# Sample Paper 2

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

## SOLUTIONS

**1.** **(c)** $\frac{\cos\theta}{\text{cosec }\theta+1}+\frac{\cos\theta}{\text{cosec }\theta-1}=$

$$\Rightarrow \frac{\cos\theta(\text{cosec }\theta-1)+\cos\theta(\text{cosec }\theta+1)}{\text{cosec}^2\theta-1}=2$$

$$\Rightarrow \frac{\cos\theta\text{ cosec }\theta-\cos\theta+\cos\theta\text{ cosec }\theta+\cos\theta}{\cot^2\theta}=2$$

$$\Rightarrow \frac{2\cos\theta\text{cosec }\theta}{\cot^2\theta}=2 \Rightarrow \frac{\cos\theta\times\frac{1}{\sin\theta}}{\cot^2\theta}=1$$

$$\Rightarrow \frac{\cot\theta}{\cot^2\theta}=1 \Rightarrow \cot\theta=1$$

$\cot\theta=\cot 45^\circ$ or $\theta=45^\circ$

**2.** **(d)** $\frac{\tan^2\theta}{\tan^2\theta-1}+\frac{\text{cosec}^2\theta}{\sec^2\theta-\text{cosec}^2\theta}$

$$=\frac{\frac{\sin^2\theta}{\cos^2\theta}}{\frac{\sin^2\theta}{\cos^2\theta}-1}+\frac{\frac{1}{\sin^2\theta}}{\frac{1}{\cos^2\theta}-\frac{1}{\sin^2\theta}}$$

$$=\frac{\sin^2\theta}{\cos^2\theta}\times\frac{\cos^2\theta}{\sin^2\theta-\cos^2\theta}+\frac{1}{\sin^2\theta}\times\frac{\sin^2\theta\cos^2\theta}{\sin^2\theta-\cos^2\theta}$$

$$=\frac{\sin^2\theta}{\sin^2\theta-\cos^2\theta}+\frac{\cos^2\theta}{\sin^2\theta-\cos^2\theta}$$

$$=\frac{\sin^2\theta+\cos^2\theta}{\sin^2\theta-\cos^2\theta}=\frac{1}{\sin^2\theta-\cos^2\theta}$$

**3.** **(d)** We have, $\sin 5\theta = \cos 4\theta$

$\Rightarrow 5\theta + 4\theta = 90^\circ$

$[\sin\alpha = \cos\beta$, than $\alpha + \beta = 90^\circ]$

$\Rightarrow 9\theta = 90^\circ \Rightarrow \theta = 10^\circ$

Now, $2\sin 3\theta - \sqrt{3}\tan 3\theta$

$= 2\sin 30^\circ - \sqrt{3}\tan 30^\circ$

$$=2\times\frac{1}{2}-\sqrt{3}\times\frac{1}{\sqrt{3}}=1-1=0$$

**4.** **(a)** Given equations are :

$7x-y=5$ and $21x-3y=k$

Here $a_1=7$, $b_1=-1$, $c_1=5$

$a_2=21$, $b_2=-3$, $c_2=k$

We know that the equations are consistent with unique solution

if $\frac{a_1}{a_2}\neq\frac{b_1}{b_2}$

Also, the equations are consistent with many solutions

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

$$\therefore \frac{7}{21}=\frac{-1}{-3}=\frac{5}{k}\Rightarrow\frac{1}{3}=\frac{5}{k}\Rightarrow k=15$$

Hence, for $k = 15$, the system becomes consistent.

**5.** **(b)** Let full fare = ₹ x

and reservation charges = ₹ y

$\therefore x + y = 2125$ ....(i )

Also $(x + y) + \left(\frac{x}{2} + y\right) = 3200$ from (i),

$$2125 + \frac{x}{2} + y = 3200, \quad \frac{x}{2} + y = 3200 - 2125$$

$\Rightarrow x + 2y = 1075 \Rightarrow x + 2y = 2150$ ....(ii)

Solving (i) and (ii), we get

$-y = -25$ or $y = 25$

Putting the value of $y = 25$ in (i)

$x + 25 = 2125$

$x = 2125 - 25$, $x = 2100$

full fare = ₹ 2100 and reservation charges = ₹ 25

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

Radius of each semi-circle = 7 cm

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

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

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

Area of the coloured portion = $588 - 462 = 126$ cm$^2$

**7.** **(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 = $\frac{90}{135} = \frac{2}{3}$

**8.** **(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 = $f(-1) = (-1)^{64} = 1$

**9.** **(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 $= \frac{AB}{AP} = \frac{\sqrt{2}}{1}$ $\therefore$ AP : AB = 1 : $\sqrt{2}$

**10.** **(c)**

**11.** **(b)** Suppose the required ratio is $m_1 : m_2$

Then, using the section formula, we get

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

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

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

**12.** **(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 = $\frac{7}{21} = \frac{1}{3}$

**13.** **(b)**

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

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

Area of square metal plate = $40 \times 40 = 1600$ 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 $= 441 \times \frac{11}{14} = 346.5$ cm$^2$

