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120 Questions

Que. 1 For two circles $x^2 + y^2 = 16$ and $x^2 + y^2 - 2y = 0$, there is / are

1. One pair of common tangent
2. Two pair of common tangents
3. Three pair of common tangents
4. No common tangents

Testbook Solution Correct Option **- 4**

CONCEPT :

The distance between the centres of two circle is less than the difference of their radii then there is no common tangent.

CALCULATION:

Equation of first circle $x^2 + y^2 = 16$ which can be re-written as: $x^2 + y^2 = 4^2$

So, the centre of the first circle (0,0) and radius = 4

Equation of second circle $x^2 + y^2 - 2y = 0$ which can be re-written as: $x^2 + (y-1)^2 = 1^2$

So, the centre of the second circle is: (0,1) and radius = 1

So, the distance between the centres $d = \sqrt{0^2 + 1^2} = 1$

The difference between the radii of the two circles = |4 - 1| = 3

As we can see that, the distance between the centres < difference of their radii

We also know that if the distance between the centres of two circle is less than the difference of their radii then there is no common tangent.

So there is no common tangent between the two given circles.

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

Que. 2 Let f: R → R be defined by $f(x) = \begin{cases} x\sin\left(\frac{1}{x}\right) & if\ x > 0 \\ 0 & x \le 0 \end{cases}$ Then

1. f is neither continuous nor differentiable at x = 0
2. f is continuous nor differentiable at x = 0
3. f is continuous but not differentiable at x = 0
4. f is not continuous but differentiable at x = 0

Testbook Solution Correct Option **- 3**

CONCEPT:

A function is continuous If $\lim_{x\to 0^-} F(x) = F(0) = \lim_{x\to 0^+} F(0)$

A function is differentiable if left hand derivative = right hand derivative

CALCULATION:

Given: $f(x) = \begin{cases} x\sin\left(\frac{1}{x}\right) & if\ x > 0 \\ 0 & x \le 0 \end{cases}$

$\Rightarrow \lim_{x\to 0^-} f(x) = 0,\ \lim_{x\to 0^+} x sin\frac{1}{x} = 0$ and f(0) = 0

As we know that, a function is continuous If $\lim_{x\to 0^-} F(x) = F(0) = \lim_{x\to 0^+} F(0)$

So the given function f(x) is continuous at x = 0

Let's calculate the left hand derivative :

$\lim_{x\to 0^-} \frac{d}{dx} f(0) = 0$

Similarly, let's calculate the right hand derivative:

$\Rightarrow \lim_{x\to 0^+} \frac{d}{dx}[x sin\frac{1}{x}] = \lim_{x\to 0^+} [x sin\frac{1}{x} - \frac{1}{x}\cos\frac{1}{x}] = -\infty$

As we can see that, left hand derivative $\neq$ right hand derivative

So, the given function is not differentiable at x = 0

Hence, **option C** is correct.

Que. 3 A particle P starts from the point $z_0 = 1 + 2i$, where $i = \sqrt{-1}$. It moves first horizontally away from the origin by 5 units and then vertically away from origin by 3 units to reach a point z_1. From z_1 the particle moves $\sqrt{2}$ units in the direction of the vector $\hat{i} + \hat{j}$ to reach z_2, and then it moves through an angle $\frac{\pi}{2}$ in an anti-clock-wise direction on a circle with center at origin, to reach a point z_3. The point z_3 is given by:

1. 6 + 7i
2. -7 + 6i
3. 7 + 6i
4. -6 + 7i

Testbook Solution Correct Option **- 4**

Concept:

The complex number a + ib is represented on a two dimensional plane where a is represented on the x-axis (the real axis) and b is represented on the y-axis (the imaginary axis).

The point on a line which makes an angle θ with the x-axis, is given by (r cos θ, r sin θ), where r is the distance of the point from the origin.

If a point on the complex plane rotates by an angle θ in the anti-clock-wise direction, then its value becomes $e^{i\theta}$ times of itself, or (cos θ + i sin θ) times. In case of a clock-wise rotation, the value become $e^{-i\theta}$ times of itself, or (cos θ - i sin θ) times.

Calculation:

When the point $z_0 = 1 + 2i$ moves horizontally, its real part will change and when it moves vertically, its imaginary part will change.

$\therefore z_1 = (1 + 5) + (2 + 3)i$

$\Rightarrow z_1 = 6 + 5i$

The vector $\hat{i} + \hat{j}$ makes an angle of 45° with the x-axis. Moving a point by $\sqrt{2}$ units along this direction will change its value by ($\sqrt{2}$ cos 45°, $\sqrt{2}$ sin 45°) = (1, 1).

$\therefore z_2 = (6 + 1) + (5 + 1)i$

$\Rightarrow z_2 = 7 + 6i$

Finally, rotating the point in the anti-clock-wise direction by an angle of $\frac{\pi}{2}$ changes its value by $e^{\frac{\pi}{2}i}$ times or $\left(\cos\frac{\pi}{2} + i\sin\frac{\pi}{2}\right) = 0 + i.1 = i$ times.

$\therefore z_3 = (7 + 6i).i =$ **-6 + 7i**.

Que. 4 If $\Delta = a^2 - (b - c)^2$, where Δ is the area of the ΔABC, then tan A equals

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1. $\frac{15}{16}$
2. $\frac{8}{15}$
3. $\frac{8}{17}$
4. $\frac{1}{2}$

Testbook Solution Correct Option **- 2**

Concept:

Let a b and c are three sides of a triangle

$s = \frac{a + b + c}{2}$, $\Delta = s\ (s - a)\ \tan\frac{A}{2}$

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

Calculations:

Given, $\Delta = a^2 - (b - c)^2$, where Δ is the area of the ΔABC.

$\Rightarrow \Delta = [a - (b - c)][a - (b - c)]$

$\Rightarrow \Delta = (a - b + c)(a + b - c)$

We know that $s = \frac{a + b + c}{2}$

$\Rightarrow \Delta = 4\ (s - c)(s - b)$

Again, we know that $\Delta = s\ (s - a)\ \tan\frac{A}{2}$

$\Rightarrow s\ (s - a)\ \tan\frac{A}{2} = 4\ (s - c)(s - b)$

$\Rightarrow \tan\frac{A}{2} = 4\ \frac{(s - c)(s - b)}{s(s - a)}$

$\Rightarrow \tan\frac{A}{2} = 4\ \tan^2\frac{A}{2}$

$\Rightarrow \tan\frac{A}{2} = \frac{1}{4}$

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

$\tan A = \frac{2 \times \frac{1}{4}}{1 - (\frac{1}{4})^2}$

$\tan A = \frac{8}{15}$

Que. 5 Two numbers a and b are chosen ar random from a set of first 30 natural numbers, then the probability that $a^2 - b^2$ is divisible by 3 is

1. $\frac{47}{87}$
2. $\frac{15}{87}$
3. $\frac{12}{87}$
4. $\frac{9}{87}$

Testbook Solution Correct Option **- 1**

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CONCEPT:

The number of combinations of n things taken r at a time is given by ${}^{n}C_{r} = \frac{n!}{r!(n-r)!}$.

CALCULATIONS:

Consider the first 30 natural numbers and the selection of two numbers 'a' and 'b' could be selected as ${}^{30}C_{r}$.

As $a^2 - b^2$ is divisible by 3

$\Rightarrow$ (a + b)(a - b) = 3p

If (a - b) is multiple of 3, then $a^2 - b^2$ will be multiple of 3 also.

These numbers (1, 4, 7, ...28) , (2, 5, ... 29), (3, 6, 9, ...30) are possible: ${}^{10}C_2 + {}^{10}C_2 + {}^{10}C_2 = 45 \times 3 = 135$

If (a + b) is multiple of 3, then $a^2 - b^2$ will be multiple of 3 also.

$\therefore$These numbers {(1, 2), (1, 5), ...(1, 29)}, {(4, 2), (4,5). . . . }. . .(28, 29)}

$\therefore$ So total cases are = 10×10

Total numbers are 135 + 100 = 235

$\therefore$Required probability = $\frac{235}{{}^{30}C_2} = \frac{235 \times 2}{30 \times 25} = \frac{47}{87}$

Therefore, option (1) is correct answer.

Que. 6 A man takes a step forward with probability 0.4 and backward with probability 0.6. The probability that at the end of eleven steps, he is one step away from the starting point is

1. $462(0.34)^2$
2. $462(0.04)^2$
3. $462(0.14)^2$
4. $462(0.24)^2$

Testbook Solution Correct Option **- 4**

CALCULATIONS:

The man either takes a step forward or a step backward.
So, 0.4+0.6=1,
Let's assume a step forward be a success and a step backward be a failure.
Then, the probability of success in one step = $p = 0.4 = \frac{2}{5}$

Again The probability of failure in one step = $q = 0.6 = \frac{3}{5}$

In 11 steps he will be one step away from the starting point if the numbers of successes and failure differ by 1.
So, the number of successes = 6 and number of failures = 5 or the number of successes = 5 and number of failures = 6

So, the required probability $= {}^{11}C_6\, p^6\, q^5 + {}^{11}C_5\, p^5\, q^6$

$= {}^{11}C_6 \left(\frac{2}{5}\right)^6 \left(\frac{3}{5}\right)^5 + {}^{11}C_5 \left(\frac{2}{5}\right)^5 \left(\frac{3}{5}\right)^6$

$= \frac{11!}{6!(5)!} \left(\frac{2}{5}\right)^5 \left(\frac{3}{5}\right)^5 \left\{\frac{2}{5} + \frac{3}{5}\right\}$

$= \frac{11.10.9.8.7}{120} \cdot \frac{2^5 3^5}{5^{10}} = 462 \times \left\{\frac{6}{25}\right\}^5 = 462 \times \{0.24\}^5$

Therefore, option (4) is the right answer.

Que. 7

Let x_i, i = 1, 2, ..., n be n observations and $w_i = px_i + k$, i = 1, 2, ..., n where p and k are constants. If the mean of x_i's is 48 and standard deviation is 12, whereas the mean of w_i's is 55 and standard deviation is 15, then the value of p and k should be

1. p = 1.25, k = -5
2. p = -1.25, k = 5
3. p = 2.5, k = -5
4. p = 25, k = 5

Testbook Solution Correct Option **- 1**

CONCEPT:

Mean is represented as $\overline{x} = \frac{\sum_{i=1}^{n} x_i}{n}$.

Mean deviation for ungrouped data: For n observation $x_1, x_2, \ldots\ldots x_n$ the mean deviation about their mean $\overline{x}$ is given by $M.D(\overline{x}) = \frac{|xi-\overline{x}|}{n}$.

Mean deviation about their **median** M is given by $M.D(M) = \frac{|xi-M|}{n}$.

CALCULATIONS:

It is given that $w_i = px_i + k$

$\overline{X} = 48, \sigma_X = 12$

$\overline{W} = 55, \sigma_W = 15$

Now as given $w_i = px_i + k$

$\therefore \overline{W} = p\overline{X} + k$

$\Rightarrow 55 = 48p + k$

Now, their variances will also be equal.

$\Rightarrow Var(w) = Var(px + k)$

$\Rightarrow Var(w) = p^2 Var(x)$

As a variance of constants are zero.

$\sigma_w^2 = p^2(\sigma_X^2)$

$\Rightarrow 15^2 = p^2(12^2)$

$\Rightarrow p^2 = \frac{225}{144}$

$= p = \frac{15}{12} = \frac{5}{4}$

Now putting the value of p in the equation $55 = 48p + k$

$\Rightarrow 55 = 48\left(\frac{5}{4}\right) + k$

$\Rightarrow$ k = 5

So, p = 1.25 and k = - 5

Therefore option (1) is the correct answer.

Que. 8 If x, y, z are distinct real numbers and $\begin{vmatrix} x & x^2 & 2+x^3 \\ y & y^2 & 2+y^3 \\ z & z^2 & 2+z^3 \end{vmatrix} = 0$, then xyz =

1. 1
2. -1
3. 2

4. -2

Testbook Solution Correct Option **- 4**

Calculations:

Given, x, y, z are distinct real numbers and $\begin{vmatrix} x & x^2 & 2+x^3 \\ y & y^2 & 2+y^3 \\ z & z^2 & 2+z^3 \end{vmatrix} = 0$

To find the value of xyz, solve the determinant $\begin{vmatrix} x & x^2 & 2+x^3 \\ y & y^2 & 2+y^3 \\ z & z^2 & 2+z^3 \end{vmatrix} = 0$

$= x[y^2(2+z^3) - z^2(2-y^3)] - x^2[y(2+z^3) - z(2+y^3)] + (2+x^3)[yz^2 - zy^2] = 0$

$= 2xy^2 + xy^2z^3 - 2xz^2 + xy^3z^2 - 2x^2y - x^2yz^3 + 2x^2z + x^2y^3z + 2yz^2 - 2zy^2 + x^3yz^2 - x^3y^2z = 0$

$= 2xy^2 - 2xz^2 - 2x^2y + 2x^2z + 2yz^2 - 2zy^2 + x^3yz^2 - x^3y^2z + xy^2z^3 + xy^3z^2 - x^2yz^3 + x^2y^3z = 0$

$= 2(xy^2 - xz^2 - x^2y + x^2z + yz^2 - zy^2) + xyz\,(xy^2 - xz^2 - x^2y + x^2z + yz^2 - zy^2) = 0$

$= (2 + xyz)(xy^2 - xz^2 - x^2y + x^2z + yz^2 - zy^2) = 0$

$= (2 + xyz) = 0$

$= xyz = -2$

Alternate Method

$$\begin{vmatrix} x & x^2 & 2+x^3 \\ y & y^2 & 2+y^3 \\ z & z^2 & 2+z^3 \end{vmatrix} = 0$$

$$\Rightarrow \begin{vmatrix} x & x^2 & 2 \\ y & y^2 & 2 \\ z & z^2 & 2 \end{vmatrix} + \begin{vmatrix} x & x^2 & x^3 \\ y & y^2 & y^3 \\ z & z^2 & z^3 \end{vmatrix} = 0$$

$$\Rightarrow 2\begin{vmatrix} x & x^2 & 1 \\ y & y^2 & 1 \\ z & z^2 & 1 \end{vmatrix} + xyz\begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix} = 0$$

$$\Rightarrow 2\begin{vmatrix} x & x^2 & 1 \\ y & y^2 & 1 \\ z & z^2 & 1 \end{vmatrix} + xyz\begin{vmatrix} x & x^2 & 1 \\ y & y^2 & 1 \\ z & z^2 & 1 \end{vmatrix} = 0$$

$$\Rightarrow (2 + xyz)\begin{vmatrix} x & x^2 & 1 \\ y & y^2 & 1 \\ z & z^2 & 1 \end{vmatrix} = 0$$

$\Rightarrow (2 + xyz) = 0$

$\therefore xyz = -2$

Que. 9 Let f(x) be a polynomial satisfying f(0) = 2, f'(0) = 3 and f''(x) = f(x). Then f(4) is equal to

1. $5\frac{(e^8-1)}{2e^4}$
2. $\frac{(5e^8-1)}{2e^4}$

3. $\frac{2e^4}{5e^8-1}$
4. $\frac{2e^4}{5(e^8+1)}$

Testbook Solution Correct Option **- 2**

CONCEPT :

If roots are real and different then complimentary solution is given by $F(x) = c_1 e^{m x} + c_2 e^{n x}$

CALCULATION :

Differential equation $f''(x) = f(x)$

$f''(x) - f(x) = 0$

$[D^2-1] f(x) = 0$

The corresponding auxiliary equation $D^2 - 1 = 0$

Root of auxiliary equation $D^2 = 1$

$\Rightarrow D = \pm 1$

Here, m = 1 and n = - 1

Roots are real and different. So complimentary solution is given by

$\Rightarrow f(x) = c_1 e^x + c_2 e^{-x}$

Put initial condition f(0) = 2 in the above equation we get,

$\Rightarrow 2 = c_1 e^0 + c_2 e^0$

$\Rightarrow 2 = c_1 + c_2$ -----(1)

$\because f(x) = c_1 e^x + c_2 e^{-x}$

$\Rightarrow f'(x) = c_1 e^x - c_2 e^{-x}$

Put initial condition $f'(0) = 3$ in the above equation

$\Rightarrow 3 = c_1 - c_2$ -----(2)

By adding equation (1) and equation (2) we get,

$\Rightarrow 2c_1 = 5 \Rightarrow c_1 = 5/2$

Put value of c_1 in equation (1)

$\Rightarrow 2 = 5/2 + c_2 \Rightarrow c_2 = - 1/2$

Solution of the given differential equation $f(x) = \frac{5}{2} e^x - \frac{1}{2} e^{-x}$

$$\Rightarrow f(x) = \frac{(5e^{2x}-1)}{2e^x}$$

So, the value of f(4)

$$\Rightarrow f(4) = \frac{(5e^8-1)}{2e^4}$$

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

Que. 10

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If a, a_1, a_2, a_3, ..., a_{2n-1}, b are in AP, a, b_1, b_2, ... b_{2n-1}, b are in GP and a, c_1, c_2, c_3, ..., c_{2n-1}, b re in HP, where a, b are positive, then the equation $a_nx^2 - b_nx + c_n = 0$ has its roots

1. Real and equal
2. Real and unequal
3. Imaginary
4. One real and one imaginary

Testbook Solution Correct Option **- 3**

Concept:

If a, b, c are in AP, than $b = \frac{a+c}{2}$

If a, b, c are in GP than $b = \sqrt{ac}$

If a, b, c are in HP than $b = \frac{2ac}{a+c}$

Calculation:

assume a = 2, b = 8, n = 1

2, a_1, 8 are in AP, than $a_1 = \frac{2+8}{2} = 5$

2, b_1, 8 are in GP, than $b_1 = \sqrt{2 \times 8} = 4$

2, c_1, 8 are in HP, than $c_1 = \frac{2\times2\times8}{2+8} = \frac{16}{5}$

Here, we have to find the nature of roots of the equation $a_nx^2 - b_nx + c_n = 0$

By substituting n = 1 in the equation $a_nx^2 - b_nx + c_n = 0$ we get

$\Rightarrow a_1x^2 - b_1x + c_1 = 0$

We know that, $a_1 = 5$, $b_1 = 4$ and $c_1 = 16/5$

So, the discrimination $D = {b_1}^2 - 4a_1c_1$ for the equation $a_1x^2 - b_1x + c_1 = 0$ is $D = 4^2 - 4 \times 5 \times \frac{16}{5} = -48$

$\because$ D < 0 so the roots are imaginary

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

Que. 11 Solution set of inequality $\log_3(x+2)(x+4) + \log_{\frac{1}{3}}(x+2) < \frac{1}{2}\log_{\sqrt{3}} 7$ is

1. (-2, -1)
2. (-2, 3)
3. (-1, 3)
4. (3, ∞)

Testbook Solution Correct Option **- 2**

Concept:

- $\log_{\alpha^\beta} m = \frac{1}{\beta}\log_\alpha m$
- $\log_\alpha \frac{m}{n} = \log_\alpha m - \log_\alpha n$
- $If\ \log_\alpha m = \log_\alpha n\ \ then\ m = n$

Calculation:

$\log_3(x+2)(x+4) + \log_{\frac{1}{3}}(x+2) < \frac{1}{2}\log_{\sqrt{3}} 7$

As we know that, $\log_{\alpha^\beta} m = \frac{1}{\beta}\log_\alpha m$

$\log_3 (x+2)(x+4) - \log_3 (x+2) < \log_3 7$

As we know that, $\log_\alpha \frac{m}{n} = \log_\alpha m - \log_\alpha n$

$\log_3 (x+4) < \log_3 7$

As we know that, $if\ \log_\alpha m = \log_\alpha n\ \ then\ m = n$

⇒x + 4 < 7

⇒ x < 3 ----------(1)

For $\log_3 (x+2)(x+4)$ to exist $x \in (-2, \infty)$---------(2)

For $\log_3 (x+2) \Rightarrow x \in (-2, \infty)$----------(3)

By combining equation 1, 2, 3 we get $x \in (-2, 3)$

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

Que. 12 If a, b, c are in GP and log a - log 2b, log 2b - log 3c and log 3c - log a are in AP, then a, b, c are the lengths of the sides of a triangle which is

1. Acute angle
2. Obtuse angled
3. Right angles
4. Equilateral

Testbook Solution Correct Option **- 2**

Concept:

The sides of an obtuse triangle should satisfy the condition that the sum of the square of two smaller sides should be less than the square of the largest side.

