

QUESTION PAPER CODE 30/4/2  
**EXPECTED ANSWER/VALUE POINTS**

**SECTION A**

1.  $\text{Disc.} = 144 - 4 \times 4 \times (-k) < 0$   $\frac{1}{2}$

$$16k < -144$$

$$k < -9$$
  $\frac{1}{2}$

2. Required distance =  $\sqrt{(-a-a)^2 + (-b-b)^2}$   $\frac{1}{2}$

$$= \sqrt{4(a^2 + b^2)} \text{ or } 2\sqrt{a^2 + b^2}$$
  $\frac{1}{2}$

3. Here  $1.41 < x < 2.6$

Any rational number lying between 1.4 ... & 2.6 ...

(variable answer) 1

OR

$$2^2 \times 5^2 \times 5 \times 3^2 \times 17 = (10)^2 \times 5 \times 3^2 \times 17$$

$\therefore$  No. of zeroes in the end of the number = Two 1

4. Here  $\frac{BC}{EF} = \frac{8}{11}$   $\frac{1}{2}$

$$\therefore BC = \frac{8}{11} \times 15.4 = 11.2 \text{ cm}$$
  $\frac{1}{2}$

5.  $\frac{\tan 65^\circ}{\cot 25^\circ} = \frac{\tan(90^\circ - 25^\circ)}{\cot 25^\circ}$   $\frac{1}{2}$

$$= \frac{\cot 25^\circ}{\cot 25^\circ} = 1$$
  $\frac{1}{2}$

OR

$$\sin 67^\circ + \cos 75^\circ = \sin(90^\circ - 23^\circ) + \cos(90^\circ - 15^\circ)$$
  $\frac{1}{2}$

$$= \cos 23^\circ + \sin 15^\circ$$
  $\frac{1}{2}$

$$6. \text{ Here } -47 = 18 + (n-1)\left(-\frac{5}{2}\right) \quad \frac{1}{2}$$

$$\Rightarrow n = 27 \quad \frac{1}{2}$$

### SECTION B

7. Let the number of white balls =  $x$

$\therefore$  The number of black balls =  $15 - x$

$$P(\text{Black}) = \frac{2}{3}$$

$$\Rightarrow \frac{15-x}{15} = \frac{2}{3} \quad 1$$

$$\Rightarrow 45 - 3x = 30$$

$$\Rightarrow x = 5 \quad 1$$

Hence number of white balls = 5.

$$8. \text{ No. of spade cards} + 3 \text{ other kings} = 13 + 3 = 16 \quad \frac{1}{2}$$

$$\therefore \text{ Cards which are neither spade nor kings} = 52 - 16 = 36 \quad \frac{1}{2}$$

$$\text{Hence } P(\text{neither spade nor king}) = \frac{36}{52} \text{ or } \frac{9}{13} \quad 1$$

$$9. \frac{3}{x} + \frac{8}{y} = -1 \quad \dots(i)$$

$$\frac{1}{x} - \frac{2}{y} = 2 \quad \dots(ii)$$

Multiply (ii) by 3 and subtract from (i), we get

$$\frac{14}{y} = -7 \Rightarrow y = -2 \quad 1$$

Substitute this value of  $y = -2$  in (i), we get  $x = 1$

$$\text{Hence, } x = 1, y = -2 \quad 1$$

OR

For unique solution  $\frac{a_1}{a_2} \neq \frac{b_1}{b_2} \Rightarrow \frac{k}{3} \neq \frac{2}{6}$  1

$\Rightarrow k \neq 1$  1

The pair of equations have unique solution for all real values of k except 1.

10. 12, 16, 20, ..., 204  $\frac{1}{2}$

Let the number of multiples be n.

$\therefore t_n = 12 + (n - 1) \times 4 = 204$  1

$\Rightarrow n = 49$   $\frac{1}{2}$

OR

Here  $t_3 = 16$  and  $t_7 = t_5 + 12$   $\frac{1}{2}$

$\Rightarrow a + 2d = 16$  (i) and  $a + 6d = a + 4d + 12$  (ii)  $\frac{1}{2}$

From (ii),  $d = 6$

From (i),  $a = 4$  1

$\therefore$  A.P. is 4, 10, 16, ...

