

QUESTION PAPER CODE 30/1  
**EXPECTED ANSWER/VALUE POINTS**

**SECTION A**

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

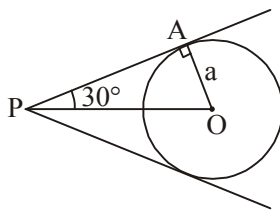
 $\frac{1}{2}$ 

$$\Rightarrow 14d = 84$$

$$\Rightarrow d = 6$$

 $\frac{1}{2}$ 

2.



$$\angle OPA = 30^\circ$$

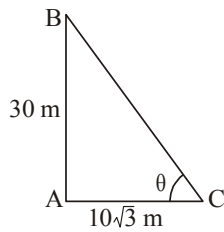
 $\frac{1}{2}$ 

$$\sin 30^\circ = \frac{a}{OP}$$

$$\Rightarrow OP = 2a$$

 $\frac{1}{2}$ 

3.



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

 $\frac{1}{2}$ 

$$\Rightarrow \theta = 60^\circ$$

 $\frac{1}{2}$ 

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

$$\therefore \frac{n}{900} = 0.18$$

 $\frac{1}{2}$ 

$$\Rightarrow n = 162$$

 $\frac{1}{2}$ 

**SECTION B**

5. Let the roots of the given equation be  $\alpha$  and  $6\alpha$ .

 $\frac{1}{2}$ 

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

$$\Rightarrow x^2 - 7\alpha x + 6\alpha^2 = 0 \quad \dots(i)$$

 $\frac{1}{2}$ 

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

 $\frac{1}{2}$ 

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  $n$ th term be first negative term

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

 $\frac{1}{2}$ 

$$\Rightarrow 3n > 83$$

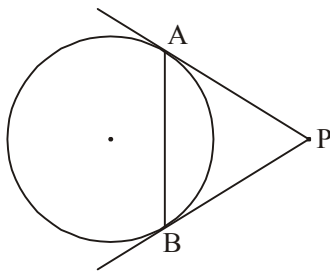
$$\Rightarrow n > 27\frac{2}{3}$$

 $\frac{1}{2}$ 

Hence 28<sup>th</sup> term is first negative term.

 $\frac{1}{2}$ 

7.



**Case I:**

Correct Figure

 $\frac{1}{2}$ 

Since  $PA = PB$

Therefore in  $\triangle PAB$

 $\frac{1}{2}$ 

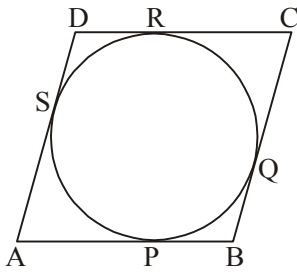
$$\angle PAB = \angle PBA$$

 $\frac{1}{2}$ 

**Case II:** If the tangents at A and B are parallel then each angle between chord and tangent =  $90^\circ$

 $\frac{1}{2}$

8.

Here  $AP = AS$ 

$$BP = BQ$$

$$CR = CQ$$

$$DR = DS$$

1

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

 $\frac{1}{2}$ 

$$\Rightarrow AB + CD = AD + BC$$

 $\frac{1}{2}$ 

9. Let the coordinates of points P and Q be (0, b) and (a, 0) resp.

 $\frac{1}{2}$ 

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

 $\frac{1}{2}$ 

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

 $\frac{1}{2}$ 

$$\therefore P(0, -10) \text{ and } Q(4, 0)$$

 $\frac{1}{2}$ 

10.  $PA^2 = PB^2$

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

1

$$\Rightarrow 12x = 8y$$

$$\Rightarrow 3x = 2y$$

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  $S_n = 400$

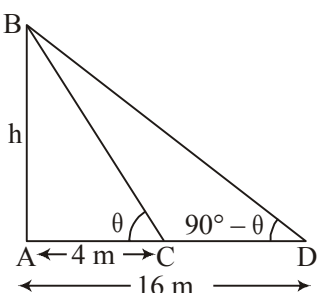
$$\therefore \frac{n}{2}(a + l) = 400 \text{ or } \frac{n}{2}(5 + 45) = 400 \quad 1$$

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

$$\text{Also } 5 + 15d = 45 \quad 1$$

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

- 13.