If a, b, c are in AP than $b = \frac{a+c}{2}$

If a, b, c are in GP than $b = \sqrt{ac}$

Calculation:

log a - log 2b, log 2b - log 3c and log 3c - log a are in AP

$\log 2b - \log 3c = \frac{\log 3c - \log a + \log a - \log 2b}{2}$

$\log \frac{2b}{3c} = \frac{\log \frac{3c}{2b}}{2}$

$\frac{4b^2}{9c^2} = \frac{3c}{2b}$

2b = 3c ----------(1)

∵ a, b, c are in GP

⇒ b^2 = ac ----------(2)

From equation 1 and 2 we get

9c = 4a

a:b:c = 9:2:4

As we know that, for obtuse triangle the sum of the square of two smaller sides should be less than the square of the largest side.

⇒ $a^2 > b^2 + c^2$

So, a, b and c are the sides of an obtuse angle triangle.

Que. 13 If $(1 + x - 2x^2)^6 = 1 + a_1x + a_2x^2 + ... + a_{12}x^{12}$, then $a_2 + a_4 + ... a_{12}$ is?

1. 29
2. 30

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3. 31
4. 32

Testbook Solution Correct Option **- 3**

Calculation:

Given, $(1 + x - 2x^2)^6 = 1 + a_1x + a_2x^2 + ... + a_{12}x^{12}$

Put, x = 1,

$(1 + 1 - 2 \times 1^2)^6 = 1 + a_1 + a_2 + ... + a_{12}$

$1 + a_1 + a_2 + ... + a_{12} = 0$ .....(1)

Now, put x = -1

$(1 - 1 - 2 \times (-1)^2)^6 = 1 - a_1 + a_2 - ... + a_{12}$

$(2)^6 = 1 - a_1 + a_2 - ... + a_{12}$ .....(2)

Add (1) and (2)

$2(1 + a_2 + a_4 + ... a_{12}) = 0 + 2^6$

$1 + a_2 + a_4 + ... a_{12} = 32$

$\therefore a_2 + a_4 + ... a_{12} = 31$

Hence, option (3) is correct.

Que. 14 If x, 2x + 2, 3x + 3 are the first three terms of a geometric progression, then 4^{th} term in the geometric progression is

1. -13.5
2. 13.5
3. -27
4. 27

Testbook Solution Correct Option **- 1**

Concept:

If a, b, c are in GP than $r = \frac{b}{a} = \frac{c}{b}$

If first term of GP is a and common ratio is r than nth term of GP is given by ar^{n-1}

Calculation:

Given: x, 2x + 2, 3x + 3 are the first three terms of a geometric progression than

$\frac{2x+2}{x} = \frac{3x+3}{2x+2}$

$\frac{2x+2}{x} = \frac{3}{2}$

$4x + 4 = 3x \Rightarrow x = -4 = a$

$r = \frac{c}{b} = \frac{3x+3}{2x+2} = \frac{3}{2}$

4^{th} term in the geometric progression is $T_4 = ar^{n-1}$

$T_4 = (-4)\{\frac{3}{2}\}^{4-1} = -13.5$

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

Que. 15 If a and b are greatest values of ${}^{2n}C_r$ and ${}^{2n-1}C_r$ respectively, then

1. a = 2b
2. b = 2a

3. a = b
4. $a^2 = 2b^2$

Testbook Solution Correct Option **- 1**

CONCEPT:

We know that the greatest value of ^nC_r is given by - $\left\{ \begin{matrix} {}^nC_{n/2} & \text{if n is even} \\ \frac{{}^nC_{n-1}}{2} \text{ or } \frac{{}^nC_{n+1}}{2} & \text{if n is odd} \end{matrix} \right\}$

CALCULATIONS:

As given a = Greatest value of $^{2n}C_r = {}^{2n}Cn$ and b = greatest value of $^{2n - 1}C_r = {}^{2n - 1}C_{n - 1}$

$\Rightarrow \frac{a}{b} = \frac{^{2n}C_n}{^{2n-1}C_{n-1}} = \frac{n}{^{2n-1}C_{n-1}} = 2 \Rightarrow a = 2b$

Therefore option (1) is the correct answer.

Que. 16 Let U and V be two events of a sample space S and P(A) denote the probability of an event A. Which of the following statements is true?

1. If P(U) = P(V), then U = V.
2. If P(U) = 0, then U^c = S.
3. If U ∩ V = ϕ, then U and V are independent.
4. If U and V are independent, then so are U^c and V^c.

Testbook Solution Correct Option **- 2**

Concept:

Probability: The probability of the occurrence of an event A out of a total possible outcomes N, is given by: P(A) = $\frac{n(A)}{N}$, where n(A) is the number of ways in which the event A can occur.

For two events A and B, we have: P(A ∪ B) = P(A) + P(B) - P(A ∩ B).

- If A and B are independent events, then P(A ∩ B) = P(A) × P(B).
- If A and B are mutually exclusive events, then P(A ∩ B) = 0.
- The complementary event of an event A is also denoted as A^c or A' or $\bar{A}$.
  $P(\bar{A}) = 1 - P(A)$.

Set Theory: $n(A^c \cap B^c) = n(A \cup B)^c$.

Calculation:

Let's look at the answer options one-by-one:

1) If P(U) = P(V), then n(U) = n(V), but that doesn't mean that U = V. Hence, FALSE.

2) If P(U) = 0, then $P(U^c) = 1 - 0 = 1$. It means that U^c = S. Hence, **TRUE**.

3) If U ∩ V = ϕ, then U and V are mutually exclusive, NOT independent. Hence, FALSE.

4) If U and V are independent, then $P(U \cap V) = P(U) \times P(V)$ but $P(U^c \cap V^c) = P(U \cup V)^c \neq P(U^c) \times P(V^c)$. Hence, FALSE.

Additional Information

- A **mutually exclusive event** is defined as a situation where two events cannot occur at same time. When a coin is a tossed, there are two events possible, either it will be a Head or a Tail. Both the events here are mutually exclusive because they cannot happen simultaneously.
- An **independent event** is where one event remains unaffected by the occurrence of the other event. If we take two separate coins and flip them, then the occurrence of a Head or a Tail on both the coins are independent of each other, because a Head/Tail on one coin, does not affect the outcome of the other coin.
- Mutually exclusive events are necessarily also dependent events because one's existence depends on the other's non-existence.

  If at least one of the events has zero probability, then the two events can be mutually exclusive and independent simultaneously. However, if both events have non-zero probability, then they cannot be mutually exclusive and independent simultaneously.

Que. 17 If a man purchases a raffle ticket, he can win a first prize of Rs. 5,000 or a second prize of Rs. 2,000 with probabilities 0.001 and 0.003 respectively. What should be a fair price to pay for the ticket?

1. Rs. 11
2. Rs. 15
3. Rs. 2,000
4. None of these

Testbook Solution Correct Option **- 1**

CALCULATIONS:

Given that $P_{(win = 5000)} = 0.001$ and $P_{(win = 2000)} = 0.003$

Let $P_{(win = 0)}$ = P(not winning either prize).

Fair price (F) is defined as the case where expected gain(E) = 0.

Then, $E_{(gain)} = E_{(win)} - E_{(loss)} = 0$

$5000 \times P_{(win = 5000)} + 2000 \times P_{(win = 2000)} - F \times P_{(win = 0)} = 0$

Substituting in probability values and moving E(loss) -

$\Rightarrow F \times (1 - 0.001 - 0.003) = 5000 \times 0.001 + 2000 \times 0.001$

$\Rightarrow F \times (0.996) = 11$

$\Rightarrow F = \frac{11}{0.996} \approx 11$

Fair price of the raffle ticket will be approximately 11.

Therefore, option (1) is the correct answer.

Que. 18 If the mean deviation 1, 1 + d, 1 + 2d, ..., 1 + 100d from their mean is 255, then d is equal to

1. 10.1
2. 10.2
3. 10.3
4. 10.4

Testbook Solution Correct Option **- 1**

CONCEPT:

MEAN: The meaning of mean is to evaluate the average. It is defined as the average of the given numbers.

Mean = Sum of Observations/Total number of observations

Mean Deviation: For n observation $x_1, x_2, x_3 \ldots\ldots x_n$, the mean deviation about their mean $\overline{x}$ is given by:

$M.D(\overline{x}) = \frac{\sum |x_i - \bar{x}|}{n}$

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

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

Mean deviation is $\frac{\sum|x_i-\bar{x}|}{n}$.

$= \frac{(1+50d-1)+(1+50d-1-d)+.....+(1+100d-1-50d)}{n}$

$\Rightarrow \frac{50d+49d+....+0+d+.....+50d}{101} = \frac{2d(1+2+.....50)}{101}$

$\Rightarrow \frac{2d(50)(51)}{101\times2}$ (As sum of first n natural numbers is given by $\frac{n(n+1)}{2}$)

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

Given that mean deviation is 255.

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

$\Rightarrow d = \frac{101\times255}{50\times51}$

$\Rightarrow d = 10.1$

Therefore option (1) is the correct answer.

Que. 19 If $\sum_{i=1}^{n} x_i = 80$ and $\sum_{i=1}^{n} x_i^2 = 400$, then a possible value of n among the following is

1. 9
2. 12
3. 15
4. 18

Testbook Solution Correct Option **- 4**

CONCEPT:

The **Root-Mean Square-Arithmetic Mean-Geometric Mean-Harmonic Mean Inequality (RMS-AM-GM-HM)**,

is an inequality of the root-mean-square, arithmetic mean, geometric mean, and harmonic mean of a set of positive real numbers $x_1, x_2, \ldots\ldots x_n$ that says :

$$\sqrt{\frac{x_1{}^2+.....+x_n{}^2}{n}} \geq \frac{x_1+.....x_n}{n} \geq \sqrt[n]{x_1....x_n} \geq \frac{n}{\frac{1}{x_1}+.....\frac{1}{x_n}}$$

CALCULATIONS:

Given $\sum_{i=1}^{n} x_i = 80$ and $\sum_{i=1}^{n} x_i^2 = 400$

Since, root mean square $\geq$ arithmetic mean, then

$\sqrt{\frac{x_1{}^2+.....+x_n{}^2}{n}} \geq \frac{x_1+.....x_n}{n}$

$\therefore \sqrt{\frac{400}{n}} \geq \frac{80}{n}$

On solving this inequality, we get -

$\Rightarrow n \geq 16$

So option (4) is the correct answer.

Que. 20 Let S be the set $\{a \in Z^+ : a \leq 100\}$. If the equation $[\tan^2 x] - \tan x - a = 0$ has real roots (where [.] is the greatest integer function), then the number of elements is S is

1. 10
2. 8
3. 9
4. 0

Testbook Solution Correct Option **- 3**

CONCEPT:

Z^+ is the set of all positive integers (1, 2, 3, . . .)

If quadratic equation $ax^2 + bx + c = 0$, has real roots then its discriminant $(b^2 - 4ac)$ should be positive.

CALCULATIONS:

Given equation is $[\tan^2 x] - \tan x - a = 0$.

$\therefore D = b^2 - 4ac = (-1)^2 - 4(1)(-a) = 1 + 4a$

So D must be an odd perfect square -

$\Rightarrow \sqrt{1 + 4a} = 2\lambda + 1$

$\Rightarrow 1 + 4a = 4\lambda^2 + 1 + 4\lambda$

$\Rightarrow a = \lambda(\lambda + 1)$

So, For different values of λ (1, 2, 3, 4, 5, 6, 7, 8, 9 but λ can not be 0

as $\{a \in Z^+ : a \leq 100\}$)we will get different values of 'a'.

So, a = 2, 6, 12, 20, 30, 42, 56, 72, 90.

Hence there are 9 values of 'a'.

Therefore option (3) is the correct answer.

Que. 21 If $\sin^2 x \tan x + \cos^2 \cot x - \sin 2x = 1 + \tan x + \cot x$, $x \in (0, \pi)$, then x

1. $\frac{3\pi}{12}, \frac{5\pi}{12}$
2. $\frac{5\pi}{12}, \frac{7\pi}{12}$
3. $\frac{7\pi}{12}, \frac{11\pi}{12}$
4. $\frac{7\pi}{12}, \frac{9\pi}{12}$

Testbook Solution Correct Option **- 3**

Concept:

- $\tan\theta = \frac{\sin\theta}{\cos\theta}$
- $\sin^2 x + cos^2 x = 1$
- $sin^4 x + cos^4 x = 1 - 2\sin^2 x cos^2 x$

Calculation:

Given: $\sin^2 x \tan x + \cos^2 \cot x - \sin 2x = 1 + \tan x + \cot x$

$\Rightarrow \frac{sin^3 x}{\cos x} + \frac{cos^3 x}{sinx} - sin2x = 1 + \frac{sinx}{cosx} + \frac{cosx}{sinx}$

$\Rightarrow \frac{\sin^4 x + \cos^4 x}{\sin x \cos x} - sin2x = 1 + \frac{sin^2 x + \cos^2 x}{\sin x cosx}$

$\Rightarrow \frac{1 - 2\sin^2 x cos^2 x}{\sin x \cos x} - sin2x = 1 + \frac{1}{\sin x cosx}$

$\Rightarrow \frac{1}{\sin x \cos x} - \frac{2\sin^2 x cos^2 x}{\sin x \cos x} - sin2x = 1 + \frac{1}{\sin x cosx}$

$\Rightarrow$ - 2 sin x cos x - sin 2x = 1

$\Rightarrow$ - 2 sin 2x = 1

$\Rightarrow$ sin 2x = - 1/2

$\Rightarrow 2x = \frac{7\pi}{6}, \frac{11\pi}{6}$

$\Rightarrow x = \frac{7\pi}{12}, \frac{11\pi}{12}$

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

Que. 22 $\vec{a}$ and $\vec{b}$ are non-zero non-collinear vectors such that $|\vec{a}| = 2, \vec{a}.\vec{b} = 1$ and the angle between $\vec{a}$ and $\vec{b}$ is $\frac{\pi}{3}$. If $\vec{r}$ is any vector satisfying $\vec{r}.\vec{a} = 2, \quad \vec{r}.\vec{b} = 8, \ (\vec{r} + 2\vec{a} - 10\vec{b}).(\vec{a} \times \vec{b}) = 6$ and $\vec{r} + 2\vec{a} - 10\vec{b} = \lambda(\vec{a} \times \vec{b})$, then λ =

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

Testbook Solution Correct Option **- 2**

CONCEPT:

The vector product of two vectors a and b is given by a vector whose magnitude is given by $|a| \, . \, |b| \, . \, |\text{Sin}\theta$.

CALCULATIONS:

Given data are - $|\vec{a}| = 2, \left|\vec{b}\right| = 1, \theta = \frac{\pi}{3}$

Given conditions are $(\vec{r} + 2\vec{a} - 10\vec{b}).(\vec{a} \times \vec{b}) = 6$ and $\vec{r} + 2\vec{a} - 10\vec{b} = \lambda(\vec{a} \times \vec{b})$,

Now eliminating $\vec{r} + 2\vec{a} - 10\vec{b}$ from both equation, we get -

$\lambda(\overrightarrow{a} \times \overrightarrow{b}).(\overrightarrow{a} \times \overrightarrow{b}) = 6$

$\lambda(\overrightarrow{a} \times \overrightarrow{b})^2 = 6$

$\lambda.(|a|.|b|.\sin\theta)^2 = 6$

$\lambda.\left(2 \times 1 \times \frac{\sqrt{3}}{2}\right)^2 = 6$

$3\lambda = 6$

$\lambda = 2$

So, option (2) is correct answer.

Que. 23 In a chess tournament, n men and 2 women players participated. Each player plays 2 games against every other player. Also, the total number of games played by the men among themselves exceeded by 66 the number of games that the men played against the women. Then the total number of players in the tournament is

1. 13
2. 11
3. 9
4. 7

Testbook Solution Correct Option **- 1**

CONCEPT:

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The combination formula is used to find the number of ways of selecting items from a collection such that the order of selection does not matter.

Combination formula can be written as ${}^{n}C_{r} = \frac{n!}{r!(n-r)!}$.

CALCULATIONS:

Let there be n men participants.

Then the number of games that the men play between themselves is $2\times {}^{n}C_{r}$

games that the men played with the women is 2×(2n).

$\therefore 2 \times C_2{}^{n} - 2 \times 2n = 66$ (Given)

Or n^2 - 5n - 66 = 0

On solving we get n = 11.

Hence, the number of participants is 11 men + 2 women =13.

So, option (1) is the correct answer.

Que. 24 Suppose $A_1, A_2, A_3, ..., A_{30}$ are thirty sets each having 5 elements with no common elements across the sets and $B_1, B_2, ..., B_n$ are n sets each with 3 elements with no common elements across the sets.

Let $\bigcup_{i=1}^{30} A_i = \bigcup_{j=1}^{n} B_j = S$ and each elements of S belongs to exactly 10 of the A_i's and exactly 9 of the B_j's. Then n is equal to

1. 15
2. 30
3. 40
4. 45

Testbook Solution Correct Option **- 4**

Calculation:

Given: $A_1, A_2, A_3, ..., A_{30}$ are thirty sets each having 5 elements

$A_1 = A_2 = ... = A_{30} = 5$

$\bigcup_{i=1}^{30} A_i = A_1 + A_2 + \ldots + A_{30} = 30 \times 5 = 150$

Given: Elements of S belongs to exactly 10 of the A_i's

Element of S = $\frac{150}{10} = 15$

$\Sigma B_j = 9 \times 15 = 135$

Given: $B_1, B_2, ..., B_n$ are n sets each with 3 elements

$\bigcup_{j=1} B_j = S$

$3B_j = 135$

$\therefore B_j = 45$

Que. 25 Let $f(x) = \begin{cases} \cos[x], & x \geq 0 \\ |x| + a, & x < 0 \end{cases}$, where [x] denotes the greatest integer ≤ x. If f should be continuous at x = 0, then a must be

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

Testbook Solution Correct Option **- 2**

Concept:

A function is continuous if $\lim_{\delta x \to 0^-} f(x) = f(0) = \lim_{\delta x \to 0^+} f(x)$ i.e left hand limit = function value = right hand limit

Calculation:

Given: $f(x) = \begin{cases} \cos[x], & x \geq 0 \\ |x| + a, & x < 0 \end{cases}$, and f is continuous at x = 0

Let's find f(0)

⇒ f(0) = cos [0] = 1

$LHL = \lim_{x \to 0^-} (|x| + a) = \lim_{h \to 0} (|0 - h| + a) = a$

As we know that, if any function is continuous if $\lim_{\delta x \to 0^-} f(x) = f(0) = \lim_{\delta x \to 0^+} f(x)$ i.e left hand limit = function value = right hand limit

∵ The given function f is continuous at x = 0

⇒ LHL = f(0)

⇒ a = 1

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

Que. 26 If x is real, then the minimum value of $\frac{x^2-x+1}{x^2+x+1}$ is

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

Testbook Solution Correct Option **- 4**

Concept:

Second Derivative Test:

- Calculate f'(x)
- Solve f'(x) = 0 and find the roots. Suppose x = c is the root of f'(x) = 0.
- Calculate f''(x) and put x = c to get the value of f''(c).

- If **f''(c) < 0** then x = c is a **point of maxima**.
- If **f''(c) > 0** then x = c is a **point of minima**.
- If **f''(c) = 0** then we need to use the **first derivative test**.

Calculation:

Given: $f(x) = \frac{(x^2-x+1)}{(x^2+x+1)}$

$\frac{df}{dx} = \frac{(x^2+x+1)(2x-1)-(x^2-x+1)(2x+1)}{(x^2+x+1)^2}$

$\frac{df}{dx} = \frac{x^2-1}{(x^2+x+1)^2}$

$\frac{df}{dx} = 0 \Rightarrow x^2 - 1 = 0 \Rightarrow x = \pm 1$

$\Rightarrow \frac{d^2f}{dx^2} = \frac{(2x-1)(x^2+x+1)-2(x^2-1)(2x+1)}{(x^2+x+1)^3}$

⇒ f''(1) = 1/9 > 0

So, x = 1 is a point of minima

⇒ f''(-1) = - 1/9 < 0

So, x = - 1 is a point of maxima

So minimum value of the given function is attained at x = 1

By substituting x = 1 in f(x) we get f(1) = 1/3.

