QUESTION PAPER CODE 30/1

EXPECTED ANSWER/VALUE POINTS

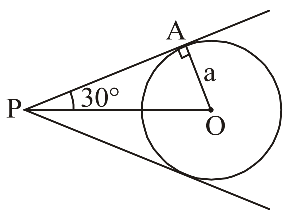
SECTION A

1. $a_{21} - a_7 = 84 \Rightarrow (a + 20d) - (a + 6d) = 84$ $\frac{1}{2}$

$\Rightarrow \quad 14d = 84$

$\Rightarrow \quad d = 6$ $\frac{1}{2}$

2.

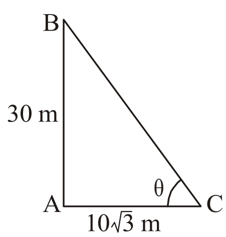


$\angle OPA = 30°$ $\frac{1}{2}$

$\sin 30° = \frac{a}{OP}$

$\Rightarrow \quad OP = 2a$ $\frac{1}{2}$

3.



$\tan \theta = \frac{30}{10\sqrt{3}} = \sqrt{3}$ $\frac{1}{2}$

$\Rightarrow \quad \theta = 60°$ $\frac{1}{2}$

4. Let the number of rotten apples in the heap be n.

$\therefore \quad \frac{n}{900} = 0.18$ $\frac{1}{2}$

$\Rightarrow \quad n = 162$ $\frac{1}{2}$

SECTION B

5. Let the roots of the given equation be α and 6α. $\frac{1}{2}$

Thus the quadratic equation is $(x - \alpha)(x - 6\alpha) = 0$

$\Rightarrow x^2 - 7\alpha x + 6\alpha^2 = 0$ ...(i) $\frac{1}{2}$

Given equation can be written as $x^2 - \frac{14}{p}x + \frac{8}{p} = 0$ ...(ii) $\frac{1}{2}$

Comparing the co-efficients in (i) & (ii) $7\alpha = \frac{14}{p}$ and $6\alpha^2 = \frac{8}{p}$

Solving to get $p = 3$ $\frac{1}{2}$

6. Here $d = \frac{-3}{4}$ $\frac{1}{2}$

Let the nth term be first negative term

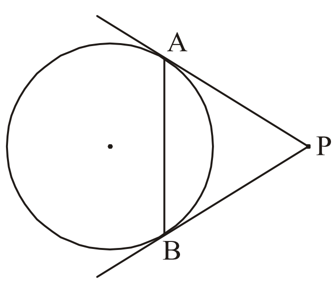
$\therefore \quad 20 + (n-1)\left(\frac{-3}{4}\right) < 0$ $\frac{1}{2}$

$\Rightarrow \quad 3n > 83$

$\Rightarrow \quad n > 27\frac{2}{3}$ $\frac{1}{2}$

Hence 28th term is first negative term. $\frac{1}{2}$

7.



Case I:

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

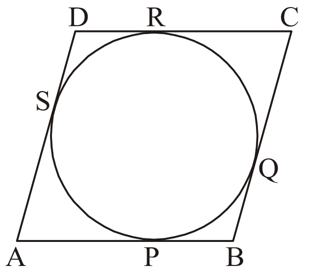
Since PA = PB

Therefore in ΔPAB $\frac{1}{2}$

$\angle PAB = \angle PBA$ $\frac{1}{2}$

Case II: If the tangents at A and B are parallel then each angle between chord and tangent = 90° $\frac{1}{2}$

8.



