QUESTION PAPER CODE 30/2/2

EXPECTED ANSWER/VALUE POINTS

SECTION A

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

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. 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. $\frac{1}{2}$

4. $\frac{3-a}{3a} - \frac{1}{a} = \frac{3-a-3}{3a} = -\frac{1}{3}$ 1

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

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

6. $a = -4\frac{1}{2},\ d = 1\frac{1}{2},\ \therefore\ a_{21} = -\frac{9}{2} + 20\left(\frac{3}{2}\right)$ $\frac{1}{2}$

$= \frac{51}{2}$ $\frac{1}{2}$

SECTION B

7. For infinitely many solutions,

$$\frac{2}{k+2} = \frac{3}{-3(1-k)} = \frac{7}{5k+1}$$ 1

$\Rightarrow$ 2k – 2 = k + 2 or 5k + 1 = 7k – 7

$\Rightarrow$ k = 4 $\Rightarrow$ 2k = 8 $\Rightarrow$ k = 4

Hence k = 4. 1

8. 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

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

9. Let larger angle be x°

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

$\therefore$ (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 $\frac{1}{2}$

10. 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

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

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

$\Rightarrow$ 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

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

LCM (306, 657) = 22338 1

SECTION C

13. $\frac{XA}{XY}=\frac{2}{5}\Rightarrow\frac{XA}{AY}=\frac{2}{3}$ 1

$\therefore$ Coords. of A are $\left(\frac{-8+18}{5},\frac{-2-18}{5}\right)$ i.e. (2, – 4) 1

A lies on 3x + k(y + 1) = 0

$\Rightarrow$ 6 + k(–3) = ⇒ k =2. 1

14. $x^2+5x-(a+3)(a-2)=0$

$x^2+(a+3)x-(a-2)x-(a+3)(a-2)=0$ $1\frac{1}{2}$

$[x+(a+3)[x-(a-2)]=0$

$\Rightarrow$ x = (a – 2) or x = –(a + 3) $1\frac{1}{2}$

Alternate method:

$x^2 + 5x - (a^2 + a - 6) = 0$

$x = \dfrac{-5 \pm \sqrt{25 + 4(a^2 + a - 6)}}{2}$ 1

$= \dfrac{-5 \pm (2a + 1)}{2}$ 1

$x = (a - 2), -(a + 3)$ 1

15. $A + 2B = 60°$ and $A + 4B = 90°$ 1+1

Solving to get $B = 15°$ and $A = 30°$ 1

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

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

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

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

LHS is irrational and RHS is rational

which is a contradiction 1

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

OR

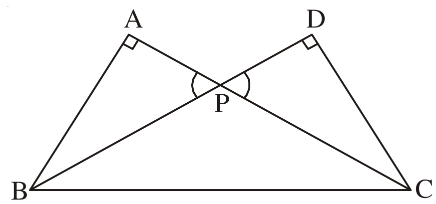
$2048 = 960 \times 2 + 128$

$960 = 128 \times 7 + 64$ 2

$128 = 64 \times 2 + 0$

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

17.



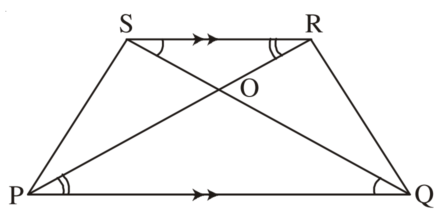
Correct Figure $\frac{1}{2}$

$\Delta APB \sim \Delta DPC$ [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

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

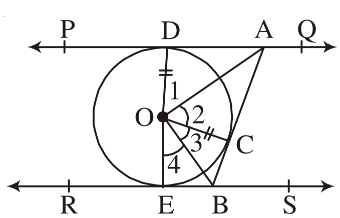
$\therefore$ $\Delta POQ \sim \Delta ROS$ [AA similarity] 1

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

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

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

18.