11.  $\left. \begin{array}{l} 867 = 3 \times 255 + 102 \\ 255 = 2 \times 102 + 51 \\ 102 = 2 \times 51 + 0 \end{array} \right\}$   $1 \frac{1}{2}$

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

12.  $\frac{AR}{AB} = \frac{3}{4} \Rightarrow \frac{AR}{RB} = \frac{3}{1}$  1

$\frac{3}{A(-4, 0)} \quad \frac{1}{B(0, 6)}$

$\therefore R = \left( \frac{3 \times 0 + 1(-4)}{4}, \frac{3 \times 6 + 1 \times 0}{4} \right)$ , i.e.,  $\left( -1, \frac{9}{2} \right)$  1

## SECTION C

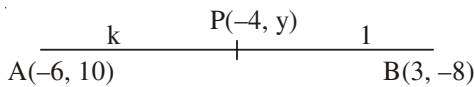
$$\begin{aligned}
 13. \quad \text{LHS} &= (\sin \theta + \cos \theta + 1)(\sin \theta + \cos \theta - 1) \sec \theta \operatorname{cosec} \theta \\
 &= [(\sin \theta + \cos \theta)^2 - 1] \sec \theta \operatorname{cosec} \theta && 1 \\
 &= 2 \sin \theta \cos \theta \sec \theta \operatorname{cosec} \theta && 1 \\
 &= 2 = \text{RHS} && 1
 \end{aligned}$$

OR

$$\begin{aligned}
 \text{LHS} &= \sqrt{\frac{\sec \theta - 1}{\sec \theta + 1}} + \sqrt{\frac{\sec \theta + 1}{\sec \theta - 1}} = \frac{(\sec \theta - 1) + (\sec \theta + 1)}{\sqrt{\sec^2 \theta - 1}} && 1 \\
 &= \frac{2 \sec \theta}{\tan \theta} && 1 \\
 &= \frac{2}{\sin \theta} = 2 \operatorname{cosec} \theta = \text{RHS} && 1
 \end{aligned}$$

14.

Let point P divides the line segment AB in the ratio k : 1



$$\therefore \frac{3k - 6}{k + 1} = -4 \quad 1$$

$$\Rightarrow 3k - 6 = -4k - 4$$

$$\Rightarrow 7k = 2 \text{ i.e., } k = \frac{2}{7} \therefore \text{Ratio is } 2 : 7 \quad 1$$

$$\text{Again } \frac{2 \times (-8) + 7 \times 10}{2 + 7} = y \Rightarrow y = 6 \quad 1$$

Hence  $y = 6$ 

OR

The points are collinear if the area of triangle formed is zero.

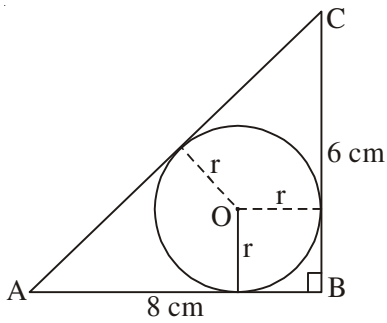
$$\text{i.e., } -5(p + 2) + 1(-2 - 1) + 4(1 - p) = 0 \quad 1 \frac{1}{2}$$

$$-5p - 10 - 3 + 4 - 4p = 0$$

$$-9p = 9$$

$$p = -1 \quad 1 \frac{1}{2}$$

15.



$$AC = \sqrt{AB^2 + BC^2} = \sqrt{64 + 36} = 10 \text{ cm} \quad \frac{1}{2}$$

$$\text{Area of } \triangle ABC = \frac{1}{2} \times 8 \times 6 = 24 \text{ cm}^2 \quad \frac{1}{2}$$

Let  $r$  be the radius of inscribed circle.

$$\text{ar}(\triangle ABC) = \text{ar}(\triangle AOB) + \text{ar}(\triangle BOC) + \text{ar}(\triangle AOC)$$

$$= \frac{1}{2} \times 8r + \frac{1}{2} \times 6r + \frac{1}{2} \times 10r \quad 1$$

$$= \frac{1}{2}r(8 + 6 + 10) = 12r$$

$$12r = 24 \Rightarrow r = 2 \text{ cm} \quad \frac{1}{2}$$

$$\therefore \text{Diameter} = 4 \text{ cm} \quad \frac{1}{2}$$

**Alternate method:**

Here  $BL = BM = r$  (sides of squares)