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

Que. 27 If $\int \cos x \cos 2x \cos 5x \, dx = A_1 \sin 2x + A_2 \sin 4x + A_3 \sin 6x + A_4 \sin 8x + c$, then the values of A_1, A_2, A_3, A_4 are

1. $A_1 = \frac{1}{2}, A_2 = \frac{1}{4}, A_3 = \frac{1}{6}, A_4 = \frac{1}{8}$
2. $A_1 = \frac{1}{8}, A_2 = \frac{1}{16}, A_3 = \frac{1}{24}, A_4 = \frac{1}{32}$
3. $A_1 = \frac{1}{6}, A_2 = \frac{1}{12}, A_3 = \frac{1}{18}, A_4 = \frac{1}{24}$
4. $A_1 = \frac{1}{4}, A_2 = \frac{1}{8}, A_3 = \frac{1}{12}, A_4 = \frac{1}{16}$

Testbook Solution Correct Option - **2**

Concept:

- 2 cos A cos B = cos (A + B) + cos (A - B)
- $\int \cos ax \, dx = \frac{1}{a} \sin ax + c$

Calculation:

Given: $\int \cos x \cos 2x \cos 5x \, dx = A_1 \sin 2x + A_2 \sin 4x + A_3 \sin 6x + A_4 \sin 8x + c$----------(1)

$\Rightarrow \int \cos x \cos 2x \cos 5x \, dx = \frac{1}{2} \int \cos 2x[2 \cos 5x \cos x]dx$

$= \frac{1}{2} \int \cos 2x[\cos 6x + \cos 4x]dx$

$= \frac{1}{4} \int [2 \cos 2x \cos 6x + 2 \cos 4x \cos 2x]dx$

$= \frac{1}{4} \int [\cos 8x + \cos 4x + \cos 6x + \cos 2x]dx$

$= \frac{1}{4} \int [\cos 2x + \cos 4x + \cos 6x + \cos 8x]dx$

$= \frac{1}{8}\sin 2x + \frac{1}{16}\sin 4x + \frac{1}{24}\sin 6x + \frac{1}{32}\sin 8x + c$----------(2)

Now by comparing (1) with (2) we get

$\Rightarrow A_1 = \frac{1}{8}, A_2 = \frac{1}{16}, A_3 = \frac{1}{24}, A_4 = \frac{1}{32}$

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

Que. 28 If $\int_{\log 2}^{x} \frac{1}{\sqrt{e^x - 1}} dx = \frac{\pi}{6}$, then x =

1. log 2
2. 2 log 2

3. 3 log 2
4. 4 log 2

Testbook Solution Correct Option **- 2**

Concept:

Integration formulas:

- $\int_a^b f(x)dx = F(b) - F(a)$
- $\int_a^b \frac{1}{1+x^2}dx = \tan^{-1}x$

Calculation:

Let us suppose, $e^x - 1 = t^2$

Now by differentiating the above equation w.r.t x we get

$\Rightarrow e^x dx = 2t\, dt$

$\Rightarrow dx = \frac{2t\, dt}{t^2+1}$

Put the value of e^x-1 and dx in given integration

$\int \frac{1}{\sqrt{t^2}} \times \frac{2tdt}{t^2+1}$

$\int 2\frac{dt}{t^2+1} \Rightarrow 2\tan^{-1}t$

Now put the value of t and limit in the above integrand

$[2\tan^{-1}\sqrt{e^x - 1}]_{\log 2}^{x} = \frac{\pi}{6}$

$2\tan^{-1}\sqrt{e^x - 1} - 2\tan^{-1}\sqrt{e^{\log 2} - 1} = \frac{\pi}{6}$

$2\tan^{-1}\sqrt{e^x - 1} - 2\tan^{-1}1 = \frac{\pi}{6}$

$2\tan^{-1}\sqrt{e^x - 1} - \frac{\pi}{2} = \frac{\pi}{6}$

$2\tan^{-1}\sqrt{e^x - 1} = \frac{2\pi}{3}$

$\sqrt{e^x - 1} = \tan\frac{\pi}{3} = \sqrt{3}$

$e^x - 1 = 3 \Rightarrow e^x = 4 \Rightarrow x = 2\log 2$

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

Que. 29 Equation of the tangent from the point (3, -1) to the ellipse $2x^2 + 9y^2 = 3$ is

1. $2x - 3y - 3 = 0$
2. $2x + 3y - 3 = 0$
3. $2x + y - 3 = 0$
4. None of these

Testbook Solution Correct Option **- 4**

Concept:

The equation of the tangent to an ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ at the **point** (x_1, y_1) is $\frac{xx_1}{a^2} + \frac{yy_1}{b^2} = 1$.

Calculations:

Given, the point is $(3, -1) = (x_1, y_1)$ and equation of ellipse is $2x^2 + 9y^2 = 3$

$\Rightarrow \frac{x^2}{\frac{3}{2}} + \frac{y^2}{\frac{1}{3}} = 1$

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The equation of the tangent to an ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ at the **point** (x_1, y_1) is $\frac{xx_1}{a^2}+\frac{yy_1}{b^2}=1$.

Here, $x_1 = 3$, $y_1 = -1$ $a^2=\frac{3}{2}$ and $b^2=1$

Equation of the tangent from the point (3, -1) to the ellipse $2x^2 + 9y^2 = 3$ is

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

$\Rightarrow 2x - 3y - 1 = 0$

Hence, Equation of the tangent from the point (3, -1) to the ellipse $2x^2 + 9y^2 = 3$ is $2x - 3y - 1 = 0$

Que. 30 The position vectors of the vertices A, B, C of a tetrahedron ABCD are $\hat{i}+\hat{j}+\hat{k}$, $\hat{i}$ and $3\hat{i}$ respectively and the altitude from the vertex D to the opposite face ABC meets the face at E. If the volume of tetrahedron is $\frac{2\sqrt{2}}{3}$, then the length of DE is:

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

Testbook Solution Correct Option **- 2**

Concept:

- The volume of a tetrahedron (pyramid) is: $V = \frac{1}{3} \times (\text{Area of base}) \times (\text{Height})$.
- The area of a triangle whose sides have position vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$ is given by: Area = $\frac{1}{2}\left|\left(\vec{b}-\vec{a}\right)\times\left(\vec{c}-\vec{a}\right)\right|$.
- If $\vec{A}=a_1\hat{i}+a_2\hat{j}+a_3\hat{k}$ and $\vec{B}=b_1\hat{i}+b_2\hat{j}+b_3\hat{k}$, then their cross product is:

$$\vec{A}\times\vec{B}=\begin{vmatrix}\hat{i} & \hat{j} & \hat{k}\\ a_1 & a_2 & a_3\\ b_1 & b_2 & b_3\end{vmatrix}.$$

Calculation:

The area of the triangular base of the tetrahedron is:

Area of base = $\frac{1}{2}\left|\left[\left(\hat{i}\right)-\left(\hat{i}+\hat{j}+\hat{k}\right)\right]\times\left[\left(3\hat{i}\right)-\left(\hat{i}+\hat{j}+\hat{k}\right)\right]\right|$

$= \frac{1}{2}\left|\left(-\hat{j}-\hat{k}\right)\times\left(2\hat{i}-\hat{j}-\hat{k}\right)\right|$

$= \frac{1}{2}\left|[(-1)(-1)-(-1)(-1)]\hat{i}+[(-1)(2)-(0)(-1)]\hat{j}+[(0)(-1)-(2)(-1)]\hat{k}\right|$

$= \frac{1}{2}\left|[0\hat{i}-2\hat{j}-2\hat{k}\right|$

$= \frac{1}{2}\sqrt{0^2+(-2)^2+(-2)^2}$

$= \sqrt{2}$

Volume of the tetrahedron = $\frac{1}{3} \times (\text{Area of base}) \times (\text{Height})$

$\Rightarrow \frac{2\sqrt{2}}{3}=\frac{1}{3}\times\sqrt{2}\times DE$

$\Rightarrow$ DE = **2**.

Additional Information

For two vectors $\vec{A}$ and $\vec{B}$ at an angle θ to each other:

- **Dot Product** is defined as $\vec{A}.\vec{B} = |\vec{A}||\vec{B}|\cos\theta$.
- **Cross Product** is defined as $\vec{A} \times \vec{B} = \vec{n}|\vec{A}||\vec{B}|\sin\theta$ where $\vec{n}$ is the unit vector perpendicular to the plane containing $\vec{A}$ and $\vec{B}$.

Que. 31 If S and S' are foci of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, B is the end of the minor axis and BSS' is an equilateral triangle, then the eccentricity of the ellipse is

1. $\frac{1}{2}$
2. $\frac{1}{3}$
3. $\frac{1}{4}$
4. $\frac{1}{5}$

Testbook Solution Correct Option **- 1**

CONCEPT:

Eccentricity of an ellipse: The eccentricity of an ellipse is the ratio of the distances from the centre of the ellipse to one of the foci and to one of the vertices of the ellipse (eccentricity is denoted by e) i.e., $e = \frac{c}{a}$.

Then since the focus is at a distance of c from the centre, in terms of the eccentricity the focus is at a distance of **ae** from the centre.

CALCULATIONS:

S = (ae, 0), S' = (−ae, 0) and B = (0, b)

Since triangle is equilateral,

So, SS' = S'B

$\Rightarrow (SS')^2 = S'B^2$

$\Rightarrow (2ae)^2 = (ae)^2 + b^2$

$\Rightarrow 3a^2e^2 = b^2$

$\Rightarrow \frac{b^2}{a^2} = 3e^2$

Thus, eccentricity of the ellipse is,

$e^2 = 1 - \frac{b^2}{a^2} = 1 - 3e^2$

$\Rightarrow 4e^2 = 1$

$\Rightarrow e^2 = \frac{1}{4}$

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

So option (1) is the correct answer.

Que. 32 The equation of the circle passing through the point (4, 6) and whose diameters are along x + 2y − 5 = 0 and 3x − y − 1 = 0 is

1. $x^2 + y^2 - 2x - 6y - 20 = 0$

2. $x^2 + y^2 - 6x - 2y - 20 = 0$
3. $x^2 + y^2 - 2x - 4y - 20 = 0$
4. $x^2 + y^2 - 4x - 2y - 20 = 0$

Testbook Solution Correct Option **- 3**

Concept:

The **center**-radius form of the **circle equation** is in the format $(x - h)^2 + (y - k)^2 = r^2$, with the **center** being at the **point** (h, k) and the radius being "r".

Hint

To find the equation of circle, use centre - radius form of circle.

To find the center of circle, solve the equations $x + 2y - 5 = 0$ and $3x - y - 1 = 0$ simultaneously.

To find the radius of circle, use distance formula.

Radius of circle = $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

Calculations:

Given, circle passing through the point (4, 6) and whose diameters are along $x + 2y - 5 = 0$ and $3x - y - 1 = 0$.

To find the center of circle, solve the equations $x + 2y - 5 = 0$ and $3x - y - 1 = 0$.

$x + 2y - 5 = 0$ .... (1)

$3x - y - 1 = 0$ .... (2)

Multiply equation (2) by 2

$\Rightarrow 6x - 2y - 2 = 0$ .... (3)

Add equation (3) to equation (1), we have

$\Rightarrow 7x - 7 = 0$

$\Rightarrow x = 1$

Put $x = 1$ in equation (1), we get

$\Rightarrow y = 2$

$\Rightarrow$ The centre of circle = (h, k) = (1, 2)

To find the radius of circle with the point (4, 6) and centre (1, 2), use distance formula.

$\Rightarrow$ Radius of circle = $\sqrt{(4 - 1)^2 + (6 - 2)^2}$

$\Rightarrow$ Radius of circle = 5

Now, to find the equation of circle, use centre - radius form of circle.

The **center**-radius form of the **circle equation** is in the format $(x - h)^2 + (y - k)^2 = r^2$, with the **center** being at the **point** (h, k) and the radius being "r".

$\Rightarrow (x - 1)^2 + (y - 2)^2 = 5^2$

$\Rightarrow x^2 + y^2 - 2x - 4y - 20 = 0$

Hence, The equation of the circle passing through the point (4, 6) and whose diameters are along $x + 2y - 5 = 0$ and $3x - y - 1 = 0$ is

$x^2 + y^2 - 2x - 4y - 20 = 0$

Que. 33 In a parallelogram ABCD, P is the midpoint of AD. Also, BP and AC intersect at Q. Then AQ : QC =

1. 1 : 3
2. 3 : 1
3. 2 : 1
4. 1 : 2

Testbook Solution Correct Option **- 4**

Concept:

If two angles and the non-included **side of one triangle** are **congruent** to the corresponding parts of another **triangle**, the **triangles are congruent.**

Calculations:

Given, In a parallelogram ABCD, P is the midpoint of AD. Also, BP and AC intersect at Q.

Join AC and BP.

$\Rightarrow \angle AQP = CQB$ and $\angle APQ = \angle CBQ$

If two angles and the non-included **side of one triangle** are **congruent** to the corresponding parts of another **triangle**, the **triangles are congruent**

$\Rightarrow \triangle APQ \sim \triangle CBQ$

$\Rightarrow \frac{AP}{BC} = \frac{AQ}{QC}$

$\Rightarrow AD = BC$

$\Rightarrow \frac{AP}{BC} = \frac{AP}{AD} = \frac{1}{2}$

$\Rightarrow \frac{AQ}{QC} = \frac{1}{2}$

Hence, In a parallelogram ABCD, P is the midpoint of AD. Also, BP and AC intersect at Q. Then AQ : QC = 1 : 2

Que. 34 The median AD of ΔABC is bisected at E and BE is extended to meet the side AC in F. The ratio AF : FC = ?

1. 1 : 3
2. 2 : 1
3. 1 : 2
4. 3 : 1

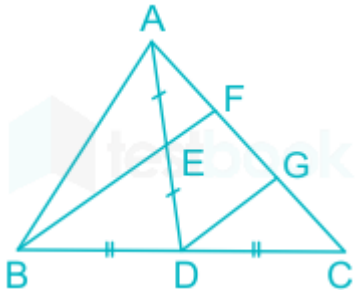
Testbook Solution Correct Option **- 3**

Concept:

Basic Proportionality Theorem: If a line is drawn parallel to one side of a triangle intersecting the other two sides in distinct points, then the other two sides are divided in the same ratio.

Calculation:

Let's draw the diagram and draw a line parallel to BE through D intersecting AC at a point G:



It is given that D is the mid-point of BC and E is the mid-point of AD.

By construction, DG || BF.

In ΔADG, AE : ED = AF : FG (Basic Proportionality Theorem)

But AE = ED.

⇒ AF = FG ... (1)

Also, in ΔBCF, BD : DC = FG : GC (Basic Proportionality Theorem)

But BD = DC.

⇒ FG = GC ... (2)

From (1) and (2), we get:

AF = FG = FC

⇒ AF : FC = **1 : 2**.

Que. 35 Let P(x) be a quadratic polynomial such that p(0) = 1. If p(x) leaves remainder 4 when divided by x - 1 and it leaves remainder 6 when divided by x + 1, then

1. p(-2) = 11
2. p(2) = 11
3. p(2) = 19
4. p(-2) = 19

Testbook Solution Correct Option **- 4**

Concept:

Remainder theorem: When any function f(x) is divided by (x – a), then the remainder is equal to f(a)

Calculation:

Let us consider $p(x) = ax^2 + bx + c$

Substituting x = 0 in this equation, we get

p(0) = 0 + 0 + c = 1

∴ c = 1

When p(x) leaves remainder 4 when divided by x - 1, we get

x - 1 = 0

⇒x = 1

Therefore, p(1) = a + b + c = 4 .....(1)

Substituting c = 1 in equ (1), we get

⇒ 4 = a + b + 1

⇒ a + b = 3 .....(2)

Also, when p(x) leaves remainder 6 when divided by x + 1, we get

x + 1 = 0

⇒x = -1

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$\Rightarrow p(-1) = a - b + c = 6$

Substituting c = 1 in equ (1), we get

$\Rightarrow a - b = 5$ .....(3)

Solving equ (2) and (3), we get

$a = 4, b = -1$

Now $p(x) = 4x^2 - x + 1$

Put x = -2

$p(-2) = 4(-2)^2 - (-2) + 1 = 4 \times 4 + 2 + 1$

$= 16 + 2 + 1 = 19$

Que. 36 The tangent at the point (2, -2) to the curve $x^2y^2 - 2x = 4(1 - y)$ does not pass through the point _____

1. (-2, -7)
2. (-4, -9)
3. $\left(4, \frac{1}{3}\right)$
4. (8, 5)

Testbook Solution Correct Option **- 1**

Concept:

Equation of tangent at the point (x_1, y_1) of the curve y = f(x) is $(y - y_1) = m(x - x_1)$, where m = f'(x) is slope of the curve.

The line is passing through the point (x_1, y_1) if the point (x_1, y_1) is satisfying the equation of a line.

Calculator:

Given, equation of curve is $x^2y^2 - 2x = 4(1 - y)$

$$\Rightarrow 2xy^2 + 2x^2y\frac{dy}{dx} - 2 = -4\frac{dy}{dx}$$

$$\Rightarrow \frac{dy}{dx}(2x^2y + 4) = 2 - 2xy^2$$

$$\Rightarrow \frac{dy}{dx} = \frac{2 - 2xy^2}{2x^2y + 4}$$

$$\Rightarrow \left(\frac{dy}{dx}\right)_{(2,-2)} = \frac{2 - 2(2)(-2)^2}{2(2)^2(-2) + 4}$$

$$\Rightarrow \left(\frac{dy}{dx}\right)_{(2,-2)} = \frac{7}{6}$$

Equation of tangent at the point (x_1, y_1) of the curve y = f(x) is $(y - y_1) = m(x - x_1)$ where m is slope of the curve.

Here (x_1, y_1) = (2, -2) and $m = \frac{7}{6}$

$$\Rightarrow (y + 2) = \frac{7}{6}(x - 2)$$

$\Rightarrow 7x - 6y = 26.$

Hence, The equation of tangent at the point (2, -2) to the curve $x^2y^2 - 2x = 4(1 - y)$ is $7x - 6y = 26$.

Now, put the point (-2, -7) in The equation of tangent $7x - 6y = 26$.

LHS = 7(-2) - 6(- 7) = 28

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RHS = 26

⇒LHS ≠ RHS

The tangent at the point (2, -2) to the curve $x^2y^2 - 2x = 4(1 - y)$ does not pass through the point (-2, -7)

Que. 37 The integral $\int \sqrt{1 + 2\cot x(\text{cosec}x + \cot x)}dx,\ \left(0 < x < \frac{\pi}{2}\right)$ (where C is a constant of integration) is equal to

1. $2\log\left(\sin\frac{x}{2}\right) + C$
2. $2\log\left(\cos\frac{x}{2}\right) + C$
3. $4\log\left(\cos\frac{x}{2}\right) + C$
4. $4\log\left(\sin\frac{x}{2}\right) + C$

Testbook Solution Correct Option **- 1**

Concept:

$\int \cot x dx = \log\sin x + c$

$\text{cosec}^2 x - \cot^2 x = 1$

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

Calculation:

$I = \int \sqrt{1 + 2\cot x(\text{cosec}x + \cot x)}dx,\ \left(0 < x < \frac{\pi}{2}\right)$

$= \int \sqrt{\text{cosec}^2 x - \cot^2 x + 2\cot x\text{cosec}\, x + 2\cot^2 x}\,dx$

$= \int \sqrt{\text{cosec}^2 x + \cot^2 x + 2\cot x\text{cosec}\, x}dx$

$= \int \sqrt{(\text{cosec}\, x + \cot x)^2}\ dx$

$= \int \text{cosec}\, x + \cot x\, dx$

$= \int \left(\frac{1}{\sin x} + \frac{\cos x}{\sin x}\right) dx$

$= \int \frac{1+\cos x}{\sin x}dx$

$= \int \frac{2\cos^2\frac{x}{2}}{2\sin\frac{x}{2}\cos\frac{x}{2}}dx$

$= \int \cot\frac{x}{2}dx$

Let $\frac{x}{2} = t$

⇒ x = 2t

Differentiating with respect to x, we get

⇒ dx = 2dt

Now,

$I = 2\int \cot t dt$

$= 2\log(\sin t) + C$

$= 2\log\left(\sin\frac{x}{2}\right) + C$

Que. 38 If all the words, with or without meaning, are written using the letters of the word QUEEN add are arranged as in English Dictionary, then the position of the word QUEEN is

1. 47^{th}
2. 44^{th}

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3. 45^{th}
4. 46^{th}

Testbook Solution Correct Option **- 4**

CONCEPT:

If there are n distinct things then no. of ways in which we can arrange them in n! ways.

CALCULATION:

No. of distinct letters in the word QUEEN is 4 i.e Q, U, E, N

So, no. of words that can be formed which are starting with E are : 4! = 24

Similarly, no. of words that can be formed which are starting with N are: 4! / 2! = 12

Similarly, no. of words that can be formed which starts with Q, followed by E = 3! = 6

Similarly, no. of words that can be formed such which starts with Q, followed by N = 3! / 2! = 3

So, the dictionary position of the word QUEEN = 24 + 12 + 6 + 3 + 1 = 46

Hence, **Option D** is the correct answer.

