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120 Questions

Que. 1 Let $\vec{a}$ and $\vec{b}$ be two vectors, which of the following vectors are not perpendicular to each other?

1. $\left(\vec{a} \times \vec{b}\right)$ and $\vec{a}$
2. $\left(\vec{a} + \vec{b}\right)$ and $\left(\vec{a} \times \vec{b}\right)$
3. $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$
4. $\vec{a} - \vec{b}$ and $\vec{a} \times \vec{b}$

Testbook Solution Correct Option **- 3**

Concept:

If $\vec{a}$and $\vec{b}$ be two vectors and their cross product is $\overrightarrow{a} \times \overrightarrow{b}$ then vector $\vec{a}$ and $\vec{b}$ both are perpendicular to the vector $\overrightarrow{a} \times \overrightarrow{b}$.

If $\vec{a}$and $\vec{b}$ be two vectors and their cross product is $\overrightarrow{a} \times \overrightarrow{b}$ then vector $\overrightarrow{a} + \overrightarrow{b}$ and $\overrightarrow{a} - \overrightarrow{b}$ both are perpendicular to the vector $\overrightarrow{a} \times \overrightarrow{b}$.

Calculation:

If $\vec{a}$and $\vec{b}$ be two vectors and their cross product is $\overrightarrow{a} \times \overrightarrow{b}$ then vector $\vec{a}$ and $\vec{b}$ both are perpendicular to the vector $\overrightarrow{a} \times \overrightarrow{b}$.

If $\vec{a}$and $\vec{b}$ be two vectors and their cross product is $\overrightarrow{a} \times \overrightarrow{b}$ then vector $\overrightarrow{a} + \overrightarrow{b}$ and $\overrightarrow{a} - \overrightarrow{b}$ both are perpendicular to the vector $\overrightarrow{a} \times \overrightarrow{b}$.

Therefore, option (3) is the correct answer.

Que. 2 If $A = \begin{bmatrix} a & b & c \\ b & c & a \\ c & a & b \end{bmatrix}$, where a, b, c are real positive numbers such that abc = 1 and $A^TA = I$ then the equation that holds true among the following is

1. $a + b + c = 1$
2. $a^2 + b^2 + c^2 = 1$
3. $ab + bc + ca = 0$
4. $a^3 + b^3 + c^3 = 4$

Testbook Solution Correct Option **- 2**

Concept:

- Identity matrix is given by $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$
- If two matrix are equal then corresponding elements are also equal.

Calculation:

$$A = \begin{bmatrix} a & b & c \\ b & c & a \\ c & a & b \end{bmatrix}, \quad A^T = \begin{bmatrix} a & b & c \\ b & c & a \\ c & a & b \end{bmatrix}$$

$A^TA = I$

$$\begin{bmatrix} a & b & c \\ b & c & a \\ c & a & b \end{bmatrix} \begin{bmatrix} a & b & c \\ b & c & a \\ c & a & b \end{bmatrix} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} a^2+b^2+c^2 & ab+bc+ca & ab+bc+ca \\ ab+bc+ca & a^2+b^2+c^2 & ab+bc+ca \\ ab+bc+ca & ab+bc+ca & a^2+b^2+c^2 \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

By comparing the corresponding elements we get $a^2 + b^2 + c^2 = 1$ and $ab + bc + ac = 0$

As we know that, $(a + b + c)^2 = a^2 + b^2 + c^2 + ab + bc + ac$

$\Rightarrow (a + b + c)^2 = 1 + 0$

$\Rightarrow a + b + c = 1$

Que. 3 The equation of the tangent at any point of the curve $x = a\cos 2t$, $y = 2\sqrt{2}a\sin t$, with m as its slope is

1. $y = mx + a\left(m - \frac{1}{m}\right)$
2. $y = mx - a\left(m + \frac{1}{m}\right)$
3. $y = mx + m\left(a + \frac{1}{a}\right)$
4. $y = amx + a\left(m - \frac{1}{m}\right)$

Testbook Solution Correct Option **- 2**

CONCEPT:

- If $x = f(t)$, $y = g(t)$, where t is a parameter, then $\frac{dy}{dx} = \frac{g'(t)}{f'(t)}$
- Tangent to a curve $y = f(x)$ at any point is given by: $m = dy/dx$
- Equation of a tangent to a curve $y = f(x)$ is given by: $y - y_1 = m \times (x - x_1)$

CALCULATION:

Given: Equation of curve is $x = a\cos 2t$, $y = 2\sqrt{2}a\sin t$

As we know that, tangent to a curve $y = f(x)$ at any point is given by: $m = dy/dx$

Here, $m = \frac{dy}{dx} = -\frac{\sqrt{2}}{2\times\sin t}$

$\Rightarrow \sin t = -\frac{\sqrt{2}}{2m}$

As it is given that, $x = a\cos 2t$, $y = 2\sqrt{2}a\sin t$

So, by using the value of sin t in $x = a\cos 2t$, $y = 2\sqrt{2}a\sin t$ we get

$\Rightarrow y = -\frac{2a}{m}$ and $x = a\left(1 - \frac{1}{m^2}\right)$

As we know that, equation of a tangent to a curve $y = f(x)$ is given by: $y - y_1 = m \times (x - x_1)$

Here, any point on the curve is given by: $\left(a\left(1 - \frac{1}{m^2}\right), -\frac{2a}{m}\right)$

So, the equation of the required tangent is: $y + \frac{2a}{m} = m \times \left[x - a\left(1 - \frac{1}{m^2}\right)\right]$

On further simplifying the above equation we get,

$\Rightarrow y = mx - a\left(m + \frac{1}{m}\right)$

Hence, **option B** is the correct answer.

Que. 4 The locus of the mid points of all chords of the parabola $y^2 = 4x$, which are drawn through its vertex, is

1. $y^2 = 8x$
2. $y^2 = 2x$
3. $x^2 + 4y^2 = 16$
4. $x^2 = 2y$

Testbook Solution Correct Option **- 2**

Concept:

Let the mid point of chord of the parabola $y^2 = 4ax$ is (h, k)

The equation of chord passing through the mid point of the chord of the parabola is given by $T = S_1$ i.e $yk - 2a(x + h) = k^2 - 4ah$, where T is the tangent and S_1 is equation of the parabola which we get by replacing y and x by k and h respectively.

Calculation:

compare the parabola $y^2 = 4x$ with parabola $y^2 = 4ax$, we get a = 1

chord passes through vertex (0, 0) so this point satisfy chord equation

$\Rightarrow 0 - 2(0 + h) = k^2 - 4h$

$\Rightarrow k^2 = 2h$

Now replace h by x and k by y in the above equation, we get

$y^2 = 2x$

Que. 5 The value of $\lim\limits_{x \to a} \frac{\sqrt{a+2x} - \sqrt{3x}}{\sqrt{3a+x} - 2\sqrt{x}}$ is

1. $\frac{2}{3}$
2. $\frac{2}{\sqrt{3}}$
3. $\frac{3\sqrt{3}}{2}$
4. $\frac{2}{3\sqrt{3}}$

Testbook Solution Correct Option **- 4**

Concept:

If $\lim\limits_{x \to a}\left[\frac{f(x)}{g(x)}\right] = \frac{0}{0}$ form and then we can rationalize denominator

Calculation:

$\lim\limits_{x \to a} \frac{\sqrt{a+2x} - \sqrt{3x}}{\sqrt{3a+x} - 2\sqrt{x}}$

$\lim\limits_{x \to a} \frac{\sqrt{a+2x} - \sqrt{3x}}{\sqrt{3a+x} - 2\sqrt{x}} \times \frac{\sqrt{3a+x} + 2\sqrt{x}}{\sqrt{3a+x} + 2\sqrt{x}} \times \frac{\sqrt{a+2x} + \sqrt{3x}}{\sqrt{a+2x} + \sqrt{3x}}$

$\lim\limits_{x \to a} \frac{a+2x-3x}{3a+x-4x} \times \frac{\sqrt{3a+x} + 2\sqrt{x}}{\sqrt{a+2x} + \sqrt{3x}}$

$\lim\limits_{x \to a} \frac{a-x}{3(a-x)} \times \frac{\sqrt{3a+x} + 2\sqrt{x}}{\sqrt{a+2x} + \sqrt{3x}}$

$\lim\limits_{x\to a}\frac{1}{3}\times\frac{\sqrt{3a+x}+2\sqrt{x}}{\sqrt{a+2x}+\sqrt{3x}}=\frac{2}{3\sqrt{3}}$

Hence, **option 4** is the correct answer.

Que. 6 The value of $\int_{-\pi/3}^{\pi/3}\frac{x\sin x}{\cos^2 x}\,dx$ is

1. $\frac{1}{3}(4\pi+1)$
2. $\frac{4\pi}{3}-2\log\tan\frac{5\pi}{12}$
3. $\frac{4\pi}{3}+\log\tan\frac{5\pi}{12}$
4. $\frac{4\pi}{3}-\log\tan\frac{5\pi}{3}$

Testbook Solution Correct Option **- 2**

Concept:

Property of definite integral:

- If f(x) is an odd function then $\int_{-a}^{a}f(x)dx=0$
- If f(x) is an even function then $\int_{-a}^{a}f(x)dx=2\int_{0}^{a}f(x)dx$

Calculation:

$\int_{-\pi/3}^{\pi/3}\frac{x\sin x}{\cos^2 x}\,dx$

$=2\int_{0}^{\pi/3}\frac{x\sin x}{\cos^2 x}dx$ [by property of definite integral]

$=2\int_{0}^{\pi/3}\frac{x\sin x}{\cos x}\frac{1}{\cos x}dx=2\int_{0}^{\pi/3}x\sec x\tan x dx$

According to ILATE rule we have u = x, v = sec x tan x

$2[x\int\sec x\tan x dx-\int\{\frac{dx}{dx}\int\sec x\tan x dx\}dx]_0^{\pi/3}$

$2[x\sec x-\int\{1.\sec x\}dx]_0^{\pi/3}$

$2[x\sec x-\log\tan(\frac{\pi}{4}+\frac{x}{2})]_0^{\pi/3}$

$2[\frac{\pi}{3}\sec\frac{\pi}{3}-\log\tan(\frac{\pi}{4}+\frac{\pi}{6})-0+\log\tan(\frac{\pi}{4}+0)]$

$2[\frac{2\pi}{3}-\log\tan\frac{5\pi}{12}+\log\tan\frac{\pi}{4}]$

$\frac{4\pi}{3}-2\log\tan\frac{5\pi}{12}+\log 1$

$\frac{4\pi}{3}-2\log\tan\frac{5\pi}{12}$

Que. 7 The foci of the ellipse $\frac{x^2}{16}+\frac{y^2}{b^2}=1$ and the hyperbola $\frac{x^2}{144}-\frac{y^2}{81}=\frac{1}{25}$ coincide, then the value of b^2 is

1. 1
2. 5
3. 7
4. 9

Testbook Solution Correct Option **- 3**

Concept:

Eccentricity for the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is given by $e=\sqrt{1-\frac{b^2}{a^2}}$ and foci = (±ae, 0)

Eccentricity for the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ is given by $e=\sqrt{1+\frac{b^2}{a^2}}$ and foci = (± ae, 0)

Calculation:

$\frac{x^2}{16}+\frac{y^2}{b^2}=1$ eccentricity of the ellipse is $e=\sqrt{1-\frac{b^2}{16}}$ and x coordinate foci = $4\sqrt{1-\frac{b^2}{16}}=\sqrt{16-b^2}$

Given hyperbola $\frac{x^2}{144}-\frac{y^2}{81}=\frac{1}{25}$ can be written as $\frac{x^2}{(12/5)^2}-\frac{y^2}{(9/5)^2}=1$,

By comparing the given hyperbola with $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$, we get a = 12/5, b = 9/5

Eccentricity of the hyperbola

$e=\sqrt{1+\frac{b^2}{a^2}}\Rightarrow\sqrt{1+\frac{(9/5)^2}{(12/5)^2}}\Rightarrow\sqrt{1+\frac{81}{144}}\Rightarrow\frac{15}{12}$

x coordinate foci of hyperbola = ae = $\frac{12}{5}\times\frac{15}{12}=3$

According to question foci of ellipse and hyperbola coincide

So x coordinate of foci of ellipse equal to the x coordinate of foci of hyperbola

$\Rightarrow\sqrt{16-b^2}=3$

$\Rightarrow 16-b^2=9$

$\Rightarrow b^2=7$

Que. 8 If A + B + C = π, then, the value of $\begin{vmatrix}\sin(A+B+C) & \sin B & \cos C\\ -\sin B & 0 & \tan A\\ \cos(A+B) & -\tan A & 0\end{vmatrix}$ is

1. 0
2. 1
3. 2 sin A sin B
4. 2

Testbook Solution Correct Option **- 1**

Concept:

- sin π = 0 and cos (π - θ) = - cos θ

Calculation:

$A=\begin{vmatrix}\sin(A+B+C) & \sin B & \cos C\\ -\sin B & 0 & \tan A\\ \cos(A+B) & -\tan A & 0\end{vmatrix}$

Put $A+B+C=\pi,$ and $A+B=\pi-C$

$\begin{vmatrix}\sin(\pi) & \sin B & \cos C\\ -\sin B & 0 & \tan A\\ \cos(\pi-C) & -\tan A & 0\end{vmatrix}$

$$\begin{vmatrix} 0 & \sin B & \cos C \\ -\sin B & 0 & \tan A \\ -cos\ (C) & -\tan A & 0 \end{vmatrix}$$

⇒ |A| = 0 - sin B × (0 + tan A × cos C) + cos C × (tan A × sin B) = 0

Que. 9 If the mean deviation of the numbers 1, 1 + d, 1 + 2d, ..., 1 + 100d from their mean is 255, then the value of d is

1. 20.0
2. 10.1
3. 20.2
4. 10.0

Testbook Solution Correct Option **- 2**

CONCEPT:

Sum of first n natural numbers is given by $1 + 2 + .. + n = \frac{n(n+1)}{2}$

sum of the AP is given by $[\frac{n}{2}(a + l)]$

Mean deviation is given by $\frac{\sum|x-x_i|}{n}$

CALCULATIONS:

Given series of numbers are 1, 1+d, 1+2d,..., 1+100d

The given numbers are in arithmetic progression with first term a = 1,

number of terms n = 101 and last term l = 1 + 100d

Therefore, sum of the numbers is $[\frac{n}{2}(a + l)]$

$\therefore \frac{n}{2}(a + l) = \frac{101}{2}(1 + 1 + 100d) = 101\ (1 + 50d)$

$= \frac{101(1+50d)}{101} = 1 + 50d$

Hence mean $= \frac{101(1+50d)}{101} = 1 + 50d$

Mean deviation is given by $\frac{\sum|x-x_i|}{n}$

$\therefore \frac{\sum|x-x_i|}{n} = \frac{(1+50d-1)+(1+50d-1-d)+...+(1+100d-1-50d)}{n}$

$\Rightarrow \frac{50d+49d+...+0+d+...+50d}{101}$

$= \frac{2d(1+...+50)}{101}$

As we know that $1 + 2 + .. + n = \frac{n(n+1)}{2}$

$\Rightarrow \frac{2d(1+...+50)}{101} = \frac{2d(50)(51)}{101\times2} = \frac{d(50)(51)}{101}$

$\therefore \frac{d(50)(51)}{101} = 255$

$\Rightarrow d = 10.1$

Therefore, option (2) is the correct answer.

Que. 10 If $P = \sin^{20}\theta + \cos^{48}\theta$, then the inequality that holds for all values of θ is

1. $P \geq 1$
2. $0 < P \leq 1$

3. $1 < P < 3$
4. $0 \le P \le 1$

Testbook Solution Correct Option **- 2**

Concept:

- $0 \le \sin^{2n} \theta \le 1$
- $0 \le \cos^{2n} \theta \le 1$

Calculation:

Given: $P = \sin^{20} \theta + \cos^{48} \theta$

As we know that, $0 \le \sin^{2n} \theta \le 1$ and $0 \le \cos^{2n} \theta \le 1$

$\Rightarrow 0 < \sin^{20} \theta + \cos^{48} \theta \le 1$

$\Rightarrow 0 < P \le 1$

Hence, **option B** is the correct answer.

Que. 11 If a, b, c are in geometric progression, then $\log_{ax} x$, $\log_{bx} x$ and $\log_{cx} x$ are in

1. Arithmetic progression
2. Geometric progression
3. Harmonic progression
4. Arithmetico-geometric progression

Testbook Solution Correct Option **- 3**

Concept:

If a, b, c are in geometric progression then $b^2 = ac$

If b - a = c - a, than a, b, c are in AP.

If 1/a, 1/b, 1/c are in AP than a, b, c are in HP.

$\log_a b = \frac{1}{\log_b a}$

Calculation:

If a, b, c are in geometric progression then $b^2 = ac$

So, by multiplying both side by x^2 and taking log on both side to the base x

$\log_x (x^2 b^2) = \log_x (x^2 ac)$

$2\log_x xb = \log_x xa + \log_x xc$

$\log_x xb - \log_x xa = \log_x xc - \log_x xb$

so $\log_x$ ax, $\log_x$ bx and $\log_x$ ax are in AP.

$\frac{1}{\log_{ax} x}, \frac{1}{\log_{bx} x}, \frac{1}{\log_{cx} x}$ are also in AP

$\log_{ax} x, \log_{bx} x, \log_{cx} x$ are in HP

Que. 12 If $\vec{a}$ and $\vec{b}$ are vectors in space, given by $\vec{a} = \frac{\hat{i} - 2\hat{j}}{\sqrt{5}}$ and $\vec{b} = \frac{2\hat{i} + \hat{j} + 3\hat{k}}{\sqrt{14}}$ then the value of $\left(2\vec{a} + \vec{b}\right)\left[\left(\vec{a} \times \vec{b}\right) \times \left(\vec{a} - 2\vec{b}\right)\right]$ is

1. 3
2. 4
3. 5

4. 6

Testbook Solution Correct Option **- 3**

Concept:

Vector triple product

If a, b, and c are three vectors then the vector triple product is written as $a \times (b \times c)$

It can be proved that $a \times (b \times c) = (a.\,c)b - (a.\,b)c$

Calculation:

$\vec{a} = \frac{\hat{i}-2\hat{j}}{\sqrt{5}}$; |a| = 1

$\overrightarrow{a}.\overrightarrow{a} = \frac{i-2j}{\sqrt{5}}.\frac{i-2j}{\sqrt{5}} = 1$

$\vec{b} = \frac{2\hat{i}+\hat{j}+3\hat{k}}{\sqrt{14}}$; |b| = 1

$\overrightarrow{b}.\overrightarrow{b} = \frac{2i+j+3k}{\sqrt{14}}.\frac{2i+j+3k}{\sqrt{14}} = 1$

$\overrightarrow{a}.\overrightarrow{b} = (\frac{i-2j}{\sqrt{5}})(\frac{2i+j+3k}{\sqrt{14}}) = 0$

$\left(2\vec{a}+\vec{b}\right)\left[\left(\vec{a}\times\vec{b}\right)\times\left(\vec{a}-2\vec{b}\right)\right]$

$(2\vec{a}+\vec{b})[(\vec{a}\times\vec{b})\times\vec{a} - (\vec{a}\times\vec{b})\times\overrightarrow{2b}]$

$(2\vec{a}+\vec{b})[-\vec{a}\times(\vec{a}\times\vec{b}) + \overrightarrow{2b}\times(\vec{a}\times\vec{b})]$

$(2\overrightarrow{a}+\overrightarrow{b})[-(\overrightarrow{a}.\overrightarrow{b})\overrightarrow{a} + (\overrightarrow{a}.\overrightarrow{a})\overrightarrow{b} + (2\overrightarrow{b}.\overrightarrow{b})\overrightarrow{a} - (2\overrightarrow{b}.\overrightarrow{a})\overrightarrow{b}]$

$(2\overrightarrow{a}+\overrightarrow{b})[-(0)\overrightarrow{a} + (1)\overrightarrow{b} + (2)\overrightarrow{a} - (0)\overrightarrow{b}]$

$(2\overrightarrow{a}+\overrightarrow{b})[\overrightarrow{b} + 2\overrightarrow{a}]$

$(2\overrightarrow{a}.\overrightarrow{b} + \overrightarrow{b}.\overrightarrow{b} + 4\overrightarrow{a}.\overrightarrow{a} + \overrightarrow{b}.2\overrightarrow{a})$