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

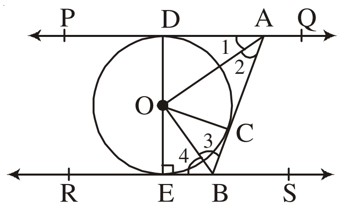
$\Delta AOD \cong AOC$ [SAS] 1

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

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 || 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

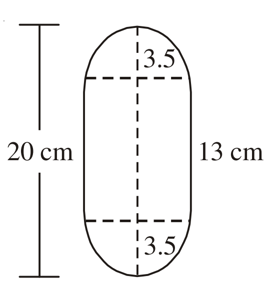
$\therefore$ Radius of circle = 2 cm $\frac{1}{2}$

$\therefore$ 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.



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

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

21.

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

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

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

22. $3x^2 - 5 \overline{)3x^4 - 9x^3 + x^2 + 15x + k} \left(x^2 - 3x + 2 \right.$

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

2

$\therefore \quad k + 10 = 0 \Rightarrow k = -10$ 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 $\frac{1}{2}$

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

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

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

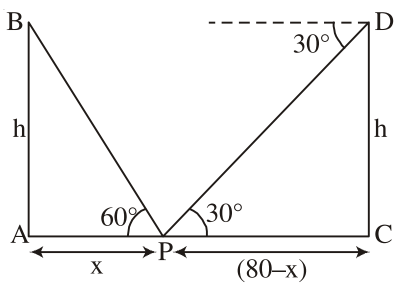
$\frac{c}{a} = -\frac{2}{3}\left(\frac{1}{7}\right) = -\frac{2}{21}$ $\therefore$ Product $= \frac{c}{a}$ $\frac{1}{2}$

SECTION D

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

For correct proof. 2

24. Correct Figure 1



In ΔABP, $\frac{h}{x} = \tan 60° = \sqrt{3}$ ...(i) $\frac{1}{2}$

In ΔCDP, $\frac{h}{80-x} = \tan 30° = \frac{1}{\sqrt{3}}$ ...(ii) $\frac{1}{2}$

dividing (i) by (ii) we get $\frac{80-x}{x} = \frac{3}{1}$

$\Rightarrow$ $3x = 80 - x$ or $4x = 80 \Rightarrow x = 20$ m. 1

and $h = 20\sqrt{3}$ m. $\frac{1}{2}$

$\therefore$ Height of poles is $20\sqrt{3}$ m

and P is at distances 20 m and 60 m from poles $\frac{1}{2}$

25. Let total length of cloth = l m.

$\therefore$ Rate per metre = ₹ $\frac{200}{l}$ $\frac{1}{2}$

$\Rightarrow$ $(l+5)\left(\frac{200}{l} - 2\right) = 200$ 1

$\Rightarrow$ $(l + 5)(200 - 2l) = 200l \Rightarrow l^2 + 5l - 500 = 0$ 1

$\Rightarrow$ $(l + 25)(l - 20) = \Rightarrow l = 20$ m. 1

$\therefore$ Rate per metre = ₹ $\frac{200}{20}$ = ₹ 10 per metre $\frac{1}{2}$

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

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

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

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

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

27. $$\text{LHS} = \frac{\tan\theta}{1 - \frac{1}{\tan\theta}} + \frac{\frac{1}{\tan\theta}}{1 - \tan\theta} = \frac{\tan^2\theta}{\tan\theta - 1} - \frac{1}{\tan\theta(\tan\theta - 1)}$$ 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 $$\frac{\sin\theta}{\operatorname{cosec}\theta + \cot\theta} = 2 + \frac{\sin\theta}{\cot\theta - \operatorname{cosec}\theta}$$ $\frac{1}{2}$

28.

	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

29. Constructing an equilateral triangle of side 5 cm 1

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

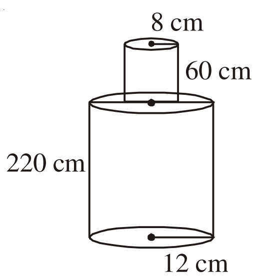
OR

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

30.



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