Sample Paper 2

ANSWERKEY																			
1	(d)	2	(b)	3	(c)	4	(a)	5	(c)	6	(c)	7	(c)	8	(b)	9	(d)	10	(b)
11	(b)	12	(b)	13	(a)	14	(c)	15	(a)	16	(c)	17	(a)	18	(b)	19	(c)	20	(b)
21	(c)	22	(b)	23	(a)	24	(d)	25	(b)	26	(b)	27	(a)	28	(a)	29	(c)	30	(a)
31	(b)	32	(b)	33	(c)	34	(a)	35	(d)	36	(a)	37	(c)	38	(c)	39	(b)	40	(c)
41	(a)	42	(d)	43	(c)	44	(d)	45	(b)	46	(a)	47	(a)	48	(c)	49	(b)	50	(c)

SOLUTIONS

1. **(d)** $\sec\theta + \tan^3\theta \operatorname{cosec}\theta$

$= \sec\theta + \frac{\sin\theta}{\cos\theta}\tan^2\theta \operatorname{cosec}\theta = \sec\theta(1+\tan^2\theta)$

$= (1+\tan^2\theta)^{3/2} = [1+(1-a^2)]^{3/2}$

2. **(b)** Diameter of each semi-circle $= \frac{42}{3} = 14$ cm

Radius of each semi-circle = 7 cm

Area of 6 semi-circle $= 6 \times \frac{\pi r^2}{2} = 3\pi r^2$

$= 3\times \frac{22}{7} \times 7 \times 7 = 462 \text{ cm}^2$

Area of cloth piece $= 42 \times 14 = 588 \text{ cm}^2$

Area of the coloured portion $= 588 - 462 = 126 \text{ cm}^2$

3. **(c)** Initial number of workers = 120

When 15 male workers are added, then the total number of workers = 120 + 15 = 135

Number of female workers = 90

$\therefore$ Probability of female workers $= \frac{90}{135} = \frac{2}{3}$

4. **(a)** When 2^{256} is divided by 17 then, $\frac{2^{256}}{2^4+1} = \frac{(2^4)^{64}}{(2^4+1)}$

By remainder theorem when $f(x)$ is divided by $x + a$ the remainder $= f(-a)$

Here, $f(a) = (2^4)^{64}$ and $x = 2^4$ and $a = 1$

$\therefore$ Remainder $= f(-1) = (-1)^{64} = 1$

5. **(c)** For a pair of linear equations having unique solution

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2} \Rightarrow \frac{3}{2m-5} \neq \frac{-2}{7}$

or $-4m + 10 \neq 21$

or $-4m \neq 11$

or $m \neq -\frac{11}{4}$

6. **(c)** As PQ is parallel to $BC \Rightarrow \Delta ABC \sim \Delta APQ$

$\Rightarrow \frac{\text{Area of } \Delta ABC}{\text{Area of } \Delta APQ} = \frac{2}{1}$

Ratio of sides $= \frac{AB}{AP} = \frac{\sqrt{2}}{1}$ $\quad\therefore$ AP : AB = 1 : $\sqrt{2}$

7. **(c)** By squaring and adding both the given equations, we get

$p^2(\sin^2\theta + \cos^2\theta) + q^2(\cos^2\theta + \sin^2\theta)$

$= a^2 + b^2$

$\Rightarrow p^2 + q^2 - a^2 - b^2 = 0$

$\Rightarrow (p-a)(p+a) + (q-b)(q+b) = 0$

$\Rightarrow \frac{p+a}{q+b} + \frac{q-b}{p-a} = 0$

8. **(b)** Suppose the required ratio is $m_1 : m_2$
Then, using the section formula, we get

$$-2=\frac{m_1(4)+m_2(-3)}{m_1+m_2}$$

$\Rightarrow$ $-2m_1 - 2m_2 = 4m_1 - 3m_2$

$\Rightarrow$ $m_2 = 6m_1 \Rightarrow m_1 : m_2 = 1 : 6$

9. **(d)** Total number of marbles = 38 – 18 + 1 = 21

The multiples of 3 from 18 to 38 are 18, 21, 24, 27, 30, 33, 36.