$0 + 1 + 4 \times 1 + 0 = 1 + 4 = 5$

Que. 13 The value of the sum $\frac{1}{2\sqrt{1}+1\sqrt{2}} + \frac{1}{3\sqrt{2}+2\sqrt{3}} + \frac{1}{4\sqrt{3}+3\sqrt{4}} + \ldots + \frac{1}{25\sqrt{24}+24\sqrt{25}}$ is

1. $\frac{9}{10}$
2. $\frac{4}{5}$
3. $\frac{14}{15}$
4. $\frac{7}{15}$

Testbook Solution Correct Option **- 2**

Calculation:

$\frac{1}{2\sqrt{1}+1\sqrt{2}} + \frac{1}{3\sqrt{2}+2\sqrt{3}} + \frac{1}{4\sqrt{3}+3\sqrt{4}} + \ldots + \frac{1}{25\sqrt{24}+24\sqrt{25}}$

On Rationalizing the above expression we get

$= \frac{1}{2\sqrt{1}+1\sqrt{2}} \times \frac{2\sqrt{1}-1\sqrt{2}}{2\sqrt{1}-1\sqrt{2}} + \frac{1}{3\sqrt{2}+2\sqrt{3}} \times \frac{3\sqrt{2}-2\sqrt{3}}{3\sqrt{2}-2\sqrt{3}} + \frac{1}{4\sqrt{3}+3\sqrt{4}} \times \frac{4\sqrt{3}-3\sqrt{4}}{4\sqrt{3}-3\sqrt{4}} + \ldots\ldots\ldots + \frac{1}{25\sqrt{24}+24\sqrt{25}} \times \frac{25\sqrt{24}-24\sqrt{25}}{25\sqrt{24}-24\sqrt{25}}$

By applying $(a + b)(a - b) = a^2 - b^2$ in denominator we get,

$\frac{2\sqrt{1}-1\sqrt{2}}{(2\sqrt{1})^2-(1\sqrt{2})^2} + \frac{3\sqrt{2}-2\sqrt{3}}{(3\sqrt{2})^2-(2\sqrt{3})^2} + \frac{4\sqrt{3}-3\sqrt{4}}{(4\sqrt{3})^2-(3\sqrt{4})^2} + \ldots\ldots\ldots + \frac{25\sqrt{24}-24\sqrt{25}}{(25\sqrt{24})^2-(24\sqrt{25})^2}$

$\frac{2\sqrt{1}-1\sqrt{2}}{2}+\frac{3\sqrt{2}-2\sqrt{3}}{6}+\frac{4\sqrt{3}-3\sqrt{4}}{12}+.....+\frac{25\sqrt{24}-24\sqrt{25}}{600}$

$\frac{2\sqrt{1}}{2}-\frac{1\sqrt{2}}{2}+\frac{3\sqrt{2}}{6}-\frac{2\sqrt{3}}{6}+\frac{4\sqrt{3}}{12}-\frac{3\sqrt{4}}{12}+.....+\frac{25\sqrt{24}}{600}-\frac{24\sqrt{25}}{600}$

$\frac{\sqrt{1}}{1}-\frac{\sqrt{2}}{2}+\frac{\sqrt{2}}{2}-\frac{\sqrt{3}}{3}+\frac{\sqrt{3}}{3}-\frac{\sqrt{4}}{4}+.....+\frac{\sqrt{24}}{24}-\frac{\sqrt{25}}{25}$

By cancelling all positive and negative terms, we get

$\frac{\sqrt{1}}{1}-\frac{\sqrt{25}}{25}\Rightarrow 1-\frac{5}{25}\Rightarrow 1-\frac{1}{5}\Rightarrow \frac{4}{5}$

Que. 14 If $\vec{a}=\hat{i}-\hat{k},\ \vec{b}=x\hat{i}+\hat{j}+(1-x)\hat{k}$ and $c=y\hat{i}+x\hat{j}+(1+x-y)\hat{k}$, then $\left[\vec{a}\vec{b}\vec{c}\right]$ depends on

1. Neither x nor y
2. Only x
3. Only y
4. Both x and y

Testbook Solution Correct Option **- 1**

Concept:

Scalar triple product:

$$[\vec{a}\ \vec{b}\ \vec{c}]=a.(b\times c)=\begin{vmatrix}a_1 & a_2 & a_3\\ b_1 & b_2 & b_3\\ c_1 & c_2 & c_3\end{vmatrix}$$

Calculation:

$\vec{a}=\hat{i}-\hat{k},\ \vec{b}=x\hat{i}+\hat{j}+(1-x)\hat{k}$ and $c=y\hat{i}+x\hat{j}+(1+x-y)\hat{k}$,

$$[\vec{a}\ \vec{b}\ \vec{c}]=\begin{vmatrix}1 & 0 & -1\\ x & 1 & 1-x\\ y & x & 1+x-y\end{vmatrix}$$

$[\vec{a}\ \vec{b}\ \vec{c}]=1\{1+x-y-(x-x^2)\}-0+(-1)\{x^2-y\}$

$[\vec{a}\ \vec{b}\ \vec{c}]=1+x-y-x+x^2-x^2+y=1$

So $\left[\vec{a}\vec{b}\vec{c}\right]$ depends on neither x nor y.

Que. 15 If $42({}^{n}P_2)={}^{n}P_4$ then the value of n is

1. 2
2. 4
3. 9
4. 42

Testbook Solution Correct Option **- 3**

Concept:

- ${}^{n}P_r=\frac{n!}{(n-r)!}$

Calculation:

Given: $42({}^{n}P_2)={}^{n}P_4$

As we know that, ${}^{n}P_{r} = \frac{n!}{(n-r)!}$

$\Rightarrow 42 \times [n \times (n - 1)] = n \times (n - 1) \times (n - 2) \times (n - 3)$

$\Rightarrow 42 = n^2 - 5n + 6$

$\Rightarrow n^2 - 5n - 36 = 0$

$\Rightarrow n^2 - 9n + 4n - 36 = 0$

$\Rightarrow n \times (n - 9) + 4 \times (n - 9) = 0$

$\Rightarrow (n + 4) \times (n - 9) = 0$

$\Rightarrow n = - 4$ or 9

$\because n \in N \Rightarrow n = 9$

Hence, **option C** is the correct answer.

Que. 16 The foot of the perpendicular from the point (2, 4) upon x + y = 1 is

1. $\left(\frac{1}{2}, \frac{3}{2}\right)$
2. $\left(-\frac{1}{2}, \frac{3}{2}\right)$
3. $\left(\frac{4}{3}, \frac{1}{2}\right)$
4. $\left(\frac{4}{3}, \frac{1}{2}\right)1$

Testbook Solution Correct Option **- 2**

Concept:

If two lines are perpendicular and their slopes are m_1 and m_2 than $m_1m_2 = -1$

Calculation:

let foot of the perpendicular on the line x + y be (x_1,y_1) then $x_1 + y_1 = 1$

The coordinate of foot of the perpendicular can be re-written as: $(x_1,1-x_1)$

slope of line x + y = 1 is $m_1 = -1$

slope of perpendicular passing through points (2, 4) and $(x_1,1-x_1)$ be m_2

$m_2 = \frac{1-x_1-4}{x_1-2} = \frac{-x_1-3}{x_1-2}$

$m_1m_2 = -1$

$\frac{-x_1-3}{x_1-2} \times -1 = -1$

$-x_1 - 3 = x_1 - 2 \Rightarrow x_1 = \frac{-1}{2}$

$y_1 = 1-x_1 = 1-(-1/2) = 3/2$

The coordinate of foot of the perpendicular is (-1/2,3/2).

Que. 17 The value of k for which the equation $(k - 2)x^2 + 8x + k + 4 = 0$ has both real, distinct and negative roots is

1. 0
2. 2
3. 3
4. -4

Testbook Solution Correct Option **- 3**

Concept:

If $ax^2 + bx + c = 0$ is a quadratic equation with $D = b^2 - 4ac$ as its discriminant then,

- D > 0 then the quadratic equation has real and distinct roots
- D = 0 then the quadratic equation has real and repeated roots
- D < 0 then the quadratic equation has complex and conjugate roots

Calculation:

Given: The quadratic equation $(k - 2)x^2 + 8x + k + 4 = 0$ has both real, distinct and negative roots

As we know that, for a quadratic equation $ax^2 + bx + c = 0$ if the discriminant D > 0 then roots are real and distinct.

Here, a = k - 2, b = 8 and c = k + 4

$\Rightarrow 64 - 4 \times (k - 2) \times (k + 4) > 0$

$\Rightarrow 16 - k^2 - 2k + 8 > 0$

$\Rightarrow k^2 + 2k - 24 < 0$

$\Rightarrow (k + 6)(k - 4) < 0$

$\Rightarrow k \in (-6, 4)$----------(1)

For both the roots to be negative - b/2a < 0

$\Rightarrow -\frac{8}{2\times(k-2)} < 0$

$\Rightarrow \frac{4}{k-2} > 0$

$\Rightarrow k \in (2, \infty)$ --------(2)

Now from (1) and (2), we get $k \in (2, 4)$

Hence, **option C** is the correct answer.

Que. 18 If (2, 1), (–1, –2), (3, 3) are the midpoints of the sides BC, CA, AB of a triangle ABC, then equation of the line BC is

1. 5x + 4y + 6 = 0
2. 5x - 4y - 6 = 0
3. 5x + 4y - 6 = 0
4. 5x - 4y + 6 = 0

Testbook Solution Correct Option **- 2**

Concept:

If a line joining mid points of any two side of a triangle is parallel to the third side.

The equation of line passing through the point (x_1, y_1) and parallel to a line with slope m is given by $y - y_1 = m(x - x_1)$.

Calculation:

Given: (2, 1), (–1, –2), (3, 3) are the midpoints of the sides BC, CA, AB of a triangle ABC

let mid points of line CA and AB are P and Q respectively

let slope of PQ be m

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3+2}{3+1} = \frac{5}{4}$

The equation of line passing through (2,1)and parallel to a line with slope 5/4 is $y - 1 = \frac{5}{4}(x - 2)$

$\Rightarrow 5x - 4y - 6 = 0$

Que. 19 If a fair dice is rolled successively, then the probability that 1 appears in an even numbered throw is

1. 5 / 36
2. 6 / 11
3. 1 / 6
4. 5 / 11

Testbook Solution Correct Option **- 4**

CONCEPT:

The formula for the sum of an infinite geometric series is $S_\infty = \frac{a}{1-r}$

CALCULATIONS:

Find the probability (p) that the first 1 is obtained in even number of throws i.e., the 2nd, 4th, 8th etc. roll of a die.

Probability of getting a 1 on 2nd throw $p\,(2) = \left(\frac{5}{6}\right)\left(\frac{1}{6}\right)$

Probability of getting a 1 on 4th throw $p\,(4) = \left(\frac{5}{6}\right)^3\left(\frac{1}{6}\right)$

Probability of getting a 1 on 6th throw $p\,(6) = \left(\frac{5}{6}\right)^5\left(\frac{1}{6}\right)$

Therefore, the total probability $= p(2) + p(4) + p(6) + \ldots\ldots\ldots$

$\Rightarrow p = \left(\frac{5}{6}\right)\left(\frac{1}{6}\right) + \left(\frac{5}{6}\right)^3\left(\frac{1}{6}\right) + \left(\frac{5}{6}\right)^5\left(\frac{1}{6}\right)\ldots.$

$\Rightarrow p = \frac{1}{6}\left(\left(\frac{5}{6}\right) + \left(\frac{5}{6}\right)^3 + \left(\frac{5}{6}\right)^5\ldots.\right)$

On applying the formula for the sum of an infinite geometric series, we get

$\Rightarrow p = \frac{1}{6}\left(\frac{\frac{5}{6}}{1-\left(\frac{5}{6}\right)^2}\right)$

$p = \frac{5}{11}$

Therefore, option (4) is the correct answer.

Que. 20 Let $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = \hat{i} - \hat{j} + \hat{k}$ and $c = \hat{i} - \hat{j} - \hat{k}$ be three vectors. A vector $\vec{v}$ in the plane of $\vec{a}$ and $\vec{b}$ whose projection on $\frac{\vec{c}}{|\vec{c}|}$ is $\frac{1}{\sqrt{3}}$, is

1. $3\hat{i} - \hat{j} + 3\hat{k}$
2. $\hat{i} - 3\hat{j} + 3\hat{k}$
3. $5\hat{i} - 2\hat{j} + 5\hat{k}$
4. $2\hat{i} - \hat{j} + 3\hat{k}$

Testbook Solution Correct Option **- 1**

Calculation:

$\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = \hat{i} - \hat{j} + \hat{k}$ and $c = \hat{i} - \hat{j} - \hat{k}$

Given: vector $\vec{v}$ in the plane of $\vec{a}$ and $\vec{b}$

Therefore, $\vec{v} = \vec{a} + \lambda\vec{b}$

$\Rightarrow \vec{v} = (\hat{i} + \hat{j} + \hat{k}) + \lambda(\hat{i} - \hat{j} + \hat{k})$

$= (1 + \lambda)\hat{i} + (1 - \lambda)\hat{j} + (1 + \lambda)\hat{k}$ .... (1)

Projection of $\vec{v}$ on $\frac{\vec{c}}{|\vec{c}|} = \frac{1}{\sqrt{3}}$

$\Rightarrow \vec{v}.\frac{\vec{c}}{|\vec{c}|} = \frac{1}{\sqrt{3}}$

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

$\Rightarrow -(1 - \lambda) = 1$

$\therefore \lambda = 2$

Now, put the value of λ in equation (1), we get

$\vec{v} = 3\hat{i} - \hat{j} + 3\hat{k}$

Que. 21 The number of bit strings of length 10 that contain either five consecutive 0's or five consecutive 1's is

1. 64
2. 112
3. 220
4. 222

Testbook Solution Correct Option **- 4**

Calculation:

Observe first 5 consecutive 0s

Summation rule: the first 5 consecutive 0's could start at position 1, 2, 3, 4, 5, or 6

Start at the first position

Other 5 bits can be anything: $2^5 = 32$

Start at the second position

The first bit must be a 1

There are various possibilities that can be included in it.

Remaining bits can be anything: $2^4 = 16$

Start at third position

The second bit must be a 1 due to above-mentioned reason.

First bit and last 3 bits can be anything: $2^4 = 16$

Starting at 4,5 and 6 positions

Same as starting at positions 2 or 3: 16 each

Total = 32 + 16 + 16 + 16 + 16 + 16 = 112

The five consecutive 1's ensue the same pattern and have different like 112 possibilities

There would be two cases counted twice (that we thus need to exclude): 0000011111 and 1111100000

Total = 112 + 112 - 2 = 222

Que. 22 If $0 < x < \pi$ and $\cos x + \sin x = \frac{1}{2}$, then the value of tan x is

1. $\frac{-4-\sqrt{7}}{3}$
2. $\frac{4+\sqrt{7}}{3}$
3. $\frac{1+\sqrt{7}}{4}$
4. $\frac{1-\sqrt{7}}{4}$

Testbook Solution Correct Option **- 1**

Concept:

The roots of a quadratic equation $ax^2+bx+c = 0$ are given by $x = \frac{-b\pm\sqrt{b^2-4ac}}{2a}$

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

Calculation:

Given: $\sin x + \cos x = \frac{1}{2}$

By squaring both the sides we get

$\Rightarrow (\sin x + \cos x)^2 = \frac{1}{4}$

$\Rightarrow \sin^2 x + \cos^2 x + 2 \sin x \cos x = \frac{1}{4}$

$\Rightarrow 1 + \sin 2x = \frac{1}{4}$

$\Rightarrow \sin 2x = \frac{-3}{4}$

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

$\Rightarrow 3\tan^2 x + 8\tan x + 3 = 0$

$\Rightarrow \tan x = \frac{-8\pm\sqrt{8^2-4\times3\times3}}{2\times3} = \frac{-8\pm\sqrt{28}}{6} = \frac{-4\pm\sqrt{7}}{3}$

Que. 23 If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are the position vectors of the vertices A, B, C of a triangle ABC, then the area of the triangle ABC is

1. $\frac{1}{2}|\vec{a}\times\vec{b}+\vec{b}\times\vec{c}+\vec{c}\times\vec{a}|$
2. $|\vec{a}\times\vec{b}|$
3. $\frac{1}{2}|\vec{a}\times\vec{b}-\vec{b}\times\vec{c}\times-\vec{c}\times\vec{a}|$
4. $|\vec{a}\times(\vec{b}\times\vec{c})|$

Testbook Solution Correct Option **- 1**

CONCEPT:

If $\vec{a}$, $\vec{b}$, $\vec{c}$ are the position vectors of the vertices of the triangle ΔABC,

Then the area of the triangle is given by half of the cross product of its two sides.

i.e. $\frac{1}{2}\left|\left(\vec{a}-\vec{b}\right)\times\left(\vec{b}-\vec{c}\right)\right|$.

CALCULATIONS:

If $\vec{a}$, $\vec{b}$, $\vec{c}$ are the position vectors of the vertices of the triangle ΔABC,

Then the area of the triangle is given by half of the cross product of its two sides.

i.e. $\frac{1}{2}\left|\left(\vec{a}-\vec{b}\right)\times\left(\vec{b}-\vec{c}\right)\right|$.

Therefore, option (1) is the correct answer.

Que. 24 If $\int e^x(f(x)-f'(x))dx = \phi(x)$, then the value of $\int e^x f(x)dx$ is

1. $\phi(x) + e^x f(x)$

2. $\phi(x) - e^x f(x)$
3. $\frac{1}{2}[\phi(x) + e^x f(x)]$
4. $\frac{1}{2}[\phi(x) + e^x f'(x)]$

Testbook Solution Correct Option **- 3**

Calculation:

Here, we have to find the value of the integrand $\int e^x (f(x) - f'(x))dx = \phi(x)$

$\int e^x f'(x))dx = -\phi(x) + \int e^x f(x)dx$ ----------(1)

For given Integration $\int e^x f(x)dx$ according to ILATE rule u = f(x); v = e^x

$\int e^x f(x)dx = f(x)\int e^x dx - \int \left[\frac{df(x)}{dx}\int e^x dx\right]dx$

$\int e^x f(x)dx = f(x)e^x - \int f'(x)e^x dx$

$\int e^x f(x)dx = e^x f(x) - \int e^x f'(x)dx$

Put the value of $\int e^x f'(x)dx$ from equation (1)

$\int e^x f(x)dx = e^x f(x) + \phi(x) - \int e^x f(x)dx$

$2\int e^x f(x)dx = e^x f(x) + \phi(x)$

$\int e^x f(x)dx = \frac{1}{2}[e^x f(x) + \phi(x)]$

Que. 25 If 3x + 4y + k = 0 is a tangent to the hyperbola $9x^2 - 16y^2 = 144$, then the value of K is

1. 0
2. 1
3. -1
4. -3

Testbook Solution Correct Option **- 1**

CONCEPT:

Condition for the line y = mx + c is tangent to the hyperbola is $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is represented as

$c = \pm\sqrt{a^2m^2 - b^2}$

CALCULATIONS:

Given hyperbola $9x^2 - 16y^2 = 144$

It can be written as $\frac{x^2}{\frac{144}{9}} - \frac{y^2}{\frac{144}{16}} = 1$

So $a^2 = \frac{144}{9}, b^2 = \frac{144}{16}$

Again Given line is 3x + 4y + k = 0 and could be written as $y = \frac{-3x}{4} - \frac{k}{4}$

So $m = \frac{-3}{4}, c = -\frac{k}{4}$

Now applying the tangency condition $c = \pm\sqrt{a^2m^2 - b^2}$

On putting the values -

$-\frac{k}{4} = \pm\sqrt{\frac{144}{9} \times \left(\frac{-3}{4}\right)^2 - \frac{144}{16}}$

On solving we get k = 0

Therefore, option (1) is the correct answer.

Que. 26 a, b, c are positive integers such that $a^2 + b^2 - 2bc = 100$ and $2ab - c^2 = 100$. Then the value of $\frac{a+b}{c}$ is

1. 10
2. 100
3. 2
4. 20

Testbook Solution Correct Option **- 3**

CALCULATION:

Given $a^2 + b^2 - 2bc = 100$ and $2ab - c^2 = 100$.