Que. 39 The curve satisfying the differential equation $ydx - (x + 3y^2)dy = 0$ and passing through the point (1, 1) also passes through the point _____

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

Testbook Solution Correct Option **- 3**

Concept:

$\frac{ydx-xdy}{y^2} = d\left(\frac{x}{y}\right)$

Calculation:

Given: $ydx - (x + 3y^2)dy = 0$

$\Rightarrow ydx - xdy - 3y^2dy = 0$

$\Rightarrow ydx - xdy = 3y^2dy$

$\Rightarrow \frac{ydx-xdy}{y^2} = 3dy$

$\Rightarrow d\left(\frac{x}{y}\right) = 3dy$

Integrating both sides, we get

$\Rightarrow \int d\left(\frac{x}{y}\right) = \int 3dy$

$\Rightarrow \frac{x}{y} = 3y + c$

$\Rightarrow x = 3y^2 + cy$ .... (1)

Curve passing through the point (1, 1)

$\Rightarrow 1 = 3 + c$

$\therefore c = -2$

Put the value of c in equation 1st we get,

$\Rightarrow x = 3y^2 - 2y$

Checking from options:

This equation is satisfied by point (-1/3, 1/3)

Hence option 3 is correct.

Que. 40 $\lim_{x\to 3} \frac{\sqrt{3x}-3}{\sqrt{2x-4}-\sqrt{2}}$ is equal to

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

Testbook Solution Correct Option **- 4**

Concept:

L-Hospital Rule: Let f(x) and g(x) be two functions

Suppose that we have one of the following cases,

I. $\lim\limits_{x\to a} \frac{f(x)}{g(x)} = \frac{0}{0}$

II. $\lim\limits_{x\to a} \frac{f(x)}{g(x)} = \frac{\infty}{\infty}$

Then we can apply L-Hospital Rule $\Leftrightarrow \lim\limits_{x\to a} \frac{f(x)}{g(x)} = \lim\limits_{x\to a} \frac{f'(x)}{g'(x)}$

Calculation:

$\lim_{x\to 3} \frac{\sqrt{3x}-3}{\sqrt{2x-4}-\sqrt{2}} = \frac{0}{0}$

So, by applying L-Hospital Rule we get

$\lim_{x\to 3} \frac{\sqrt{3x}-3}{\sqrt{2x-4}-\sqrt{2}} = \lim_{x\to 3} \frac{\frac{1}{2}\times\frac{3}{\sqrt{3x}}}{\frac{1}{2}\times\frac{2}{\sqrt{2x-4}}}$

$\Rightarrow \lim\limits_{x\to 3} \frac{3\sqrt{2x-4}}{2\sqrt{3x}} \Rightarrow \frac{3}{2}\sqrt{\frac{2}{3}} \Rightarrow \frac{1}{\sqrt{2}}$

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

Que. 41 The sum of infinite terms of a decreasing GP is equal to the greatest value of the function $f(x) = x^3 + 3x - 9$ in the interval [-2, 3] and the difference between the first two terms is f'(0). Then the common ratio of GP is

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

Testbook Solution Correct Option **- 3**

Concept:

GP is represented as $a, ar, ar^2, ar^3, \ldots\ldots\ldots\ldots, ar^n$, where a is the first term, r is the common ratio.

The sum of infinite terms of a decreasing GP$= \frac{a}{1-r}$

Calculation:

$f(x) = x^3 + 3x - 9$

$f'(x) = 3x^2 + 3 = 3(x^2 + 1) \geq 3$ for all x ∈ R

f(x) is strictly increasing function for all x ∈ R

so the greatest value of f(x) in the interval is [-2, 3] is at x = 3 So, let's find f(3)

⇒ f(3) = 27

According to question we know that the sum of infinite terms of a decreasing GP is equal to the greatest value of the function f(x)

$\Rightarrow \frac{a}{1-r} = 27$

⇒ a = 27 × (1 - r) ----------(1)

According to question, the difference between the first two terms is f'(0)

⇒ a - ar = f'(0) = 3

⇒ a(1 - r) = 3 ----------(2)

So, using equation (1) and (2) we get,

⇒ 27 × (1 - r) × (1 - r) = 3

$\Rightarrow (1 - r)^2 = 1/9$

⇒ (1 - r) = ± 1/3

$\Rightarrow r = \frac{2}{3}\ or\ \frac{4}{3}$

GP is decreasing series so common ratio $r = \frac{2}{3}$

Que. 42 Number of onto (surjective) functions from A to B if n(A) = 6 and n(B) = 3, is

1. $2^6 - 2$
2. $3^6 - 3$
3. 340
4. 540

Testbook Solution Correct Option **- 4**

Concept:

If X has **n** elements and Y has **m** elements, the number of onto functions is given by:

$\binom{m}{0}m^n - \binom{m}{1}(m-1)^n + \binom{m}{2}(m-2)^n - \binom{m}{3}(m-3)^n + \ldots$

Calculation:

Given: n(A) = 6 and n(B) = 3

Let n(A) = n = 6 and n(B) = m = 3

Number of onto (surjective) functions from A to B =

$\binom{m}{0}m^n - \binom{m}{1}(m-1)^n + \binom{m}{2}(m-2)^n - \binom{m}{3}(m-3)^n + \ldots$

$= \binom{3}{0}3^6 - \binom{3}{1}(3-1)^6 + \binom{3}{2}(3-2)^6 - \binom{3}{3}(3-3)^6$

$= 3^6 - 3 \times 2^6 + 3 - 0$

= 540

Que. 43 If $|z| < \sqrt{3} - 1$, then $|z^2 + 2z \cos \alpha|$ is

1. less than 2
2. $\sqrt{3} + 1$
3. $\sqrt{3} - 1$
4. None of these T_1 T_2

Testbook Solution Correct Option **- 1**

Concept:

Triangle inequality:

$|z_1 + z_2| \leq |z_1| + |Z_2|$

$|\cos \alpha| \leq 1$

Calculations:

Given, $|z^2 + 2z \cos \alpha| \leq |z^2| + |2z \cos \alpha|$

We know that, $|\cos \alpha| \leq 1$

$\Rightarrow |z^2 + 2z \cos \alpha| \leq |z^2| + |2z|$

Put the value of $|z|$ as $\sqrt{3} - 1$

$\Rightarrow |z^2 + 2z \cos \alpha| < (\sqrt{3} - 1)^2 + 2(\sqrt{3} - 1)$

$\Rightarrow |z^2 + 2z \cos \alpha| < 2$

Hence, If $|z| < \sqrt{3} - 1$, then $|z^2 + 2z \cos \alpha|$ is less than 2

Que. 44 A computer producing factory has only two plants T_1 and T_2. Plant T_1 produces 20% and plant T_2 produces 80% of the total computers produced. 7% of the computers produced in the factory turn out to be defective. It is known that P(computer turns out to be defective given that it is produced in plant T_2) = 10 × P(computer turns out to be defective given that it is produced in plant T_1). A computer produced in the factory is randomly selected and it does not turn out to be defective, then the probability that it is produced in plant T_2 is:

1. $\frac{36}{73}$
2. $\frac{47}{79}$
3. $\frac{78}{93}$
4. $\frac{75}{83}$

Testbook Solution Correct Option **- 3**

Concept:

- The probability of the occurrence of an event A out of a total possible outcomes N, is given by: $P(A) = \frac{n(A)}{N}$, where n(A) is the number of ways in which the event A can occur.
- Probability of "A given B" is written as P(A|B) and its value is: $P(A|B) = \frac{P(A \cap B)}{P(B)}$.

Calculation:

Let's say that 100 computers are produced in the factory and x be the probability of a computer from plant T_1 being defective and y be the probability of a computer from plant T_2 being defective.

Total number of defective computers produced in the plant = 20x + 80y.

According to the question, P(defective) = 7%.

$\Rightarrow \frac{20x+80y}{100} = \frac{7}{100}$

$\Rightarrow 20x + 80y = 7$ ... (1)

Also, P(computer turns out to be defective given that it is produced in plant T_2) = 10 × P(computer turns out to be defective given that it is produced in plant T_1).

$\Rightarrow \frac{P(T_1 \cap T_2)}{P(T_2)} = 10 \times \frac{P(T_1 \cap T_2)}{P(T_1)}$

$\Rightarrow P(T_1) = 10 \times P(T_2)$

$\Rightarrow x = 10y$ ... (2)

From equations (1) and (2), we get:

$20x + 8x = 7$

$\Rightarrow x = \frac{7}{28} = \frac{1}{4}$

And $y = \frac{1}{40}$.

Probability that no defective computer is produced in the factory = 100 - 7 = 93%.

Probability that a not-defective computer is produced in T_2 = $\frac{\text{Number of not-defective computers produced at } T_2}{\text{Total number of not-defective comuters produced in the factory}}$

$= \frac{80 \times \left(1 - \frac{1}{40}\right)}{93}$

$= \frac{78}{93}$.

Que. 45 If A > 0, B > 0 and $A + B > \frac{\pi}{6}$, then the minimum value of tan A + tan B is

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

Testbook Solution Correct Option **- 2**

Concept:

- tan x is a increasing from 0^0 to 90^0
- $\tan 15^0 = 2 - \sqrt{3}$

Calculation:

Given: A > 0, B > 0 and $A + B > \frac{\pi}{6}$

In order to find the minimum value of tan A + tan B we need to have

tan A = tan B ⇒ A = B and $A + B = \frac{\pi}{6} \Rightarrow 2A = \frac{\pi}{6} \Rightarrow A = 15^0$

$\tan A + \tan B \Rightarrow 2 \tan A \Rightarrow 2 \tan 15^0 \Rightarrow 4 - 2\sqrt{3}$

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

Que. 46 The mean of 5 observation is 5 and their variance is 124. If three of the observations are 1, 2, 6, then the mean deviation from the mean of the data is

1. 2.5
2. 2.6
3. 2.8
4. 2.4

Testbook Solution Correct Option **- 3**

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CONCEPT:

Arithmetic Mean - For the values x_1, x_2, ...x_n of the variant x the arithmetic mean is given by $\overline{x} = \frac{x_1+x_2+x_3+.....+x_n}{n}$.

Mean Deviation:

Mean Deviation - If x_1, x_2, ...x_n are n discrete observations then the mean deviation from the point A is given by $\frac{1}{n}\sum|x_i - A|$

Variance -In case of discrete data is given by $\sigma_X^2 = \left(\frac{\sum {x_i}^2}{n}\right) - \left(\frac{\sum x_i}{n}\right)^2$

CALCULATIONS:

According to the question given mean = 5

$\therefore \sum \frac{x_i}{5} = 5 \Rightarrow \sum x_i = 25$

$\sum \frac{{x_i}^2}{5} - \left(\sum \frac{x_i}{n}\right)^2 = 124$

$\therefore \sum \frac{{x_i}^2}{5} - 25 = 124 \Rightarrow \sum {x_i}^2 = 149 \times 5 = 745$

Given three observations are 1, 2, 6.

Let two remaining observations are a and b.

So, a + b + 1 + 2 + 6 = 25

$\therefore$a + b = 16

$a^2 + b^2 + 1^2 + 2^2 + 6^2 = 745$

$a^2 + b^2 + 1 + 4 + 36 = 745$

$a^2 + b^2 = 704$

So, Mean deviation will be $\frac{1}{n}\sum|x_i - A|$

$\Rightarrow \frac{\sum|x_i-5|}{5} = \frac{|x_1-5|+|x_2-5|+|1-5|+|2-5|+|6-5|}{5}$

As a + b = 16; we will replace the value of x_2 in terms of x_1

$\therefore \frac{8+|x_1-5|+|11-x_1|}{5} = \frac{8+6}{5} = 2.8$

So option (3) is the correct answer.

Que. 47 In a beauty contest, half the number of experts voted for Mr. A and two third voted for Mr. B. 10 voted for both and 6 did not for either. How many experts were there in all?

1. 18

2. 36
3. 24
4. None of these

Testbook Solution Correct Option **- 3**

CONCEPT:

Intersection of Sets:

The intersection of sets A and B is the set of all elements which are common to both A and B. The symbol '∩' is used to denote the intersection.
i.e A ∩ B = {x : x ∈ A and x ∈ B}.

SOLUTION:

Let the total number of experts be X.
P is the set of experts who voted for miss A.
Q is the set of experts who voted for miss B.
Since 6 did not vote for either, n(P∪Q) = X−6.

$n(P) = \frac{X}{2}, n(Q) = \frac{2}{3}X$ and $n(P \cap Q) = 10$

So according to given condition, $X - 6 = \frac{X}{2} + \frac{2}{3}X - 10$

On solving the equation, we get X = 24.

Therefore option (3) is the correct answer.

Que. 48 The value of non-zero scalars α and β for all vectors $\vec{a}$ and $\vec{b}$, such that $\alpha\left(2\vec{a} - \vec{b}\right) + \beta\left(\vec{a} + 2\vec{b}\right) = 8\vec{b} - \vec{a}$ is:

1. α = 2, β = 1
2. α = -2, β = -3
3. α = 1, β = 3
4. α = -2, β = 3

Testbook Solution Correct Option **- 4**

Concept:

If two vectors $\vec{a} = a_1\hat{i} + a_2\hat{j} + a_3\hat{k}$ and $\vec{b} = b_1\hat{i} + b_2\hat{j} + b_3\hat{k}$ are equal, then $a_1 = b_1$, $a_2 = b_2$ and $c_1 = c_2$.

Calculation:

It is given that $\alpha\left(2\vec{a} - \vec{b}\right) + \beta\left(\vec{a} + 2\vec{b}\right) = 8\vec{b} - \vec{a}$.

$\Rightarrow (2\alpha + \beta)\vec{a} + (-\alpha + 2\beta)\vec{b} = 8\vec{b} - \vec{a}$

Comparing the scalar coefficients on both sides, we get:

$2\alpha + \beta = -1$ ... (1)

$-\alpha + 2\beta = 8$ ... (2)

Adding twice the equation (2) with the equation (1), we get:

$5\beta = 15$

$\Rightarrow \beta = 3$

And using either equation (1) or (2), we get:

$\alpha = -2$

Hence, **α = -2, β = 3**.

Que. 49 A force of 78 grams acts at the point (2, 3, 5), the direction ratios of the line of action being 2, 2, 1. The magnitude of its moment about the line joining the origin to the point (12, 3, 4) is:

1. 24
2. 136
3. 36
4. 0

Testbook Solution Correct Option **- 2**

Concept:

- The moment $\vec{\tau}$ of a force $\vec{F}$ about a line vector $\vec{r}$ is given by: $\vec{\tau} = \vec{r} \times \vec{F}$.
- A vector along the line with direction ratios l, m, n is simply the vector $l\hat{i} + m\hat{j} + n\hat{k}$.

Calculation:

The direction ratios of the line of action of the force are 2, 2, 1.

So the force vector is given by:

$\vec{F} = 78\frac{2\hat{i}+2\hat{j}+\hat{k}}{\sqrt{2^2+2^2+1^2}}$

$\Rightarrow \vec{F} = 26\left(2\hat{i} + 2\hat{j} + \hat{k}\right)$

Now, the vector joining the point of action (2, 3, 5) with the origin is: $2\hat{i} + 3\hat{j} + 5\hat{k}$.

The moment $\vec{M}$ of the force $\vec{F}$ about the origin = $(2\hat{i} + 3\hat{j} + 5\hat{k}) \times 26\ (2\hat{i} + 2\hat{j} + \hat{k}) = 26(-7\hat{i} + 8\hat{j} - 2\hat{k})$.

The moment of this force about the line joining the origin to the point (12, 3, 4) will be component of the above moment along this line.

The unit vector along this line is: $\frac{12\hat{i}+3\hat{j}+4\hat{k}}{\sqrt{12^2+3^2+4^2}} = \frac{1}{13}\left(12\hat{i} + 3\hat{j} + 4\hat{k}\right)$.

The required magnitude of the component of the moment along the given line is:

$|26\left(-7\hat{i} + 8\hat{j} - 2\hat{k}\right) . \frac{1}{13}\left(12\hat{i} + 3\hat{j} + 4\hat{k}\right)|$.

= |2(-84 + 24 - 12)|

= |2(-72)|

= **136**.

Que. 50 Number of real solution of the equation $\sin(e^x) = 5^x + 5^{-x}$ is

1. 0
2. 1
3. 2
4. Infinitely many

Testbook Solution Correct Option **- 1**

Concept:

$-1 \le \sin x \le 1$

AM, GM, HM Formulas

If A is the **arithmetic mean** of numbers a and b and is given by $\Leftrightarrow A = \frac{a+b}{2}$

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If G is the **geometric mean** of the numbers a and b and is given by $\Leftrightarrow G = \sqrt{ab}$

If H is the **Harmonic mean** of numbers a and b and is given by $\Leftrightarrow H = \frac{2ab}{a+b}$

Relation between AM, GM and HM

I. $G^2 = AH$

II. $AM \geq GM \geq HM$

Calculations:

Given, the equation is $\sin(e^x) = 5^x + 5^{-x}$

Consider, LHS = $\sin(e^x) < 1$

As we know AM ≥ GM

$\Rightarrow \frac{5^x+5^{-x}}{2} \geq (5^x \times 5^{-x})^{1/2}$

$\therefore 5^x + 5^{-x} \geq 2$

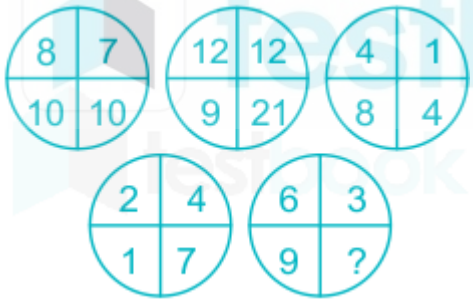
RHS = $5^x + 5^{-x} \geq 2$

Here, LHS ≠ RHS

⇒The equations $\sin(e^x) = 5^x + 5^{-x}$ have no solution. This means that no matter what value is plugged in for the variable, you will ALWAYS get a contradiction.

Hence, Number of real solution of the equation $\sin(e^x) = 5^x + 5^{-x}$ is zero.

Que. 51 Which number replaces the question mark in the figure given below?



1. 11
2. 6
3. 3
4. 21

Testbook Solution Correct Option **- 3**

The logic is :

1. (10 + 10) - (8 + 7) = 20 -15 = 5

2. (21 + 9) - (12 +12) = 30 - 24 = 6

3. (8 + 4) - (4 + 1) = 12 - 5 = 7

Here, 5, 6, and 7 are consecutive numbers.

Similarly,

4. (7 + 1) - (2 + 4) = 8 - 6 = 2

5. (9 + 3) - (6 + 3) = 12 - 9 = 3

Here, 2, and 3 are consecutive numbers.

Hence, '3' is the correct answer.

Que. 52 **Statement- I :** Out of total of 200 readers, 100 read Indian Express, 120 read Times of India and 50 read Hindu.
Statement – II : Out of a total of 200 readers, 100 read Indian Express, 120 reads Times of India and 50 read neither. How many people (from the group surveyed) read both Indian Express and Times of India?

1. The question can be answered with the help of statement II, alone
2. Both, statement I and statement II are needed to answer the question
3. The question can be answered with the help of statement I alone.
4. The question cannot be answered even with the help of both the statements

Testbook Solution Correct Option **- 1**
Given:

Statement - 1 : Out of total of 200 readers, 100 read Indian Express, 120 read Times of India and 50 read Hindu.
Statement - 2 : Out of a total of 200 readers, 100 read Indian Express, 120 reads Times of India and 50 read neither.

Calculation:

From statement 1, we not sure say how many readers read all news paper and how many readers read two news paper or only one news paper, then from statement 1 question cannot be answered.

From statement 2, we say that how many readers read the both news paper, then the number readers read both news paper is

⇒ (100 + 120) - (200 - 50)

⇒ 220 - 150

⇒ 70

∴ The question can be answered with the help of statement II, alone.

Que. 53 If 137 + 276 = 435, how much is 731 + 672 = ?

1. 534
2. 1403
3. 1623
4. 1531

Testbook Solution Correct Option **- 1**
The logic is :

On comparing the two equations -

137 + 276 = 435 ..... (i)

731 + 672 = ? .....(ii)

The first and last digit of numbers are interchange -

137 → 731

276 → 672

Similarly,

435 → 534

Hence, '534' is the correct answer.

Que. 54 Study the information carefully and answer the questions given below:
If we arrange the alphabets in the word "RATE" in the English alphabetical order, word "AERT" is formed. Then the third alphabet from the left in this word is "R". similarly, from the word "OPEN" we get - "ENOP" and the third alphabet from the left is "O". From the word "CHEF" we get - "CEFH" the third alphabet from the left "F". From the word "TOY" we get - "OTY" and the third alphabet from the left is "Y". From the word "EAT" we get - "AET" and the third alphabet from the left is "T" If we use all these letters, then a meaningful English word "FORTY" can be formed. Now find which of the following word set DOES NOT give a meaningful word in a similar way.

