad k \neq 6$ 1

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

LCM (306, 657) = 22338 1

SECTION C

13. Any point on y-axis is P(0, y) 1



Let P divides AB in k : 1

$\Rightarrow 0 = \frac{5k-1}{k+1} \Rightarrow k = \frac{1}{5}$ i.e. 1:5 1

$\Rightarrow \quad y = \frac{-6k-4}{k+1} = \frac{-\frac{6}{5}-4}{\frac{1}{5}+1} = \frac{-26}{6} = \frac{-13}{3}$ 1

$\Rightarrow \quad$ P is $\left(0, \frac{-13}{3}\right)$

14. Given expression $= \left(\frac{3\tan 41°}{\tan 41°}\right)^2 - \left(\frac{\sin 35° \operatorname{cosec} 35°}{\tan 10° \tan 20° (\sqrt{3}) \cot 20° \cot 10°}\right)^2$ $1\frac{1}{2}$

$= 9 - \frac{1}{3} = \frac{26}{3}$ $1\frac{1}{2}$

15. Radius of first sphere = 3 cm $\therefore\ \frac{4}{3}\pi(3)^3 d = 1\ \{d = \text{density}\}$ $\frac{1}{2}$

let radius of 2nd sphere be r cm $\therefore\ \frac{4}{3}\pi(r)^3.d = 7 \Rightarrow r^3 = 7(3)^3$ $\frac{1}{2}$

$\Rightarrow\ \frac{4}{3}\pi(3)^3 + \frac{4}{3}\pi\cdot(3)^3\cdot 7 = \frac{4}{3}\pi R^3$ 1

$\Rightarrow\ R^3 = (3)^3\ (1 + 7) \Rightarrow R = 3(2) = 6$ $\frac{1}{2}$

$\therefore$ Diameter = 12 cm. $\frac{1}{2}$

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

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

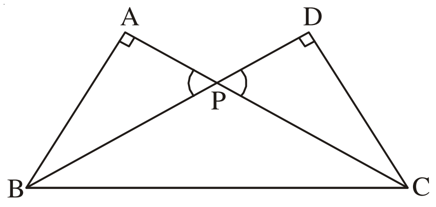
$2048 = 960 \times 2 + 128$

$960 = 128 \times 7 + 64$ 2

$128 = 64 \times 2 + 0$

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

17.



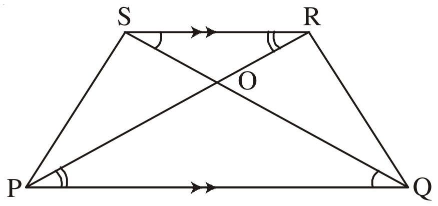
Correct Figure $\frac{1}{2}$

$\Delta APB \sim \Delta DPC$ [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

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

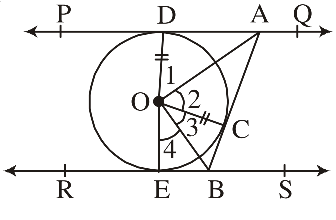
$\therefore$ $\Delta POQ \sim \Delta ROS$ [AA similarity] 1

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

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

$\therefore$ $ar(\Delta POQ) : ar(\Delta ROS) = 9 : 1$

18.



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

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

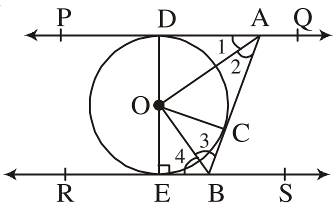
$\Rightarrow \angle 1 = \angle 2$ $\frac{1}{2}$

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

19. 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

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

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

$\therefore$ 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

20. $x^2 + px + 16 = 0$ 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 $x = 4$ $\frac{1}{2}$

21.
$$\begin{array}{r|l} 3x^2-5 & \overline{3x^4-9x^3+x^2+15x+k}\,\big(\,x^2-3x+2 \\ & 3x^4 \qquad\quad -5x^2 \\ & \underline{-\qquad\qquad\; +\qquad\qquad\qquad} \\ & \quad -9x^3+6x^2+15x+k \\ & \quad -9x^3 \qquad\quad +15x \\ & \underline{\quad +\qquad\qquad\quad -\qquad\quad} \\ & \qquad\quad 6x^2+k \\ & \qquad\quad 6x^2-10 \\ & \qquad\quad \underline{-\qquad +} \\ & \qquad\quad \underline{k+10} \end{array}$$ 2

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

OR

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

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

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

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

$$\frac{-b}{a} = \frac{11}{21} \quad \therefore \text{ sum of zeroes} = \frac{-b}{a}$$ 1

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

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

22.

22. 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_iu_i :	–42	–32	–28	0	18	16	9,	$\Sigma f_iu_i = -59$	1

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

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

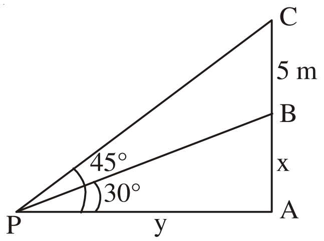
If some one write, data is wrong, give full 3 marks.

SECTION D

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

For correct proof. 2

24. In ΔPAC, Correct Figure 1



$$\frac{AC}{AP} = \tan 45° = 1$$ 1

$\Rightarrow x + 5 = y$ $\frac{1}{2}$

In ΔPAB, $\frac{x}{y} = \tan 30° = \frac{1}{\sqrt{3}}$

$$\frac{x}{x+5} = \frac{1}{\sqrt{3}} \Rightarrow x = \frac{5}{\sqrt{3}-1} = \frac{5(\sqrt{3}+1)}{3} = 6.83$$ $1\frac{1}{2}$

$\therefore$ Height of tower = 6.83 m

25. Volume of ice-cream in the cylinder = $\pi(6)^2 \cdot 15$ cm^3 1

Volume of ice-cream in one cone = $\frac{1}{3}\pi r^2 \cdot 4r + \frac{2}{3}\pi r^3$ cm^3 1
(Given h = 4r)

$= 2\pi r^3$ cm^3 $\frac{1}{2}$

$\Rightarrow$ $10(2\pi r^3) = \pi(6)^2 \times 15$ 1

$\Rightarrow$ $r^3 = (3)^3 \Rightarrow r = 3$ cm. $\frac{1}{2}$

26. Let marks in Hindi be x

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

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

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

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

$\therefore$ 30 − 13 = 17 or 30 − 12 = 18 — 1

$\therefore$ Marks in Hindi & English are

(13, 17) or (12, 18) — $\frac{1}{2}$

27. Let $-82 = a_n \therefore -82 = -7 + (n-1)(-5)$ — 1

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

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

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

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

$\therefore$ −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

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

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

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

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

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

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

OR

Consider

$$\frac{\sin\theta}{\operatorname{cosec}\theta+\cot\theta}-\frac{\sin\theta}{\cot\theta-\operatorname{cosec}\theta} = \frac{\sin\theta}{\operatorname{cosec}\theta+\cot\theta}+\frac{\sin\theta}{\operatorname{cosec}\theta-\cot\theta}$$

1+1

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

$1\frac{1}{2}$

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

29.

	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

30. 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