On comparing eq. (i) & (ii), we get

$a^2 + 2b^2 - 2bc = 2ab - c^2$

To make this equation in whole square -

$\Rightarrow a^2 + b^2 + b^2 - 2bc = 2ab - c^2$

$\Rightarrow a^2 + b^2 + b^2 - 2bc - 2ab + c^2 = 0$

$\Rightarrow [a^2 - 2ab + b^2] + [b^2 - 2bc + c^2] = 0$

We know: $(a - b)^2 = a^2 - 2ab + b^2$

$\Rightarrow [a - b]^2 + [b - c]^2 = 0$

$\therefore [a - b]^2 = 0$ & $[b - c]^2 = 0$

$\Rightarrow [a - b] = 0$ & $[b - c] = 0$

$\Rightarrow a = b$ & $b = c$

$\Rightarrow a = b = c$

Let's assume $a = b = c =$ **"p"**

We will substitute $a = b = c = p$ in eq. (i)

$p^2 + 2p^2 - 2pp = 100$

$\Rightarrow p^2 + 2p^2 - 2p^2 = 100$

$\Rightarrow p^2 = 100$

$\Rightarrow$ **p = ± 10**

We will now substitute the value $a = b = c = +10$ in $\frac{a+b}{c}$ and we will get

$= \frac{10+10}{10} = 2$

We will now substitute the value $a = b = c = -10$ in $\frac{a+b}{c}$ and we will get

$= \frac{-10-10}{-10} = 2$

Therefore option (3) is the correct answer.

Que. 27 If (– 4, 5) is one vertex and $7x – y + 8 = 0$ is one diagonal of a square, then the equation of the other diagonal is

1. $x + 7y = 21$
2. $x + 7y = 31$
3. $x + 7y = 28$
4. $x + 7y = 35$

Testbook Solution Correct Option **- 2**

Concept:

If two straight lines are perpendicular and their slopes are m_1 and m_2 then $m_1m_2 = -1$

If straight line slope m_1 and passing through the point (x_1, y_1) are given then equation of straight line is given by $y - y_1 = m_1(x - x_1)$

Calculation:

First diagonal of a square is $7x – y + 8 = 0$ it can be written as $y = 7x + 8$

By comparing it with $y = mx + c$ we get, slope of first diagonal $m_1 = 7$

As we know that, diagonals of square are perpendicular to each other

So slope of second diagonal = -1/slope of first diagonal = -1/7.

second diagonal pass through the point (-4, 5)

As we know that, equation of a straight line with slope m_1 and passing through the point (x_1, y_1) is given by $y - y_1 = m_1(x - x_1)$

Equation of second diagonal

$y - 5 = \frac{-1}{7}(x + 4)$

$\Rightarrow 7y - 35 = - x - 4$

$\Rightarrow x + 7y = 31$

Que. 28 Out of 2n + 1 tickets, which are consecutively numbered, three are drawn at random. Then the probability that the numbers on them are in the arithmetic progression is

1. $\frac{n^2}{4n^2 - 1}$
2. $\frac{n}{4n^2 - 1}$
3. $\frac{3n^2}{4n^2 - 1}$
4. $\frac{3n}{4n^2 - 1}$

Testbook Solution Correct Option **- 4**

CONCEPT:

Out of **2n+1** numbers, **n+1** would be odd and **n** would be even or vice-versa.

CALCULATION:

Out of **2n+1** numbers, **n+1** would be odd and n would be even or vice-versa.

If we select any 2 of the **n+1** numbers, the third number will be automatically decided so as to have the three in AP and the same reasoning would be valid if we select any 2 of the **n** numbers (for example, if we select 5 and 13, the third the number has to be 9).

So, the probability $= \frac{^{n+1}C_2 + ^nC_2}{^{2n+1}C_3} = \frac{[(n+1)\times n + n(n-1)]\times 3!}{2!\times(2n+1)\times 2n\times(2n-1)} = \frac{3n}{4n^2-1}$

Therefore, option (4) is the correct answer.

Que. 29 A circle touches the X-axis and also touches another circle with centre at (0, 3) and radius 2. Then the locus of the centre of the first circle is

1. a parabola
2. a hyperbola
3. a circle
4. an ellipse

Testbook Solution Correct Option **- 1**

CONCEPT:

When two circles having radius r_1 and r_2 and centers at c_1 and c_2 respective touches each other then $|C_1C_2| = r_1 + r_2$

CALCULATION:

Let C_1 (h, k) be the center of the circle.

∵ Circle touches the x-axis then its radius is $r_1 = k$.

Also, the circle with centre C_1 touches the another circle with centre C_2 (0, 3) and radius $r_2 = 2$.

$\therefore |C_1C_2| = r_1 + r_2$

$\Rightarrow \sqrt{(h-0)^2 + (k-3)^2} = |k+2|$

On Squaring both the sides of the above equation we get

$\Rightarrow h^2 - 10k + 5 = 0$

Now replace h with x and k with y in the above equation we get

⇒ Locus is $x^2 - 10y + 5 = 0$, which is parabola.

Therefore, option (1) is the correct answer.

Que. 30 Let $\overline{P}$ and $\overline{Q}$ denote the complements of two sets P and Q. Then the set (P - Q) ∪ (Q - P) ∪ (P ∩ Q) is

1. P ∪ Q
2. $\overline{P} \cup \overline{Q}$
3. P ∩ Q
4. $\overline{P} \cap \overline{Q}$

Testbook Solution Correct Option **- 1**

Concept:

P - Q = The set of elements which belong to P but not to Q

P U Q = The set which consists of all elements of P and all elements of Q, the common elements being taken only once.

P ∩ Q = The set of all elements which are common to both A and B.

Calculation:

let us suppose P = {1, 2, 3, 4} and Q = {3, 4, 5, 6}

⇒ P - Q = {1, 2}

⇒ Q - P = {5, 6}

⇒ P U Q = {1, 2, 3, 4, 5, 6}

⇒ P ∩ Q = {3, 4}

⇒ (P - Q) ∪ (Q - P) ∪ (P ∩ Q) = {1, 2} U {5, 6} U {3, 4} = {1, 2, 3, 4, 5, 6} = P U Q

Que. 31

With the usual notation $\frac{d^2x}{dy^2}$ is

1. $\left(\frac{d^2y^{-1}}{dx^2}\right)$
2. $\frac{d^2y}{dx^2}\left(\frac{dy}{dx}\right)^2$
3. $-\left(\frac{d^2y}{dx^2}\right)^{-1}\left(\frac{dy}{dx}\right)^{-3}$
4. $-\left(\frac{d^2y}{dx^2}\right)\left(\frac{dy}{dx}\right)^{-3}$

Testbook Solution Correct Option **- 4**

Concept:

$\frac{d^2x}{dy^2} = \frac{d\left(\frac{dx}{dy}\right)}{dy}$

$\frac{d}{dx}\left(\frac{1}{y}\right) = -\frac{1}{y^2}\frac{dy}{dx}$

Calculation:

$\frac{d^2x}{dy^2} = \frac{d\left(\frac{dx}{dy}\right)}{dy}$

$= \frac{d\left(\frac{1}{\left(\frac{dy}{dx}\right)}\right)}{\frac{dy}{dx}}$

$= \frac{dx}{dy} \times \frac{-1}{\left(\frac{dy}{dx}\right)^2} \times \frac{d^2y}{dx^2}$

$= -\frac{d^2y}{dx^2}\left(\frac{dy}{dx}\right)^{-3}$

Hence, option (4) is correct.

Que. 32 The radius of the circle passing through the foci of the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$ and having it centre at (0, 3) is

1. 4 units
2. 3 units
3. $\sqrt{12}$ units
4. $\frac{7}{2}$ units

Testbook Solution Correct Option **- 1**

Concept:

Radius: It is the distance from the centre of the circle to any point on the circle.

Foci of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is given by (± ae, 0) where $e = \sqrt{1 - \frac{b^2}{a^2}}$

Distance between two points (x_1, y_1) and (x_2, y_2) is given by $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

Calculation:

From the ellipse $\frac{x^2}{16}+\frac{y^2}{9}=1$, a = 4, b = 3.

$e=\sqrt{1-\frac{b^2}{a^2}}=\sqrt{1-\frac{3^2}{4^2}}=\sqrt{\frac{7}{16}}=\frac{\sqrt{7}}{4}$

Foci of the ellipse = (± ae, 0) = $(\pm 4\times\frac{\sqrt{7}}{4},0)=\pm(\sqrt{7},0)$

Distance between two points $(\sqrt{7},0)$ and (0, 3) = radius

$radius=\sqrt{(\sqrt{7}-0)^2+(0-3)^2}=4\ units$

Hence, option 1 is the correct answer.

Que. 33 A function f : (0, π) → R defined by f(x) = 2 sin x + cos 2x has

1. A local minimum but no local maximum
2. A local maximum but no local minimum
3. Both local minimum and local maximum
4. Neither a local minimum nor a local maximum

Testbook Solution Correct Option **- 3**

Concept:

For any function f(x), local minima occur at x = a, if f'(a) = 0 and f''(a) > 0, and local maxima occur at x = a, if f'(a) = 0 and f''(a) < 0.

Calculation:

A function f : (0, π) → R defined by f(x) = 2 sin x + cos 2x

Differentiate f(x) with respect to x

f'(x) = 2 cos x - 2sin 2x

For local minima and maxima f'(x) = 0

2 cos x - 2sin 2x = 0

cos x - sin 2x = 0

cos x - 2sin x cos x = 0

cos x (1 - 2sin x) = 0

cos x = 0 or 1 - 2sin x = 0

cos x = 0 or sin x = 1/2

$x=\frac{\pi}{2}$ or $x=\frac{\pi}{6}or\frac{5\pi}{6}$

f'(x) = 2 cos x - 2sin 2x differentiate it again

f''(x) = -2sin x - 4cos 2x

At $x=\frac{\pi}{2}$,

f''(π/2) = -2sin (π/2) - 4cos (2π/2) = -2×1 - 4×-1 = -2 + 4 = 2 > 0

so at x = π/2 local minima occur.

At x = π/6,

f''(π/6) = -2sin (π/6) - 4cos (2π/6) = -2×1/2 - 4×1/2 = -1 - 2 = -3 < 0

so at x = π/6 , local maxima occur.

At x = 5π/6,

f''(5π/6) = -2sin (5π/6) - 4cos (2×5π/6) = -2×1/2 - 4×-1/2 = -1 + 2 = 1> 0

so at x = 5π/6 local minima occur.

Que. 34 A matrix M_r is defined as $M_r = \begin{bmatrix} r & r-1 \\ r-1 & r \end{bmatrix}$ $r \in N$, then the value of det (M_1) + det(M_2) + ... + det(M_{2015}) is

1. 2014^2
2. 2013^2
3. 2015
4. 2015^2

Testbook Solution Correct Option **- 4**

Concept:

$|M_r| = \begin{vmatrix} r & r-1 \\ r-1 & r \end{vmatrix} r \in N |M_r| = 2r - 1$

$\sum_{r=1}^{n} n = \frac{n(n+1)}{2}$

Calculations:

A matrix M_r is defined as $M_r = \begin{bmatrix} r & r-1 \\ r-1 & r \end{bmatrix} r \in N$

$\Rightarrow |M_r| = \begin{vmatrix} r & r-1 \\ r-1 & r \end{vmatrix} r \in N$

$\Rightarrow |M_r| = 2r - 1$

Now, consider det (M_1) + det(M_2) + ... + det(M_{2015})

$= \sum_{r=1}^{2015} |M_r| = 2\sum_{r=1}^{2015} r - 2015$

$= \sum_{r=1}^{2015} |M_r| = 2 \times \frac{2015 \times 2016}{2} - 2015$

$= 2015^2$

Que. 35 If $\overrightarrow{AC} = 2\hat{i} + \hat{j} + \hat{k}$ and $\overrightarrow{BD} = -\hat{i} + 3\hat{j} + 2\hat{k}$ then the area of the quadrilateral ABCD is

1. $\frac{5}{2}\sqrt{3}$
2. $5\sqrt{3}$
3. $\frac{15}{2}\sqrt{3}$
4. $10\sqrt{3}$

Testbook Solution Correct Option **- 1**

Concept:

The area of the quadrilateral ABCD = $\frac{1}{2}|\overrightarrow{AC} \times \overrightarrow{BD}|$, where $\overrightarrow{AC}$ and $\overrightarrow{BD}$ are diagonals.

Calculations:

Let $\overrightarrow{AC} = 2\hat{i} + \hat{j} + \hat{k}$ and $\overrightarrow{BD} = -\hat{i} + 3\hat{j} + 2\hat{k}$ are the diagonal of the quadrilateral ABCD.

The area of the quadrilateral ABCD = $\frac{1}{2}|\overrightarrow{AC} \times \overrightarrow{BD}|$ ....(1)

$$\Rightarrow(\overrightarrow{AC}\times\overrightarrow{BD})=\begin{vmatrix}\vec{i}&\vec{j}&\vec{k}\\2&1&1\\-1&3&2\end{vmatrix}$$

$$\Rightarrow(\overrightarrow{AC}\times\overrightarrow{BD})=-\vec{i}-5\vec{j}+7\vec{k}$$

$$\Rightarrow|\overrightarrow{AC}\times\overrightarrow{BD}|=\sqrt{(-1)^2+(-5)^2+(7)^2}$$

$$\Rightarrow|\overrightarrow{AC}\times\overrightarrow{BD}|=\sqrt{75}=5\sqrt{3}$$

From equation (1), we have

The area of the quadrilateral ABCD = $\frac{5\sqrt{3}}{2}$

Que. 36 The value of $\sin^{-1}\frac{1}{\sqrt{2}}+\sin^{-1}\frac{\sqrt{2}-\sqrt{1}}{\sqrt{6}}+\sin^{-1}\frac{\sqrt{3}-\sqrt{2}}{\sqrt{12}}+\ldots$ upto infinity is equal to

1. π
2. $\frac{\pi}{3}$
3. $\frac{\pi}{2}$
4. $\frac{\pi}{4}$

Testbook Solution Correct Option **- 3**

Concept

$\sin^{-1}x-\sin^{-1}y=\sin^{-1}[x\sqrt{1-y^2}-y\sqrt{1-x^2}]$

Calculation:

$$\sin^{-1}\frac{1}{\sqrt{2}}+\sin^{-1}\frac{\sqrt{2}-\sqrt{1}}{\sqrt{6}}+\sin^{-1}\frac{\sqrt{3}-\sqrt{2}}{\sqrt{12}}+\ldots$$

$T_n=\sin^{-1}\left[\frac{\sqrt{n}-\sqrt{n-1}}{\sqrt{n}\sqrt{n+1}}\right]$

$=\sin^{-1}\left[\frac{\sqrt{n}}{\sqrt{n}\sqrt{n+1}}-\frac{\sqrt{n-1}}{\sqrt{n}\sqrt{n+1}}\right]$

$=\sin^{-1}\left[\frac{1}{\sqrt{n}}\sqrt{\frac{n}{n+1}}-\frac{1}{\sqrt{n+1}}\sqrt{\frac{n-1}{n}}\right]$

As we know, $\sin^{-1}x-\sin^{-1}y=\sin^{-1}[x\sqrt{1-y^2}-y\sqrt{1-x^2}]$

$T_n=\sin^{-1}\left[\frac{1}{\sqrt{n}}\sqrt{\frac{n}{n+1}}-\frac{1}{\sqrt{n+1}}\sqrt{\frac{n-1}{n}}\right]=\sin^{-1}\left[\frac{1}{\sqrt{n}}\right]-\sin^{-1}\left[\frac{1}{\sqrt{n+1}}\right]$

Now,

$T_1=\sin^{-1}\left[\frac{1}{\sqrt{1}}\right]-\sin^{-1}\left[\frac{1}{\sqrt{2}}\right]$

$T_2=\sin^{-1}\left[\frac{1}{\sqrt{2}}\right]-\sin^{-1}\left[\frac{1}{\sqrt{3}}\right]$

$T_3=\sin^{-1}\left[\frac{1}{\sqrt{3}}\right]-\sin^{-1}\left[\frac{1}{\sqrt{4}}\right]$

.

.

.

$T_\infty = \sin^{-1}\left[\frac{1}{\sqrt{\infty}}\right] - \sin^{-1}\left[\frac{1}{\sqrt{\infty+1}}\right]$

Now,

$S_\infty = T_1 + T_2 + T_3 + ... + T_\infty$

$= \sin^{-1}\left[\frac{1}{\sqrt{1}}\right] - \sin^{-1}\left[\frac{1}{\sqrt{\infty+1}}\right]$

$= \sin^{-1} 1 - \sin^{-1} 0$

$= \frac{\pi}{2}$

Que. 37 If two circles $x^2 + y^2 + 2gx + 2fy = 0$ and $x^2 + y^2 + 2g's + 2f'y = 0$ touch each other then which of the following is true?

1. gf = g'f'
2. g'f = gf'
3. gg' = ff'
4. None of these

Testbook Solution Correct Option **- 2**

Concept:

If circle have center at point (h, k) and radius r then equation of circle is given by $(x-h)^2 + (y-k)^2 = r^2$

If two circles touch each other then distance between their center is equal to the sum of their radii.

Distance between two points (x_1, y_1) and (x_2, y_2) is given by $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

Calculation:

Equation of first circle $x^2 + y^2 + 2gx + 2fy = 0$ can be written as $(x+g)^2 + (y+f)^2 = g^2 + f^2$

Center of first circle (-g, -f) and radius $\sqrt{g^2 + f^2}$

Equation of second circle $x^2 + y^2 + 2g's + 2f'y = 0$ can be written as $(x+g')^2 + (y+f')^2 = g'^2 + f'^2$

Center of first circle (-g', -f') and radius $\sqrt{g'^2 + f'^2}$

The two circle touch each other so $\sqrt{(-g+g')^2 + (-f+f')^2} = \sqrt{g^2 + f^2} - \sqrt{g'^2 + f'^2}$

By squaring on both sides we get

$(-g+g')^2 + (-f+f')^2 = (\sqrt{g^2 + f^2} - \sqrt{g'^2 + f'^2})^2$

$gg' + ff' = \sqrt{g^2 + f^2}\sqrt{g'^2 + f'^2}$

Again by squaring on both sides we get

$(gg' + ff')^2 = (\sqrt{g^2 + f^2}\sqrt{g'^2 + f'^2})^2$

$2gg'ff' = (gf'^2) + (g'f)^2$

$(gf'^2) + (g'f)^2 - 2gg'ff' = 0$

$(gf' - g'f)^2 = 0 \Rightarrow gf' - g'f = 0$

gf' = g'f

Que. 38 $\int_0^{\pi} [\cot x] dx$, where $[\bullet]$ denotes the greatest integer function, is equal to

1. $\frac{\pi}{2}$
2. 1
3. -1
4. $-\frac{\pi}{2}$

Testbook Solution Correct Option **- 4**

Concept:

We know that

$\int_0^a f(x)dx = \int_0^a f(a-x)dx$

[x] + [-x] = -1, $x \in Z$

[x] + [-x] = 0, $x \notin Z$

Calculations:

Given, $I = \int_0^{\pi} [\cot x]dx$. . . . (1)

We know that

$\int_0^a f(x)dx = \int_0^a f(a-x)dx$

$I = \int_0^{\pi} [\cot(\pi - x)]dx$

$I = \int_0^{\pi} [-\cot x]dx$ ....(2)

Adding (1) and (2), we get

$2I = \int_0^{\pi} [\cot x] + [-\cot x]dx$

$2I = -\pi$

$I = \frac{-\pi}{2}$

Que. 39 In a right angled triangle, the hypotenuse is four times the perpendicular drawn to it from the opposite vertex. The value of one of the acute angles is

1. 45°
2. 30°
3. 15°
4. None of these

Testbook Solution Correct Option **- 3**

Concept:

sin(θ) = opposite side / hypotenuse ,

cos(θ) = adjacent side / hypotenuse .

Calculations:

Consider, In a right angled triangle ABC, $\angle ACB = \theta$

The hypotenuse is four times the perpendicular drawn to it from the opposite vertex.

⇒BD = x

⇒AC = 4x

$\cos\theta = \frac{BC}{AC} = \frac{BC}{4x}$ ....(1)

Now, in triangle BCD,

$\sin\ \theta = \frac{BD}{BC} = \frac{x}{BC}$ ....(2)

Multiply equation (1) and (2), we get

$\Rightarrow \sin\ \theta.\cos\ \theta = \frac{1}{4}$

$\Rightarrow 2\sin\ \theta.\cos\ \theta = \frac{1}{2}$

$\Rightarrow \sin\ 2\theta = \sin 30^\circ$

$\Rightarrow \theta = 15^\circ$

Que. 40 A is targeting B, B and C are targeting A. Probability of hitting the target by A, B and C are $\frac{2}{3}$, $\frac{1}{2}$ and $\frac{1}{3}$ respectively. If A is hit then the probability that B hits the target and C does not, is

1. $\frac{1}{2}$
2. $\frac{1}{3}$
3. $\frac{2}{3}$
4. $\frac{3}{4}$

Testbook Solution Correct Option **- 1**

Concept:

The probability of the complement of an event is one minus the probability of the event. P(B') = 1 - P(B)

$P((B \cap C'|E) = \frac{P(B)P(C')}{P(E)}$

Calculations:

Given, A is targeting B, B and C are targeting A.