Here $AP = AS$

$BP = BQ$ 1

$CR = CQ$

$DR = DS$

Adding $(AP + PB) + (CR + RD) = (AS + SD) + (BQ + QC)$ $\frac{1}{2}$

$\Rightarrow \quad AB + CD = AD + BC$ $\frac{1}{2}$

9. Let the coordinates of points P and Q be (0, b) and (a, 0) resp. $\frac{1}{2}$

$\therefore \quad \frac{a}{2} = 2 \Rightarrow a = 4$ $\frac{1}{2}$

$\frac{b}{2} = -5 \Rightarrow b = -10$ $\frac{1}{2}$

$\therefore \quad P(0, -10)$ and $Q(4, 0)$ $\frac{1}{2}$

10. $PA^2 = PB^2$

$\Rightarrow \quad (x - 5)^2 + (y - 1)^2 = (x + 1)^2 + (y - 5)^2$ 1

$\Rightarrow \quad 12x = 8y$

$\Rightarrow \quad 3x = 2y$ 1

SECTION C

11. $D = 4(ac + bd)^2 - 4(a^2 + b^2)(c^2 + d^2)$ 1

$= -4(a^2d^2 + b^2c^2 - 2abcd)$

$= -4(ad - bc)^2$ 1

Since $ad \neq bc$

Therefore $D < 0$ $\frac{1}{2}$

The equation has no real roots $\frac{1}{2}$

12. Here $a = 5$, $l = 45$ and $S_n = 400$

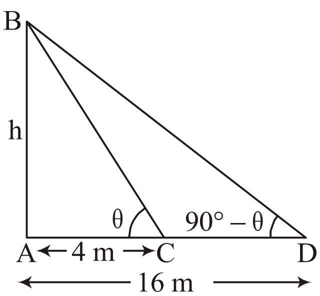
$\therefore \frac{n}{2}(a + l) = 400$ or $\frac{n}{2}(5 + 45) = 400$ 1

$\Rightarrow \quad n = 16$ $\frac{1}{2}$

Also $5 + 15d = 45$ 1

$\Rightarrow \quad d = \frac{8}{3}$ $\frac{1}{2}$

13.



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

$\tan\theta = \frac{h}{4}$ ...(i) $\frac{1}{2}$

$\tan(90 - \theta) = \frac{h}{16}$

$\Rightarrow \quad \cot\theta = \frac{h}{16}$ ...(ii) 1

Solving (i) and (ii) to get

$h^2 = 64$

$\Rightarrow \quad h = 8m$ 1

14. Let the number of black balls in the bag be n.

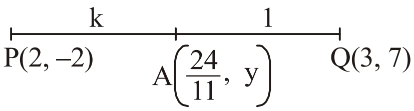
$\therefore$ Total number of balls are $15 + n$ 1

Prob(Black ball) = 3 × Prob(White ball)

$\Rightarrow \quad \frac{n}{15 + n} = 3 \times \frac{15}{15 + n}$ 1

$\Rightarrow \quad n = 45$ 1

15.



Let PA: AQ = k : 1

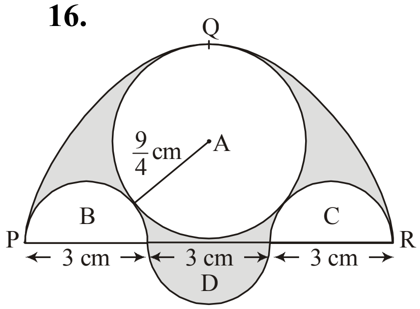
$\therefore \quad \frac{2+3k}{k+1} = \frac{24}{11}$ 1

$\Rightarrow \quad k = \frac{2}{9}$ $\frac{1}{2}$

Hence the ratio is 2 : 9. $\frac{1}{2}$

Therefore $y = \frac{-18+14}{11} = \frac{-4}{11}$ 1

16.



Area of semi-circle PQR $= \frac{\pi}{2}\left(\frac{9}{2}\right)^2 = \frac{81}{8}\pi \text{ cm}^2$ $\frac{1}{2}$

Area of region A $= \pi\left(\frac{9}{4}\right)^2 = \frac{81}{16}\pi \text{ cm}^2$ $\frac{1}{2}$

Area of region (B + C) $= \pi\left(\frac{3}{2}\right)^2 = \frac{9}{4}\pi \text{ cm}^2$ $\frac{1}{2}$