These are 7 in numbers

$\therefore$ Required probability = $\frac{7}{21}=\frac{1}{3}$

10. **(b)**

11. **(b)** $196 = 2^2 \cdot 7^2$, sum of exponents = 2 + 2 = 4

12. **(b)** We have,

Area of square metal plate = 40 × 40 = 1600 cm^2

Area of each hole $=\pi r^2=\frac{22}{7}\times\left(\frac{1}{2}\right)^2=\frac{11}{14}cm^2$

$\therefore$ Area of 441 holes $=441\times\frac{11}{14}=346.5cm^2$

Hence, area of the remaining square plate

= (1600 – 346.5) = 1253.5 cm^2

13. **(a)** $x = r \sin A \cos C$, $y = r \sin A \sin C$, $z = r \cos A$

$x^2 + y^2 + z^2 = r^2\sin^2 A \cos^2 C + r^2 \sin^2 A \sin^2 C + r^2 \cos^2 A$

$= (r^2 \sin^2 A)(\cos^2 C + \sin^2 C) + r^2 \cos^2 A$

$= r^2 \sin^2 A(1) + r^2 \cos^2 A = r^2(\sin^2 A + \cos^2 A) = r^2$

14. **(c)**

15. **(a)** Given, $AB = 2DE$ and $\Delta ABC \sim \Delta DEF$

Hence, $\frac{\text{area}(\Delta ABC)}{\text{area}(\Delta DEF)}=\frac{AB^2}{DE^2}$

or $\frac{56}{\text{area}(\Delta DEF)}=\frac{4DE^2}{DE^2}=4$ $[\because AB = 2DE]$

area $(\Delta DEF)=\frac{56}{4}=14$ sq.cm.

16. **(c)** Here, $\frac{a_1}{a_2}=\frac{k}{12}$, $\frac{b_1}{b_2}=\frac{3}{k}$, $\frac{c_1}{c_2}=\frac{k-3}{k}$

For a pair of linear equations to have infinitely many solutions:

$$\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$$

So, we have $\frac{k}{12}=\frac{3}{k}=\frac{k-3}{k}$ or $\frac{k}{12}=\frac{3}{k}$ which gives

$k^2 = 36$ i.e., $k = \pm 6$

Also, $\frac{3}{k}=\frac{k-3}{k}$ gives $3k = k^2 - 3k$, i.e., $6k = k^2$, which means $k = 0$ or $k = 6$.

Therefore, the value of k that satisfies both the conditions, is $k = 6$. For this value, the pair of linear equations has infinitely many solutions.

17. **(a)** H.C.F. (91, 126) $=\frac{91\times126}{\text{L.C.M.}(91,126)}=\frac{91\times126}{182}=13$

18. **(b)** Total number of cards = 52

Total number of diamond cards = 13

I. P(diamond cards) = 13/52 = 1/4

II. P(an ace of heart) = 1/52

III. P(not a heart) = $-\frac{1}{4}=\frac{3}{4}$

IV. P(king or queen) = $\frac{4}{52}+\frac{4}{52}=\frac{8}{52}=\frac{2}{13}$

19. **(c)** By squaring and adding both the given equations, we get

$p^2(\sin^2\theta + \cos^2\theta) + q^2(\cos^2\theta + \sin^2\theta)$

$= a^2 + b^2$

$\Rightarrow$ $p^2 + q^2 - a^2 - b^2 = 0$

$\Rightarrow$ $(p - a)(p + a) + (q - b)(q + b) = 0$

$\Rightarrow$ $\frac{p+a}{q+b}+\frac{q-b}{p-a}=0$

20. **(b)** Let the required ratio be K : 1

$\therefore$ The coordinates of the required point on the y-axis is

$x=\frac{K(-4)+3(1)}{K+1}$; $y=\frac{K(2)+5(1)}{K+1}$

Since, it lies on y-axis

$\therefore$ Its x-cordinates = 0

$\therefore \frac{-4K+3}{K+1}=0 \Rightarrow -4K+3=0$

$\Rightarrow K=\frac{3}{4}$

$\Rightarrow$ Required ratio = $\frac{3}{4}$: 1

$\therefore$ ratio = 3 : 4

21. **(c)** We have, $x = a(\text{cosec}\,\theta + \cot\theta)$

$\Rightarrow \frac{x}{a}=(\text{cosec}\,\theta+\cot\theta)$ ...(i) and $y = b\left(\frac{1-\cos\theta}{\sin\theta}\right) \Rightarrow \frac{y}{b} = \frac{1}{\sin\theta} - \frac{\cos\theta}{\sin\theta}$