P(A): Probability of hitting the target by A = $\frac{2}{3}$

P(B): Probability of hitting the target by B = $\frac{1}{2}$

⇒P(B') = 1 - P(B) = 1 - $\frac{1}{2}$ = $\frac{1}{2}$

P(C): Probability of hitting the target by C = $\frac{1}{3}$

⇒P(C') = 1 - P(C) = 1 - $\frac{1}{3}$ = $\frac{2}{3}$

P(E): Probability that A will be hitting

⇒ P(E) = 1 - P(B')P(C')

⇒ P(E) = 1 - $(\frac{1}{2})(\frac{2}{3})$

⇒ P(E) = $\frac{2}{3}$

Probability that A is hit then the probability that B hits the target and C does not = $P((B \cap C'|E) = \frac{P(B)P(C')}{P(E)}$

$$= \frac{\frac{1}{2} \times \frac{2}{3}}{\frac{2}{3}}$$

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

Hence, A is targeting B, B and C are targeting A. Probability of hitting the target by A, B and C are $\frac{2}{3}, \frac{1}{2}$ and $\frac{1}{3}$ respectively. If A is hit then the probability that B hits the target and C does not, is $\frac{1}{2}$

Que. 41 if the angles of a triangle are in the ratio 2 : 3 : 7, then the ratio of the sides opposite to these angles is

1. $\sqrt{2} : 2 : \sqrt{3} + 1$
2. $2 : \sqrt{2} : \sqrt{3} + 1$
3. $2 : \sqrt{2} : \frac{\sqrt{2}}{\sqrt{3} - 1}$
4. $\frac{1}{\sqrt{2}} : 2 : \frac{\sqrt{3} + 1}{2}$

Testbook Solution Correct Option **- 1**

Concept:

The **Law of Sines** says that in any given triangle, the ratio of any side length to the sine of its opposite angle is the same for all three sides of the triangle.

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Calculations:

Given, the angles of a triangle are in the ratio 2 : 3 : 7.

The sum of the angles of triangle is 180º

⇒ 2x + 3x + 7x = 180º

⇒12 x = 180º

⇒ x = 15º

First angle of triangle = 2x = 30º

Second angle of triangle = 3x = 45º

And third angle of triangle = 7x = 105º

By the Law of sine, we have

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

The sides are in the ratio of sin 30º = sin 45º = sin 105º

$$\Rightarrow \frac{1}{2} : \frac{1}{\sqrt{2}} : \frac{\sqrt{3} + 1}{2\sqrt{2}}$$

$$\Rightarrow \sqrt{2} : 2 : \sqrt{3} + 1$$

Hence, if the angles of a triangle are in the ratio 2 : 3 : 7, then the ratio of the sides opposite to these angles is $\sqrt{2} : 2 : \sqrt{3} + 1$

Que. 42 Suppose that A and B are two events with probabilities $P(A) = \frac{1}{2}, P(B) = \frac{1}{3}$. Then which of the following is true?

1. $\frac{1}{3} \leq P(A \cap B) \leq \frac{1}{2}$
2. $\frac{1}{4} \leq P(A \cap B) \leq \frac{1}{3}$
3. $\frac{1}{6} \leq P(A \cap B) \leq \frac{1}{3}$
4. $\frac{1}{4} \leq P(A \cap B) \leq \frac{1}{2}$

Testbook Solution Correct Option **- 3**

Concept:

If A and B are any two events then P(A ∪ B) = P(A) + P(B) - P(A ∩ B)

Calculation:

Given: A and B are two events with probabilities $P(A) = \frac{1}{2}, P(B) = \frac{1}{3}$

If A and B are two independent P(A ∩ B) = P(A) × P(B)

⇒ P(A ∩ B) = 1/2 × 1/3 = 1/6

Hence, **option C** is the correct answer.

Que. 43 The number of one-to-one functions from {1, 2, 3} to {1, 2, 3, 4, 5} is

1. 125
2. 243
3. 10
4. 60

Testbook Solution Correct Option **- 4**

Concept:

The function f(x) is said to be one to one function if

f(a) = f(b) ⇒ a = b, for every a, b

Calculations:

The function f(x) is said to be one to one function if

f(a) = f(b) ⇒ a = b, for every a, b

consider the co-domain {1, 2, 3}.

'1' can be related to any of the 5 numbers.
'2' can be associated with any of the other four numbers as '1' has already been associated to one of them. leaving us with 4 options to associate 2.

finally '3' can be associated with the remaining 3 numbers.
Hence total number of ways of doing so =5 × 4 × 3
= 60

Hence, The number of one-to-one functions from {1, 2, 3} to {1, 2, 3, 4, 5} is 60

Que. 44 A harbour lies in a direction 60° South of West from a fort and at a distance 30 km from it, a ship sets out from the harbour at noon and sails due East at 10 km an hour. The time at which the ship will be 70

km from the fort is

1. 7 PM
2. 8 PM
3. 5 PM
4. 10 PM

Testbook Solution Correct Option **- 2**

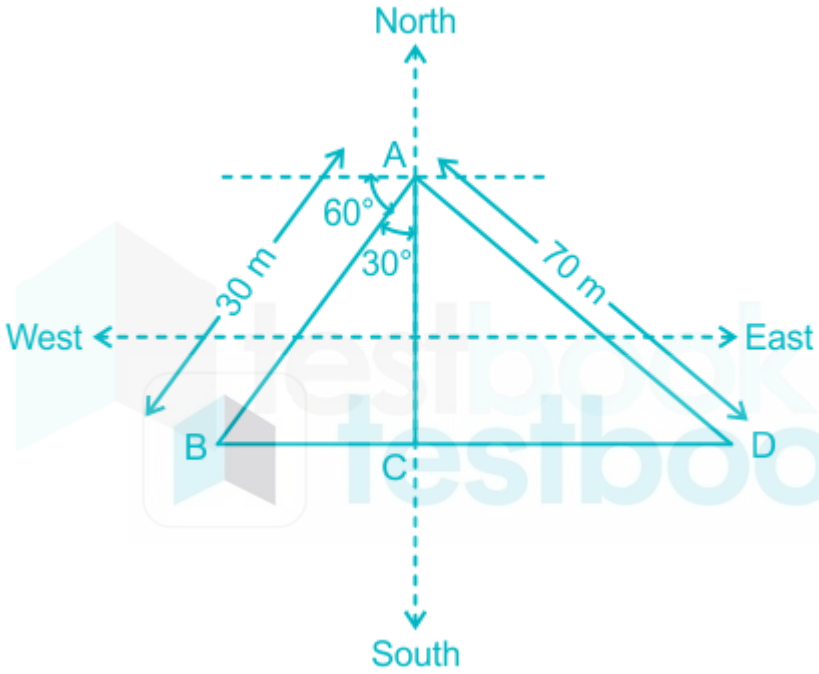
Concept:

we know, Time = Distance/Speed

$\cos\theta = \frac{base}{hypotenuse}$

$\sin\theta = \frac{altitude}{hypotenuse}$

Calculation:



Lets fort is at point A and harbour is at point B.

AB = 30KM, AD = 70KM

In triangle ABC

$\angle BCA = 90 - 60 = 30^0$

$\sin 30 = \frac{BC}{AB} = \frac{BC}{30} \Rightarrow BC = 15$

$\cos 30 = \frac{AC}{AB} = \frac{AC}{30} \Rightarrow AC = 15\sqrt{3}$

In triangle ACD,

We use pythagorous theorem

$AD^2 = AC^2 + CD^2$

$CD^2 = AD^2 - AC^2$

$CD^2 = 70^2 - (15\sqrt{3})^2 = 4900 - 675 = 4225$

$CD = \sqrt{4225} = 65$

Distance cover in east direction by ship = BC + CD = 15 + 65 = 80

Time taken by ship to travel from B to D = distance/speed

$time = \frac{80}{10} = 8hr$

Ship start at noon so it reach at 8PM.

Que. 45 If x, y, z are three consecutive positive integers, then log (1 + xz) is

1. log y
2. $\log \frac{y}{2}$
3. log (2y)
4. 2 log (y)

Testbook Solution Correct Option **- 4**

Concept:

Logarithm Rule

$\log m^n = n \log m$

Calculations:

Let x, y, z are three consecutive positive integers.

⇒ y = x + 1 and z = y + 1

⇒ z = x + 2

Consider, log (1 + xz)

= log [1 + x(x+2)]

= log [1 + x^2 + 2x]

= log $(1 + x)^2$

= 2 log (1 + x)

= 2 log y

Hence, If x, y, z are three consecutive positive integers, then log (1 + xz) is 2 log y

Que. 46 A professor has 24 text books on computer science and is concerned about their coverage of the topics (P) compilers, (Q) data structures and (R) Operating systems. The following data gives the number of books that contain material on these topics: n(P) = 8, n(Q) = 13, n(R) = 13, n(P ∩ R) = 3, n(P ∩ R) = 3, n(Q ∩ R) = 3, n(Q ∩ R) = 6, n(P ∩ Q ∩ R) = 2, where n(x) is the cardinality of the set x. Then the number of text books that have no material on compilers is

1. 4
2. 8
3. 12
4. 16

Testbook Solution Correct Option **- 4**

Concept:

We know, if three sets A, B and C, and their union is U then

- n(U) = n(AUBUC)
- $n(\overline{A}\ U\ B\ UC) = n(U) - n(A)$

Calculation:

Total number of text books = n(U) = 24

number of text books on compliers = n(P) = 8

number of text books on data structures = n(Q) = 13

number of text books on operating system = n(R) = 13

number of text books that have no material no compliers = n(U) - n(P)

= 24 - 8 = 16

Que. 47 The value of $\tan\left(\frac{7\pi}{8}\right)$ is

1. $1-\sqrt{2}$
2. $1+\sqrt{2}$
3. $\sqrt{2}+\sqrt{3}$
4. $\sqrt{2}-\sqrt{3}$

Testbook Solution Correct Option **- 1**

Concept:

$\tan 2A = \frac{2\tan A}{1-\tan^2 A}$

Calculation:

As we know that, $\tan 2A = \frac{2\tan A}{1-\tan^2 A}$

Put A = π/8 in the above formula we get

$\tan\frac{\pi}{4} = \frac{2\tan\frac{\pi}{8}}{1-\tan^2\frac{\pi}{8}}$

$1-\tan^2\frac{\pi}{8} = 2\tan\frac{\pi}{8}$

$\tan^2\frac{\pi}{8} + 2\tan\frac{\pi}{8} - 1 = 0$

use quadratic formula $x = \frac{-b\pm\sqrt{b^2-4ac}}{2a}$

$\tan\frac{\pi}{8} = \frac{-2\pm\sqrt{4+4}}{2} = \frac{-2\pm\sqrt{8}}{2} = -1\pm\sqrt{2}$

$\tan\frac{\pi}{8}$ come in first coordinate so $\tan\frac{\pi}{8} = -1+\sqrt{2}$

$\tan\frac{7\pi}{8} = \tan(\pi-\frac{\pi}{8}) = -\tan\frac{\pi}{8} = -(-1+\sqrt{2}) = 1-\sqrt{2}$

Que. 48 If $\vec{a}$ and $\vec{b}$ are vectors such that $|\vec{a}| = 13$, $|\vec{b}| = 5$ and $\vec{a}\cdot\vec{b} = 60$ then the value of $|\vec{a}\times\vec{b}|$ is

1. 625
2. 225
3. 45
4. 25

Testbook Solution Correct Option **- 4**

Concept:

$\vec{a}.\vec{b} = |\vec{a}||\vec{b}|\cos\theta$

$|\vec{a}\times\vec{b}| = |\vec{a}||\vec{b}|\sin\theta$

Calculations:

Given,

$\vec{a}$ and $\vec{b}$ are vectors such that $|\vec{a}| = 13$, $|\vec{b}| = 5$ and $\vec{a}\cdot\vec{b} = 60$

We know that

$\vec{a}.\vec{b} = |\vec{a}||\vec{b}|\cos\theta$

$\Rightarrow 60 = 13.5 \cos\theta$

$\Rightarrow \cos\theta = \frac{12}{13}$

$\Rightarrow \sin\ \theta = \frac{5}{13}$

Now, $|\vec{a} \times \vec{b}| = |\vec{a}||\vec{b}| sin\ \theta$

$\Rightarrow |\vec{a} \times \vec{b}| = 13 \times 5 \times \frac{5}{13}$

$\Rightarrow |\vec{a} \times \vec{b}| = 25$

Que. 49 Two towers face each other separated by a distance of 25 meters. As seen from the top of the first tower, the angle of depression of the second tower's base is 60° and that of the top is 30°. The height (in meters) of the second tower is

1. $\frac{50}{\sqrt{3}}$
2. $\frac{25}{\sqrt{3}}$
3. 50
4. $25\sqrt{3}$

Testbook Solution Correct Option **- 1**

Concept:

The line of sight is the line drawn from the eye of an observer to the point in the object viewed by the observer.

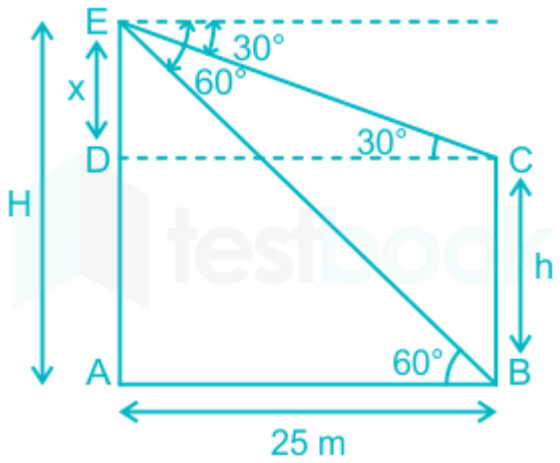
The angle of depression of a point on the object being viewed is the angle formed by the line of sight with the horizontal when the point is below the horizontal level.

Calculation:

Lets first tower height = AE = H, and ED = x

and second tower height = BC = h

and distance between two tower = AB = DC = 25m



In triangle ABE,

$\tan 60 = \frac{AE}{AB} = \frac{H}{25}$

$H = 25\sqrt{3}$

In triangle EDC,

$\tan 30 = \frac{ED}{CD} = \frac{x}{25}$

$x = 25/\sqrt{3}$

From image height of second tower = h = H - x

$h = 25\sqrt{3} - \frac{25}{\sqrt{3}} = \frac{50}{\sqrt{3}}$

Que. 50 If $\vec{a} = 4\hat{j}$ and $\vec{b} = 3\hat{j} + 4\hat{k}$, then the vector form of the component of $\vec{a}$ along $\vec{b}$ is

1. $\frac{18}{10\sqrt{3}}(3\hat{j} + 4\hat{k})$
2. $\frac{18}{5}(3\hat{j} + 4\hat{k})$
3. $\frac{18}{\sqrt{13}}(3\hat{j} + 4\hat{k})$
4. $(3\hat{j} + 4\hat{k})$

Testbook Solution Correct Option **- 2**

Concept:

The vector form of the component of $\vec{a}$ along $\vec{b} = \left(\frac{\vec{a}.\vec{b}}{|\vec{b}|^2}\right)\vec{b}$

Calculations:

Given, $\vec{a} = 4\hat{j}$ and $\vec{b} = 3\hat{j} + 4\hat{k}$

$\Rightarrow \vec{a}.\vec{b} = (4\vec{j}).(3\vec{j} + 4\vec{k})$

$\Rightarrow \vec{a}.\vec{b} = 12$

and $|\vec{b}| = 5$

The vector form of the component of $\vec{a}$ along $\vec{b} = \left(\frac{\vec{a}.\vec{b}}{|\vec{b}|^2}\right)\vec{b}$

$= \frac{12}{5}(3\vec{j} + 4\vec{k})$

Hence, if $\vec{a} = 4\hat{j}$ and $\vec{b} = 3\hat{j} + 4\hat{k}$, then the vector form of the component of $\vec{a}$ along $\vec{b}$ is $\frac{12}{5}(3\vec{j} + 4\vec{k})$

Que. 51 The letters of the English alphabet from A to M were written, leaving space for one letter between every two letters, and then the remaining letters were inserted beginning with N and ending the series with Z after M.

Which letter would be exactly in the middle of eighteenth letter from the beginning and fifteenth from the end?

1. G
2. H
3. J
4. L

Testbook Solution Correct Option **- 2**

Given:

The letters of the English alphabet from A to M were written, leaving space for one letter between every two letters

A _ B _ C _ D _ E _ F _ G _ H _ I _ J _ K _ L _ M

Then the remaining letters were inserted beginning with N and ending the series with Z after M.

A N B O C P D Q E R F S G T H U I V J W K X L Y M Z

Eighteenth letter from the beginning V

Fifteenth from the end S

Series: S G T **H** U I V

Hence, **H** is in the middle.

Que. 52 Which letter would be 3rd to the right of the 7th letter from the left

1. C
2. O
3. R
4. S

Testbook Solution Correct Option **- 3**

Given:

The letters of the English alphabet from A to M were written, leaving space for one letter between every two letters

A _ B _ C _ D _ E _ F _ G _ H _ I _ J _ K _ L _ M

Then the remaining letters were inserted beginning with N and ending the series with Z after M.

A N B O C P D Q E R F S G T H U I V J W K X L Y M Z

7th letter from the left is D

3rd to the right of the D is R

Hence, **R** is the correct answer.

Que. 53 How many 3-digit numbers divisible by 5, can be formed using the digits 2 3 5 6 7 and 9, without repetition of digits?

1. 216
2. 20
3. 120
4. 24

Testbook Solution Correct Option **- 2**

Given,

Numbers that can be used = {2,3,5,6,7,9} = 6

The three digits number has to be formed without repetition

∴ Let the three digit number be abc

Now c is the unit digit and for the number to be divisible by 5, the unit digit can be 5

∴ c = {5} = 1 way

b is the tenth digit and can be formed using numbers 2,3,6,7 and 9

∴ b = {2,3,6,7,9} = 5 or b = $^5C_1$ = 5

c is the hundredth digit and can be formed using remaining 4 numbers has there can be no repetition of digits

$\therefore c = {}^4C_1 = 4$

$\therefore$ Possiblity of a three digit number divisible by $5 = 4 \times 5 \times 1 = 20$ ways

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Que. 54 Using only 2, 5, 10, 25 and 50 paise coins, what is the smallest number of coins required to pay exactly 78 paise, 69 paise and Rs. 1.01 to three different persons?

1. 19
2. 20
3. 17
4. 18

Testbook Solution Correct Option **- 1**

For smallest number of coins use the coins with maximum possible denomination first (50, 25, 10, 5 and 2 paise)

For 69 paise

$\Rightarrow (1 \times 50) + (1 \times 10) + (1 \times 5) + (2 \times 2) = 5$ coins

For 78 paise

$\Rightarrow (1 \times 50) + (2 \times 10) + (4 \times 2) = 7$ coins

For 1.01 rupees or 101 paise

$\Rightarrow (1 \times 50) + (1 \times 25) + (2 \times 10) + (3 \times 2) = 7$ coins

$\therefore$ Total minimum coins required $= 5 + 7 + 7 = 19$ coins

---

Que. 55 Which of the following two patterns will fit in the blanks of the series ZA_5 ,Y_4 B, XC_6 , W_3 D, _____ , _____?

1. V_E7 and U_2E
2. V_2E andU_7F
3. VE_7 andU_2F
4. VF_7 andU_2E

Testbook Solution Correct Option **- 3**

The position of letters according to the English alphabet series:

Alphabets	A	B	C	D	E	F	G	H	I	J	K	L	M
Positional value	1	2	3	4	5	6	7	8	9	10	11	12	13
Positional value	26	25	24	23	22	21	20	19	18	17	16	15	14
Alphabets	Z	Y	X	W	V	U	T	S	R	Q	P	O	N

The pattern followed here is :

Hence, 'VE_7 andU_2F' is the correct answer.

Que. 56 Which of the following numbers comes next in the two-digit decimal number sequence 61, 52, 63, 94, _____?

1. 65
2. 64

3. 56
4. 46

Testbook Solution Correct Option **- 4**

Given,

61, 52, 63, 94, _____?

On reverse the numbers of series:

16, 25, 36, 94_____ ?