Area of region D $= \frac{\pi}{2}\left(\frac{3}{2}\right)^2 = \frac{9}{8}\pi \text{ cm}^2$ $\frac{1}{2}$

Area of shaded region $= \left(\frac{81}{8}\pi - \frac{81}{16}\pi - \frac{9}{4}\pi + \frac{9}{8}\pi\right) \text{cm}^2$

$= \frac{63}{16}\pi \text{ cm}^2$ or $\frac{99}{8} \text{cm}^2$ 1

17. Area of region ABDC $= \pi \frac{60}{360} \times (42^2 - 21^2)$

$= \frac{22}{7} \times \frac{1}{6} \times 63 \times 21$

$= 693 \text{ cm}^2$ 1

Area of shaded region $= \pi(42^2 - 21^2) -$ region ABDC

$= \frac{22}{7} \times 63 \times 21 - 693$ 1

$= 4158 - 693$

$= 3465 \text{ cm}^2$ 1

18. Volume of water flowing in 40 min $= 5.4 \times 1.8 \times 25000 \times \frac{40}{60} \text{ m}^3$ 1

$= 162000 \text{ m}^3$ $\frac{1}{2}$

Height of standing water = 10 cm = 0.10 m

$\therefore$ Area to be irrigated $= \frac{162000}{0.10}$ 1

$= 1620000 \text{ m}^2$ $\frac{1}{2}$

19. Here $l = 4$ cm, $2\pi r_1 = 18$ cm and $2\pi r_2 = 6$ cm

$\Rightarrow \quad \pi r_1 = 9, \ \pi r_2 = 3$ 1

Curved surface area of frustum $= \pi(r_1 + r_2) \times l$ or $(\pi r_1 + \pi r_2) \times l$ 1

$= (9 + 3) \times 4$ $\frac{1}{2}$

$= 48 \text{ cm}^2$ $\frac{1}{2}$

20. Volume of cuboid $= 4.4 \times 2.6 \times 1 \text{ m}^3$ $\frac{1}{2}$

Inner and outer radii of cylindrical pipe = 30 cm, 35 cm $\frac{1}{2}$

$\therefore$ Volume of material used $= \frac{\pi}{100^2}(35^2 - 30^2) \times h \text{ m}^3$

$= \frac{\pi}{100^2} \times 65 \times 5h$ $\frac{1}{2}$

Now $\frac{\pi}{100^2} \times 65 \times 5h = 4.4 \times 2.6$

$\Rightarrow \quad h = \frac{7 \times 4.4 \times 2.6 \times 100 \times 100}{22 \times 65 \times 5}$ $\frac{1}{2} + \frac{1}{2}$

$\Rightarrow \quad h = 112$ m $\frac{1}{2}$

SECTION D

21. Here $[(5x + 1) + (x + 1)3](x + 4) = 5(x + 1)(5x + 1)$ 1

$\Rightarrow \quad (8x + 4)(x + 4) = 5(5x^2 + 6x + 1)$

$\Rightarrow \quad 17x^2 - 6x - 11 = 0$ 1

$\Rightarrow \quad (17x + 11)(x - 1) = 0$ 1

$\Rightarrow \quad x = \frac{-11}{17}, x = 1$ 1

22. Let one tap fill the tank in x hrs.

Therefore, other tap fills the tank in $(x + 3)$ hrs. $\frac{1}{2}$

Work done by both the taps in one hour is

$\frac{1}{x} + \frac{1}{x+3} = \frac{13}{40}$ 1

$\Rightarrow \quad (2x + 3)\,40 = 13(x^2 + 3x)$

$\Rightarrow \quad 13x^2 - 41x - 120 = 0$ 1

$\Rightarrow (13x + 24)(x - 5) = 0$

$\Rightarrow \quad x = 5$ 1

(rejecting the negative value)

Hence one tap takes 5 hrs and another 8 hrs separately to fill the tank. $\frac{1}{2}$