1. SAME, ROOM, BEST, AUTO
2. GOAT, PEST, WATT, ARMY
3. MALE, FIND, LOST, THAT
4. JUMP, LIME, DUMB, SOME

Testbook Solution Correct Option **- 4**
The logic is :

1. Arrangement of words as per the English alphabetical order and the third alphabet from the left after the arrangement is shown below -

SAME, ROOM, BEST, AUTO → AE**M**S, MO**O**R, BE**S**T, AO**T**U

Meaningful English word can be formed - MOST

2. GOAT, PEST, WATT, ARMY → AG**O**T, EP**S**T, AT**T**W, AM**R**Y

Meaningful English word can be formed - SORT

3.MALE, FIND, LOST, THAT → AE**L**M, DF**I**N, LO**S**T, AH**T**T

Meaningful English word can be formed - LIST

Similarly,

4. JUMP, LIME, DUMB, SOME → JM**P**U, EI**L**M, BD**M**U, EM**O**S

Meaningful English word can not be formed - PLMO

Hence, 'JUMP, LIME, DUMB, SOME' is the correct answer.

Que. 55 Navjivan Express from Ahmedabad to Chennai leaves Ahmedabad at 6:30 am and travels at 50kmph towards Baroda situated 100 km away. At 7.00 am Howrah-Ahmedabad Express leaves Baroda towards Ahmedabad and travels at 40 kmph. At 7:30 am Mr. Shah, the traffic controller at Baroda realizes that both trains are running on the same track. How much time does he have to avert a head-on collision between the two trains?

1. 15 min
2. 20 min
3. 25 min
4. 30 min

Testbook Solution Correct Option **- 1**
Given:

Navjivan Express from Ahmedabad to Chennai leaves Ahmedabad at 6:30 am and travels at 50km/h towards Baroda

At 7.00 am Howrah-Ahmedabad Express leaves Baroda towards Ahmedabad and travels at 40 km/h

At 7:30 am Mr. Shah, the traffic controller at Baroda realizes that both trains are running on the same track

The distance between Ahmedabad to Baroda is 100 km.

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Concept:

Time = Distance/Speed

Calculation:

At 7.30 AM, Distance travel by Navijan express is

⇒ 50 × 1

⇒ 50 km

At 7.30 AM, Distance travel by Howrah-Ahmedabad Express is

⇒ 40 × 1/2

⇒ 20 km

Now, Distance left between the both train is

⇒ 100 - 50 - 20

⇒ 30 km

Both train travel in opposite direction, then relative speed of the trains is

⇒ 50 + 40

⇒ 90 km/h

Time taken to cover this distance by both train is

⇒ 30/90

⇒ 1/3 hour = 20 min

So, He have to time less than 20 min to avert the head on collision between two trains.

∴ 15 min

Que. 56 If the points $P(a^2,a)$ lie in the region corresponding to the acute angle between the lines 2y = x and 4y = x, then

1. $a \in (2,6)$
2. $a \in (4,6)$
3. $a \in (2, 4)$
4. $a \in (10, 12)$

Testbook Solution Correct Option **- 3**

Given:

The lines 2y = x and 4y = x

The point P (a^2, a)

Calculation:

2y = x, 4y = x

u = x - 2y, v = x - 4y

joint equations

u × v = 0

(x - 2y) (x - 4y) = 0

⇒ $x^2 - 6xy + 8y^2 = 0$

If the point P (a^2, a), lies in the interior of acute angle formed by these lines,

then the point (x, y) at P $(a^2, a) < 0$

⇒ $(a^2)^2 - 6a^2a + 8a^2 < 0$

$\Rightarrow a^2(a^2 - 6a + 8) < 0$

$\Rightarrow (a^2 - 6a + 8) < 0$

$\Rightarrow (a - 2)(a - 4) < 0$

$\Rightarrow a \in (2, 4)$

$\therefore a \in$ **(2, 4)**

Que. 57 Some friends planned to contribute equally to jointly buy a CD player. However, two of them decided to withdraw at the last minute. As a result, each of the others had to shell out one rupee more than what they had planned for. If the price (in Rs.) of the CD player is an integer between 1000 and 1100, find the number of friends who actually contributed?

1. 44
2. 23
3. 21
4. 46

Testbook Solution Correct Option **- 1**

Calculation:

Let the total number of friends initially is 'y' and each friends contribute z rupees

According to the question

The cost of CD player is between 1000 and 1100 rupees, then

$\Rightarrow 1000 < y \times z < 1100$

Now,

Two friends withdraw last minute, then contribution increase by 1 rupee

$\Rightarrow 1000 < (y - 2)(z + 1) < 1100$

So,

$\Rightarrow y \times z = (y - 2)(z + 1)$

$\Rightarrow y \times z = y \times z + y - 2z - 2$

$\Rightarrow y - 2z = 2$

Here, we take suitable value y and z which satisfied the equation and product of y and z greater than 1000 and less than 1100

Now, we take the value y and z is 46 and 22 respectively

But, Number of friends contributed = y - 2

$\Rightarrow 46 - 2$

$\Rightarrow 44$

$\therefore$ **The number of friends who contributed is 44.**

Que. 58 Two liquids A and B are in the ratio 5:1 in container 1 and in the ratio 1:3 in container 2. In what ratio should the contents of the two containers be mixed so as to obtain a mixture of A and B in the ratio 1:1?

1. 1 : 2
2. 4 : 3
3. 3 : 2
4. 3 : 4

Testbook Solution Correct Option **- 1**

Given:

Two liquids A and B in the ratio 5 : 1 in container 1 and in the container 2 the ratio of 1 : 3.

Calculation:

Let the container 1 and 2 is mixed in the ratio of x : y

Then,

From the container 1, the quantity of liquid A is taken 5x and liquid B is 1x

From the container 2, the quantity of liquid A is taken 1y and liquid B is 3y

According to the question

$\Rightarrow (5x + 1y) : (1x + 3y) = 1 : 1$

$\Rightarrow 5x + 1y = 1x + 3y$

$\Rightarrow 5x - 1x = 3y - 1y$

$\Rightarrow 4x = 2y$

$\Rightarrow x/y = 2/4$

$\Rightarrow x : y = 1 : 2$

$\therefore$ **The required ratio is 1 : 2.**

Que. 59 Each family in a locality has at most two adults, and no family has fewer than 3 children. Considering all the families together, there are more adults than boys, more boys than girls, and more girls than families. Then the minimum possible number of families in the locality is

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

Testbook Solution Correct Option **- 2**

Calculation:

By option elimination method

As they asked minimum take first I number of family is 2

Now try to satisfied given condition

Adult > Boy > girl > family

5 > 4 > 3 > 2 (We needs this but the constraints each family is atmost 2 adults not hold here)

So, Now suppose if number of family is 3

Now try to satisfied given constraints

Adult > Boy > girl > family

6 > 5 > 4 > 3

Now, 3 families each have 2 adults so total 6 adults.

Each family 3 children so total 9 children (5 boys and 4 girls)

So, All condition satisfied with number of family = 3

$\therefore$ **3**

Que. 60 Fresh grapes contain 90% by weight while dried grapes contain 20% water by weight. What is the weight of dry grapes available from 20 kg of fresh grapes?

1. 2.5 kg
2. 2.4 kg
3. 2kg
4. 10 kg

Testbook Solution Correct Option **- 1**

Given:

Fresh grapes contains 90% while dried grapes contains 20% water by weight.

Quantity of fresh grapes is 20 kg

Calculation:

Let the weight of dry grapes obtain from 20 kg of fresh grapes is Y kg

According to the question

The quantity of water in 20 kg of fresh grapes is

⇒ 20 × 90%

⇒ 18 kg

The remaining weight of 20 kg of fresh grapes is

⇒ 20 - 18

⇒ 2 kg

Now, 2 kg of weight is equal to 80% of dry grapes, then

⇒ Y × 80% = 2

⇒ Y = (2 × 5)/4

⇒ Y = 2.5 kg

∴ **The required weight of dry grapes is 2.5 kg.**

Que. 61 Directions for questions Answer the questions on the basis of the information given below: A, B, C, D, E, and F are a group of friends. There are two housewives, one professor, one engineer, one accountant and one lawyer in the group. There are only two married couples in the group. The lawyer is married to D, who is a housewife. No woman in the group is either an engineer or an accountant. C, the accountant, is married to F, who is a professor. A is married to a housewife. E is not a housewife.

What is E's profession?

1. Accountant
2. Lawyer
3. Professor
4. Engineer

Testbook Solution Correct Option **- 4**

Symbol Representation :

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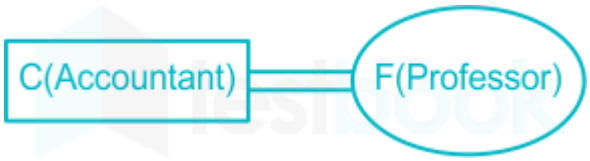
Symbol in Diagram	Meaning
○	Female
□	Male
=	Married Couple
—	Siblings
|	Difference of a Generation

1) C and F are couples in which C is an accountant and F is a professor. No woman in the group is either an engineer or an accountant(So, C is a male and F is a female)



2) The lawyer is married to D, who is a housewife. A is married to a housewife(So, A is the lawyer because there are only two married couples in the group)

3) No woman in the group is either an engineer or an accountant' and E is not a housewife.

So, E is a Male must be an engineer and B is a housewife(Female).

Person	Profession + Gender	Relation
A	Lawyer(M)	Husband of D
B	Housewife(F)	
C	Accountant(M)	Husband of F
D	Housewife(F)	Wife of A
E	Engineer(M)	
F	Professor(F)	Wife of C

Hence, 'E' profession is Engineer'

Que. 62 How many members of the group are males?

1. 2
2. 3
3. 4
4. Cant be determined

Testbook Solution Correct Option **- 2**

Symbol Representation :

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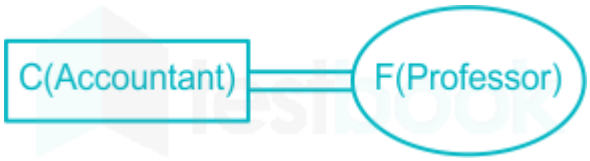
Symbol in Diagram	Meaning
○	Female
□	Male
=	Married Couple
—	Siblings
|	Difference of a Generation

1) C and F are couples in which C is an accountant and F is a professor. No woman in the group is either an engineer or an accountant(So, C is a male and F is a female)



2) The lawyer is married to D, who is a housewife. A is married to a housewife(So, A is the lawyer because there are only two married couples in the group)

3) No woman in the group is either an engineer or an accountant' and E is not a housewife.

So, E is a Male must be an engineer and B is a housewife(Female).

Person	Profession + Gender	Relation
A	Lawyer(M)	Husband of D
B	Housewife(F)	
C	Accountant(M)	Husband of F
D	Housewife(F)	Wife of A
E	Engineer(M)	
F	Professor(F)	Wife of C

Male members - CAE

Female members - FDB

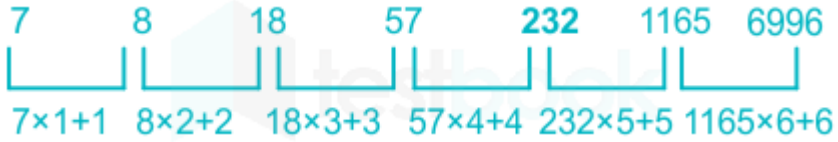
Hence, '3 members of the group are male' is the correct answer.

Que. 63 Wrong number in the series 7, 8, 18, 57, 288, 1165, 6996

1. 288
2. 18
3. 57
4. 25

Testbook Solution Correct Option **- 1**

The logic is :



Hence, '288' is the correct answer.

Que. 64 Direction for the Questions Each of the questions given below consists of a statement and / or a question and two statements numbered I and II given below it. You have to decide whether the data provided in the statement(s) is/are sufficient to answer the given question. Read both statements and Give the answer (U) if the data in statement I alone are sufficient to answer the question, while the data in statement II alone are not sufficient to answer the question.
Give the answer (V) if the data in statement I| alone are sufficient to answer the question, while the data in statement I alone are not sufficient to answer the question.
Give the answer (W) if the data either in Statement I or in Statement II alone are sufficient to the answer of the question. Give the answer (X) if the data in both statements I and II together are not sufficient to answer the question. Give the answer (Y) if the data in both statements I and II together are necessary to answer the question.

How much time will the leak take to empty the full cistern?

(i) The cistern is normally filled in 9 hours. (ii) It takes one hour more than the usual time to fill the cistern because of a leak in the bottom.

1. V
2. U
3. X
4. Y

Testbook Solution Correct Option **- 4**

Given:

The statement

1) The cistern is normally filled in 9 hours.

2) It takes one hour more than the usual time to fill the cistern because of a leak in the bottom.

Calculation:

Suppose the capacity = 90 units (LCM of 9 and 10)

The efficiency of inlet pipe is 10 units

The efficiency of leakage and inlet pipe is 9 units

Now,

The efficiency of leakage is 1 units

So,

Time taken by leakage the empty the cistern is

⇒ 90/1

⇒ 90 hours

∴ **Both statements I and II together are necessary to answer the question.**

Que. 65 How will long it take to empty the tank if both the inlet pipe P1 and the outlet pipe P2 are opened simultaneously?

(i) P_1 can fill the tank in 16 minutes.

(ii) P_2 can empty the full tank in 8 minutes.

1. 8 minutes
2. 12 minutes
3. 16 minutes
4. 15 minutes

Testbook Solution Correct Option **- 3**

Given:

Inlet pipe P_1 fill the tank in 16 minutes and outlet pipe P_2 empty the tank in 8 minutes.

Calculation:

Suppose capacity of tank = 16 units (LCM of 16 and 8)

Efficiency of inlet pipe P_1 = 16/16 = 1

Efficiency of outlet pipe P_2 = 16/8 = 2

Now,

Both the pipe are opened together, then efficiency of P_1 and P_2 together in each minutes

⇒ 1 + (-2)

⇒ -1 (Negative sign show tank is emptied)

So,

Time taken to emptied the tank is

⇒ 16/1

⇒ 16 minutes

∴ **The required time is 16 minutes.**

Que. 66 How many positive numbers less than 10,000 are such that the product of their digits is 210?

1. 36
2. 42
3. 48
4. 54

Testbook Solution Correct Option **- 4**

Given:

Product of digits of a number which is less than 10,000 = 210

Concept used:

Numbers formed by n digits = Factorial of n (n!)

n! = n × (n – 1) × (n – 2) × ..... × [n – (n – 1)].

Calculation:

Factors of 210 = 1 × 2 × 3 × 5 × 7

Combination of four digits = {2,3,5,7}; {1,6,5,7}

Combination of three digits = {6,5,7}

Numbers formed by {2,3,5,7} = 4!

⇒ 4 × 3 × 2 × 1 = 24

Numbers formed by {1,6,5,7} = 4!

⇒ 4 × 3 × 2 × 1 = 24

Numbers formed by {6,5,7} = 3!

⇒ 3 × 2 × 1 = 6

Total numbers formed = 24 + 24 + 6 = 54

∴ **There are 54 positive numbers less than 10,000 are such that the product of their digits is 210.**

Que. 67 Each of the five people K, L, M, P and Q is of a different weight. It is known that the number of people heavier than P is the same as the number of people lighter than Q. L is the heaviest and K is not the lightest. Who is the lightest?

1. M
2. L
3. Q
4. P

Testbook Solution Correct Option **- 1**

Given data :

1) Number of people heavier than P is the same as the number of people lighter than Q and L is the heaviest.

L > P > _ > Q > _ or L > Q > _ > P > _

2) K is not the lightest.

L > P > K > Q > **M** or L > Q > K > P > **M**

Hence, 'M' is the lightest among all people.

Que. 68 John, Johny and Janardan participated in a race and each won a different medal among Gold, Silver and Bronze, not necessarily in that order. Each person among them gives two replies to any question, one of which is true and the other is false (in any order). When asked about the details of the medals obtained by them, the following were their replies:

John: I won the Gold medal. Johny won the Bronze medal. Johny: John won the Silver medal. I won the Gold medal. Janardan: Johny won the Silver medal. I won the Gold medal.

Which among the following is the correct order of the persons who won the Gold medal, the Silver medal and the Bronze medal respectively?

1. John, Johny, Janardan
2. Janardan, John, Johny
3. Johny, Janardan, John
4. Janardan, Johny, John

Testbook Solution Correct Option **- 2**

Given data :

John: I won the Gold medal. Johny won the Bronze medal.

Johny: John won the Silver medal. I won the Gold medal.

Janardan: Johny won the Silver medal. I won the Gold medal.

Let John's first statement be true and second be false -

John: I won the Gold medal - True(Assuming)
Johny won the Bronze medal - False(Assuming)

Johny: John won the Silver medal - False(As John won the gold medal)

I won the Gold medal - False(As John won the gold medal)

Janardan: Johny won the Silver medal - True(Assuming)
I won the Gold medal - False(As John won the gold medal)

Person	I Reply	II Reply	Medal
John	T	F	Gold
Johny	**F**	**F**	Silver
Janardan	T	F	Bronze

Condition: Each person among them gives two replies to any question, one of which is true and the other is false (in any order).

Here, Johny's both replies are false which means the initial assumption was false.

Now, Let John's first statement be false and second be true -

John: I won the Gold medal - False(Assuming)
Johny won the Bronze medal - True(Assuming)

Johny: John won the Silver medal - True(Assuming)
I won the Gold medal - False(As Johny won the Bronze medal)

Janardan: Johny won the Silver medal - False(As Johny won the Bronze medal)
I won the Gold medal - True(Assuming)

Person	I Reply	II Reply	Medal
John	F	T	Silver
Johny	T	F	Bronze
Janardan	F	T	Gold

Now, the correct order is - Janardan ⇒ Gold medal, John ⇒ Silver medal and Johny ⇒ Bronze medal

Hence, 'Janardan, John, Johny' is the correct answer.

Que. 69 Each of A, B and C is a different digit among 1 to 9. How many different values of the sum of A, B and C are possible, if ABA X AA = ACCA ?

1. 1
2. 3
3. 7
4. 8

Testbook Solution Correct Option **- 3**

Concept used:

If unit digit of any two numbers is A, then the unit digit of their product will be A only if A = 1.

Calculation:

ABA × AA = ACCA

Possible value of A = 1

⇒ 1B1 × 11 = 1CC1

⇒ 1(B + 1)(B + 1)1 = 1CC1

⇒ C = B + 1

Possible values of B = 2, 3, 4, 5, 6, 7, 8

Possible value of C = 3, 4, 5, 6, 7, 8, 9

Possible pairs of A, B and C= {1,2,3}, {1,3,4}, {1,4,5}, {1,5,6}, {1,6,7}, {1,7,8}, {1,8,9}

Number of possible values of the sum of A, B and C = 7

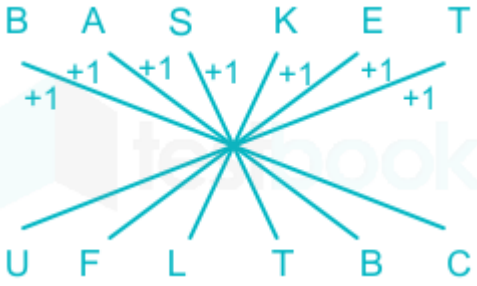
∴ 7 different values of the sum of A, B and C are possible.

Que. 70 In a certain language , if the word 'BASKET' is coded as 'UFLTBC', then how is the word 'SIMPLE' coded in that language?

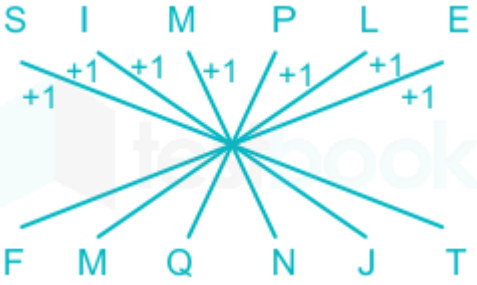
1. FMQNJT
2. FMQGNJ
3. FMQNJH
4. MFNQTJ

Testbook Solution Correct Option **- 1**

The logic is :



Similarly,



Hence, 'FMQNJT' is the correct answer.

Que. 71 A dealer offers sells half of the eggs that he has and another half an egg to Anurag. Then he sells half of the balance eggs and another half an egg to Deepak. Then he sells half of the balance eggs and another half an egg to Sivani. In the end he is left with just 7 eggs and he claims that he never broke an egg. How many eggs did he start with?