The pattern followed here is:

$4 \times 4 = 16$

$5 \times 5 = 25$

$6 \times 6 = 36$

$7 \times 7 = 49$

$8 \times 8 = 64$

On reversing the obtained number

64 = 46

Hence, '46' is the correct answer.

Que. 57 Three ladies X, Y and Z marry three men A, B and C. X is married to A, Y is not married to an engineer. Z is not married to a doctor, C is not a doctor and A is a lawyer. Then which of the following statements is correct?

1. X is married to a doctor
2. Y is married to C, who is a doctor
3. Z is married to B, who is an engineer
4. None of these

Testbook Solution Correct Option **- 4**

Given,

Three ladies X, Y and Z marry three men A, B and C.

1) X is married to A, Y is not married to an engineer.

2) Z is not married to a doctor, C is not a doctor and A is a lawyer.

By checking the given options:

1) X is married to a doctor → It is not possible because as mention in question 'A is a lawyer'.

2) Y is married to C, who is a doctor → It is not possible because as mention in question 'C is not a doctor '.

3) Z is married to B, who is an engineer → it is not possible because Z is not married to a doctor and Y is not married to an engineer so by this statements we can conclude that Z married to an engineer now according to the question C is not a doctor and A is lawyer it means C is an engineer.

So, no statement follows.

Hence, 'None of these' is the correct answer.

Que. 58 There are five books A, B, C, D and E placed on table. If A is placed blow E, C is placed above D, B is placed below A and D is placed between A and E, then which of the following books can be on the top?

1. D or E
2. C or E

3. A or E
4. None of these

Testbook Solution Correct Option **- 2**

Given,

There are five books A, B, C, D and E placed on the table.

1) A is placed blow E.

E
A

2) C is placed above D.

C
D

3) B is placed below A.

E
A
B

4) D is placed between A and E so the final arrangement is :

E/C
D
A
B

Hence, 'E or D' is the correct answer.

Que. 59 Among five children A, B, C, D and E, B is taller than E but shorter than D. A is shorter than C but taller than D. If all the children stand in a line according to their heights, then who would be the fourth if counted from the tallest one?

1. D
2. C
3. B
4. A

Testbook Solution Correct Option **- 3**

Given,

Five children A, B, C, D and E.

1) B is taller than E but shorter than D.

D > B > E

2) A is shorter than C but taller than D. So, the final arrangement is :

C > A > D > B > E

Hence, 'B' is the correct answer.

Que. 60 Questions 60 to 63 are based on the following:

- In a family of six person A, B, C, D, E and F there are two married couples.
- D is grandmother of A and mother of B.

- C is wife of B and mother of F
- F is the grand daughter of E

Which of the following is true?

1. A is brother of F
2. A is sister of F
3. B has two daughters
4. None of these

Testbook Solution Correct Option **- 4**

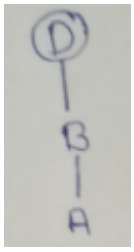
Given Information,

In the family of six-person A, B, C, D, E and F, there are two married couples.

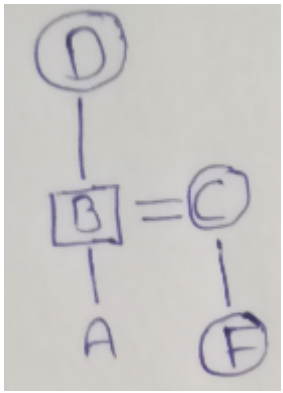
Preparing the family tree using the following symbols,

Symbol in Diagram	Meaning
○	Female
□	Male
=	Married couple
—	Siblings
|	Difference of a generation

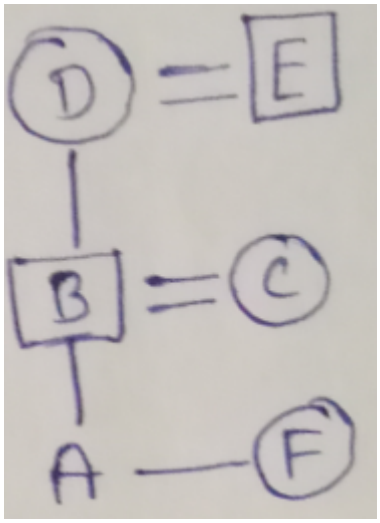
1) D is the grandmother of A and mother of B.



2) C is the wife of B and mother of F.



3) F is the granddaughter of E.



All the option are wrong according to the family tree.

Hence, the answer is **none of these**.

Que. 61 Who among the following is one of the couples?

1. CD
2. DE
3. EB
4. Cannot be determined

Testbook Solution Correct Option **- 2**

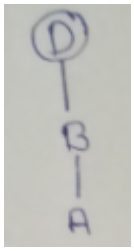
Given,

In the family of six-person A, B, C, D, E and F, there are two married couples.

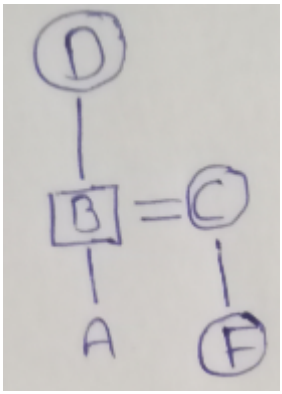
Preparing the family tree using the following symbols,

Symbol in Diagram	Meaning
○	Female
□	Male
=	Married couple
—	Siblings
|	Difference of a generation

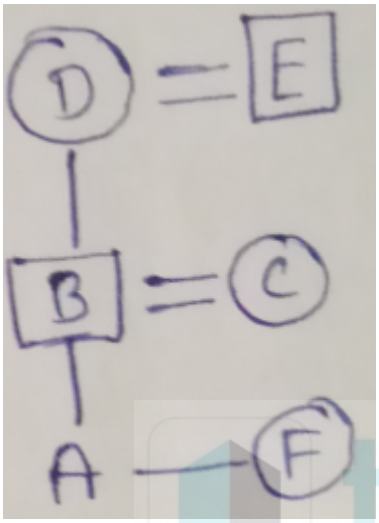
1) D is the grandmother of A and mother of B.



2) C is the wife of B and mother of F.



3) F is the granddaughter of E.



Hence, 'DE' is the correct answer.

Que. 62 How many male members are there in the family?

1. Two
2. Three
3. Four
4. Cannot be determined

Testbook Solution Correct Option **- 4**

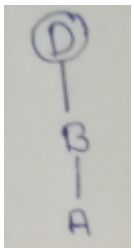
Given Information,

In the family of six-person A, B, C, D, E and F, there are two married couples.

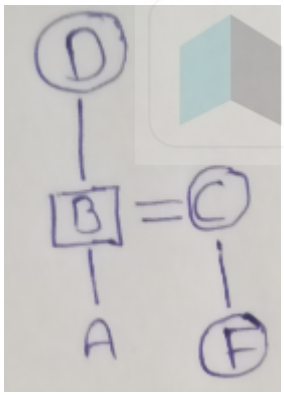
Preparing the family tree using the following symbols,

Symbol in Diagram	Meaning
○	Female
□	Male
=	Married couple
—	Siblings
|	Difference of a generation

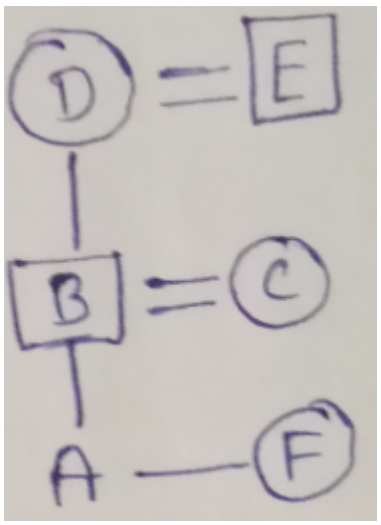
1) D is the grandmother of A and mother of B.



2) C is the wife of B and mother of F.



3) F is the granddaughter of E.



Gender of 'A' is not given.

Hence, 'Can not be determined' is the correct answer.

Que. 63 What is C to A?

1. Daughter
2. Grandmother
3. Mother
4. Cannot be determined

Testbook Solution Correct Option **- 3**

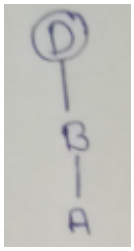
Given Information,

In the family of six-person A, B, C, D, E and F, there are two married couples.

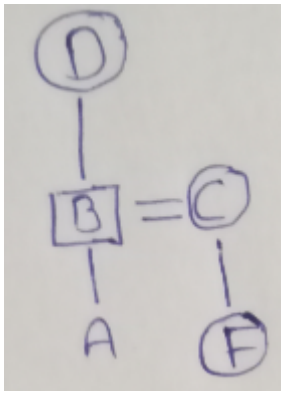
Preparing the family tree using the following symbols,

Symbol in Diagram	Meaning
○	Female
□	Male
=	Married couple
—	Siblings
|	Difference of a generation

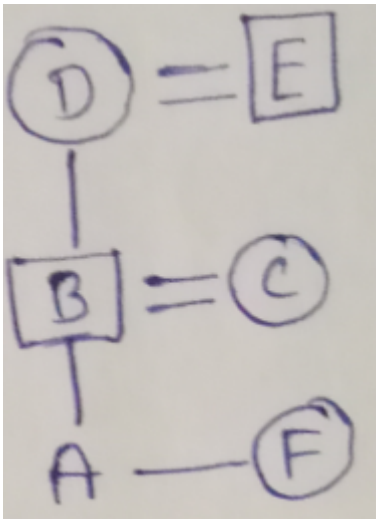
1) D is the grandmother of A and mother of B.



2) C is the wife of B and mother of F.



3) F is the granddaughter of E.



C is the mother of A.

Hence, the answer is **Mother**.

Que. 64 Questions 64 to 67 are based on the following : A, B, C, D, E, F and G are seven girls having different amount of money from among Rs. 10, 20, 40, 60, 80, 120 and 200 with them. They had 3 chocolates, 2 toffees and 2 lollipops together, each one having one of these seven items.

- B and F do not have chocolates and they have Rs. 200 and Rs. 80 respectively.
- C has Rs. 60 with her and G has an amount which is neither Rs. 40 nor Rs. 120.
- A has Rs. 10 and does not have a toffee.
- The girl having Rs. 40 with her is the only one other than A to have the same type of item.
- E and the girl having Rs. 20 with her have the same kind of item.

Which girl has Rs. 40 with her?

1. E
2. A
3. D
4. None of these

Testbook Solution Correct Option **- 3**

Given,

A, B, C, D, E, F and G are seven girls having a different amount of money from among Rs. 10, 20, 40, 60, 80, 120 and 200 with them.

They had 3 chocolates, 2 toffees and 2 lollipops together, each one having one of these seven items.

1) B and F do not have chocolates and they have Rs. 200 and Rs. 80 respectively.

2) C has Rs. 60 with her and G has an amount which is neither Rs. 40 nor Rs. 120.

Girls	Rs.	Items	Not
A			
B	200		Chocolates
C			
D			
E			
F	80		Chocolates

G			40, 120

3) A has Rs. 10 and does not have a toffee.

4) The girl having Rs. 40 with her is the only one other than A to have the same type of item.

Girls	Rs.	Items	Not
A	10		Toffee
B	200		Chocolates
C			
D			
E			
F	80		Chocolates
G			40, 120

5. E and the girl having Rs. 20 with her have the same kind of item.

Girls	Rs.	Items
A	10	Lollipop
B	200	Toffee
C	60	Chocolate
D	40	Lollipop
E	120	Chocolate
F	80	Toffee
G	20	Chocolate

Hence, 'D' is the correct answer.

Que. 65 Which of the following combination is definitely correct?

1. C – chocolate – Rs. 60
2. G – toffee – Rs. 20
3. D – chocolate – Rs. 40
4. None of these

Testbook Solution Correct Option **- 1**

Given,

A, B, C, D, E, F and G are seven girls having a different amount of money from among Rs. 10, 20, 40, 60, 80, 120 and 200 with them.

They had 3 chocolates, 2 toffees and 2 lollipops together, each one having one of these seven items.

1) B and F do not have chocolates and they have Rs. 200 and Rs. 80 respectively.

2) C has Rs. 60 with her and G has an amount which is neither Rs. 40 nor Rs. 120.

Girls	Rs.	Items	Not
A			
B	200		Chocolates
C			
D			
E			
F	80		Chocolates
G			40, 120

3) A has Rs. 10 and does not have a toffee.

4) The girl having Rs. 40 with her is the only one other than A to have the same type of item.

Girls	Rs.	Items	Not
A	10		Toffee
B	200		Chocolates
C			
D			
E			
F	80		Chocolates
G			40, 120

5. E and the girl having Rs. 20 with her have the same kind of item.

Girls	Rs.	Items
A	10	Lollipop
B	200	Toffee
C	60	Chocolate
D	40	Lollipop
E	120	Chocolate
F	80	Toffee
G	20	Chocolate

Hence, 'C – chocolate – Rs. 60' is the correct answer.

Que. 66 Which of the following girls have chocolates with them?

1. F, C, G
2. C, G, E
3. C, G, D
4. G, D, E

Testbook Solution Correct Option **- 2**

Given,

A, B, C, D, E, F and G are seven girls having a different amount of money from among Rs. 10, 20, 40, 60, 80, 120 and 200 with them.

They had 3 chocolates, 2 toffees and 2 lollipops together, each one having one of these seven items.

1) B and F do not have chocolates and they have Rs. 200 and Rs. 80 respectively.

2) C has Rs. 60 with her and G has an amount which is neither Rs. 40 nor Rs. 120.

Girls	Rs.	Items	Not
A			
B	200		Chocolates
C			
D			
E			
F	80		Chocolates
G			40, 120

3) A has Rs. 10 and does not have a toffee.

4) The girl having Rs. 40 with her is the only one other than A to have the same type of item.

Girls	Rs.	Items	Not
A	10		Toffee
B	200		Chocolates
C			
D			
E			
F	80		Chocolates
G			40, 120

5. E and the girl having Rs. 20 with her have the same kind of item.

Girls	Rs.	Items
A	10	Lollipop
B	200	Toffee
C	60	Chocolate
D	40	Lollipop
E	120	Chocolate
F	80	Toffee
G	20	Chocolate

Hence, 'CGE' is the correct answer.

Que. 67 How much amount does G have with her?

1. Rs. 20
2. Rs. 10
3. Rs. 60
4. None of these

Testbook Solution Correct Option **- 1**

Given,

A, B, C, D, E, F and G are seven girls having a different amount of money from among Rs. 10, 20, 40, 60, 80, 120 and 200 with them.

They had 3 chocolates, 2 toffees and 2 lollipops together, each one having one of these seven items.

1) B and F do not have chocolates and they have Rs. 200 and Rs. 80 respectively.

2) C has Rs. 60 with her and G has an amount which is neither Rs. 40 nor Rs. 120.

Girls	Rs.	Items	Not
A			
B	200		Chocolates
C			
D			
E			
F	80		Chocolates
G			40, 120

3) A has Rs. 10 and does not have a toffee.

4) The girl having Rs. 40 with her is the only one other than A to have the same type of item.

Girls	Rs.	Items	Not
A	10		Toffee
B	200		Chocolates
C			
D			
E			
F	80		Chocolates
G			40, 120

5. E and the girl having Rs. 20 with her have the same kind of item.

Girls	Rs.	Items
A	10	Lolipop
B	200	Toffee
C	60	Chocolate
D	40	Lolipop
E	120	Chocolate
F	80	Toffee
G	20	Chocolate

Hence, '20' is the correct answer.

Que. 68 P, Q, R, S, T, U and V are sitting in a row facing North. In order to determine, who is sitting exactly in the middle of the row, which of the following information is needed?

(I) T and U are sitting at extreme ends of the row

(II) S is third to the right of T

(III) Q is four places to the left of R and P is two places to the left of V

1. I and II only are sufficient
2. I and III only are sufficient
3. I and either II or III are sufficient
4. I, II and III

Testbook Solution Correct Option **- 1**

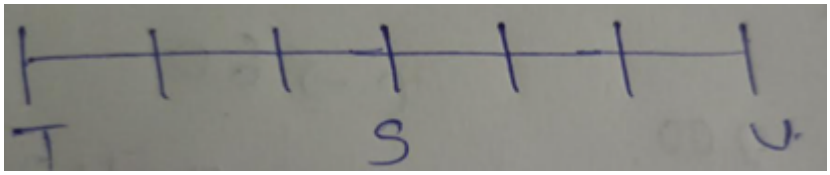
Given,

P, Q, R, S, T, U and V are sitting in a row facing North.

According to the first and second statement :

1)T and U are sitting at extreme ends of the row.

2) S is third to the right of T.



So, by statement 1 and 2 we can conclude that 'S' is sitting in the middle of the row.

Hence, 'I and II are sufficient' is the correct answer.

Que. 69 How many times do the hour and the minute hands of a clock overlap in 24 hours?

1. 24
2. 22
3. 26
4. 20

Testbook Solution Correct Option **- 2**

In T hours, the minute hand completes T laps. In the same amount of time, the hour hand completes T/ 12.

he first time the minute and hour hands overlap, the minute hand has completed one lap more than the hour hand.

So, T= T/12 + 1

T = T/12 + n

T = 24 n = ?

24 = 24/ 12 = n

n = 24 - 2

n = 22

Hence, '22' is the correct answer.

Que. 70 In a certain code, TOGETHER is coded as RQEGRJCT. In the same code, PAROLE will be written as:

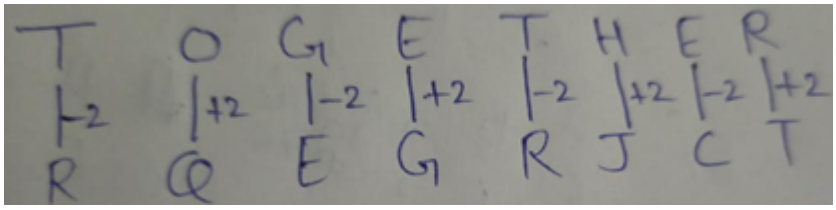
1. NCPQJG
2. NCQPJG
3. RCPQJK
4. RCTQNG

Testbook Solution Correct Option **- 1**

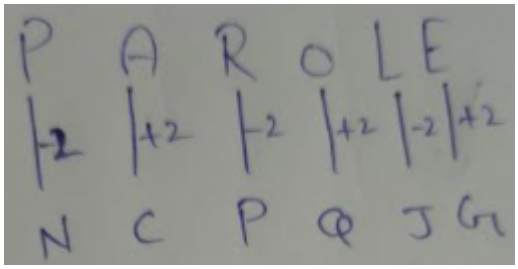
The position of letters according to the English alphabet series:

Alphabets	A	B	C	D	E	F	G	H	I	J	K	L	M
Positional value	1	2	3	4	5	6	7	8	9	10	11	12	13
Positional value	26	25	24	23	22	21	20	19	18	17	16	15	14
Alphabets	Z	Y	X	W	V	U	T	S	R	Q	P	O	N

The pattern followed here is :



Similarly,



Hence, 'NCPQJG' is the correct answer.

Que. 71 A drawer contains 10 black and 10 brown socks which are all mixed up. What is the smallest number of socks to be taken from the drawer to decide without seeing them, to be sure that there is atleast one pair of socks of the same colour?

1. 11
2. 10
3. 3
4. Cannot be determined

Testbook Solution Correct Option **- 3**

Given,

10 black shoes and 10 brown socks

Suppose a person choose black socks in first turn

In the second turn, he can either choose black or brown socks, suppose he choose brown socks

In the third turn, he can choose either black socks or brown socks

Now, he has at least a pair of black socks or brown socks in 3 turns

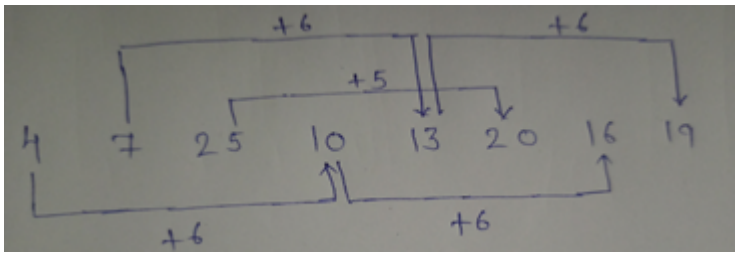
∴ The smallest number of socks to be taken from the drawer to decide that there is atleast one pair of socks of the same colour is 3

Que. 72 Find the missing number in the series: 4, 7, 25, 10, _____, 20, 16, 19.