23. Let the first terms be a and a′ and d and d′ be their respective common differences.

$$\frac{S_n}{S'_n} = \frac{\frac{n}{2}(2a+(n-1)d)}{\frac{n}{2}(2a'+(n-1)d')} = \frac{7n+1}{4n+27}$$ 1

$$\Rightarrow \quad \frac{a+\left(\frac{n-1}{2}\right)d}{a'+\left(\frac{n-1}{2}\right)d'} = \frac{7n+1}{4n+27}$$ 1

To get ratio of 9^{th} terms, replacing $\frac{n-1}{2} = 8$

$\Rightarrow \quad n = 17$ 1

Hence $\frac{t_9}{t'_9} = \frac{a+8d}{a'+8d'} = \frac{120}{95}$ or $\frac{24}{19}$ 1

24. Correct given, to prove, construction and figure $4\times\frac{1}{2}=2$

Correct Proof 2

25. In right angled ΔPOA and ΔOCA

$\Delta OPA \cong \Delta OCA$

$\therefore \quad \angle POA = \angle AOC \quad ...(i)$ 1

Also $\Delta OQB \cong \Delta OCB$

$\therefore \quad \angle QOB = \angle BOC \quad ...(ii)$ 1

Therefore $\angle AOB = \angle AOC + \angle COB$

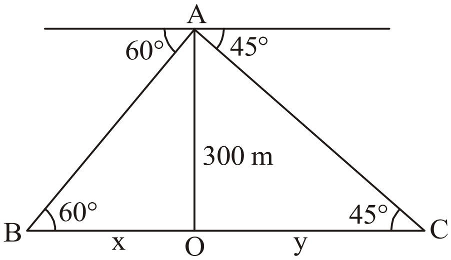
$= \frac{1}{2}\angle POC + \frac{1}{2}\angle COQ$ 1

$= \frac{1}{2}(\angle POC + \angle COQ)$

$= \frac{1}{2}\times 180^\circ$

$= 90^\circ$ 1

26. Correct construction of ΔABC and corresponding similar triangle — 2+2

27. 

Correct Figure — 1

$\tan 45° = \frac{300}{y}$

$\Rightarrow \quad 1 = \frac{300}{y}$ or $y = 300$ — 1

$\tan 60° = \frac{300}{x}$

$\Rightarrow \quad \sqrt{3} = \frac{300}{x}$ or $x = \frac{300}{\sqrt{3}} = 100\sqrt{3}$ — 1

Width of river = $300 + 100\sqrt{3} = 300 + 173.2$

= 473.2 m — 1

28. Points A, B and C are collinear

Therefore $\frac{1}{2}[(k+1)(2k+3-5k)+3k(5k-2k)+(5k-1)(2k-2k-3)]=0$ — 1

$= (k+1)(3-3k) + 9k^2 - 3(5k-1) = 0$

$= 2k^2 - 5k + 2 = 0$ — 2

$= (k-2)(2k-1) = 0$

$\Rightarrow \quad k = 2, \frac{1}{2}$ — 1

29. Total number of outcomes = 36 — 1

(i) P(even sum) = $\frac{18}{36} = \frac{1}{2}$ — $1\frac{1}{2}$

(ii) P(even product) = $\frac{27}{36} = \frac{3}{4}$ — $1\frac{1}{2}$

30. Area of shaded region $= (21 \times 14) - \frac{1}{2} \times \pi \times 7 \times 7$ 1

$= 294 - \frac{1}{2} \times \frac{22}{7} \times 7 \times 7$

$= 294 - 77$

$= 217 \text{ cm}^2$. 1

Perimeter of shaded region $= 21 + 14 + 21 + \frac{22}{7} \times 7$ 1

$= 56 + 22$

$= 78$ cm 1

31. Volume of rain water on the roof = Volume of cylindrical tank $\frac{1}{2}$

i.e., $22 \times 20 \times h = \frac{22}{7} \times 1 \times 1 \times 3.5$ 1

$\Rightarrow \quad h = \frac{1}{40}$ m 1

$= 2.5$ cm $\frac{1}{2}$

Water conservation must be encouraged

or views relevant to it. 1