$\Rightarrow \frac{y}{b} = \text{cosec}\ \theta - \cot\theta$ ...(ii)

$\Rightarrow \frac{x}{a} \times \frac{y}{b} = (\text{cosec}\ \theta + \cot\theta)(\text{cosec}\ \theta - \cot\theta)$

$\Rightarrow \frac{xy}{ab} = (\text{cosec}^2\theta - \cot^2\theta) \quad \therefore\ xy = ab$

22. **(b)** Since (x, y) is midpoint of (3, 4) and (k, 7)

$\therefore \quad x = \frac{3+k}{2}$ and $y = \frac{4+7}{2}$

Also 2x + 2y + 1 = 0 putting values we get

3 + k + 4 + 7 + 1 = 0

$\Rightarrow$ k + 15 = 0 $\Rightarrow$ k = – 15

23. **(a)** If the lines are parallel, then

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

Here, $a_1 = 3, b_1 = -1, c_1 = -5$,

$a_2 = 6, b_2 = -2, c_2 = -p$

$\Rightarrow \quad \frac{3}{6} = \frac{-1}{-2} \neq \frac{-5}{-p}$ ... (i)

Taking II and III part of equation (i), we get

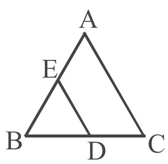
$\Rightarrow \quad \frac{1}{2} \neq \frac{-5}{-p} \quad \Rightarrow \quad -p \neq -10 \quad \Rightarrow \quad p \neq 10$

So, option (a) is correct.

24. **(d)** All equilateral triangles are similar

$\therefore \quad \Delta ABC \sim \Delta EBD$

$\Rightarrow \quad \frac{\text{Area of } \Delta ABC}{\text{Area of } \Delta BDE} = \frac{BC^2}{BD^2}$



D is mid-point of BC

$\therefore BC = 2BD \ = \frac{(2BD)^2}{BD^2} = \frac{4}{1}$

$\Rightarrow$ Area (ΔABC) : Area (ΔBDE) = 4 : 1

25. **(b)** Coordinates of mid-point are given by

$\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

Here, coordinates of mid-point are $\left(\frac{a}{3}, 4\right)$

So, $\frac{a}{3} = \frac{-6-2}{2}$

$\therefore$ a = – 12

26. **(b)** [**Hint.** The outcomes are 1, 2, 3, 4, 5, 6. Out of these, 4 is the only composite number which is less than 5].

27. **(a)** In ΔABC, AB = AC

Draw AL ⊥ BC,

then L is the mid-point of BC

Using Pythagoras theorem in ΔABL, we get

AL = 8cm

Also, ΔBPS ≅ ΔCQR,

$\therefore$ BS = RC

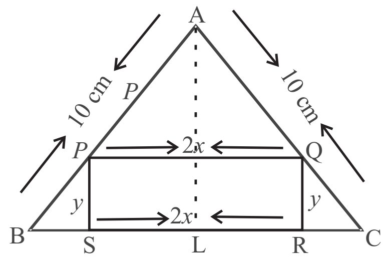
SL = LR = x cm

$\therefore$ BS = CR = 6 – x

In ΔABL, PS || AL

$\therefore \quad \frac{PS}{AL} = \frac{BS}{BL} \Rightarrow \frac{y}{8} = \frac{6-x}{6}$

or $x = 6 - \frac{3}{4}y$



28. **(a)** Since zeroes are reciprocal of each other, so product of the roots will be 1, so $\frac{k+2}{k^2} = 1$,

$k^2 - k - 2 = 0 \Rightarrow (k-2)(k+1) = 0$

$k = 2, k = -1$, Since $k > 0 \quad \therefore \quad k = 2$

29. **(c)** H.C.F. of 20 and 15 = 5

So, 5 students are in each group.