1. 65
2. 63
3. 67
4. 69

Testbook Solution Correct Option **- 2**

Given:

Number of eggs left with the dealer = 7

Concept used:

In this type of question, we solve it from the end according to the given conditions.

Calculation:

Number of eggs he had before selling an egg to Sivani = (7 + 1/2) × 2

⇒ 14 + 1

⇒ 15

Number of eggs he had before selling an egg to Deepak = (15 + 1/2) × 2

⇒ 30 + 1

⇒ 31

Number of eggs he had before selling an egg to Anurag = (31 + 1/2) × 2

⇒ 62 + 1

⇒ 63

∴ **The dealer had started with 63 eggs.**

Que. 72 A team must be selected from the ten portable players A, B, C, D, E, F, G, H, I and J. Of these, A, C, E and J are forwards, B, G and H are point guards and D, F and I are defenders.

- The team must have at least one forward, one point guard and one defender.
- If the team includes J, it must also include F.
- The team must include E or B, but not both.
- If the includes G, it must also include F.
- The team must include exactly one among C, G and I.
- C and F cannot be members of the same team.
- D and H cannot be members of the same team.
- The team must include both A and D or neither of them.
- There is no restriction on the number of members in the team.

What could be the maximum size of the team that includes G?

1. 4
2. 3
3. 6
4. More than 6

Testbook Solution Correct Option **- 2**

Given,

A team must be selected from the ten portable players A, B, C, D, E, F, G, H, I and J. Of these, A, C, E and J are forwards, B, G and H are point guards and D, F and I are defenders.

- The team must have at least one forward, one point guard and one defender.
- If the team includes J, it must also include F.
- The team must include E or B, but not both.
- If the includes G, it must also include F.
- The team must include exactly one among C, G and I.
- C and F cannot be members of the same team.
- D and H cannot be members of the same team.
- The team must include both A and D or neither of them.
- There is no restriction on the number of members in the team.

If G is in any team then the possibility of the player get selected in the team is :

G, F, J → If the team includes J, it must also include F, If the includes G, it must also include F and the team must include exactly one among C, G and I.

G, F, J, A, D →The team must include both A and D or neither of them and D and H cannot be members of the same team.

G, F, J, A, D, E/ B → The team must include E or B, but not both and C and F cannot be members of the same team.

The team must have at least one forward, one point guard and one defender → G (point guards), J (forward) and F (Defender)

Maximum size of the team that includes G is 6.

The team formed is G, F, J, A, D, E/ B

Hence, the correct answer is **6.**

Que. 73 How many 4 - digit numbers that can be formed from the digits 2, 3, 5, 6, 7 and 9, which are divisible by 5 and none of the digits is repeated?

1. 216
2. 60
3. 24
4. 25

Testbook Solution Correct Option **- 2**

Given:

Digits = 2, 3, 5, 6, 7 and 9

Concept used:

Divisibility rule of 5:

The number is divided by 5, if the unit digit of a number is either 5 or 0.

Calculation:

Unit digit can only be 5.

There is only 1 possible way to fill unit place.

Remaining places can be filled by 2, 3, 6, 7 or 9.

There is 5 possible ways to fill ten's place.

There is 4 possible ways to fill hundredth place as digits cannot be repeated.

There is 3 possible ways to fill the first place of four digit number.

Total numbers that can be formed = $1 \times 5 \times 4 \times 3 = 60$

∴ 60 four-digit numbers can be formed from the digits 2, 3, 5, 6, 7 and 9.

Que. 74 In a family of six persons, there are people from three generations. Each person has separate profession and also they like different colours. There are two couples in the family. Rohan is a CA and his wife neither is a doctor nor likes green colour. Engineer likes red colour and his wife is a teacher. Mohini is mother-in-

law of Savita and she likes orange colour. Deepak is grandfather of Titu and Titu, who is a principal, likes black color. Neeru is grand-daughter of Mohini and she likes blue colour. Neeru's mother likes white colour. Savita is a ?

1. Doctor
2. Teacher
3. Housewife
4. None of these

Testbook Solution Correct Option **- 3**

Given data :

1) Rohan is a CA and his wife neither is a doctor nor likes green color.

2) Engineer likes the red color and his wife is a teacher.

3) Titu, who is a principal, likes black color. Neeru likes blue color.

Person	Profession	Color
Rohan	CA	
(Rohan's wife)		
	Engineer	Red
(Engineer's wife)	Teacher	
Titu	Principal	Black
Neeru		Blue

4) Deepak is the grandfather of Titu. Neeru is the grand-daughter of Mohini. (Rohan's wife is not a doctor so, Neeru is a doctor)

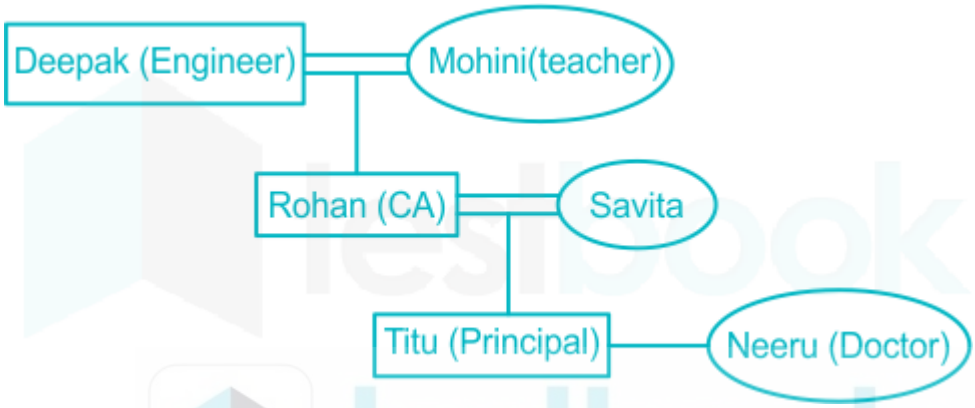
5) Only person left is Savita who is Rohan's wife. Neeru's mother likes white color.

6) Mohini likes orange color.

Person	Profession	Color
Rohan	CA	
Savita(Rohan's wife)		White
Deepak	Engineer	Red
Mohini(Engineer's wife)	Teacher	Orange
Titu	Principal	Black
Neeru	Doctor	Blue

Symbol Representation :

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



NOTE - A housewife is not given in the question so, the answer must be a housewife.
Hence, 'Savit's profession is housewife' is the correct answer.

Que. 75 1.All chickens are birds.
2. Some chickens are hens.
3. Female birds lay eggs.

If the above three statements are facts, which of the following statement must also be a fact?

I. All birds lay eggs.

II. Some hens are birds.

III. Some chickens are not hens.

1. II Only
2. II and III only
3. I, II and III
4. None of the statements is known as fact.

Testbook Solution Correct Option **- 1**
Given statements -

1.All chickens are birds.
2. Some chickens are hens.
3. Female birds lay eggs.

Conclusions :

1. All birds lay eggs → False(Only Female birds lay eggs is given in the statement)

2. Some hens are birds → True(Some hens are chickens and all chickens are birds so, some hens are birds is definitely true)

3. Some chickens are not hens → False(Not condition is not given in the statement so, It is possible but not definite)

Hence, 'II Only' is the correct answer.

Que. 76 The number that comes next in the series 0,1, 2, 3, 6, 11, 20, 37, 68,...

1. 105
2. 124
3. 125
4. 126

Testbook Solution Correct Option **- 3**

The logic is :

Addition of last three previous numbers starting from number '3' in the series

1) 0 + 1 + 2 = 3

2) 1 + 2 + 3 = 6

3) 2 + 3 + 6 = 11

4) 3 + 6 + 11 = 20

5) 6 + 11 + 20 = 37

6) 11 + 20 + 37 = 68

7) 20 + 37 + 68 = 125

Hence, '125' is the correct answer.

Que. 77 Using only 2, 5, 10, 25 and 50 paise coins, the smallest number of coins required to pay exactly 79 paise, 66 paise and Rs. 1.01 to three different persons is

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

Testbook Solution Correct Option **- 3**

Given:

Value of coins in paise = 2, 5, 10, 25 and 50

Amounts to be paid = 79 paise, 66 paise and Rs. 1.01

Calculation:

Minimum number of coins required to pay 78 paise = 50 + 10 + 10 + 2 + 2 + 2 + 2

Total coins required to pay 78 paise = 7

Minimum number of coins required to pay 69 paise = 50 + 10 + 5 + 2 + 2

Total coins required to pay 69 paise = 5

Minimum number of coins required to pay Rs. 1.01 = 50 + 25 + 10 + 10 + 2 + 2 + 2

Total coins required to pay Rs. 1.01 = 5

Total number of coins = 7 + 5 + 7 = 19 Coins

∴ The smallest number of coins required to pay exactly 79 paise, 66 paise and Rs. 1.01 to three different persons is 19.

Que. 78 What pair comes next in the following sequence 99, 90, 83, 78, ...

1. 75, 74
2. 69,57
3. 67,59
4. 69,63

Testbook Solution Correct Option **- 1**
The logic is :

Hence, '75, 74' is the correct answer.

Que. 79 A dealer offers a cash discount of 20% and still makes a profit of 20%, when he further allows 16 articles to a dozen to a particularly sticky bargainer. How much percent above the actual price were his article listed?

1. 100%
2. 80%
3. 75%
4. 66%

Testbook Solution Correct Option **- 1**
Given:
Discount = 20%
Profit on cost price = 20%
Concept used:
S.P. = C.P. × (100 + Profit %)/100
Indirect process:-
M.P. = S.P. × 100/(100 – discount %)
Calculation:
Let the cost price of the articles be 100
Selling price of the articles to get 20% profit = 100 × (100 + 20)/100 = 120
Loss percentage incurred by selling 16 articles at the cost of 12 articles = (16 – 12)/16 × 100
⇒ 4/16 × 100
⇒ 1/4 × 100
⇒ 25%
Selling price of the articles before allows 16 articles to a dozen = 120 × 100/(100 – 25)
⇒ 120 × 100/75
⇒ 120 × 4/3
⇒ 160
Listed price of the articles before given the 20% discount = 160 × 100/(100 – 20)
⇒ 160 × 100/80
⇒ 2 × 100
⇒ 200
Percentage of listed price marked above the cost price = 100%
∴ 100% above the actual price were his article listed.

Que. 80 Question are based on the following instructions Twelve classmates A, B, C, D, E, F, G, H I, J, K and L are sitting on a square table with 3 persons on each side. ABC and GJK are sitting on opposite sides. A and L are adjacent to each other. K is sitting diagonally to C.
If F is sitting between D and E, who is sitting to the left of K?

1. H
2. I
3. H or I
4. None of these

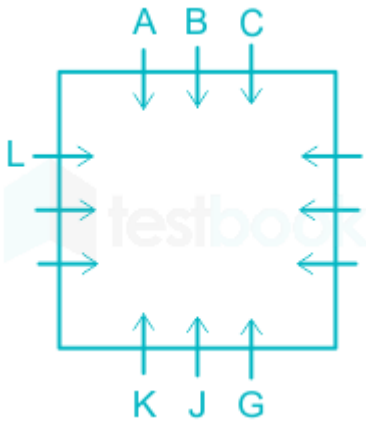
Testbook Solution Correct Option **- 3**

Given data :

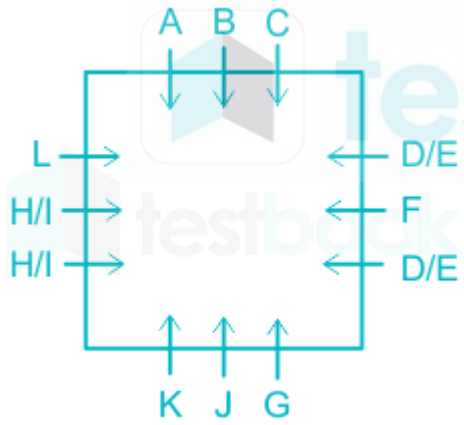
Twelve classmates - A, B, C, D, E, F, G, H I, J, K and L.

1) All are sitting on a square table with 3 persons on each side. (All are facing inside)

2) ABC and GJK are sitting on opposite sides. A and L are adjacent to each other. K is sitting diagonally to C.



3) If F is sitting between D and E.



Left of the K is either 'H or I' will seat.

Hence, 'H or I' is the correct answer.

Que. 81 If H is sitting between L and F and and I is sitting between the D and E., then H will be facing ?

1. D
2. E
3. G
4. I

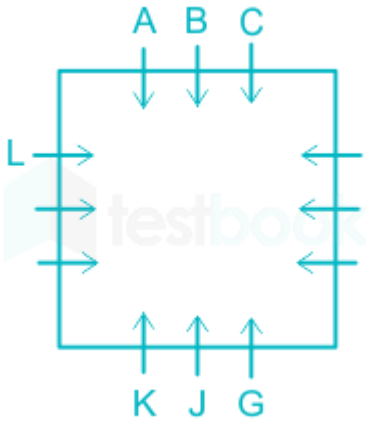
Testbook Solution Correct Option **- 4**

Given data :

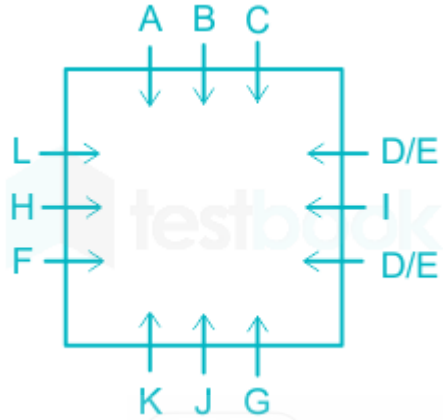
Twelve classmates - A, B, C, D, E, F, G, H I, J, K and L.

1) All are sitting on a square table with 3 persons on each side. (All are facing inside)

2) ABC and GJK are sitting on opposite sides. A and L are adjacent to each other. K is sitting diagonally to C.



3) If H is sitting between L and F and I is sitting between the D and E.



H will be facing 'I'

Hence, 'I' is the correct answer.

Que. 82 If G and E are facing C and H respectively and I is sitting between the L and H and F is sitting between the D and E then neighbors of K are?

1. J and G
2. J and E
3. H and J
4. H and E

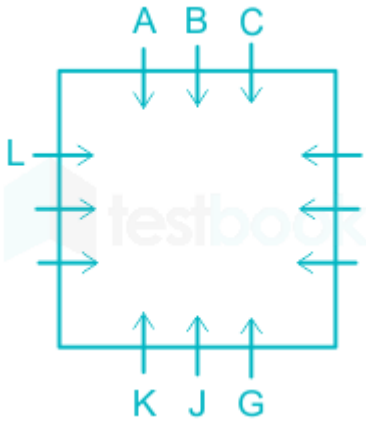
Testbook Solution Correct Option **- 3**

Given data :

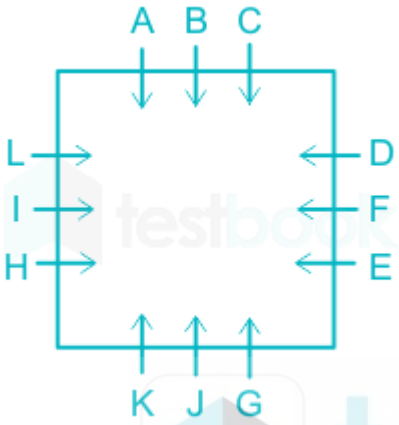
Twelve classmates - A, B, C, D, E, F, G, H I, J, K and L.

1) All are sitting on a square table with 3 persons on each side. (All are facing inside)

2) ABC and GJK are sitting on opposite sides. A and L are adjacent to each other. K is sitting diagonally to C.



3) If G and E are facing C and H respectively and I is sitting between the L and H and F is sitting between the D and E



The neighbors of K are - H and J

Hence, 'H and J' is the correct answer.

Que. 83 The integers 34041 and 32506, when divided by a 3 - digit integer n, leave the same remainder. What can be the value of n?

1. 289
2. 307
3. 367
4. 493

Testbook Solution Correct Option **- 2**

Given:

3-digit integer = n

Two integers = 34041 and 32506

Concept used:

Whenever we divide any two numbers with a common divisor and the remainder comes out to be same then the difference of those two numbers is a multiple of the divisor.

Calculation:

Let the common remainder be x.

32506 – x is divisible by n.

34041 – x is divisible by n.

Difference of (32506 – x) and (34041 – x) = (32506 – x) – (34041 – x)

⇒ 32506 – x – 34041 + x

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⇒ 32506 – 34041

⇒ 1535

Factors of 1535 = 1 × 5 × 307 × 1535

3-digit number = 307

⇒ n = 307

∴ **The value of n is 307.**

Que. 84 The number of solid spheres ,each of diameter 3 cm that could be moulded to form a solid metal cylinder of height 54 cm and diameter 4 cm is?

1. 16
2. 24
3. 36
4. 48

Testbook Solution Correct Option **- 2**

Given:

Diameter of the each sphere = 3 cm

Diameter of the solid metal cylinder = 4 cm

Height of the solid metal cylinder = 54 cm

Concept used:

Volume of spherical ball = $4/3 \times \pi \times r^3$

Volume of cylinder = $\pi \times r^2 \times h$

Number of small balls (n) = (Volume of cylinder)/(Volume of sphere)

Calculation:

Let the number of solid spheres be n.

Radius of the each sphere = 3/2 cm

Radius of the solid metal cylinder = 4/2 = 2 cm

Volume of each sphere = $(4/3) \times \pi \times (3/2)^3$

⇒ $\pi \times (4/3) \times (27/8)$

⇒ $9\pi/2$ cm^3

Volume the solid metal cylinder = $\pi \times (2)^2 \times 54 = 216\pi$ cm^3

n = $216\pi/9\pi$

⇒ n = 24

∴ **The number of solid spheres is 24.**

Que. 85 A clock is set right at 5 AM. The clock loses 16 minutes in 24 hours. What will be the true time when the clock indicates 10 p.m. on 4th day?

1. 11:15 PM
2. 11:00 PM
3. 12:00 PM
4. 12:30 PM

Testbook Solution Correct Option **- 2**

The logic is :

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5 Am	First day
5 Am	Second day
5 Am	Third day
5 Am + (5 Am to 10 Pm = 17 Hours)	Fourth day

Number of hours between 5 a.m to 10 p.m of 4th day = 24 × 3 + 17

= 72 + 17 = 89 Hours

The clock loses 16 minutes in 24 hours.

This clock shows 23 Hour 44mins = Actual correct clock time is 24 Hours

23 + 44/60 Hours(minutes converted into Hours) = 24 Hours

23 + 11/15 Hours = 24 Hours

Now, for 1 Hour = 24 × 15/(15 × 23 + 11)

= 24 × 15/(356)

So, for 89 Hours = 24 × 15/(356) × 89

= 6 × 15 = 90 Hours

The true time of clock is (90 - 89 = 1Hour) more than the current showing time = 10 p.m on 4th day + 1 Hour = 11 p.m on 4th day

Hence, '11:00 PM' is the correct answer.

Que. 86 A train overtakes two persons who are walking in the same direction in which the train is going, at the rate of 2 kmph and 4 kmph and passes them completely in 9 and 10 seconds respectively. The length of the train is:

1. 72 m
2. 54 m
3. 50 m
4. 45 m

Testbook Solution Correct Option **- 3**

Given:

Speed of the first person = 2 km/h

Speed of the second person = 4 km/h

Train taken to overtake the first person = 9 sec

Train taken to overtake the second person = 10 sec

Formula Used:

Speed = Distance/Time

km/h × 5/18 = m/sec

Concept used:

When two bodies move in the same direction, then

Relative speed = Difference of their speeds

Calculation:

Let the length and the speed of a train be L and V respectively.

Speed of the first person = 2 × 5/18 = 5/9 m/sec

Speed of the second person = 4 × 5/18 = 10/9 m/sec

Relative speed of the train and the first person = (V – 5/9) m/sec

⇒ V – 5/9 = L/9

⇒ V = L/9 + 5/9 ----(1)

Relative speed of the train and the first person = (V – 10/9) m/sec

⇒ V – 10/9 = L/10

⇒ V = L/10 + 10/9 ----(2)

Equating equation (1) and equation (2),

⇒ L/9 + 5/9 = L/10 + 10/9

⇒ L/9 – L/10 = 10/9 – 5/9

⇒ (10 × L – 9 × L)/(10 × 9) = (10 – 5)/9

⇒ (10L – 9L)/90 = 5/9

⇒ L = 5/9 × 90

⇒ L = 50 m

∴ **The length of the train is 50 m.**

Que. 87 Decide which of the given conclusions logically follow from the given students(s) :

Statements:

All suns are moons.

Some moons are planets.

