# Sample Paper 3

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

## SOLUTIONS

**1.** **(a)** Let speed of boat in still water = $x$ km/hr

and speed of stream = $y$ km/hr

According to question,

time $(t_1) = \dfrac{9}{x+y} = 2$ (for down = rate) ... (i)

and time $(t_2) = \dfrac{9}{x-y} = 6$ (for up = rate) ... (ii)

Solving equations (i) & (ii), we get

$x = 3$ km/hr and $y = 1.5$ km/hr

Speed of the boat = 3 km/hr

Speed of the current = 1.5 km/hr

**2.** **(c)** P(raining on both day) = 0.2 × 0.3 = 0.06

(Because both independent event)

**3.** **(a)** Statement given in option (a) is false.

**4.** **(b)** $2\pi r_1 = 503$ and $2\pi r_2 = 437$

$\therefore \quad r_1 = \dfrac{503}{2\pi}$ and $r_2 = \dfrac{437}{2\pi}$

Area of ring = $\pi(r_1 + r_2)(r_1 - r_2)$

$= \pi\left(\dfrac{503+437}{2\pi}\right)\left(\dfrac{503-437}{2\pi}\right)$

$= \dfrac{940}{2}\left(\dfrac{66}{2\pi}\right) = 235 \times \dfrac{66}{22} \times 7 = 235 \times 21 = 4935$ sq. cm.

**5.** **(d)**

**6.** **(c)** $\because \tan^2\theta = 1 - e^2$

$\Rightarrow \sec\theta = \sqrt{1+\tan^2\theta} = \sqrt{1+1-e^2}$

$\Rightarrow \sec\theta = \sqrt{2-e^2}$ ...(i)

$\therefore \sec\theta + \tan^3\theta \operatorname{cosec}\theta = \dfrac{1}{\cos\theta} + \tan^2\theta . \dfrac{\sin\theta}{\cos\theta} . \dfrac{1}{\sin\theta}$

$= \dfrac{1}{\cos\theta}(1+\tan^2\theta) = \dfrac{\sec^2\theta}{\cos\theta} = \sec^3\theta = (2-e^2)^{3/2}$ [from (i)]

**7.** **(d)** L.C.M × H.C.F = First number × second number

Hence, required number = $\dfrac{36 \times 2}{18} = 4$ .

**8.** **(b)**

**9.** **(a)**

**10.** **(d)** Sum is 888 ⇒ unit's digit should add up to 8. This is possible only for option (d) as "3" + "5" = "8".

**11.** **(b)** In $\Delta KPN$ and $\Delta KLM$, we have

$\angle KNP = \angle KML = 46°$

$\angle K = \angle K$ (Common)

$\therefore \quad \Delta KNP \sim \Delta KML$ (By *A A* criterion of similarity)

$\Rightarrow \dfrac{KN}{KM} = \dfrac{NP}{ML} \Rightarrow \dfrac{c}{b+c} = \dfrac{x}{a}$

12. **(d)** Let the fraction be $\frac{x}{y}$

According to given conditions,

$$\frac{x+1}{y+1} = 4 \quad \text{... (i)}$$

and $$\frac{x-1}{y-1} = 7 \quad \text{... (ii)}$$

Solving (i) and (ii), we have $x = 15$, $y = 3$

i.e. numbers = 15

13. **(a)** Let the radii of the two circles be $r_1$ and $r_2$, then

$r_1 + r_2 = 15$ (given) ..... (i)

and $\pi r_1^2 + \pi r_2^2 = 153\pi$ (given)

$\Rightarrow \quad r_1^2 + r_2^2 = 153$ ..... (ii)

On solving, we get

$r_1 = 12$, $r_2 = 3$

Required ratio = 12 : 3 = 4 : 1

14. **(b)** $x^2 - (m+3)x + mx - m(m+3) = 0$

$\Rightarrow \quad x[x - (m+3)] + m[x - (m+3)] = 0$

$\Rightarrow \quad (x + m)[x - (m+3)] = 0$

$\therefore \quad x + m = 0 \quad | \quad x - (m+3) = 0$

$x = -m \quad | \quad x = m + 3$

15. **(a)** cosec $x$ – sin $x$ = $a$ & sec $x$ – cos $x$ = $b$

$$\operatorname{cosec} x - \frac{1}{\operatorname{cosec} x} = a \ \& \ \sec x - \frac{1}{\sec x} = b$$

$$\Rightarrow \quad \frac{\operatorname{cosec}^2 x - 1}{\operatorname{cosec} x} = a \ \& \ \frac{\sec^2 x - 1}{\sec x} = b$$

$$\Rightarrow \quad \frac{\cot^2 x}{\operatorname{cosec} x} = a \ \& \ \frac{\tan^2 x}{\sec x} = b$$

$$\frac{\cos^2 x}{\sin x} = a \ \& \ \frac{\sin^2 x}{\cos x} = b$$

Now, $a^2 b = \frac{\cos^4 x}{\sin^2 x} \cdot \frac{\sin^2 x}{\cos x} = \cos^3 x$