1. 13
2. 15
3. 20
4. 28

Testbook Solution Correct Option **- 1**

The pattern followed here is :



Hence, '13' is the correct answer.

Que. 73 A circular field with inner radius of 10 meters and outer radius of 20 meters is divided into 5 successive stages for ploughing, The ploughing at each stage, with starting points P1, P2, P3, P4 and P5, was allotted to one of the five farmers F1, F2, F3, F4 and F5, not necessarily in that order.

- F5 was allotted the stage starting at point P4.
- The stage from P5 to P3 was not the first Stage.
- F4 was allotted the work of the fourth stage.
- Finishing point of stage 3 was P1 and the work was not allotted to F1.
- F3 was allotted the work of the stage ending at point P5

What is the starting point for stage 3?

1. P2

2. P3
3. P4
4. Cannot be determined

Testbook Solution Correct Option **- 2**

Given:

The ploughing at each stage, with starting points P1, P2, P3, P4, and P5, were allotted to one of the five farmers F1, F2, F3, F4, and F5.

F5 was allotted the stage starting at point P4

The stage from P5 to P3 was not the first Stage.

F4 was allotted the work of the fourth stage.

The finishing point of stage 3 was P1 and the work was not allotted to F1.

Farmer F3 was given work of stage ending at point P5.

According to the given conditions :

Stage	Start point	End point	Framer
1	P2	P5	F3
2	P5	P3	F1
3	P3	P1	F2
4	P1	P4	F4
5	P4	P2	F5

Hence, 'P3' is the correct answer.

Que. 74 What are the starting and ending points of the field ploughed by F4?

1. P1 and P2
2. P1 and P4
3. P4 and P2
4. P2 and P4

Testbook Solution Correct Option **- 2**

Given:

The ploughing at each stage, with starting points P1, P2, P3, P4, and P5, were allotted to one of the five farmers F1, F2, F3, F4, and F5.

F5 was allotted the stage starting at point P4

The stage from P5 to P3 was not the first Stage.

F4 was allotted the work of the fourth stage.

The finishing point of stage 3 was P1 and the work was not allotted to F1.

Farmer F3 was given work of stage ending at point P5.

According to the given conditions :

Stage	Start point	End point	Framer
1	P2	P5	F3
2	P5	P3	F1
3	P3	P1	F2
4	P1	P4	F4
5	P4	P2	F5

Hence, 'P1 and P4' is the correct answer.

Que. 75 Which stage was ploughed by F5?

1. 2
2. 3
3. 4
4. 5

Testbook Solution Correct Option **- 4**

Given:

The ploughing at each stage, with starting points P1, P2, P3, P4, and P5, were allotted to one of the five farmers F1, F2, F3, F4, and F5.

F5 was allotted the stage starting at point P4

The stage from P5 to P3 was not the first Stage.

F4 was allotted the work of the fourth stage.

The finishing point of stage 3 was P1 and the work was not allotted to F1.

Farmer F3 was given work of stage ending at point P5.

According to the given conditions :

Stage	Start point	End point	Framer
1	P2	P5	F3
2	P5	P3	F1
3	P3	P1	F2
4	P1	P4	F4
5	P4	P2	F5

Hence, '5' is the correct answer.

Que. 76 Which of the following is the finish point for farmer F2?

1. P1
2. P2
3. P3
4. P4

Testbook Solution Correct Option **- 1**

Given:

The ploughing at each stage, with starting points P1, P2, P3, P4, and P5, were allotted to one of the five farmers F1, F2, F3, F4, and F5.

F5 was allotted the stage starting at point P4

The stage from P5 to P3 was not the first Stage.

F4 was allotted the work of the fourth stage.

The finishing point of stage 3 was P1 and the work was not allotted to F1.

Farmer F3 was given work of stage ending at point P5.

According to the given conditions :

Stage	Start point	End point	Framer
1	P2	P5	F3
2	P5	P3	F1

3	P3	P1	F2
4	P1	P4	F4
5	P4	P2	F5

Hence, 'P1' is the correct answer.

Que. 77 If Tuesday falls on the fourth of a month then which day will fall three days after 24th of the same month?

1. Monday
2. Tuesday
3. Thursday
4. Friday

Testbook Solution Correct Option **- 3**

Given,

4th of a month is Tuesday.

Three days after 24th of the month is 27th

So days between 27th and 4th is 23days

The number of odd days is 23 ÷ 7

So the number of odd days is 2.

Tuesday + 2 days = Thrusday

Hence, 'Thursday' is the correct answer.

Que. 78 If the statements “All chickens are birds”, “Some chickens are hens” and “Female birds lay eggs”, are all facts, then which of the following must also be a fact?

I. All birds lay eggs

II. Some hens are birds

III. Some chickens are not hens

1. I and II
2. II and III
3. I and III
4. Neither I nor II nor III

Testbook Solution Correct Option **- 2**

Given,

I. All birds lay eggs → False (“Female birds lay eggs")

II. Some hens are birds → True (Some chickens are hens)

III.Some chickens are not hens → True (Some chickens are hens so rest of the chickens are not hens)

Hence, 'II and III' is the correct answer.

Que. 79 Questions 79 to 82 are based on the following:

- There is a family of six members A, B, C, D, E and F
- There are two married couples in the family and the family members represent three generations.
- Each member has a distinct choice of colour amongst Green, Yellow, Black, Red, White and Pink
- No lady member likes either Green or White.

- C, who likes Black colour, is the daughter-in-law of E.
- B is the brother of F and son of D and likes Pink
- A is the grandmother of F and F does not like Red.
- Wife of the husband having a choice for Green colour likes Yellow.

Which of the following is true about F?

1. Brother of B
2. Sister of B
3. Daughter of C
4. Gender of F cannot be determined

Testbook Solution Correct Option **- 1**

According to the given information,

Symbol in Diagram	Meaning
○	Female
□	Male
=	Married couple
—	Siblings
|	Difference of a generation

Six members A, B, C, D, E, and F with two married couples.

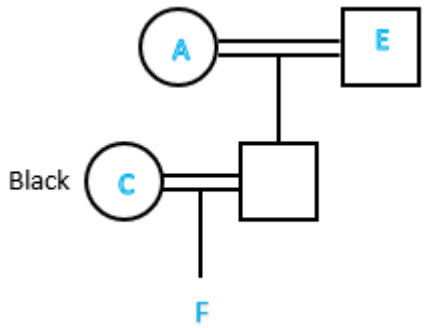
Six colors Green, Yellow, Black, Red, White, and Pink.

1. No lady member likes either Green or White. (It means, Green and White is the choice of male members)

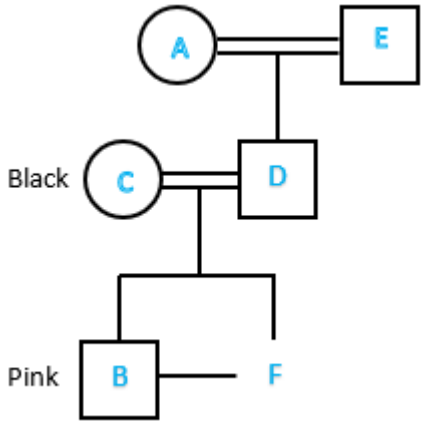
2. C, who likes Black color, is the daughter-in-law of E. (It means, C is female and married to the son of E)

3. A is the grandmother of F and F does not like Red. (It means, A belong to first-generation and F belongs to third-generation)

As A, is the grandmother then E is the grandfather. So, AE is a married couple.



4. B is the brother of F and son of D and likes Pink. (It means, D is the parent of both B and F)

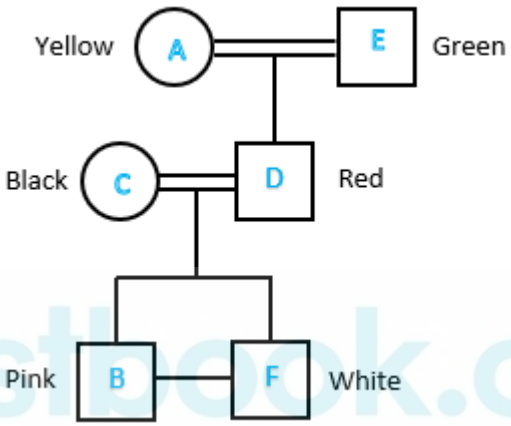


5. Wife of the husband having a choice for Green color, likes Yellow. (It means, husband likes Green color and wife likes Yellow color)

As no lady member likes either Green or White. So, F is a male member.

So, the final family tree will be as follows.

Color	Person
Green	E
Yellow	A
Black	C
Red	D
White	F
Pink	B



Hence, **F is the brother of B** is true.

Que. 80 Which of the following is one of the married couples?

1. CD
2. AC
3. AD
4. Cannot be determined

Testbook Solution Correct Option **- 1**

According to the given information,

Symbol in Diagram	Meaning
○	Female
□	Male
=	Married couple
—	Siblings
|	Difference of a generation

Six members A, B, C, D, E, and F with two married couples.

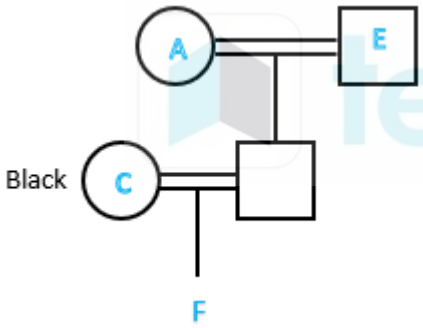
Six colors Green, Yellow, Black, Red, White, and Pink.

1. No lady member likes either Green or White. (It means, Green and White is the choice of male members)

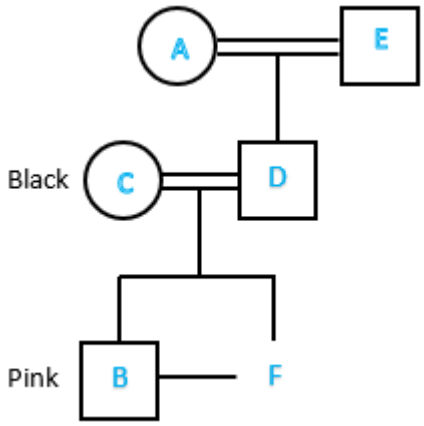
2. C, who likes Black color, is the daughter-in-law of E. (It means, C is female and married to the son of E)

3. A is the grandmother of F and F does not like Red. (It means, A belong to first-generation and F belongs to third-generation)

As A, is the grandmother then E is the grandfather. So, AE is a married couple.



4. B is the brother of F and son of D and likes Pink. (It means, D is the parent of both B and F)



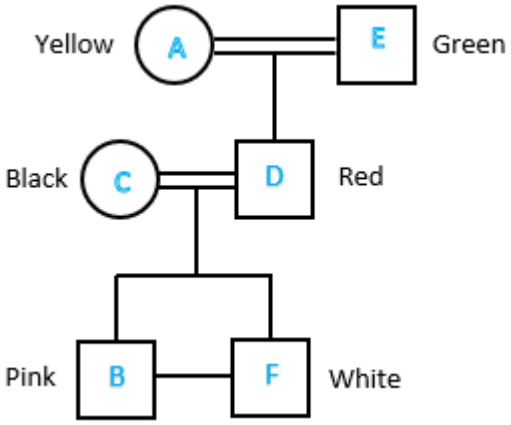
5. Wife of the husband having a choice for Green color, likes Yellow. (It means, husband likes Green color and wife likes Yellow color)

As no lady member likes either Green or White. So, F is a male member.

So, the final family tree will be as follows.

Color	Person

Green	E
Yellow	A
Black	C
Red	D
White	F
Pink	B



Hence, one of the married couples is **CD**.

Que. 81 Which of the following could be the color combination of one of the couples?

1. Yellow-Red
2. Green-Black
3. Red-Yellow
4. Yellow-Green

Testbook Solution Correct Option **- 4**

According to the given information,

Symbol in Diagram	Meaning
○	Female
□	Male
=	Married couple
—	Siblings
|	Difference of a generation

Six members A, B, C, D, E, and F with two married couples.

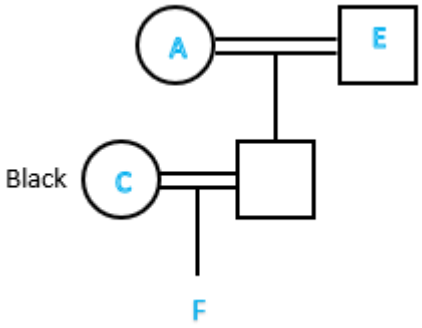
Six colors Green, Yellow, Black, Red, White, and Pink.

1. No lady member likes either Green or White. (It means, Green and White is the choice of male members)

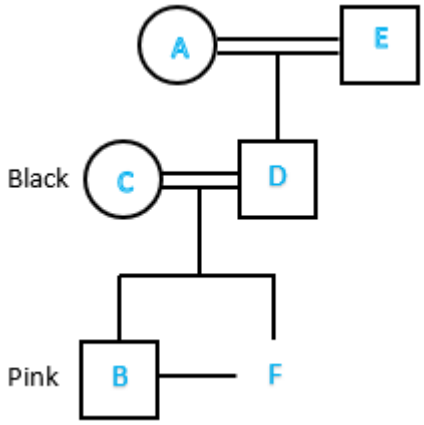
2. C, who likes Black color, is the daughter-in-law of E. (It means, C is female and married to the son of E)

3. A is the grandmother of F and F does not like Red. (It means, A belong to first-generation and F belongs to third-generation)

As A, is the grandmother then E is the grandfather. So, AE is a married couple.



4. B is the brother of F and son of D and likes Pink. (It means, D is the parent of both B and F)

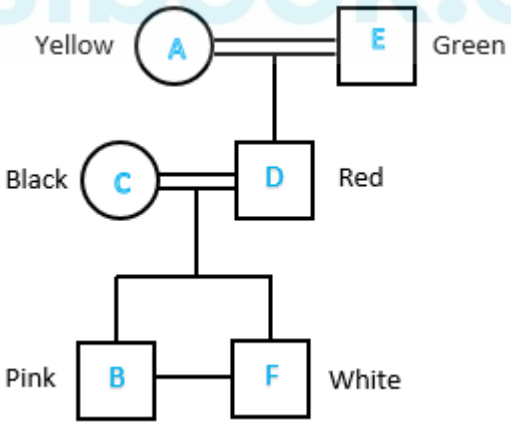


5. Wife of the husband having a choice for Green color, likes Yellow. (It means, husband likes Green color and wife likes Yellow color)

As no lady member likes either Green or White. So, F is a male member.

So, the final family tree will be as follows.

Color	Person
Green	E
Yellow	A
Black	C
Red	D
White	F
Pink	B



Hence, the color combination of one of the couples is **Yellow-Green**.

Que. 82 Which of the following is the color preference of A?

1. Red
2. Yellow
3. Either Red or Yellow
4. Cannot be determined

Testbook Solution Correct Option **- 2**

According to the given information,

Symbol in Diagram	Meaning
○	Female
□	Male
=	Married couple
—	Siblings
|	Difference of a generation

Six members A, B, C, D, E, and F with two married couples.

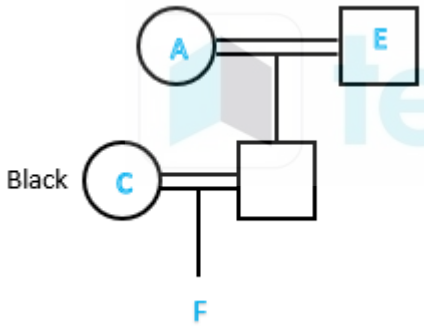
Six colors Green, Yellow, Black, Red, White, and Pink.

1. No lady member likes either Green or White. (It means, Green and White is the choice of male members)

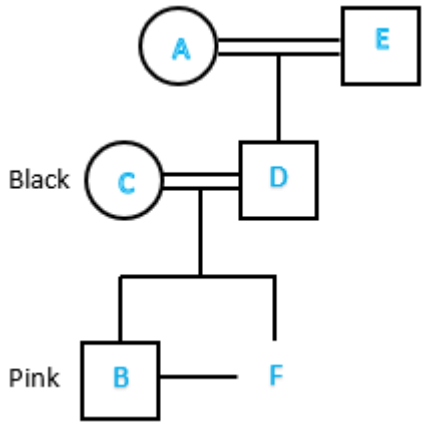
2. C, who likes Black color, is the daughter-in-law of E. (It means, C is female and married to the son of E)

3. A is the grandmother of F and F does not like Red. (It means, A belong to first-generation and F belongs to third-generation)

As A, is the grandmother then E is the grandfather. So, AE is a married couple.



4. B is the brother of F and son of D and likes Pink. (It means, D is the parent of both B and F)



5. Wife of the husband having a choice for Green color, likes Yellow. (It means, husband likes Green color and wife likes Yellow color)

As no lady member likes either Green or White. So, F is a male member.

So, the final family tree will be as follows.

Color	Person

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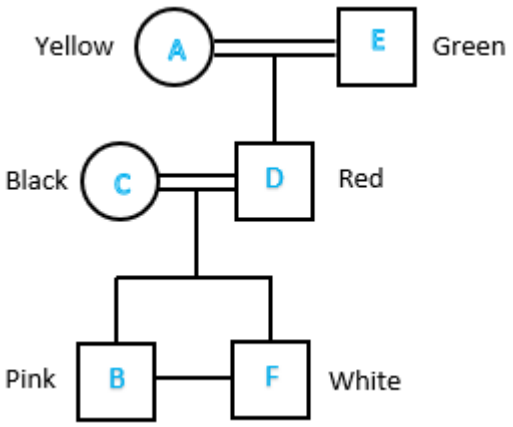


Hence, the color preference of A is **Yellow**.

Que. 83 If the English word "EXAMINATION" is coded as 56149512965, then the word "GOVERNMENT" is coded as

1. 7645954552
2. 7654694562
3. 7645955423
4. 7654964526

Testbook Solution Correct Option **- 1**

The positions of the letters according to the English alphabet series:

Alphabets	A	B	C	D	E	F	G	H	I	J	K	L	M
Positional value	1	2	3	4	5	6	7	8	9	10	11	12	13
Positional value	26	25	24	23	22	21	20	19	18	17	16	15	14
Alphabets	Z	Y	X	W	V	U	T	S	R	Q	P	O	N

The pattern followed here is :

Letter	E	X	A	M	I	N	A	T	I	O	N
Logic	05→ 0 + 5 = 5	24 → 2 + 4 = 6	01 → 0 + 1 = 1	13 → 1 + 3 = 4	09 → 0 + 9 = 9	14 → 1 + 4 = 5	01 → 0 + 1 = 1	20 → 2 + 0 = 2	09 → 0 + 9 = 9	15 → 1 + 5 = 6	14 → 1 + 4 = 5
Code	5	6	1	4	9	5	1	2	9	6	5

Similarly,

Letter	G	O	V	E	R	N	M	E	N	T
Logic	07→ 0 + 7 = 7	15 → 1 + 5 = 6	22 → 2 + 2 = 4	05 → 0 + 5 = 5	18 → 1+ 8 = 9	14 → 1 + 4 = 5	13 → 1 + 3 = 4	05 → 0 + 5 = 5	14 → 0 1 + 4 = 5	20 → 2 + 0 =2 2
Code	7	6	4	5	9	5	4	5	5	2

Hence, '7645954552' is the correct answer.

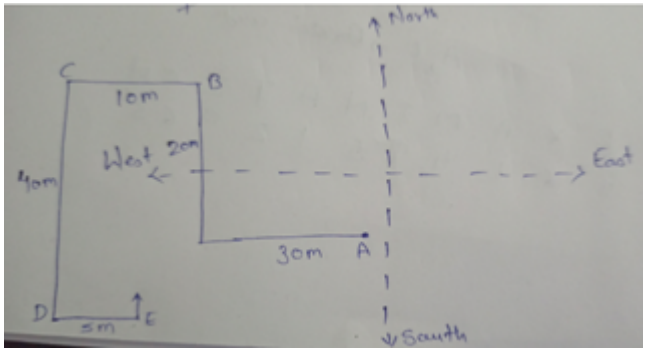
Que. 84 Gopal starts from his house towards West. After walking a distance of 30 meters, he turned towards right and walked 20 meters. He turned left and after moving a distance of 10 meters, turned to his left

again and walked 40 meters. He then turned left and walked 5 meters. Finally, he turns to his left. In which direction is he walking now?

1. North
2. South
3. East
4. South West

Testbook Solution Correct Option **- 1**

Let us draw the diagram according to the information given in the question,



According to the above diagram Gopal facing North direction.

Hence, 'North' is the correct answer.