Conclusions :

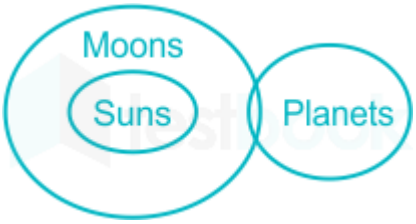
I. All moons are suns.

II. At least some moons are planets.

1. Either conclusion I or II is true
2. Neither conclusion I nor II is true
3. Both conclusion I or II is true
4. Only conclusion II is true

Testbook Solution Correct Option **- 4**

The best possible Venn diagram for the above two statements is shown below -



Conclusions :

1. All moons are suns → False(It is definitely false from the above Venn diagram)

2. At least some moons are planets → True(It is definitely true from the above Venn diagram)

Hence, 'Only conclusion II is true' is the correct answer.

Que. 88 Ten points are marked on a straight line and eleven points are marked on another straight line. How many triangles can be constructed with vertices from among the above points?

1. 495
2. 550
3. 1045

4. 2475

Testbook Solution Correct Option **- 3**

Given:

Ten points are marked on a straight line and eleven points are marked on another straight line.

Calculations:

Number of triangles that can be constructed with vertices from among the above points.

$\Rightarrow {}^{10}C_2 \times 11 + {}^{11}C_2 \times 10$

$= 45 \times 11 + 55 \times 10$

$= 1045$

∴ Number of triangles that can be constructed with vertices from among the above points is 1045.

Que. 89 The greatest number which on dividing 1657 and 2037 leaves remainders 6 and 5 respectively, is:

1. 123
2. 127
3. 235
4. 305

Testbook Solution Correct Option **- 2**

Concept used:

HCF = Highest common factor

The greatest number which divides each of the two or more numbers is called HCF or Highest Common Factor.

Calculations:

Required number = H.C.F. of (1657 - 6) and (2037 - 5)

H.C.F. of 1651 and 2032

$1651 = 13 \times 127$

$2032 = 4 \times 4 \times 127$

HCF of 1651 and 2032 = 127

∴ The greatest number which on dividing 1657 and 2037 leaves remainders 6 and 5 respectively, is 127.

Que. 90 In IEEE single precision floating point representation, exponent is represented in _____

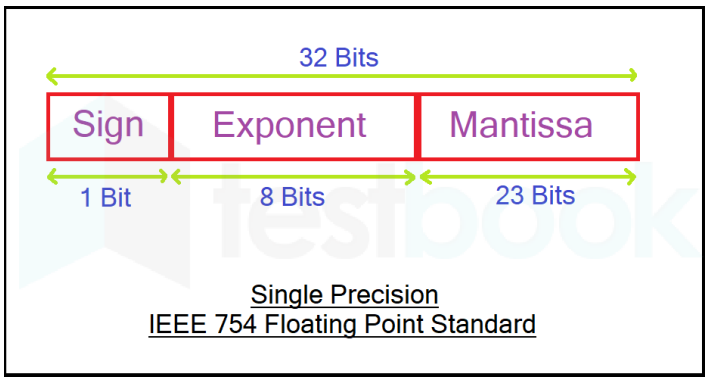
1. 8 bit Sign – magnitude representation
2. 8 bit 2's complement representation
3. Biases exponent representation with a bias value 127
4. Biases exponent representation with a bias value 128

Testbook Solution Correct Option **- 1**

The correct answer is **8 bit Sign – magnitude representation**

Important Point

- The **exponent part** in **IEEE single-precision floating-point representation** is represented in **8 bits** as shown in the figure below -



Key-Points

- The IEEE Standard for **Floating-Point Arithmetic (IEEE 754)** is a technical standard for floating-point computation which was established in **1985** by the **Institute of Electrical and Electronics Engineers (IEEE)**. The standard addressed many problems found in the **diverse floating point implementations** that made them difficult to use reliably and reduced their portability. IEEE Standard 754 floating point is the most common representation today for real numbers on computers, including **Intel-based PC's, Macs, and most Unix platforms**.
- There are several ways to represent floating-point number but IEEE 754 is the most efficient in most cases. IEEE 754 has 3 basic components:

    1. **The Sign of Mantissa –**
       This is as simple as the name. 0 represents a positive number while 1 represents a negative number.
    2. **The Biased exponent –**
       The exponent field needs to represent both positive and negative exponents. A bias is added to the actual exponent in order to get the stored exponent.
    3. **The Normalised Mantissa –**
       The mantissa is part of a number in scientific notation or a floating-point number, consisting of its significant digits. Here we have only 2 digits, i.e. O and 1. So a normalized mantissa is one with only one 1 to the left of the decimal.

Que. 91 With 4-bit 2's complement arithmetic, which of the following addition will result in overflow?

1. 1111+1101
2. 0110+0110
3. 1101+0101
4. 0101+1011

Testbook Solution Correct Option **- 1**
The correct answer is **1111+1101**

Important Point

- If the result of an arithmetic operation is **too large** (positive or negative) to fit into the **resultant bit-group**, then arithmetic **overflow** occurs.
- Overflow occurs if

    1. **(+A) + (+B) = −C**
    2. **(−A) + (−B) = +C**

- In the first option, we have 1111 + 1101 which results 1 1100 (As per 2's Complement addition rule). Here, 1 at the **LSB** of Result is overflow bit.

Key-Points

- The rules for detecting overflow in a **two's complement sum** are simple:

  1. If the **sum of two positive numbers** yields a **negative result**, the sum has overflowed.
  2. If the **sum of two negative numbers** yields a **positive result**, the sum has overflowed.
  3. Otherwise, the sum has not overflowed.

- It is important to note the **overflow** and **carry out ,both of them can** occur without the each other. In **unsigned numbers**, carry out is equivalent to overflow. In **two's complement, carry out tells you nothing about overflow**.
- The reason for the rules is that overflow in two's complement occurs, not when a bit is carried out out of the **left column**, but when **one** is carried into it. That is when there is a carry into the **sign**. **The rules detect this error by examining the sign of the result**. A **negative and positive added together cannot overflow**, because the sum is between the addends. Since both of the addends fit within the allowable range of numbers, and their sum is between them, it must fit as well.

Que. 92 If we can generate a maximum of 4 Boolean functions using n Boolean variables, what will be minimum value of n?

1. 65536
2. 16
3. 1
4. 4

Testbook Solution Correct Option **- 3**
The correct answer is **1**

Important Point

- First, we need to understand that when there are **no variables**, there are two expressions :
  - **False=0** and **True=1**
- For **one variable p**, **four** functions can be constructed. A function maps each **input value** of a variable to **one** and only **one output** value.
  - The **False(p)** function maps each value of p to 0 (False).
  - The **identity (p)** function maps each value of p to the identical value.
  - The **flip (p)** function maps False to True and True to False.
  - The **True (p)** function maps each value of p to 1 (True).
- For one variable:
  - **4** = 2^{2^1}, functions can be constructed.This information can be collected into a table:
Input	**Function**			
p	**False**	**p**	**-p**	**True**
0	0	0	1	1
1	0	1	0	1
- For n Variables:

Number of	Number of Boolean

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Variables	Functions
0	$2^{2^0} = 2^0 = 2$
1	$2^{2^1} = \mathbf{2^2 = 4}$
2	$2^{2^2} = 2^4 = 16$
3	$2^{2^3} = 2^8 = 256$
4	$2^{2^4} = 2^{16} = 65536$
n	2^{2^n}

- Therefore, according to the above table, a maximum of **4 Boolean functions** can be generated with **1 variable**.

Que. 93 If the 2's complement representation of a number is $(011010)_2$, what is its equivalent hexadecimal representation?

1. $(110\ )_{16}$
2. $(1A)_{16}$
3. $(16)_{16}$
4. $(26)_{16}$

Testbook Solution Correct Option **- 2**
The correct answer is **$(1A)_{16}$**

Important Point

- To convert Binary number to Hexadecimal or vice versa, the following table needs to be considered:

Decimal	Hex	Binary
0	0	0
1	1	1
2	2	10
3	3	11
4	4	100
5	5	101
6	6	110
7	7	111
8	8	1000
9	9	1001
10	A	1010
11	B	1011
12	C	1100

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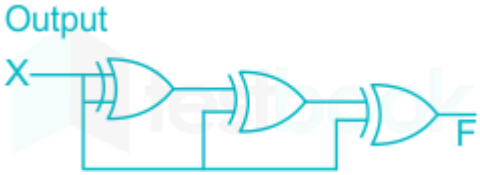
Decimal	Hex	Binary
13	D	1101
14	E	1110
15	F	1111
16	10	10000
17	11	10001
18	12	10010
19	13	10011
20	14	10100
...	...	...
25	19	11001
26	**1A**	**11010**
27	1B	11011
28	1C	11100
29	1D	11101
30	1E	11110
31	1F	11111
32	20	100000
33	21	100001
34	22	100010

- Following are the steps to be followed in order to perform the conversion:
  - Start from the **least significant bit (LSB)** at the right of the binary number and **divide it up into groups of 4 digits**. (4 digital bits is called a "nibble").
  - **Convert each group of 4 binary digits to its equivalent hex value** (see table above).
  - Concatenate the results together, giving the total **hex number**.

Que. 94 For the circuit shown below, the complement of the output



1. 0
2. X
3. X'
4. 1

Testbook Solution Correct Option **- 4**
The correct answer is **1**

- Here the **input X** is available to **both the input of the XOR gates** and **one of the inputs** of the XOR gates is **interconnected**.
- The **Truth Table** of **XOR** Gate is:
Symbol	Truth Table		
	B	**A**	**Q**
	0	0	0
	0	1	1
	1	0	1
2-input Ex-OR Gate	1	1	0
Boolean Expression Q = A ⊕ B	A **OR** B but NOT **BOTH** gives Q		
- According to the above table, we can conclude that
  - If input **B** = 0, then in our question, **F = A**
  - If input **B** = 1, then in our question, **F =** $\bar{A}$
  - If input **B** = **A**, then in our question, **F = 0**
  - If input **B** = $\bar{A}$, then in our question, **F = 1**
- Now using the above conclusions, we can see data flow in the figure given in the question. In the **first gate**, both inputs are the same, so **the result of the first gate is 0**. In the **second gate**, the first input is 0 therefore **the second input is the result of the second gate**. In the **third and final gate**, **both the inputs will be the same** and hence the output will be equal to **0**. The question is asking about the complement of the output, so the answer is **1.**

Que. 95 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 $\boldsymbol{(C3D8)_{16}}$

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. 96 The base (or radix) of the number system such that the following equation holds 312/20 = 131.1 is

1. 3
2. 4
3. 5
4. 6

Testbook Solution Correct Option **- 3**
The correct answer is **5**

Important Point

- Let 'x' be the base or radix of the number system. The equation is:
  - $\frac{3x^2+1x^1+2x^0}{2x^1+0x^0} = 1x^1 + 3x^0 + 1x^{-1}$
  - $\Rightarrow \frac{3x^2+x+2}{2x} = x + 3 + \frac{1}{x}$
  - $\Rightarrow \frac{3x^2+x+2}{2x} = \frac{x^2+3x+1}{x}$
  - $\Rightarrow 3x^2 + x + 2 = 2x^2 + 6x + 2$
  - $\Rightarrow x^2 + -5x = 0$
  - $\Rightarrow x(x-5) = 0$
  - $\Rightarrow x = 0$ or $x = 5$
- Therefore, **x = 5**

Que. 97 Which of the following represents $(D4)_{16}$?

1. $(4E)_{16}$ - $(5B)_{16}$
2. $(14E)_{16}$ - $(7A)_{16}$
3. $(15C)_{16}$ - $(6D)_{16}$
4. $(1E4)_{16}$ - $(A7)_{16}$

Testbook Solution Correct Option **- 2**
The correct answer is

Important Point

- All operations given in the above options are simply **arithmetic operations in the hexadecimal number system**. We can perform this operation in multiple ways, i.e., we can either SUBTRACT them directly in hex or we can convert them to binary and then perform the operation and convert the result into hexadecimal again.
- Use the following table for conversion:
-

Hex	Binary	Decimal
0	0	0
1	1	1

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2	10	2
3	11	3
4	100	4
5	101	5
6	110	6
7	111	7
8	1000	8
9	1001	9
A	1010	10
B	1011	11
C	1100	12
D	1101	13
E	1110	14
F	1111	15
14	10100	20
3F	111111	63

- In option 2, we have **14E = 000 10100 1110** and **7A = 00000 111 1010**
- **14E - 7A = 000101001110 - 000001111010 = 000011010100**
- **000011010100 = D4**
- Therefore, $(14E)_{16} - (7A)_{16} = (D4)_{16}$

Que. 98 How many Boolean expressions can be be formed with 3 Boolean variables?

1. 16
2. 1024
3. 32
4. 256

Testbook Solution Correct Option **- 4**
The correct answer is **256**

Important Point

- First, we need to understand that when there are **no variables**, there are two expressions :
  - **False=0** and **True=1**
- For **one variable p**, **four** functions can be constructed. A function maps each **input value** of a variable to **one** and only **one output** value.
  - The **False(p)** function maps each value of p to 0 (False).
  - The **identity (p)** function maps each value of p to the identical value.
  - The **flip (p)** function maps False to True and True to False.
  - The **True (p)** function maps each value of p to 1 (True).
- For one variable:
  - **4** = 2^{2^1}, functions can be constructed.This information can be collected into a table:

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Input	Function			
p	False	p	-p	True
0	0	0	1	1
1	0	1	0	1

- For n Variables:

Number of Variables	Number of Boolean Functions
0	$2^{2^0} = 2^0 = 2$
1	$2^{2^1} = 2 = 4$
2	$2^{2^2} = 2^4 = 16$
3	$\mathbf{2^{2^3} = 2^8 = 256}$
4	$2^{2^4} = 2^{16} = 65536$
n	2^{2^n}

- Therefore, according to the above table, a maximum of **256 Boolean functions** can be generated with **3 variables**.

Que. 99 In an 8 bit representation of computer system the decimal number 26 has to be subtracted from 22 and the result in binary 2's complement is _____

1. 00000100
2. 00001100
3. 00000101
4. 00010100

Testbook Solution Correct Option **- 1**
The correct answer is **00000100**

Important Point

- **Two's complement representation**, or, in other words, **signed notation** - the first bit tells about the sign. The convention is that **a number with a leading 1 is negative**, while **a leading 0 denotes a positive value**. In an 8-bit representation, we can write any number from -128 to 127. The name comes from the fact that a negative number is a **two's complement** of a positive one.
- 26 has to be subtracted from 22 hence result will be negative. So, to avoid negative results, 2's complement is to be used. We have to find 2's complement of the **Subtrahend (26)** and add it to the **minuend (22).** To calculate 2's complement, first, we need to find the 1's complement by swapping all 1 to 0 and all 0 to 1 and then we need to add 1 to it:
  - for 22, Binary = 10110
  - for 26, Binary = 11010, 1's Complement = 00101, 2's Complement = 00110
  - Addition = 10110 + 00110 = 11100
  - now in the answer obtained, there is no carry generated. In this case, we will have to find 2's complement of the result in order to find the final result.
  - 11100 = 1's Complement = 00011, 2's Complement = **00100**
  - In 8 bit representation, we will write **00000100**
  - hence our answer is **00000100**

Que. 100 **Choose the phrasal verb to replace the explanation in brackets.**

We must (be quick) _____ or we'll be late for school.

1. Act up
2. Hurry up
3. Fasten on
4. Speed at

Testbook Solution Correct Option **- 2**

The correct answer is '**Hurry up**'.

Key-Points

- In the given question '**be quick**' is a **phrase**. The meaning of it is as follows:
- **Be quick: happening or done with great speed, or lasting only a short time.**
  - *Example: I had a **quick** coffee and left the house.*
- **Hurry up: do something more quickly.**
  - *Example: **Hurry up**, or we'll miss the bus!*
- By reading the above definition we find that the phrasal verb to replace the explanation in brackets is 'Hurry up'.
- Therefore, the correct answer is **'Hurry up'**.

Correct Answer: *We must **hurry up** or we'll be late for school.*

Additional Information

- The meaning of the other **phrasal verbs** as follows:
  - **"Act Up": If a person, especially a child, acts up, they behave badly.**
    *Example: Sophie got bored and started **acting up.***
  - **"Fasten on": to give attention to something, because it is of special interest or often because you think it is the cause of a problem.**
    *Example: The politician has **fastened on** the problems of the working poor.*
  - **"Speed at": how fast something happens.**
    *Example: It was the **speed at** which it all happened that shocked me.*

Que. 101 Anne had to pay for everything because as usual, Peter _____ his wallet at home.

1. had left
2. was leaving
3. left
4. leave

Testbook Solution Correct Option **- 1**

The correct answer is '**had left**'.

Key-Points

- The first clause of the given sentence is in the **simple past tense**.
- When the first part of the sentence is in the simple past tense the part that follows it should be in the **past perfect tense**.
- **The past perfect tense** is used to show that something **happened before another action in the past.**
- It can also be used to show that **something happened before a specific time in the past.**

Correct Answer: Anne had to pay for everything because as usual, Peter ***had left*** his wallet at home.

Que. 102 **Direction: Select the most appropriate word for the given group of words.**

Extreme old age when a man behaves like a child.

1. Imbecility
2. Senility
3. Dotage
4. Superannuation

Testbook Solution Correct Option **- 2**
The correct answer is **'Senility'.**

Key-Points

- In the given question the correct answer is **'Senility'**.
- **Senility: showing poor mental ability because of old age, especially being unable to think clearly and make decisions**
  - *Example: The hormone can damage brain cells and lead to premature* ***senility.***
- By reading the above definition we can infer that the correct answer is **Option 2.**

Correct Answer: *Senility*

Additional Information

- The meaning of the other words given in the Option as follows:
  - **Dotage: the period of life in which a person is old and weak.**
    Example: you could live here and look after me in my ***dotage.***
  - **Imbecility: the quality or state of being very stupid or foolish.**
    Example: The kids were giggling and acting goofy to the point of ***imbecility.***
  - **Superannuation: money that people pay while they are working so that they will receive payment when they stop working when they are old, or the payment they receive when they stop working.**
    Example: Since the ***superannuation*** *fund returns are also gross of fees, index returns are comparable.*

Mistake Point

- We might tend to choose **dotage** as the correct option but it is wrong.
- In the question, it is explicitly stated that **'old age when a man behaves like a child'**.
- This meaning of behaving like a child is not conveyed through dotage.
- Instead in **senility** due to old age, o**ne loses his or her mental faculties which makes them behave like a child**, therefore **senility** is the correct answer."

Que. 103 **Select the correct one word for the given group of words:**

To try to achieve something is difficult circumstances despite setbacks.

1. Persuade

2. Persevere
3. Picturesque
4. Perspective

Testbook Solution Correct Option **- 2**
The correct answer is '**Persevere**'.

Key-Points

- In the given One Word the correct answer is '**Persevere**'.
- **Persevere: to try to do or continue doing something in a determined way, despite having problems.**
  - *Example: Despite receiving little support, the women are **persevering** with their crusade to fight crime.*
- By reading the above definition we can infer that the correct answer is Option 2.

Correct Answer: *Persevere.*

Additional Information

- The meaning of the other words given in the option as follows:
  - **Persuade: to make someone do or believe something by giving them a good reason to do it or by talking to that person and making them believe it.**
    *Example: If she doesn't want to go, nothing you can say will **persuade** her.*
  - **Picturesque: (especially of a place) attractive in appearance, especially in an old-fashioned way.**
    *Example: The countryside in this region is very **picturesque.***
  - **Perspective: a particular way of considering something.**
    *Example: Her attitude lends a fresh **perspective** to the subject.*

Que. 104 In the following, a part of the sentence is underlined. Four different ways of phrasing the underlined part are indicated below.
Chose the best alternative among the four choices given.

When he entered the house, it was at sixes and sevens.

1. It was six O'clock when he entered the house
2. Inmates were eulogized when he entered
3. House was in pandemonium
4. House wad blissful

Testbook Solution Correct Option **- 3**
The correct answer is '**House was in pandemonium**'.

Key-Points

- In the given question **'at sixes and sevens'** is an idiom. The meaning of it as follows:
- **At sixes and sevens: in a confused, badly organized, or difficult situation.**
  - *Example: We've been **at sixes and sevens** in the office this week.*
- **In Pandemonium: a situation in which there is a lot of noise and confusion because people are excited, angry, or frightened.**
  - *Example: **Pandemonium** reigned in the hall as the unbelievable election results were readout.*

- Both phrases are **similar** in meaning therefore, the correct answer is **Option 3.**
- Hence, the correct answer is **Option 3.**

Correct Answer: *When he entered the house, House was in pandemonium.*

Que. 105 Fill in the blanks choosing the correct adjective :

The phoenix is a _____Bird.