$\Rightarrow \quad \cos x = (a^2 b)^{1/3} \Rightarrow \cos^2 x = (a^2 b)^{2/3}$

Similarly, $\sin^2 x = (ab^2)^{2/3}$

We know that, $\sin^2 x + \cos^2 x = 1$

$\Rightarrow \quad (ab^2)^{2/3} + (a^2 b)^{2/3} = 1$

16. **(c)** We have, sum of zeroes

$$= a + b = -\frac{(-4)}{2} = 2$$

Product of zeroes = $ab = \frac{3}{2}$

$$\therefore \ a^2 b + ab^2 = ab\,(a + b) = \frac{3}{2} \times 2 = 3$$

17. **(c)** Since, $DE \parallel BC \quad \therefore \Delta ADE \sim \Delta ABC$

$$\therefore \ \frac{AD}{DB} = \frac{AE}{EC} \Rightarrow \frac{1.5}{3} = \frac{1}{EC} \Rightarrow EC = 2 \text{ cm}$$

18. **(d)** $3^{13} - 3^{10} = 3^{10}(3^3 - 1) = 3^{10}(26) = 2 \times 13 \times 3^{10}$

Hence, $3^{13} - 3^{10}$ is divisible by 2, 3 and 13.

19. **(c)** Let the ages of father and son be $7x$, $3x$

After 10 years,

$\therefore (7x + 10) : (3x + 10) = 2 : 1$ or $x = 10$

$\therefore$ Age of the father is $7x$ i.e. 70 years.

20. **(b)** 24 out of the 90 two digit numbers are divisible by '3' and not by '5'.

The required probability is therefore, $\frac{24}{90} = \frac{4}{15}$.

21. **(b)** $\pi d_1 + \pi d_2 = \pi d \Rightarrow d_1 + d_2 = d$

22. **(c)** We have, $p(x) = x^2 - 10x - 75 = x^2 - 15x + 5x - 75$

$= x(x - 15) + 5(x - 15) = (x - 15)(x + 5)$

$\therefore \ p(x) = (x - 15)(x + 5)$

So, $p(x) = 0$ when $x = 15$ or $x = -5$. Therefore required zeroes are 15 and –5.

23. **(d)** Let cosec $x$ – cot $x$ = $\frac{1}{3}$

$$\Rightarrow \quad \frac{1}{\sin x} - \frac{\cos x}{\sin x} = \frac{1}{3}$$

$$\Rightarrow \quad \frac{1 - \cos x}{\sin x} = \frac{1}{3} \Rightarrow \frac{2\sin^2 \frac{x}{2}}{2 \sin \frac{x}{2} \cos \frac{x}{2}} = \frac{1}{3}$$

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

Consider

$$\tan x = \frac{2 \tan \frac{x}{2}}{1 - \tan^2 \frac{x}{2}} = \frac{\frac{2}{3}}{1 - \frac{1}{9}} = \frac{3}{4}$$

Thus $\sin x = \frac{3}{5}, \cos x = \frac{4}{5}$

$\therefore \quad \cos^2 x - \sin^2 x = \frac{16}{25} - \frac{9}{25} = \frac{7}{25}$

**24.** **(a)** $x^3 - 3x^2 - 10x + 24$

$\because$ Last term = (product of roots)

$\therefore$ Factorising $24 = 2 \times 4 \times 3$

Also sum of roots must be "3"

$\therefore$ Possible factors are (2, 4, –3)

$\therefore$ Factorization of $x^3 - 3x^2 - 10x + 24$

$= (x - 2)(x + 3)(x - 4)$

**25.** **(b)** The point satisfy the line $4y = x + 1$

**26.** **(b)** Let salary of $Y$ be $= A$ and of $X$ is $= \frac{A}{2}$

$\therefore$ Total salary of $X$ and $Y = \frac{3A}{2}$ ... (i)

Let $X'$ and $Y'$ be the new salary after increment, then we get

$X' = \frac{3A}{4}$ and $Y' = \frac{5A}{4} \Rightarrow X' + Y' = 2A$ ... (ii)

$\therefore$ Required percentage increase $= \frac{\left(\frac{2A - 3A}{2}\right) \times 100}{\frac{3A}{2}}$

[from (i) & (ii) eqns.]

$= \frac{1}{3} \times 100 \Rightarrow 33\frac{1}{3}\%$

**27.** **(a)** Perimeter of sector = 25 cm

$\Rightarrow 2r + \frac{\theta}{360°} \times 2\pi r = 25$

$\Rightarrow 2r + \frac{90°}{360°} \times 2 \times \frac{22}{7} \times r = 25$

$\Rightarrow 2r + \frac{11}{7} r = 25 \Rightarrow \frac{25}{7} r = 25 \Rightarrow r = 7$

Area of minor segment $= \left(\frac{\pi\theta}{360°} - \frac{\sin\theta}{2}\right) r^2$

$= \left(\frac{22}{7} \times \frac{90°}{360°} - \frac{\sin 90°}{2}\right)(7)^2$

$= \left(\frac{11}{14} - \frac{1}{2}\right) \times 49 = \frac{4}{14} \times 49 = 14 \text{ cm}^2$.