Que. 85 Read the conclusion and then decide which of the given conclusions logically follows from the two given statements, (i) and (ii) disregarding commonly known facts.

Statements:

(i) No woman teacher can play.

(ii) Some woman teachers are athletes.

Conclusions:

I. Male athletes can play.

II. Some athletes can play.

1. Only conclusion I follows
2. Only conclusion II follows
3. Either I or II follows
4. Neither I nor II follows

Testbook Solution Correct Option **- 4**

Given:

Statements:

(i) No woman teacher can play.

(ii) Some woman teachers are athletes.

According to the statement, the possible Venn diagram is as follows:

Conclusions:

I. Male athletes can play. (**False,** athletes can be either male or female but there is no mention of the male athletes can play or not.)

II. Some athletes can play. (**False,** It is possible but not definite from the statement and diagram.)

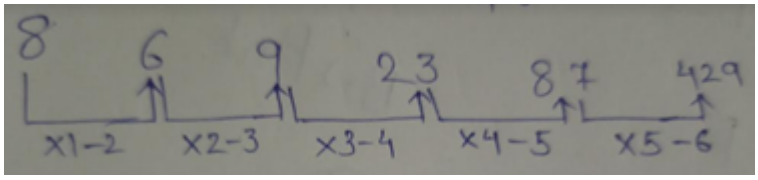
Hence, **Neither I nor II follows.**

Que. 86 Which of the following numbers come next in the series 8, 6, 9, 23, 87, _____?

1. 128
2. 226
3. 324
4. 429

Testbook Solution Correct Option **- 4**

The pattern followed here is :



Hence, '429' is the correct answer.

Que. 87 In an examination, there are 100 questions divided into 3 parts A, B, C, and each part should contain at least one question. Each question in parts A, B, and C carries 1, 2 and 3 marks respectively. Part A is for at least 60% of the total marks and part B should contain 23 questions. How many questions must be set in part C?

1. 1
2. 2
3. 3
4. Cannot be determined

Testbook Solution Correct Option **- 1**

Given,

An examination as 3 parts - A, B, and C

Part	Marks
A	1 mark
B	2 marks
C	3 marks

1. Part A is for at least 60% of the total marks

2. Part B should contain 23 questions. As in part B, each question carries 2 marks. So, 23 x 2 = 46 marks.

3. Each part should contain at least one question. So, there will be a minimum of 1 question in part C which carries 3 marks.

Let us assume, out of a total of 100 questions 23 are in part B and 1 is in part C.

Remaining = 100 - 23 - 1 = 76 will be part A which will carry 76 marks.

So, total marks = 76 + 46 + 3 = 125.

As given in the question Part A is for at least 60% of the total marks. So, $76/125 = 60.8\%$

Here, all the conditions of the question are satisfied if there is only 1 question in part C.

Hence, **1 question** must be set in part C.

Que. 88 If ÷ means addition, – means division, × means subtraction and + means multiplication, then the value of $\frac{(36\times4)-8\times4}{4+8\times2+16\div1)}$

1. 0
2. 8
3. 12
4. 16

Testbook Solution Correct Option **- 1**

The above equation can be written as,

{(36 – 4) ÷ 8 – 4}/{4 × 8 – 2 × 16 + 1}

Follow BODMAS rule to solve this question, as per the order given below,

B	Brackets in order (), {}, []	ब्रैकेट (), {}, [] क्रम में
O	of	का
D	Division (÷)	विभाजन (÷)
M	Multiplication (×)	गुणा (×)
A	Addition (+)	जोड़ (+)
S	Subtraction (–)	घटाव (–)

⇒ {(32/8) – 4}/32 – 32 + 1

⇒ 0/1

∴ **The value is 0**

Que. 89 Which letter in the word CYBERNETICS occupies the same position as it does in the English alphabet?

1. C
2. E
3. 1
4. T

Testbook Solution Correct Option **- 1**

Alphabets	A	B	C	D	E	F	G	H	I	J	K	L	M
Positional value	1	2	3	4	5	6	7	8	9	10	11	12	13
Positional value	26	25	24	23	22	21	20	19	18	17	16	15	14
Alphabets	Z	Y	X	W	V	U	T	S	R	Q	P	O	N

The given word is CYBERNETICS,

Letters	C	Y	B	E	R	N	E	T	I	C	S

Position	1	2	3	4	5	6	7	8	**9**	10	11
Positional Values	3	25	2	5	18	14	5	20	**9**	3	19

Hence, the letter **C** occupies the same position as it does in the English alphabet.

Que. 90 The remainder when 2^{31} is divided by 5 is

1. 1
2. 2
3. 3
4. 4

Testbook Solution Correct Option **- 3**

For a given number x^y, divide y by 5 to find the remainder

Divide the power of 2 by 4 i.e 31/4

$\Rightarrow 4 \times 7 = 28$

$\therefore$ Remainder $31 - 28 = 3$

$\therefore$ A cycle of 3 can be used

$\Rightarrow 2^3/5 = 8/5$ or remainder 3 $\quad (5 \times 1 = 5, 8 - 5 = 3)$

$\therefore$ The remainder when 2^{31} is divided by 5 is 3

Que. 91 Which optical phenomenon is utilized in the operation of the latest write-once optical storage medium called digital paper?

1. Polarisation
2. Interference
3. Internal reflection
4. Diffraction

Testbook Solution Correct Option **- 2**

Digital paper: It is also known as interactive paper, is the patterned paper used in conjunction with a digital pen to create handwritten digital documents.

The printed dot pattern uniquely identifies the position coordinates on the paper. The digital pen uses this pattern to store the handwriting and upload it to a computer.

Basically it involves the **Interference phenomenon** in it to store the optical data collected through the digital paper.

Que. 92 If N is a 16-bit signed integer, The 2's complement representation of N is $(F87B)_{16}$.The 2's complement representation of 8*N is _____

1. $(C3D8)_{16}$
2. $(187B)_{16}$
3. $(F878)_{16}$
4. $(987B)_{16}$

Testbook Solution Correct Option **- 1**

The correct answer is $(C3D8)_{16}$

Important Point

- **N = $(F87B)_{16}$** is **-1111 1000 0111 1011** in **bianry**
- Note that **most significant bit** in the binary representation is **1**, which implies that the number is **negative**. To get the value of the number perform the **2's complement** of the number. We get **N** as **-1925** and **8N** as **-15400**
- Since 8N is also **negative**, we need to find 2's complement of it (-15400)
- Binary of **15400 = 0011 1100 0010 1000**
- 2's Complement = **1100 0011 1101 1000 = $(C3D8)_{16}$**

Extra- Bites - In the case of large decimal numbers, use hex code as an intermediate stage i.e., convert decimal to hex then that to binary

Que. 93 Given f_1 , f_3 and f in canonical sum of products form (in decimal) for the circuit

f_1 Σm (4, 5, 6, 7, 8), f_3 Σm (1, 6, 15) and f Σm (1, 6, 8, 15) then f_2 is

1. ∑(4,6)
2. ∑(4,8)
3. ∑(6,8)
4. ∑(4,6,8)

Testbook Solution Correct Option **- 3**

Given that,

$f_1 = \Sigma\, m(4, 5, 6, 7, 8)$

$f_3 = \Sigma\, m(1, 6, 15)$

$f = \Sigma\, m(1, 6, 8, 15)$

From the given logic diagram,

$f = f_1\, f_2 + f_3$

Option 1: $f_2 = \Sigma\, m(4, 6)$

$f_1\, f_2 = \Sigma\, m(4, 6)$

$f = \Sigma\, m(1, 4, 6, 15)$

It is incorrect.

Option 2: $f_2 = \Sigma\, m(4, 8)$

$f_1\, f_2 = \Sigma\, m(4, 8)$

$f = \Sigma\, m(1, 4, 6, 8, 15)$

It is incorrect.

Option 3: $f_2 = \Sigma\, m(6, 8)$

$f_1 f_2 = \Sigma m(6, 8)$

$f = \Sigma m(1, 6, 8, 15)$

It is correct.

Option 4: $f_2 = \Sigma m(4, 6, 8)$

$f_1 f_2 = \Sigma m(4, 6, 8)$

$f = \Sigma m(1, 4, 6, 8, 15)$

It is incorrect.

Que. 94 Which of the following is equivalent to the expression $\left(\overline{\overline{X+Y}+\bar{Z}}\right)$?

1. $(\bar{X} + \bar{Y})Z$
2. $(X + Y)\bar{Z}$
3. $(\bar{X} + \bar{Y})\bar{Z}$
4. $(X + Y)Z$

Testbook Solution Correct Option **- 4**

$f = \left(\overline{\overline{X+Y}+\bar{Z}}\right)$

De Morgan's Law

$f = \left(\overline{\overline{X+Y}}.\bar{\bar{Z}}\right)$

f = (X + Y).Z

Important Point

Name	AND Form	OR Form
Identity law	1.A = A	0 + A = A
Null Law	0.A = 0	1 + A = 1
Idempotent Law	A.A = A	A + A = A
Inverse Law	AA' = 0	A + A' = 1
Commutative Law	AB = BA	A + B = B + A
Associative Law	(AB)C	(A + B) + C = A + (B + C)
Distributive Law	A + BC = (A + B)(A + C)	A(B + C) = AB + AC
Absorption Law	A(A + B) = A	A + AB = A
De Morgan's Law	**(AB)' = A' + B'**	**(A + B)' = A'B'**

Que. 95 $(p \rightarrow q \vee r, q \rightarrow s, r \rightarrow s\}$ is logically equivalent to

1. $q \rightarrow r$
2. $r \rightarrow q$
3. $p \rightarrow s$
4. $s \rightarrow p$

Testbook Solution Correct Option **- 3**
Explanation:

Given that $p \rightarrow q \vee r$, $q \rightarrow s$, $r \rightarrow s$

$q \rightarrow s$, $r \rightarrow s$: q or $r \rightarrow s$

$q \vee r \rightarrow s$

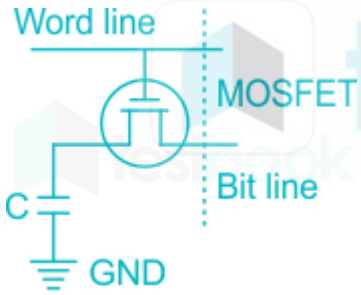
$\Rightarrow p \rightarrow s$

Que. 96 The number of MOS transistors required to implement a typical dynamic RAM cell is:

1. 6
2. 5
3. 1
4. 2

Testbook Solution Correct Option **- 3**
In a DRAM, **a capacitor is used to store a bit of data along with a MOSFET** (transfer device) which acts as a switch.

The circuit is as shown:



In a DRAM:

- Periodic refreshing is required.
- The information is stored in a capacitor.
- Both read and write operations cannot be performed simultaneously.

Important Point

For an SRAM, the storage element is a flip-flop.

A comparison of SRAM and DRAM is as shown:

Basis of Comparison	SRAM	DRAM
Speed	Faster	Slower
Size	Small	Larger
Cost	Expensive	Cheap
Used in	Cache Memory	Main memory

Density	Less Dense	Highly dense
Construction	**Complex and uses transistors and latches**	**Simple and uses capacitors and transistor**
Single block of memory requires	6 transistors	Only one transistor
Charge Leakage	Not present	Present and hence require periodic refreshing
Power Consumption	Low	High

Que. 97 Consider 4-bit gray code representation of numbers. Let $h_3\ h_2\ h_1\ h_0$ be the gray code representation of a number n and $g_1g_2g_3g_0$ be the gray code representation of the number (n + 1) modulo 16. Which one of the following functions is correct?

1. $g_0\ (h_3\ h_2\ h_1\ h_0) = \Sigma(1,2,3,6,10,13,14,15)$
2. $g_1\ (h_3\ h_2\ h_1\ h_0) = \Sigma(4,9,10,11,12,13,14,15)$
3. $g_2\ (h_3\ h_2\ h_1\ h_0) = \Sigma(2,4,5,6,7,12,13,15)$
4. $g_3\ (h_3\ h_2\ h_1\ h_0) = \Sigma(0,1,6,7,10,11,12,13)$

Testbook Solution Correct Option **- 3**

$h_3\ h_2\ h_1\ h_0$ be the gray code representation of a number n and $g_1g_2g_3g_0$ be the gray code representation of the number (n + 1) modulo 16.

The truth table is as shown below.

Decimal	**Binary**	**h_3**	**h_2**	**h_1**	**h_0**	**g_3**	**g_2**	**g_1**	**g_0**
0	0000	0	0	0	0	0	0	0	1
1	0001	0	0	0	1	0	0	1	1
2	0010	0	0	1	1	0	0	1	0
3	0011	0	0	1	0	0	1	1	0
4	0100	0	1	1	0	0	1	1	1
5	0101	0	1	1	1	0	1	0	1
6	0110	0	1	0	1	0	1	0	0
7	0111	0	1	0	0	1	1	0	0
8	1000	1	1	0	0	1	1	0	1
9	1001	1	1	0	1	1	1	1	1
10	1010	1	1	1	1	1	1	1	0
11	1011	1	1	1	0	1	0	1	0
12	1100	1	0	1	0	1	0	1	1
13	1101	1	0	1	1	1	0	0	1

14	1110	1	0	0	1	1	0	0	0
15	1111	1	0	0	0	0	0	0	0

From the above truth table,

$g_3(h_3\ h_2\ h_1\ h_0) = \Sigma(4, 9, 10, 11, 12, 13, 14, 15)$

$g_2(h_3\ h_2\ h_1\ h_0) = \Sigma(2, 4, 5, 6, 7, 12, 13, 15)$

$g_1(h_3\ h_2\ h_1\ h_0) = \Sigma(1, 2, 3, 6, 10, 13, 14, 15)$

$g_0(h_3\ h_2\ h_1\ h_0) = \Sigma(0, 1, 6, 7, 10, 11, 12, 13)$

Que. 98 The minimum number of NAND gates required to realize AB + AB'C + AB'C' is

1. 3
2. 2
3. 1
4. 0

Testbook Solution Correct Option **- 4**

Concept:

Name of Law	AND Law	OR Law
Identity Law	$1 \cdot A = A$	$0 + A = A$
Null Law	$0 \cdot A = 0$	$1 + A = 1$
Inverse Law	$A \cdot A = A$	$A + A = A$
Idempotent Law	$A \cdot A' = 0$	$A + A' = 1$
Associative Law	$A \cdot B = B \cdot A$	$A + B = B + A$
Distributive Law	$(A \cdot B)\ C = A\ (B \cdot C)$	$(A + B) + C = A + (B + C)$
Absorption Law	$A\ (A + B) = A$	$A + A \cdot B = A$
De Morgan Law	$(A \cdot B)' = A' + B'$	$(A + B)' = A' \cdot B'$

Calculation:

Given,

F = A B + AB'C + AB'C'

F = AB + AB' (C + C')

F = AB + AB'

F = A (B + B')

F = A

Hence, **'0' gate is required** for that expression

Que. 99 When the value 37H is divided by 17H, the remainder is

1. C0H
2. 03H
3. 07H
4. 09H

Testbook Solution Correct Option **- 4**

Concept:

Hexa decimal division process:

Step 1: Convert the given hexadecimal numbers to decimal.

Step 2: perform division operation to the decimal numbers.

Step 3: Convert the result to requires number system.

Calculation:

Convert the given hexadecimal numbers to decimal and perform division operation and for the remainder obtained, convert that remainder into hexadecimal.

$\Rightarrow 37H = 3 \times 16^1 + 7 \times 16^0 = (55)_{10}$

$\Rightarrow 17H = 1 \times 16^1 + 7 \times 16^0 = (23)_{10}$

$\Rightarrow$ remainder of $(55 / 23) = (9)_{10}$

$(9)_{10}$ in hexa decimal form is represented as shown

$\Rightarrow (9)_{10} = 0 \times 16^1 + 9 \times 16^0 = 09H$

$\therefore$ **The remainder is 09H**

Note: From 0 - 9 vales of the both decimal and hexadecimal number systems are same.

Que. 100 The number of Boolean functions possible with n binary variables is equal to

1. 2^{2^n}
2. 2^n
3. 2^{2n-1}
4. 2^{n-1}

Testbook Solution Correct Option **- 1**

Boolean Functions (Expressions):

It is useful to know how many different Boolean functions can be constructed on a set of Boolean variables.

When there are no variables: There are two expressions

False = 0 and True = 1

For one variable p: Four functions can be constructed.

Recall, a function maps each input value of a variable to one and only one output value.

1. The False(p) function maps each value of p to 0 (False).
2. The identity(p) function maps each value of p to the identical value.
3. The flip(p) function maps False to True and True to False.
4. The True(p) function maps each value of p to 1 (True).

So, For one variable p, $4 = 2^{2^1}$ functions can be constructed.

This information can be collected into a table

Input variable	**Functions possible**			
p	**False**	**p**	**-p**	**True**
0	0	0	1	1
1	0	1	0	1

For two variables: p and q, 16 Boolean functions can be constructed.

Boolean Functions of n Variables:

Number of variables	Number of boolean functions.
0	$2 = 2^1 = 2^{2^0}$
1	$4 = 2^2 = 2^{2^1}$
2	$16 = 2^4 = 2^{2^2}$
3	$256 = 2^8 = 2^{2^3}$
4	$65,536 = 2^{16} = 2^{2^4}$
n	2^{2^n}

∴ There are 2^{2^n} different Boolean functions on n Boolean variables

Que. 101 Choose the one which best expresses the following sentence in passive/active voice :

"You can play with these kittens quite safely".

1. These kittens can be played with quite safely.
2. These kittens can be played with you quite safely.
3. These kittens can be play with you quite safely.
4. These kittens can played with quite safely.

Testbook Solution Correct Option **- 1**

The correct answer is- **These kittens can be played with quite safely.**

Key-Points

- Let's look at the **structures** given below in **active** and **passive** forms:
  - Active- **Subject + modal verb + V_1 + Object.**
  - Passive- **Object + modal verb + be + V_3 + by + Subject.**
- Example:
  - *She **might** her task. **(active)***
  - *Her task **might be finished** by her. **(passive)***
- **'Play with'** is a transitive verb that means **'to deal with something'** hence the object of this transitive verb is 'these kittens' in which **'these' is a pronoun/determiner.**

Following the passive voice form, we finally get- *These kittens can be played with quite safely.*

Confusion Points

- One may consider the **2nd option** as the correct choice but it doesn't contain the preposition '**by**' before the subject '**you**'.
- Thus the **2nd option** is eliminated.

Additional Information

- There is a difference between '**must**' and '**have to**' given below:
  - **Must** expresses **obligation or compulsion** imposed by the **speaker.**
  - Whereas '**have to**' expresses **external obligations.**

- **Example:**
  - *We must fasten our seat belts.* ***(the speaker thinks so)***
  - *They have to help the needy.* ***(others think this and not the speaker)***

Que. 102 Which of the following terms refers to the original inhabitants of a place?

1. Originals
2. Aborigines
3. Abominables
4. Cannibals

Testbook Solution Correct Option **- 2**
The correct answer is- **Aborigines.**

Key-Points

- Let's look at the meaning of the marked option:
  - **Aborigines-** a person, animal, or plant that has been in a country or region from earliest times
- Let's look at the meanings of the other given options:
  - **Originals-** something serving as a model or basis for imitations or copies
  - **Abominable-** causing moral revulsion
  - **Cannibals-** a person who eats the flesh of other human beings
- Hence, from the given meanings, we find that **Aborigines** is the correct **one-word substitute.**

Que. 103 Replace the underlined word with one of the choices given without changing the meaning of the sentence:

"The news of our success was met with exuberant cries".

1. Excited
2. Pathetic
3. Exclusive
4. Poignant

Testbook Solution Correct Option **- 1**
The correct answer is- **Excited.**

Key-Points

- Let's look at the meanings of the given word and marked option:
  - **Exuberant-** filled with or characterized by a lively energy and excitement
  - **Excited-** cause strong feelings of enthusiasm and eagerness in (someone)
- Let's look at the meanings of the other given options:
  - **Pathetic-** arousing pity, especially through vulnerability or sadness
  - **Exclusive-** excluding or not admitting other things
  - **Poignant-** evoking a keen sense of sadness or regret
- Hence from the given meanings, we find that **Exuberant** and **Excited** can be used **interchangeably**.