$$AC = \sqrt{AB^2 + BC^2} = 10 \text{ cm} \quad 1$$

$$AL = AN = 8 - r \text{ and } CM = CN = 6 - r \quad \frac{1}{2}$$

$$AC = AN + NC$$

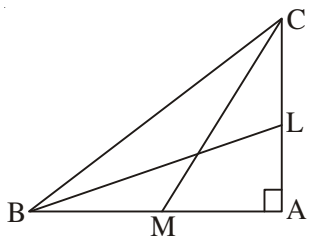
$$\Rightarrow 10 = 8 - r + 6 - r$$

$$\Rightarrow 2r = 4$$

$$\Rightarrow r = 2 \quad \frac{1}{2}$$

$$\therefore \text{Diameter} = 4 \text{ cm} \quad 1$$

16.



In right angled triangle CAM,

$$CM^2 = CA^2 + AM^2 \quad \dots(i)$$

$$\text{Similarly, } BC^2 = AC^2 + AB^2 \quad \dots(ii) \quad 1$$

$$\text{and } BL^2 = AL^2 + AB^2 \quad \dots(iii)$$

$$\text{Now } 4(BL^2 + CM^2) = 4(AL^2 + AB^2 + AC^2 + AM^2) \quad 1$$

$$\text{But } AL = LC = \frac{1}{2}AC \text{ and } AM = MB = \frac{1}{2}AB$$

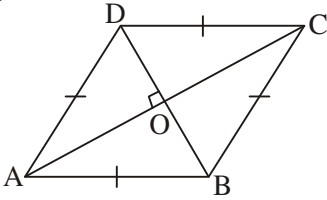
$$\therefore 4(BL^2 + CM^2) = 4\left(\frac{AC^2}{4} + AB^2 + AC^2 + \frac{AB^2}{4}\right)$$

$$= 4\left(\frac{5}{4}AB^2 + \frac{5}{4}AC^2\right)$$

$$= 5(AB^2 + AC^2) = 5BC^2$$

1

OR



Let ABCD be rhombus and its diagonals intersect at O.

$$\text{In } \triangle AOB, AB^2 = AO^2 + OB^2$$

1

$$= \left(\frac{AC}{2}\right)^2 + \left(\frac{BD}{2}\right)^2$$

$$= \frac{1}{4}(AC^2 + BD^2)$$

1

$$\Rightarrow 4AB^2 = AC^2 + BD^2$$

$$\Rightarrow AB^2 + BC^2 + CD^2 + AD^2 = AC^2 + BD^2 \quad (\text{ABCD being rhombus})$$

1

17. Area of shaded region

$$= \left[ \pi(42)^2 - \pi(21)^2 \right] \frac{300^\circ}{360^\circ}$$

1

$$= \frac{22}{7} \times 63 \times 21 \times \frac{5}{6}$$

1

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

1

18. Here the modal class is 20 – 25

 $\frac{1}{2}$ 

$$\text{Mode} = 20 + \frac{20-7}{40-7-8} \times 5$$

2

$$= 20 + \frac{13}{25} \times 5 = 22.6 \quad \text{Hence mode} = 22.6$$

 $\frac{1}{2}$ 

19. Volume of cone =  $\frac{1}{3}\pi r^2 h = \frac{1}{3}\pi(6)^2 \times 24 \text{ cm}^3$

1

Let the radius of the sphere be R cm

$$\therefore \frac{4}{3}\pi R^3 = \frac{1}{3}\pi \times 36 \times 24$$

1

$$\Rightarrow R^3 = 6 \times 6 \times 6$$

$$\Rightarrow R = 6 \text{ cm}$$

$$\text{Surface area} = 4\pi R^2 = 144\pi \text{ cm}^2$$

OR

$$\text{Water required to fill the tank} = \pi(5)^2 \times 2 = 50\pi \text{ m}^3$$

$$\begin{aligned} \text{Water flown in 1 hour} &= \pi \left( \frac{1}{10} \right)^2 \times 3000 \text{ m}^3 \\ &= 30\pi \text{ m}^3 \end{aligned}$$

$$\text{Time taken to fill } 30\pi \text{ m}^3 = 60 \text{ minutes}$$

$$\text{Time taken to fill } 50\pi \text{ m}^3 = \frac{60}{30} \times 50 = 100 \text{ minutes}$$