Hence, area of the remaining square plate

= (1600 – 346.5) = 1253.5 cm$^2$

**16.** **(c)**

**17.** **(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.

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

**19.** **(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) = $1 - \frac{1}{4} = \frac{3}{4}$

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

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

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

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

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.** **(d)** We have, $\frac{\cos\theta - \sin\theta}{\cos\theta + \sin\theta} = \frac{1-\sqrt{3}}{1+\sqrt{3}}$

$\Rightarrow \frac{(\cos\theta - \sin\theta) + (\cos\theta + \sin\theta)}{(\cos\theta - \sin\theta) - (\cos\theta + \sin\theta)}$

$= \frac{(1-\sqrt{3}) + (1+\sqrt{3})}{(1-\sqrt{3}) - (1+\sqrt{3})}$

[Applying componendo and dividendo]

$\Rightarrow \frac{2\cos\theta}{-2\sin\theta} = \frac{2}{-2\sqrt{3}} \Rightarrow \cot\theta = \frac{1}{\sqrt{3}}$

$\Rightarrow \tan\theta = \sqrt{3} \Rightarrow \tan\theta = \tan 60° \Rightarrow \theta = 60°$

**22.** **(c)** We have, x = a (cosec θ + cot θ)

$\Rightarrow \frac{x}{a} = (\text{cosec}\,\theta + \cot\theta)$ ...(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)

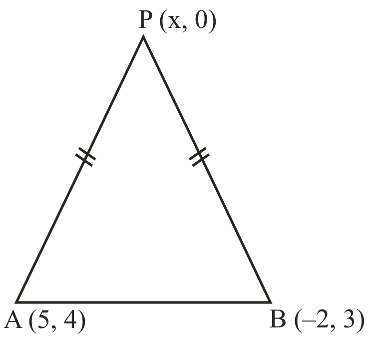
$\Rightarrow \frac{x}{a} \times \frac{y}{b} = (\text{cosec}\,\theta + \cot\theta)(\text{cosec}\,\theta - \cot\theta)$

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

**23.** **(d)** All the statements given in option (a, b, c) are correct.

**24.** **(a)** Since, the required point (say P) is on the x-axis, its ordinate will be zero. Let the abscissa of the point be x.

Therefore, coordinates of the point P are (x, 0).




Let A and B denote the points (5, 4) and (–2, 3) respectively.

Given that AP = BP, we have

$AP^2 = BP^2$

*i.e.* $(x-5)^2 + (0-4)^2$

$= (x+2)^2 + (0-3)^2$

$\Rightarrow x = 2$

**25.** **(c)** Given points are A(–2, –19) and B(5, 4)

Let P be the point trisection of the line AB, then P divides AB in the ratio 1 : 2

So coordinate of P is

$\left(\frac{1(5)+2(-2)}{1+2}, \frac{1(4)+2(-19)}{1+2}\right)$

$= \left(\frac{5-4}{3}, \frac{4-38}{3}\right) = \left(\frac{1}{3}, \frac{-34}{3}\right)$

**26.** **(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

**27.** **(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

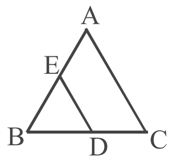
$\Rightarrow \quad \frac{1}{2} \neq \frac{-5}{-p} \quad \Rightarrow \quad -p \neq -10 \quad \Rightarrow \quad p \neq 10$

So, option (a) is correct.

**28.** **(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

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

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

**29.** **(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, $\frac{a}{3} = \frac{-6-2}{2}$

$\therefore \quad a = -12$

**30. (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].

**31. (a)** In $\Delta ABC$, AB = AC

Draw $AL \perp BC$,

then L is the mid-point of BC

Using Pythagoras theorem in $\Delta ABL$, we get

AL = 8cm

Also, $\Delta BPS \cong \Delta CQR$,

$\therefore$ BS = RC

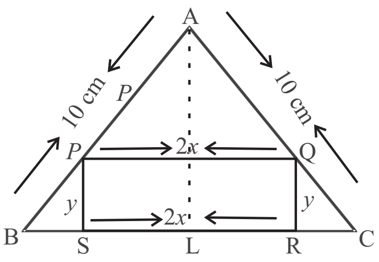
SL = LR = $x$ cm

$\therefore$ BS = CR = $6 - x$

In $\Delta ABL$, PS || AL

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

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




**32. (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 $k > 0 \quad \therefore \quad k = 2$

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

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

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

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

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

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

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

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

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

**37. (a)** In $\Delta AFD$ & $\Delta FEB$,

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

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

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

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

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

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

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

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

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

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

$\Rightarrow x = 7, -3$

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

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

**40. (c)**

**41. (c)** $\frac{AB}{A'B'} = \frac{AC}{A'C'} \Rightarrow \frac{5}{15} = \frac{3}{A'C'}$

$\Rightarrow A'C' = 9$ cm

**42. (a)** $\frac{AB}{A'B'} = \frac{BC}{B'C'} \Rightarrow \frac{5}{15} = \frac{BC}{12}$

$\Rightarrow BC = 4$ cm

**43. (b)** $\because \angle A = \angle A' = 80°$

**44. (a)** $\because \angle B = \angle B' = 60°$

**45. (b)** $\because \angle A + \angle B + \angle C = 180°$

$80° + 60° + \angle C = 180°$

$\angle C = 40°$

**46. (a)** **47. (a)** **48. (c)**

**49. (b)** **50. (c)**