Correct Figure

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

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

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

Solving (i) and (ii) to get

$$h^2 = 64$$

$$\Rightarrow h = 8\text{m} \quad 1$$

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

$$\therefore \text{Total number of balls are } 15 + n \quad 1$$

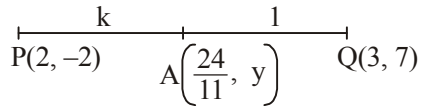
$$\text{Prob(Black ball)} = 3 \times \text{Prob(White ball)}$$

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

$$\Rightarrow n = 45 \quad 1$$

15.

Let PA: AQ = k : 1



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

1

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

 $\frac{1}{2}$ 

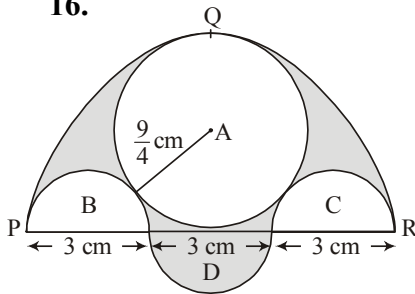
Hence the ratio is 2 : 9.

 $\frac{1}{2}$ 

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

1

16.



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

 $\frac{1}{2}$ 

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

 $\frac{1}{2}$ 

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

 $\frac{1}{2}$ 

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

 $\frac{1}{2}$ 

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

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

1

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

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

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

1

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

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

$$= 4158 - 693$$

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

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

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

Height of standing water = 10 cm = 0.10 m

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

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

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

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

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

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

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

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

Inner and outer radii of cylindrical pipe = 30 cm, 35 cm 1

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

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

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

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

$$\frac{1}{2} + \frac{1}{2}$$

$$\Rightarrow h = 112 \text{ m}$$

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

### SECTION D

$$21. \text{ Here } [(5x + 1) + (x + 1)3](x + 4) = 5(x + 1)(5x + 1)$$

$$1$$

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

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

$$1$$

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

$$1$$

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

$$1$$

$$22. \text{ Let one tap fill the tank in } x \text{ hrs.}$$

Therefore, other tap fills the tank in  $(x + 3)$  hrs.

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

Work done by both the taps in one hour is

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

$$1$$

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

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

$$1$$

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

$$\Rightarrow x = 5$$

$$1$$

(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.

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

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

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

$$\Rightarrow n = 17 \quad 1$$

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

24. Correct given, to prove, construction and figure

$$4 \times \frac{1}{2} = 2$$

Correct Proof 2

25. In right angled  $\triangle POA$  and  $\triangle OCA$

$$\triangle OPA \cong \triangle OCA$$

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

Also  $\triangle OQB \cong \triangle OCB$

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

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

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

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

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

$$= 90^\circ \quad 1$$



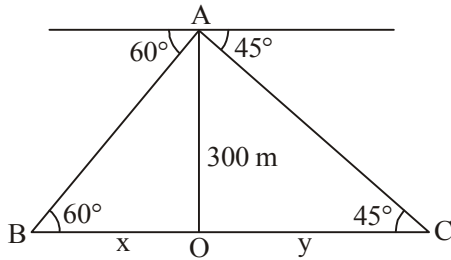
26. Correct construction of  $\triangle ABC$  and corresponding similar triangle

2+2

27.

Correct Figure

1



$$\tan 45^\circ = \frac{300}{y}$$

$$\Rightarrow 1 = \frac{300}{y} \text{ or } y = 300$$

1

$$\tan 60^\circ = \frac{300}{x}$$

$$\Rightarrow \sqrt{3} = \frac{300}{x} \text{ or } x = \frac{300}{\sqrt{3}} = 100\sqrt{3}$$

1

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

$$= 473.2 \text{ m}$$

1

28. Points A, B and C are collinear

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

1

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

$$= 2k^2 - 5k + 2 = 0$$

2

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

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

1

29. Total number of outcomes = 36

1

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

$1\frac{1}{2}$

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

$1\frac{1}{2}$

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

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

$$= 294 - 77$$

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

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

$$= 56 + 22$$

$$= 78 \text{ cm} \quad 1$$

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

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

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

Water conservation must be encouraged

or views relevant to it. 1