$\therefore \quad n = \frac{20+15}{5} = \frac{35}{5} = 7$

Hence, x = 4, y = 3 and n = 7

30. **(a)** Area of the shaded region

$= \frac{40°}{360°} \times \frac{22}{7} \times (7)^2 - \frac{40°}{360°} \times \frac{22}{7} \times (3.5)^2$

$= \frac{1}{9} \times \frac{22}{7} \times (7^2 - 3.5^2) = \frac{1}{9} \times \frac{22}{7} \times \left(49 - \frac{49}{4}\right)$

$= \frac{1}{9} \times \frac{22}{7} \times \frac{49}{4} \times 3 = \frac{77}{6} \text{cm}^2$

31. **(b)** We have,

$a(b_1 - b + b_1) + a_1(b - b_1 - b) + (a - a_1)(b - a_1)(b - b_1) = 0$

$\Rightarrow 2ab_1 - ab - a_1b_1 + ab - ab_1 - a_1b + a_1b_1 = 0$

$\Rightarrow ab_1 - a_1b = 0$

$\Rightarrow ab_1 = a_1b.$

32. **(b)** $\dfrac{(2+2\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(2-2\cos\theta)} = \dfrac{2(1+\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(2)(1-\cos\theta)}$

$= \dfrac{2(1-\sin^2\theta)}{2(1-\cos^2\theta)} = \dfrac{2\cos^2\theta}{2\sin^2\theta} = \cot^2\theta = \left(\dfrac{15}{8}\right)^2 = \dfrac{225}{64}$

33. **(c)** [**Hint.** The English alphabet has 26 letters in all. The word 'DELHI' has 5 letter, so the number of favourable outcomes = 5.]

34. **(a)** Required number = H.C.F. {(70 – 5), (125 – 8)}

= H.C.F. (65, 117) = 13.

35. **(d)** Let AB be the chord of circle such that $\angle AOB = 90°$

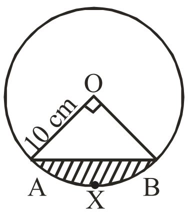
Let OA = 10 cm

$\therefore AB = 10\sqrt{2}$ cm

Area of minor segment A X B

= Area of the sector AOB – Area of ΔAOB

$= \dfrac{90°}{360°} \times \pi(10)^2 - \dfrac{1}{2} \times 10 \times 10$



$= 25\pi - 50 = 25 \times 3.14 - 50 = 78.5 - 50 = 28.5 \text{ cm}^2$

36. **(a)** In ΔAFD & ΔFEB,

$\angle 1 = \angle 2$ (V.O.A)

$\angle 3 = \angle 4$ (Alternate angle)

$\therefore \Delta FBE \sim \Delta FDA$

So, $\dfrac{EF}{FA} = \dfrac{FB}{DF}$

37. **(c)** $PQ = 13 \Rightarrow PQ^2 = 169$

$\Rightarrow (x - 2)^2 + (-7 - 5)^2 = 169$

$\Rightarrow x^2 - 4x + 4 + 144 = 169$

$\Rightarrow x^2 - 4x - 21 = 0$

$\Rightarrow x^2 - 7x + 3x - 21 = 0$

$\Rightarrow (x - 7)(x + 3) = 0$

$\Rightarrow x = 7, -3$

38. **(c)** $\sec^2\theta (1 + \sin\theta)(1 - \sin\theta) = k$

$\left(\dfrac{1}{\cos^2\theta}\right)(1 - \sin^2\theta) = k$

$\Rightarrow \left(\dfrac{1}{\cos^2\theta}\right)(\cos^2\theta) = k \Rightarrow 1 = k.$

39. **(b)** Required number = H.C.F.{(245 – 5), (1029 – 5)}

= H.C.F. (240, 1024) = 16.

40. **(c)** **41.** **(a)**

42. **(d)** **43.** **(c)**

44. **(d)** **45.** **(b)**

46. **(a)** **47.** **(a)**

48. **(c)** **49.** **(b)**

50. **(c)**