Que. 104 Select the word that is furthest in meaning to the below word

AFFLUENCE

1. Stagnation
2. Misery
3. Neglect
4. Poverty

Testbook Solution Correct Option **- 4**
The correct answer is- **Poverty.**

Key-Points

- Let's look at the meanings of the given word and marked option:
  - **Affluence-** the state of having a great deal of money; wealth
  - **Poverty-** the state of being extremely poor
- Let's look at the meanings of the other given options:
  - **Stagnation-** the state of not flowing or moving
  - **Misery-** a state or feeling of great distress or discomfort of mind or body
  - **Neglect-** fail to care for properly
- Hence from the given meanings, we find that **Affluence** and **Poverty** are **antonyms.**

Que. 105 Identify the type of error in the sentence:

"The cost of this project will be much lesser than 5% more than that predicted earlier".

1. syntactical error
2. punctuation error
3. grammatical error
4. conflicting words

Testbook Solution Correct Option **- 4**
The correct answer is- **conflicting words.**

Key-Points

- Let's have a look at the types of errors given below:
  - **syntactical-** consists of a sentence with the **incorrect** arrangement of **words** and **phrases** such as:
    We has been living here for 20 years. **(the usage of the auxiliary verb 'has' is wrong)**
  - **punctuation-** consists of a sentence with the **incorrect** usage of **punctuation** such as:
    He is, a good singer. **(the usage comma after 'is' is wrong)**
  - **grammatical-** consists of a sentence with the **incorrect** usage of any aspect related to grammar such as:
    Garry like her. **(the usage of the verb 'like' is wrong)**
  - **conflicting words-** consists of a sentence with the **incorrect** arrangement of words and phrases such as:
    There was a deafening silence at that place. **(the usage of the words 'deafening' and 'silence' together is wrong)**
- Upon perusal of the sentence given in the question, we find that the latter part of the sentence contains **conflicting words ('lesser than' and 'more than').**
- Thus the **latter part** of the sentence can be arranged in **two ways** as given below:

Correct sentences: *"The cost of this project will be much lesser than 5%, as predicted earlier". or "The cost of this project will be 5% more than that predicted earlier".*

Que. 106 Insert appropriate prepositions in the blanks to complete the following sentence

"This property has been _____ the possession _____ the royal family _____ generations".

1. with, of, of
2. in, of, for
3. in, with, by
4. of, by, since

Testbook Solution Correct Option **- 2**
The correct answer is**- in, of, for.**

Key-Points

- Let's look at the meanings of the following phrases:
  - **have possession of something-** something that you own, or the condition of owning something
  - **in possession of something-** the situation in which someone has or owns something
- Example:
  - *The Court of Appeal admitted that Ms. Mountford did **have** exclusive **possession of** the property.*
  - *He was found **in possession of** explosives.*
- As per the context of the sentence, **the above-mentioned property is owned by the royal family.**
- As per the structure of the **2nd phrase** given above, **the first two blanks** will be filled by the prepositions **'in' and 'of' respectively.**
- Thus the **2nd option** will be the correct choice in the **blank** parts of the sentence.

Correct Sentence: *"This property has been **in** the possession **of** the royal family **for** generations".*

Que. 107 Choose the right word to fill in the blank in the following sentence:

"The mermaid legend _____ have originated with a group of mammals collectively known to science as Srinians"

1. should
2. may
3. need
4. can

Testbook Solution Correct Option **- 2**
The correct answer is- **may.**

Key-Points

- The modal verb '**may**' is the **present tense** form in indirect speech.
- It is used to **express possibility, ask or give permission, to introduce a wish or a hope, etc.**
- Example:
  - The cause of the accident may never be discovered. ***(possibility)***
  - *A reader may borrow up to six books at any one time. **(permission)***
- Since a **possibility is being expressed in the question**, **'may'** will be used as per the rule given above.

Correct Sentence: *"The mermaid legend **may** have originated with a group of mammals collectively known to science as Srinians"*

Additional Information

- Let's have a look at the **modal** formations given below:
  - **Can/could not help + V_1 + ing**
  - **Can/could not help + but + V_1**
- Both of the phrases mean to have a **compulsion** to do something that is **too strong** to **ignore or avoid.**
- Example:
  - *My cousin **can't help but meddling** in my life.* ✗
  - *My cousin **can't help but meddle** in my life.* ✓

Que. 108 Identify appropriate word to fill the blank in the following sentence:

"The feeling of guilt left a _____ impression in his life".

1. perennial
2. parennial
3. perannial
4. perinial

Testbook Solution Correct Option **- 1**
The correct answer is - **perennial.**

Key-Points

- Let's look at the **correct spelling** and meaning of the marked option:
  - **perennial-** lasting or existing for a long or apparently infinite time; enduring or continually recurring
- Example:
  - *We face the **perennial** problem of not having enough money.*

Correct sentence: *"The feeling of guilt left a **perennial** impression in his life".*

Que. 109 Which of the following sentences is grammatically correct?

1. He is smiling
2. He smile
3. He always smile
4. He is always smiled

Testbook Solution Correct Option **- 1**
The correct answer is - **He is smiling.**

Key-Points

- The **simple present** tense is used when **an action is happening right now, to state or ask about things in general, or when it happens regularly or unceasingly.**
- The **present continuous** tense is used when **an action or condition is happening now, frequently, and may continue into the future.**
- The structures are given below **respectively**:
  - **Subject + V_1 + object.**
  - **Subject + is/am/are + V_1 + ing + object.**
- The **verb** will take **'s/es'** if the given **noun/pronoun (3rd person) is singular.**
- Example:
  - *He **plays** badminton daily.*
  - *They **are eating** at Scott's favorite restaurant today.*
- In the given sentence, the **verb** will take **'s/es'** as the given **pronoun (He) is singular.**
- Thus the **2nd option** and the **3rd option** are eliminated.
- The **4th option** is eliminated too as it doesn't contain the **present participle form of the verb i.e. smiling.**
- The required structure is followed only in the **1st option.**

Correct Sentence: *He is smiling.*

Additional Information

- Certain verbs used only in the **simple present tense** are given below:
  - **See, think, know, possess, like, want, desire, hate, seem, imagine, etc.**
- **Example:**
  - *My brother **is owning** a car. (incorrect)*
  - *My brother **owns** a car. (correct)*

Que. 110 **Find the most suitable phrasal verb to be filled in the blank in the following sentence:**

"Left too long in the sun, the leaves had all _____".

1. shrugged off
2. shared out
3. shrivelled up
4. skived off

Testbook Solution Correct Option **- 3**
The correct answer is**- shrivelled up.**

Key-Points

- Let's look at the meanings of the following phrasal verbs:
  - **shrugged off-** to get rid of something unpleasant that you do not want
  - **shared out-** an act of dividing something between several people
  - **shrivelled up-** dry, smaller than normal, and covered with lines as if by crushing or folding
  - **skived off-** to not go to work, school, etc. when you should
- As per the possible context of the sentence, **the leaves got dried up due to being left in the sun for a long time.**
- Thus the correct choice will be the **3rd option i.e. shrivelled up.**

Correct sentence: *"Left too long in the sun, the leaves had all **shrivelled up**".*

Que. 111 Fill in the blank from among the choices in the following sentence:

A 'Couch potato's is a person who _____

1. spends a lot of time watching television
2. spends money on potatoes
3. likes potatoes
4. is lazy, but intelligent

Testbook Solution Correct Option **- 1**

The correct answer is- **spends a lot of time watching television.**

Key-Points

- Let's look at the meaning of the given **idiom**:
  - **Couch potato-** a person who takes little or no exercise and watches a lot of television
- Example:
  - *It is no good you being a **couch potato** and having a Dobermann.*

Additional Information

- Let's look at the **origin** of the idiom:
  - This idiomatic expression is supposed to be originated in the 1970s in America by a comic artist who drew two **idle, inactive and lazy** characters named **"Couch Potatoes".**
  - Since then this phrase became very popular to call names to **someone who spends lots of time watching television.**
  - Being habitual of TV, they put on **weight** and look more like a **potato**.

Que. 112 Which of the following sentences is grammatically incorrect?

1. She never travelled abroad for fear of becoming ill through eating foreign food.
2. She avoids foreign travel as she fears she will become ill through eating foreign food.
3. She never travelled abroad due to her fear of becoming ill through eating foreign food.
4. She never travelled abroad in fear for becoming ill with eating foreign food.

Testbook Solution Correct Option **- 4**

The correct answer is **- She never travelled abroad in fear for becoming ill with eating foreign food.**

Key-Points

- There are some **verbs/nouns/adjectives** which are followed by **fixed** preposition given below:
  - **Exonerate from, refrain from, subject to, based on, aptitude for, an antidote to, fear of, a predilection for, vexed at,** etc.
- Example:
  - *There is no **antidote to** this poison.*
- Hence, according to the **phrases** given above, **'of'** will be the correct choice.
- The given phrase **'fear of'** means **a feeling of anxiety concerning the outcome of something or the safety and well-being of someone.**

Correct Sentence: *She never travelled abroad in fear **of** becoming ill **by** eating foreign food.*

Additional Information

- There are some fixed prepositional phrases given below:
  - **by the dint of, out of jealousy, in danger, by car/bus/train, owing to, on a trip, for a change, etc.**
- For example:
  - *I went **on a trip** to Goa last month.*

Que. 113 Match the most suitable phrasal verb from Group L to each word in Group M.

Group L	Group M
(1) Call out	(P) A Footballer
(2) Stand-in for	(Q) A Criminal
(3) Send down	(R) A Colleague
(4) Send off	(S) A Student

1. 3 – R, 2 – S, 1 – P, 4 – Q
2. 1 – S, 2 – R, 3 – Q, 4 – P
3. 1 – P, 2 – Q, 3 – R, 4 – S
4. 2 – P, 3 – S, 4 – R, 1 – Q

Testbook Solution Correct Option **- 4**
The correct answer is- **2 – P, 3 – S, 4 – R, 1 – Q.**

Key-Points

- Let's look at the meanings of the following phrasal verbs:
  - **call out-** to publicly criticize or fault (someone)
  - **stand in for-** to do the job that another person was going to do or usually does, or to take that person's place at an event, because they cannot be there
  - **send down-** to suspend or dismiss someone from a university
  - **send off-** instruct someone to go
- A **criminal** can be **called out (criticized or condemned)** for his/her **actions** whereas one can **act as a stand-in (temporarily replace someone) for a footballer.**
- A **student** can be **sent down (suspend or dismiss)** for his/her **rude behaviour** whereas a **colleague** can be **sent off** by his/her **senior officials.**

Thus the correct match is: **2 – P, 3 – S, 4 – R, 1 – Q.**

Que. 114 Rearrange the parts of a sentence referred to by P, Q, R and S to form a complete and meaningful sentence:

"I enclose _____ _____ _____ _____"

P : and the postage

Q : a postal order

R : the price of books

S : which will cover

1. R P S Q
2. Q S P R
3. Q S R P
4. Q P S R

Testbook Solution Correct Option **- 3**
The correct answer is- **Q S R P.**

Key-Points

- While arranging the parts of the passage, we should find some grammatical or contextual connections between them-
  - The introductory phrase '**I enclose**' is given.
  - **Sentence Q contains the required clause 'a postal order' preceded by the verb 'enclose'.** Hence it will be put in the **first place.**
  - **Sentence S** follows **sentence Q** as it tells **the purpose of the postal order.** It will be put in **second place.**
  - **Sentence R** is in **continuation (mentions the price of books)** of the previous sentence. Hence it will be the **3rd** sentence.
  - **The last sentence is P as it mentions the inclusion of the postage in the price as well.**
- Thus, the correct order is- **Q S R P.**

Que. 115 Which of the following is the antonym of the word "Exigency"?

1. Penchant
2. Emergency
3. Earnestness
4. Indifference

Testbook Solution Correct Option **- 4**
The correct answer is- **Indifference.**

Key-Points

- Let's look at the meanings of the given word and marked option:
  - **Exigency-** an urgent need or demand
  - **Indifference-** lack of interest, concern, or sympathy or **absence of compulsion to or toward one thing or another**
- Let's look at the meanings of the other given options:
  - **Penchant-** a strong or habitual liking for something or tendency to do something
  - **Emergency-** a serious, unexpected, and often dangerous situation requiring immediate action
  - **Earnestness-** sincere and intense conviction
- Hence from the given meanings, we find that **Exigency** and **Indifference** are **antonyms.**

Que. 116 Which of the following propositions fills up the blank in the following sentence?

"Quinine is an effective antidote _____ Malaria"

1. to
2. against

3. for
4. none of these

Testbook Solution Correct Option **- 1**
The correct answer is **to.**

Key-Points

- There are some **verbs/nouns/adjectives** which are followed by **fixed** preposition given below:
  - **Exonerate from, refrain from, subject to, based on, aptitude for, an antidote to, accused of, a predilection for, vexed at,** etc.
- Example:
  - *There is no **antidote to** this poison.*
- Hence, according to the **phrases** given above, '**to**' will be the correct choice.
- The given phrase **'antidote to'** means **something that relieves, prevents, or counteracts.**

Correct Sentence: *"Quinine is an effective antidote **to** Malaria"*

Additional Information

- There are some fixed prepositional phrases given below:
  - **by the dint of, out of jealousy, in danger, by car/bus/train, owing to, on a trip, for a change, etc.**
- For example:
  - *I went **on a trip** to Goa last month.*

Que. 117 In the sentence "**The defence labs have showcased many new innovations this year**", there is an error of:

1. redundancy
2. word order
3. collocation
4. omission

Testbook Solution Correct Option **- 1**
The correct answer is- **redundancy.**

Key-Points

- Let's have a look at the points given below:
  - **redundancy-** the unnecessary use of more than one word or phrase meaning the same thing
  - **innovation-** a new method, idea, product, etc.
- Example:
  - *The recording industry is driven by constant **innovation.***
- Upon perusal of the sentence given in the question, we find that the use of the **adjective 'new'** isn't required as the **noun 'innovation'** itself contains the required meaning.

Correct sentence: *The defence labs have showcased many **innovations** this year.*

Que. 118 **Questions 108 to 110 are based on the following:**

The proud warrior class of the samurai (meaning 'those who serve') grew from a band of mercenaries hired by feudal landowners in the 11th century to win them the control of Honshu, Japan's main island. These mercenaries lived by the cult of the sword, worshipping athletic prowess and martial skills. They developed a fierce loyalty to their masters and a fearlessness that made them formidable adversaries. They fought in elaborate armour, wielding their most prized possession, a double-edged sabre with which they could cut a man in half. Later the spartan principles of Zen Buddhism, with its love of nature softened their fighting zeal. It became fashionable for them to live sparse and frugal lives during the Kamakura era (1192 – 1333), when the ruling warrior family Minamato moved their seat of power to the eastern city of Kamakura.

In the Kamakura period it became fashionable for these warriors to live

1. Zealous lives
2. Austere lives
3. Powerful lives
4. Natural lives

Testbook Solution Correct Option **- 2**
The correct answer is- **Austere lives.**

Key-Points

- Let's have a look at the **last sentence** from the **given** paragraph:
  - *"It became fashionable for them to live sparse and frugal lives during the Kamakura era (1192 – 1333) when the ruling warrior family Minamato moved their seat of power to the eastern city of Kamakura."*
- Upon perusal of the above statement, it can be concluded that in the **Kamakura period living austere i.e. severe or strict in manner life became fashionable for the warriors.**

Que. 119 Which of the following best describes the warriors?

1. Proud, greedy
2. Fearless, worshipful
3. Loyal, fearless
4. Possessive, soft

Testbook Solution Correct Option **- 3**
The correct answer is- **Loyal, fearless.**

Key-Points

- Let's have a look at the **3rd sentence** from the **given** paragraph:
  - *"They developed a fierce loyalty to their masters and a fearlessness that made them formidable adversaries."*
- Upon perusal of the above statement, it can be concluded that **the warriors can be best described as loyal and fearless.**

Que. 120 Who are usually refered to as mercenaries?

1. Soldiers with martial skills

2. Proud warriors
3. Soldiers who fight for money
4. Loyal warriors

Testbook Solution Correct Option **- 3**
The correct answer is- **Soldiers who fight for money.**

Key-Points

- Let's have a look at the points given below:
  - **Mercenary-** a soldier who fights for any country or group that pays them
- Example:
  - *He had some **mercenary** scheme to marry a wealthy widow.*
- Upon perusal of the above definition and example, it can be concluded that the **3rd option** is the correct choice.

120 Questions

Que. 1	Correct Option - 3
Que. 2	Correct Option - 2
Que. 3	Correct Option - 2
Que. 4	Correct Option - 2
Que. 5	Correct Option - 4
Que. 6	Correct Option - 2
Que. 7	Correct Option - 3
Que. 8	Correct Option - 1
Que. 9	Correct Option - 2
Que. 10	Correct Option - 2
Que. 11	Correct Option - 3
Que. 12	Correct Option - 3
Que. 13	Correct Option - 2
Que. 14	Correct Option - 1
Que. 15	Correct Option - 3
Que. 16	Correct Option - 2
Que. 17	Correct Option - 3
Que. 18	Correct Option - 2
Que. 19	Correct Option - 4
Que. 20	Correct Option - 1
Que. 21	Correct Option - 4
Que. 22	Correct Option - 1
Que. 23	Correct Option - 1
Que. 24	Correct Option - 3
Que. 25	Correct Option - 1

Que. 26	Correct Option - 3
Que. 27	Correct Option - 2
Que. 28	Correct Option - 4
Que. 29	Correct Option - 1
Que. 30	Correct Option - 1
Que. 31	Correct Option - 4
Que. 32	Correct Option - 1
Que. 33	Correct Option - 3
Que. 34	Correct Option - 4
Que. 35	Correct Option - 1
Que. 36	Correct Option - 3
Que. 37	Correct Option - 2
Que. 38	Correct Option - 4
Que. 39	Correct Option - 3
Que. 40	Correct Option - 1
Que. 41	Correct Option - 1
Que. 42	Correct Option - 3
Que. 43	Correct Option - 4
Que. 44	Correct Option - 2
Que. 45	Correct Option - 4
Que. 46	Correct Option - 4
Que. 47	Correct Option - 1
Que. 48	Correct Option - 4
Que. 49	Correct Option - 1
Que. 50	Correct Option - 2
Que. 51	Correct Option - 2

Que. 52	Correct Option - 3
Que. 53	Correct Option - 2
Que. 54	Correct Option - 1
Que. 55	Correct Option - 3
Que. 56	Correct Option - 4
Que. 57	Correct Option - 4
Que. 58	Correct Option - 2
Que. 59	Correct Option - 3
Que. 60	Correct Option - 4
Que. 61	Correct Option - 2
Que. 62	Correct Option - 4
Que. 63	Correct Option - 3
Que. 64	Correct Option - 3
Que. 65	Correct Option - 1
Que. 66	Correct Option - 2
Que. 67	Correct Option - 1
Que. 68	Correct Option - 1
Que. 69	Correct Option - 2
Que. 70	Correct Option - 1
Que. 71	Correct Option - 3
Que. 72	Correct Option - 1
Que. 73	Correct Option - 2
Que. 74	Correct Option - 2
Que. 75	Correct Option - 4
Que. 76	Correct Option - 1
Que. 77	Correct Option - 3
Que. 78	

	Correct Option - 2
Que. 79	Correct Option - 1
Que. 80	Correct Option - 1
Que. 81	Correct Option - 4
Que. 82	Correct Option - 2
Que. 83	Correct Option - 1
Que. 84	Correct Option - 1
Que. 85	Correct Option - 4
Que. 86	Correct Option - 4
Que. 87	Correct Option - 1
Que. 88	Correct Option - 1
Que. 89	Correct Option - 1
Que. 90	Correct Option - 3
Que. 91	Correct Option - 2
Que. 92	Correct Option - 1
Que. 93	Correct Option - 3
Que. 94	Correct Option - 4
Que. 95	Correct Option - 3
Que. 96	Correct Option - 3
Que. 97	Correct Option - 3
Que. 98	Correct Option - 4
Que. 99	Correct Option - 4
Que. 100	Correct Option - 1
Que. 101	Correct Option - 1
Que. 102	Correct Option - 2
Que. 103	Correct Option - 1
Que. 104	

	Correct Option - 4
Que. 105	Correct Option - 4
Que. 106	Correct Option - 2
Que. 107	Correct Option - 2
Que. 108	Correct Option - 1
Que. 109	Correct Option - 1
Que. 110	Correct Option - 3
Que. 111	Correct Option - 1
Que. 112	Correct Option - 4
Que. 113	Correct Option - 4
Que. 114	Correct Option - 3
Que. 115	Correct Option - 4
Que. 116	Correct Option - 1
Que. 117	Correct Option - 1
Que. 118	Correct Option - 2
Que. 119	Correct Option - 3
Que. 120	Correct Option - 3