20. Let  $2 + 3\sqrt{3} = a$  where  $a$  is a rational number

$$\text{Then } \sqrt{3} = \frac{a-2}{3}$$

Which is contradiction as LHS is irrational and

RHS is rational

$$\therefore 2 + 3\sqrt{3} \text{ is irrational}$$

21. Let  $x$  and  $y$  be length of the sides of two squares.

$$\therefore x^2 + y^2 = 157 \text{ and } 4(x + y) = 68 \Rightarrow x + y = 17$$

$$\therefore x^2 + (17 - x)^2 = 157$$

$$x^2 + 289 + x^2 - 34x - 157 = 0$$

$$\text{or } x^2 - 17x + 66 = 0$$

$$(x - 6)(x - 11) = 0$$

$$\therefore x = 6 \text{ or } 11$$

$$\therefore y = 11 \text{ or } 6$$

Hence length of sides of squares are 6 m and 11 m.

22. If  $\alpha, \beta$  are zeroes of the polynomial, then

$$\alpha + \beta = -1, \alpha\beta = -20$$

$$\therefore \text{Polynomial is } (x^2 + x - 20)$$

$$(x + 5)(x - 4)$$

$\therefore$  Zeroes of the polynomial are 4 and -5

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

### SECTION D

23. Let  $x$  km/hr be the usual speed of the plane

$$\therefore \frac{1500}{x} - \frac{1500}{x + 250} = \frac{1}{2}$$

$$\Rightarrow x^2 + 250x - 750000 = 0$$

$$\Rightarrow x = -1000 \text{ or } 750$$

$\therefore$  Speed of the plane = 750 km/h

1  $\frac{1}{2}$ 

1

1

1  $\frac{1}{2}$ 

OR

Let  $l$  be the length and  $b$  be the breadth of the park

$$\therefore 2(l + b) = 60 \Rightarrow l + b = 30 \text{ and } l \times b = 200$$

$$l(30 - l) = 200$$

$$\Rightarrow l^2 - 30l + 200 = 0$$

$$\Rightarrow (l - 20)(l - 10) = 0$$

$$\Rightarrow l = 20 \text{ or } 10$$

Hence length = 20 m, breadth = 10 m

1

1

1

1

24. Let  $x$  be the  $n$ th term

$$\therefore t_n = x = 2 + (n - 1)4 \text{ i.e. } x = 4n - 2$$

$$\text{Also } S_n = 1800 = \frac{n}{2}\{4 + (n - 1)4\}$$

$$\text{i.e. } \frac{4n^2}{2} = 1800$$

1

1

$$n^2 = 900 \Rightarrow n = 30 \quad 1$$

$$\therefore x = 30 \times 4 - 2 = 118 \quad 1$$

25.  $\sec \theta + \tan \theta = m \quad \dots(i)$

We know that  $\sec^2 \theta - \tan^2 \theta = 1 \quad 1$

$$\sec \theta - \tan \theta = \frac{1}{m} \quad \dots(ii) \quad 1$$

From (i) and (ii),  $2 \sec \theta = m + \frac{1}{m}$  and  $2 \tan \theta = m - \frac{1}{m} \quad 1$

$$\text{Now } \sin \theta = \frac{2 \tan \theta}{2 \sec \theta} = \frac{m - \frac{1}{m}}{m + \frac{1}{m}} = \frac{m^2 - 1}{m^2 + 1} \quad 1$$

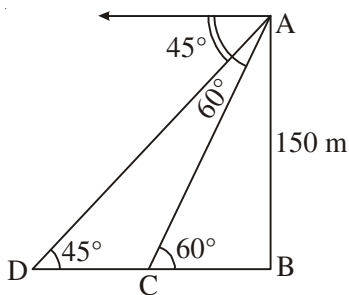
26. In  $\triangle ABD$ ,  $AB^2 = AD^2 + BD^2 \Rightarrow AD^2 = AB^2 - BD^2 \quad 1$

$$\begin{aligned} \text{In } \triangle ADC, AC^2 &= AD^2 + CD^2 \\ &= AB^2 - BD^2 + (BC - BD)^2 \quad 1 \end{aligned}$$