**28.** **(d)** $\because \frac{\text{Perimeter of } \Delta ABC}{\text{Perimeter of } \Delta PQR} = \frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}$

**29.** **(d)** We have, $\tan\theta = \frac{a \sin\phi}{1 - a\cos\phi}$

$\Rightarrow \cot\theta = \frac{1}{a\sin\phi} - \cot\phi \Rightarrow \cot\theta + \cot\phi = \frac{1}{a\sin\phi}$ ...(i)

and $\tan\phi = \frac{b\sin\theta}{1 - b\cos\theta}$

$\Rightarrow \cot\phi = \frac{1}{b\sin\theta} - \cot\theta$

$\Rightarrow \cot\phi + \cot\theta = \frac{1}{b\sin\theta}$ ...(ii)

From (i) and (ii), we have

$\frac{1}{a\sin\phi} = \frac{1}{b\sin\theta} \Rightarrow \frac{a}{b} = \frac{\sin\theta}{\sin\phi}$

**30.** **(a)** The number divisible by 15, 25 and 35 = L.C.M. (15, 25, 35) = 525

Since, the number is short by 10 for complete division by 15, 25 and 35.

Hence, the required least number = 525 – 10 = 515.

**31.** **(b)** [**Hint.** One digit prime numbers are 2, 3, 5, 7. Out of these numbers, only the number 2 is even.]

**32.** **(d)** Work ratio of $A : B = 100 : 160$ or $5 : 8$

$\therefore$ time ratio = 8 : 5 or 24 : 15

If $A$ takes 24 days, $B$ takes 15 days. Hence, $B$ takes 30 days to do double the work.

**33.** **(b)** Hypotenuse = 270m

$\Rightarrow$ Hypotenuse$^2$ = Side$^2$ + Side$^2$ = 2 Side$^2$

$\Rightarrow$ Side$^2 = (270)^2/2 = 72900/2 = 36450$

or Side = 190.91m

$\Rightarrow$ Required area = 1/2 × 190.91 × 190.91

= 36446.6/2 = 18225 m$^2$ (approx).

**34.** **(d)** Out of $n$ and $n + 2$, one is divisible by 2 and the other by 4, hence $n(n + 2)$ is divisible by 8. Also $n$, $n + 1$, $n + 2$ are three consecutive numbers, hence one of them is divisible by 3. Hence, $n(n + 1)(n + 2)$ must be divisible by 24. This will be true for any even number $n$.

**35.** **(d)** $(\cos^4 A - \sin^4 A) = (\cos^2 A)^2 - (\sin^2 A)^2$

$= (\cos^2 A - \sin^2 A)(\cos^2 A + \sin^2 A)$

$= (\cos^2 A - \sin^2 A)(1) = \cos^2 A - (1 - \cos^2 A)$

$= 2\cos^2 A - 1$

**36.** **(d)** The L.C.M. of 16, 20 and 24 is 240. The least multiple of 240 that is a perfect square is 3600 and also we can easily eliminate choices (a) and (c) since they are not perfect number. Hence, the required least number which is also a perfect square is 3600 which is divisible by each of 16, 20 and 24.

**37.** **(a)** Since, $\Delta ABC \sim \Delta PQR$

$\therefore \dfrac{\text{ar}(\Delta PQR)}{\text{ar}(\Delta ABC)} = \dfrac{PR^2}{AC^2} = \dfrac{QR^2}{BC^2} = \dfrac{9}{1} \left[\because \dfrac{QR}{BC} = \dfrac{3}{1}\right] = 9$

**38.** **(b)** Area of rectangle = 28 × 23 = 644 $cm^2$

Radius of semi-circle = 28 ÷ 2 = 14 cm

Radius of quadrant = 23 – 16 = 7 cm

Area of unshaded region

$= \left(\dfrac{1}{2} \times \dfrac{22}{7} \times 14 \times 14\right) + \left(2 \times \dfrac{1}{4} \times \dfrac{22}{7} \times 7 \times 7\right) = 385 \text{ cm}^2$

$\therefore$ Shaded area = (644 – 385) = 259 $cm^2$

**39.** **(d)** $\dfrac{1}{5} = \dfrac{2}{k} \neq \dfrac{-3}{7}$ $\left[\because \text{For inconsistent } \dfrac{a_1}{a_2} = \dfrac{b_1}{b_2} \neq \dfrac{c_1}{c_2}\right]$

$\Rightarrow k = 10$

**40.** **(a)** Required probability $= \dfrac{4}{6} = \dfrac{2}{3}$.

**41.** **(c)** (0, 0)

**42.** **(a)** (4, 6)

**43.** **(a)** (6, 5)

**44.** **(a)** (16, 0)

**45.** **(b)** (–12, 6)

**46.** **(d)** parabola

**47.** **(a)** 2

**48.** **(b)** –1, 3

**49.** **(c)** $x^2 - 2x - 3$

**50.** **(d)** 0