$$= AB^2 - BD^2 + BC^2 + BD^2 - 2BC \times BD \quad 1$$

$$= AB^2 + BC^2 - 2BC \times BD \quad 1$$

27. Correct Figure 1



$$\frac{150}{BC} = \tan 60^\circ = \sqrt{3}$$

$$\Rightarrow BC = \frac{150}{\sqrt{3}} = 50\sqrt{3} \text{ m} \quad \frac{1}{2}$$

$$\text{Also } \frac{AB}{BD} = \tan 45^\circ = 1 \Rightarrow AB = BD = 150 \text{ m} \quad \frac{1}{2}$$

$$\text{Now } CD = BD - BC = (150 - 50\sqrt{3}) \text{ m} \quad \frac{1}{2}$$

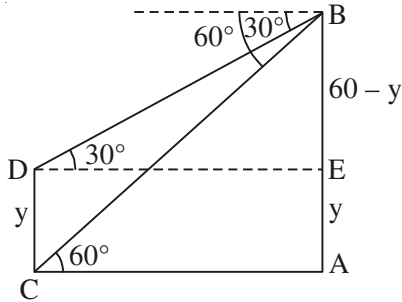
$$\text{Distance travelled in 2 minutes} = (150 - 50\sqrt{3}) \text{ m}$$

$$\therefore \text{Distance travelled in 1 minute} = (75 - 25\sqrt{3}) \text{ m} \quad 1$$

$$\text{or } 75 - 25(1.732) = 75 - 43.3 = 31.7 \text{ m/minute}$$

$$\text{Hence speed of boat is } (75 - 25\sqrt{3}) \text{ m/minutes or } 31.7 \text{ m/minutes} \quad \frac{1}{2}$$

OR



Correct Figure

1

$$\text{In } \triangle ABC, \frac{AB}{AC} = \tan 60^\circ$$

$$\frac{60}{y} = \sqrt{3}$$

$$AC = 20\sqrt{3} \text{ m}$$

1

$$\text{In } \triangle BED, \frac{60-y}{DE} = \tan 30^\circ = \frac{1}{\sqrt{3}}$$

1

$$\text{i.e., } \frac{60-y}{20\sqrt{3}} = \frac{1}{\sqrt{3}} \Rightarrow 60-y = 20 \text{ i.e., } y = 40 \text{ m}$$

 $\frac{1}{2}$ 

Hence width of river =  $20\sqrt{3}$  m and  
height of other pole = 40 m

 $\frac{1}{2}$ 

28. Correct Construction of triangle

1

Correct Construction of similar triangle

3

29. Classes	Class mark (X)	Frequency ( $f_i$ )	$f_i x_i$
10-30	20	5	100
30-50	40	8	320
50-70	60	12	720
70-90	80	20	1600
90-110	100	3	300
110-130	120	2	240

Correct Table 2

$$\left. \begin{aligned} \text{Mean} &= \frac{\sum f_i x_i}{\sum f_i} \\ &= \frac{3280}{50} \\ &= 65.6 \end{aligned} \right\}$$

2

Alternate methods by assuming mean are acceptable.

OR

cf

More than or equal to 65 24

More than or equal to 60 54

More than or equal to 55 74

More than or equal to 50 90

More than or equal to 45 96

More than or equal to 40 100

Plotting graph of (40, 100), (45, 96), (50, 90), (55, 74), (60, 54)

and (65, 24) and joining the points

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

30. Volume of the container =  $\frac{\pi}{3}h(r_1^2 + r_2^2 + r_1r_2)$

$$= \frac{3.14}{3} \times 16(20^2 + 8^2 + 20 \times 8)$$

$$= 3.14 \times 16 \times 208 = 10450 \text{ cm}^3$$

$$= 10.45 \text{ litres}$$

 $\frac{1}{2}$ 

1

$$\text{Cost of milk} = 10.45 \times 50 = ₹ 522.50$$

 $\frac{1}{2}$ 

$$\text{Slant height of frustum} = \sqrt{16^2 + 12^2} = 20 \text{ cm}$$

 $\frac{1}{2}$ 

$$\text{Surface area} = \pi[(r_1 + r_2)l + r_2^2]$$

$$= 3.14[(8 + 20)20 + 8^2]$$

$$= 3.14 \times 624 = 1959.36 \text{ cm}^2$$

1

$$\therefore \text{Cost of metal used} = \frac{10}{100} \times 1959.36 = ₹ 195.93$$

 $\frac{1}{2}$