1. Mythical
2. Ethical
3. Natural
4. Carnivorous

Testbook Solution Correct Option **- 1**
The correct answer is '**Mythical**'.

Key-Points

- In the given sentence '**Mythical**'.
- **Phoneix: in ancient stories, an imaginary bird that set fire to itself every 500 years and was born again, rising from its ashes (= the powder left after its body has been burned).**
  - *Example: The town was bombed but was then rebuilt and rose from the ashes like a **phoenix.***
- By reading the above definition we can infer that The bird phoenix is a mythical bird.
- Therefore, the correct answer is **Option 1.**

Correct Answer: *Mythical.*

Additional Information

- The meaning of the other words given in the Options as follows:
  - **Ethical: a system of accepted beliefs that control behavior, especially such a system based on morals.**
    *Example: The **ethics** of journalism are much debated.*
  - **Natural: as found in nature and not involving anything made or done by people.**
    *Example: Floods and earthquakes are natural **disasters.***
  - **Carnivorous: an animal that eats meat.**
    *Example: Lions and tigers are **carnivores.***

Que. 106 Which of the following is the correct passive of the sentence.

John has eaten the apples.

1. The apples are being eaten by John.
2. The apples are eaten by John.
3. The apples have been eaten by John.
4. The apples will be eaten by John.

Testbook Solution Correct Option **- 3**
The correct answer is **'The apples have been eaten by John'.**

Key-Points

- The given sentence is in **the Active Voice.** As per the question we have to change it into **Passive Voice.**
- The process of transformation as follows:
  - The subject of the given sentence is **'John'**.
  - The object of the given sentence is **'The apples'**.
  - **The subject will be put in the place of the object. And the object will be put in the place of the subject.**
  - **'Has eaten'** will be changed into **'Have been eaten'.** We know that in Passive Voice **'been'** is used in **The Perfect Tense.**
  - **'The apples'** is **plural.** Therefore, it will be followed by **a plural helping verb.**
- Therefore, the correct answer is **Option 3.**

Correct Answer: *The apples have been eaten by John.*

- दी गई sentence active voice **में है।** सवाल के अनुसार हमें इसे **Passive voice** में बदलना होगा ।
- परिवर्तन की प्रक्रिया इस प्रकार है:
  - दिए गए वाक्य का subject **'John** ' है।
  - दिए गए वाक्य का Object **'The apples** ' है।
  - **'Subject' 'object' के स्थान पर रखा जाएगा। और object को subject के स्थान पर रखा जाएगा।**
  - **'Has eaten'** को **'have been eaten'** में बदल दिया जाएगा । हम जानते हैं कि **Passive voice में 'been' perfect tense** का इस्तेमाल किया जाता है ।
  - **'The apples ' बहुवचन है।** इसलिए, इसके बाद **बहुवचन helping verb** आएगी।

Que. 107 **Choose one of the words that is most nearly the same as the meaning of the given word** 'Indemnify'.

1. Insure
2. Compensate for loss
3. Assure
4. Sue for damages

Testbook Solution Correct Option **- 2**
The correct answer is **'Compensate for loss'.**

Key-Points

- The exact synonym of the given word **'Indemnify'** is **'Compensate for loss'.**
- **Indemnify: to pay or promise to pay someone an amount of money if they suffer damage or loss.**
  - *Example: The farm bill contained provisions enabling the secretary of agriculture to indemnify farmers from certain losses.*
- **Compensate: to pay someone money in exchange for something that has been lost or damaged or for some problem.**

- *Example: Victims of the crash will be compensated for their injuries.*
- By reading the above definitions we can infer that the correct answer is **Option 2.**

Correct Answer: *Compensate for loss.*

Additional Information

- The meaning of the other words given in the options as follows:
  - **Insure: to protect yourself against risk by regularly paying a special company that will provide a fixed amount of money if you are killed or injured or if your home or possessions are damaged, destroyed, or stolen.**
    *Example: The house is **insured** for two million dollars.*
  - **Assure: to tell someone confidently that something is true, especially so that they do not worry.**
    *Example: The unions **assured** the new owners of the workers' loyalty to the company.*

Que. 108 Select a word from the given alternatives which has the same meaning as the underlined word:

He has a propensity for getting into debt.

1. Tendency
2. Aptitude
3. Characteristics
4. Quality

Testbook Solution Correct Option **- 1**
The correct answer is '**Tendency**'.

Key-Points

- The exact synonym of the given word **'Propensity' is 'Tendency'.**
- **Propensity: the fact that someone is likely to behave in a particular way, especially a bad way.**
  - *Example: She's inherited from her father a **propensity** to talk too much.*
- **Tendency: If someone has a tendency to do or like something, they will probably do it or like it.**
  - *Example: His **tendency** to exaggerate is well known.*
- By reading the above definitions we can infer that the correct answer is **Option 1.**

Correct Answer: *Tendency.*

Additional Information

- The meaning of the other options as follows:
  - **Aptitude: a natural ability or skill.**
    *Example: We will take your personal **aptitudes** and abilities into account.*
  - **Characteristics: a typical or noticeable quality of someone or something.**
    *Example: Unfortunately a big nose is a family **characteristic.***
  - **Quality: how good or bad something is.**
    *Example: Their products are of very high **quality.***

Que. 109 Select the most suitable synonym from the given choices for the word:
'Antediluvian'

1. Recluse
2. Maverick
3. Archaic
4. Bellicose

Testbook Solution Correct Option **- 3**
The correct answer is '**Archaic**'.

Key-Points

- The exact synonym of the given word **'Antediluvian' is 'Archaic'.**
- **Antediluvian: extremely old-fashioned.**
  - *Example: My mother has some hopelessly **antediluvian** ideas about the role of women.*
- **Archaic: of or belonging to an ancient period in history, very old.**
  - *Example: Planned in the 1990s, the system was **archaic** by the time it was implemented.*
- By reading the above definitions we can infer that the correct answer is **Option 3.**

Correct Answer: *Archaic.*

Additional Information

- The meaning of the other words given in the option as follows:
  - **Recluse: a person who lives alone and avoids going outside or talking to other people.**
    *Example: He is a millionaire **recluse** who refuses to give interviews.*
  - **Maverick: a person who thinks and acts in an independent way, often behaving differently from the expected or usual way.**
    *Example: He was considered as something of a **maverick** in the publishing world.*
  - **Bellicose: wishing to fight or start a war.**
    *Example: The general made some **bellicose** statements about his country's military strength.*

Que. 110 Select the most suitable antonym from the given choices for the word:
'Sangfroid'.

1. Equanimity
2. Steadiness
3. Aplomb
4. Turbulence

Testbook Solution Correct Option **- 4**
The correct answer is '**Turbulence**'.

Key-Points

- The exact antonym of the given word **'Sangfroid' is 'Turbulence'.**
- **Sangfroid: the ability to stay calm in a difficult or dangerous situation.**
  - *Example: I congratulate her on the elegance and **sangfroid** with which she stood on her head.*
- **Turbulence: a state of confusion without any order.**

- *Example: There are signs of **turbulence** ahead for the economy.*
- By reading the above definitions we can infer that the correct answer is **Option 4.**

Correct Answer: *Turbulence.*

Additional Information

- The meaning of other words given in the options as follows:
  - **Equanimity: a calm mental state, especially after a shock or disappointment or in a difficult situation.**
    *Example: He received the news of his mother's death with remarkable **equanimity.***
  - **Steadiness: behavior that is reasonable and shows good judgment, so that people trust you.**
    *Example: He displayed a **steadiness,** intellectual curiosity, and a depth of knowledge.*
  - **Aplomb: confidence and style.**
    *Example: Rosalind conducted the meeting with characteristic **aplomb.***

Que. 111 The word PIN is used in four different ways.

Choose the option in which the usage of the word is incorrect or inappropriate?

1. She combed her heir backward and secured it with a pin.
2. Jack managed to grab the thief and pin him against the wall until the police arrived on the scene.
3. It is imprudent to pin your hopes on someone to help you out of his situation.
4. You can't pin the blame at anyone without verifying facts.

Testbook Solution Correct Option **- 4**
The correct answer is **You can't pin the blame at anyone without verifying facts.**

Key-Points

- In the given question the word '**Pin**' is given. We know that it is used as a Noun and a Verb.
- **When we use it as a Noun its meaning is a small thin piece of metal with a point at one end, especially used for temporarily holding pieces of cloth together.**
  - *Example: I'll keep the trouser patch in place with pins while I sew it on.*
- **When we use it as a Verb its meaning is: to fasten or attach with or as with a pin or pins.**
  - *Example: The debris pinned him down.*
- We know that **'pin the blame'** has no meaning. **'Put the blame'** is the correct Phrase.
- Therefore, the correct answer is Option 4.

Correct Answer: *You can't pin the blame at anyone without verifying facts.*

Que. 112 Pick the most appropriate substitute for the capitalized word in the following sequence.

The weapon inspector's report was not expected to provide INCONTROVERTIBLE evidence of weapons of mass destruction.

1. Conclusive
2. Disputable
3. Inconvenient
4. Indecisive

Testbook Solution Correct Option **- 1**
The correct answer is '**Conclusive**'.

Key-Points

- The exact synonym of the given word '**Incontrovertible**' is '**Conclusive**'.
- **Incontrovertible: impossible to doubt because of being obviously true.**
  - *Example: Her logic is utterly **incontrovertible.***
- **Conclusive: proving that something is true, or ending any doubt.**
  - *Example: They had **conclusive** evidence of her guilt.*
- By reading the above definitions we can infer that the correct answer is '**Conclusive**'.

Correct Answer: *Conclusive.*

Additional Information

- The meaning of the other words given in the option as follows:
  - **Disputable: not certain.**
    *Example: People say that they produce the best athletes in the world, but I think that's **disputable.***
  - **Inconvenient: causing problems or difficulties.**
    *Example: It will be very **inconvenient** for me to have no car.*
  - **Indecisive: the state of being unable to make a choice.**
    *Example: This **indecisive** attitude did not last long, and the split in the party rapidly widened.*

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Que. 113 In the sentence given below, a part of the sentence is underlined.
Four different ways of phrasing the underlined part are indicated as four choices.
Choose the best alternative and mark its corresponding letter as your answer.

A nation is built not by legislation but by the stirrings in the heart of the people.

1. By legislation and by inspiration
2. Not by laws but by the excitement of the people
3. By law and by inciting the people
4. More by the passions in the hearts of the people than by laws

Testbook Solution Correct Option **- 4**
The correct answer is More by the passions in the hearts of the people than by laws.

Key-Points

- The most appropriate replacement of the given underlined part is **More by the passions in the hearts of the people than by laws.**
- **Stirring: A stirring speech or song is one that produces strong, positive emotions.**
- **Passions: a very powerful feeling, for example, love, hate, anger, or other emotion.**
- By reading the above definitions we can infer both are similar words.
- Therefore, the correct replacement is **Option 4.**

Correct Answer: *A nation is built not by legislation but m*ore *by the passions in the hearts of the people than by laws.*

Que. 114 **Select the most suitable synonym for the underlined word in the sentence.**

All the members of the organization expressed implacable opposition to the move.

1. Indignant
2. Adamant
3. Unified
4. Quixotic

Testbook Solution Correct Option **- 2**

The correct answer is '**Adamant**'.

Key-Points

- The exact synonym of the given word **'Implacable' is 'Adamant'.**
- **Implacable: used to describe (someone who has) strong opinions or feelings that are impossible to change.**
  - *Example: He encouraged, even inspired, many others to join in what was early on thought to be an overwhelming task against an **implacable** force.*
- **Adamant: impossible to persuade, or unwilling to change an opinion or decision.**
  - *Example: I've told her she should stay at home and rest but she's **adamant** that she's coming.*
- By reading the above definitions we can infer that the correct answer is **Option 2.**

Correct Answer: *Adamant.*

Additional Information

- The meaning of the other words given in the Options as follows:
  - **Indignant: angry because of something that is wrong or not fair.**
    *Example: She wrote an **indignant** letter to the paper complaining about the council's action.*
  - **Unified: brought together, combined, or united.**
    *Example: We have to be able to speak with a **unified** voice on this subject.*
  - **Quixotic: having or showing ideas that are different and unusual but not practical or likely to succeed.**
    *Example: This is a vast, exciting and some say **quixotic** project.*

Que. 115 **There are two blanks in the sentences given below. From the pairs of word given below the sentences,**
choose the pair that fills the blank most appropriately.

Private companies supplying 'breakfast cereals' have started _____ in agriculture in poorer countries. This has _____ the spectre of land grabs and political conflicts.

1. Spending ... intensified
2. Dealing ... inflated
3. Ploughing ... increased
4. Investing ... raised

Testbook Solution Correct Option **- 4**

The correct answer is Option 4: **'Investing ... raised'.**

Key-Points

- In the given fill in the blanks, the correct answer is **Option 4**. The meaning of the words given in **option 4** as follows:
  - **Investing: to put money, effort, time, etc. into something to make a profit or get an advantage.**
    Example: The institute will invest five million in the project.
  - **Raised: to lift something to a higher position.**
    Example: He raised the window and leaned out.
- By reading the above sentence we can infer that '**Private companies invest**' rather than **spend or deal** in agriculture in poor countries and in the second fill in the blank '**raised**' is the most appropriate answer.
- Therefore, the correct answer is Option 4.

Correct Answer: Private companies supplying 'breakfast cereals' have started i**nvesting** in agriculture in poorer countries. This has **raised** the spectre of land grabs and political conflicts.

Mistake Point

- We tend to go for **Option 1** but it would be wrong because Private Firms 'invest' rather than spend anywhere. Therefore, the correct answer is **Option 4.**

Additional Information

- The meaning of the other words given in the options as follows:
  - Option 1:
    Spending: the money that is used for a particular purpose, especially by a government or organization.
    Intensified: to become greater, more serious, or more extreme, or to make something do this.
  - Option 2:
    Dealing: activities involving buying and selling or business in general.
    Inflated: Inflated prices, costs, numbers, etc. are higher than they should be, or higher than people think is reasonable.
  - Option 3:
    Ploughing: a large farming tool with blades that digs the soil in fields so that seeds can be planted.
    Increased: to (make something) become larger in amount or size.

Que. 116 Use the appropriate phrasal verb and complete the sentence given below.

The new system in education is aimed at _____ the differences between rich and poor.

1. Goof around
2. Evening Out
3. Glossing Over
4. Give Over

Testbook Solution Correct Option **- 2**
The correct answer is '**Evening Out**'.

Key-Points

- In the given sentence the most suitable **Phrasal Verb is 'Evening Out'.** The meaning of it as follows:
- **Evening Out: to become equal, or to make something equal.**
  - *Example: The league is divided into two skill levels in order to even out the competition.*
- By reading the above definition we can infer that the correct answer is **Option 2.**

Correct Answer: *Evening Out.*

Additional Information

- The meaning of the other Phrasal Verbs given in the Options as follows:
  - **Goof around: to spend time doing nothing important or behaving in a silly way.**
    Example: The boys spent the whole summer just goofing around.
  - **Glossing Over: to avoid considering something, such as an embarrassing mistake, to make it seem not important, and to quickly continue talking about something else.**
    Example: She glossed over the company's declining profits.
  - **Give Over: to stop doing something, usually something annoying.**
    Example: It's time you gave over pretending you're still a teenager.

Que. 117 Read the following passage and answer questions.

I have, myself, full confidence that if all do their duty, if nothing is neglected, and if the best arrangements are made, as they are being made, we shall prove ourselves once again able to defend our Island home, to ride out the storm of war, and to outlive the menace of tyranny, if necessary for years, if necessary alone. At any rate, that is what we are going to try to do. That is the resolve of His Majesty's Government-every man of them.

That is the will of the parliament of our nation. The British Empire and the French Republic, linked together in their cause and in their need, will defend to the death their native soil, aiding each other like good comrades to the utmost of their strength. Even though large tracts of Europe and many old and famous States have fallen or may fall into the grip of the Gestapo and all the odious apparatus of Nazi rule, we shall not flag or fail. We shall go on to the end, we shall fight in France, we shall fight on the seas and oceans, we shall fight with growing confidence and growing strength in the air, we shall defend our Island, whatever the cost may be, we shall fight on the beaches, we shall fight on the landing grounds, we shall fight in the fields and in the streets, we shall fight in the hills; we shall never surrender, and even if, which I do not for a moment believe, this island or a large part of it were subjugated and starving, then our Empire beyond the seas, armed and guarded by the British Fleet, would carry on the struggle, until, in God's good time, the New World, with all its power and might, steps forth to the rescue and the liberation of the old."

What does the term *'ride out the storm'* mean?

1. Handle a crisis successfully
2. Hide from storm
3. Hide in some place where one cannot be found.
4. Ride on a boat at the time of storm

Testbook Solution Correct Option **- 1**
The correct answer is 'Handle a crisis successfully'.

Key-Points

- In the given question 'Ride out the storm' is an idiom. The meaning of the given idiom as follows:
- **Ride out the storm: to manage not to be destroyed, harmed, or permanently affected by the difficult situation you experience.**
  - *Example: The government seems confident that it will **ride out the storm.***
- By reading the above definition we can infer that the correct answer is **Option 1.**

Correct Answer: *Handle a crisis successfully.*

Mistake Point

- We tend to go for the other options but it would be wrong because an idiom has a certain meaning. And the meaning of the given idiom is 'Handle a crisis successfully.'
- Therefore, the correct answer is **Option 1.**

Que. 118 What does *'subjugate'* mean?

1. Surrender
2. Compare
3. Control
4. Abandon

Testbook Solution Correct Option **- 3**
The correct answer is 'Control'.

Key-Points

- The exact synonym of the given word **'Subjugate' is 'Control'**. The meaning of the given words as follows:
- **Subjugate: to defeat people or a country and rule them in a way that allows them no freedom.**
  - *Example: Charles determined to subjugate the island and sailed with his fleet for Messina.*
- **Control: to order, limit, or rule something, or someone's actions or behavior.**
  - *Example: You're going to have to learn to control your temper.*
- By reading the above definitions we can infer that the most similar word of the **Subjugate is Control.**
- Therefore, the correct answer is **Option 3.**

Correct Answer: *Control.*

Additional Information

- The meaning of the other words given in the options as follows:
  - **Surrender: to stop fighting and admit defeat.**
    Example: They would rather die than surrender.
  - **Compare: to examine or look for the difference between two or more things.**
    Example: If you compare house prices in the two areas, it's quite amazing how different they are.
  - **Abandon: to leave a place, thing, or person, usually forever.**
    Example: We had to abandon the car.

Que. 119 "That is the resolve of His Majesty's Government." What is their resolve?

1. Surrender to the Nazis
2. Negotiate with the Nazis.
3. Run away from the Nazis.
4. Fight the Nazis.

Testbook Solution Correct Option **- 4**
The correct answer is **'Fight the Nazis'.**

Key-Points

- The given passage is about **"The War of the British and French with the Nazis."**
- The third line of the second passage clearly talks about **the odious apparatus of Nazi rule. And the resolve of the British government to fight to the bitter end against the Nazi Government.**
- **And everyone in the British Parliament has resolved to end the Nazi rule.**
- The resolve of His Majesty's Government is **'Fight the Nazis'.**
- Therefore, the correct answer is **Option 4.**

Correct Answer: *Fight the Nazis.*

Additional Information

- **Nazi Rule:** Nazi Germany, officially known as the German Reich until 1943 and Greater German Reich in 1943–45, was the German state between 1933 and 1945 when Adolf Hitler and the Nazi Party controlled the country as a fascist dictatorship.

Que. 120 A question paper must have a question on one of the 8 poets; A, B, C, D, E, F, G or H. First 4 belong to medieval period while the rest are considered modern poets. Generally modern poets figure in the question papers in alternate years. Generally those who like H like G also; and those who like F like E also. The paper setters do not like to ask about F as he was written book on F, but he likes F. last year, the paper contained a question on A. On the basis of information given, this year paper is most likely to contain a question on

1. C
2. E
3. F
4. H

Testbook Solution Correct Option **- 2**
Given:

8 poets; A, B, C, D, E, F, G or H. First 4 belong to the medieval period while the rest are considered modern poets.

According to the question:

1. Generally modern poets figure in the question papers in alternate years.

2. Generally those who like H like G also; and those who like F like E also.

3. The paper setters do not like to ask about F as he was written a book on F, but he likes F.

4. Last year, the paper contained a question on A.

By checking the option:

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1. C can not be the answer because last year, the paper contained a question on A and generally modern poets figure in the question papers in alternate years.

2. E is the answer because generally those who like H like G also; and those who like F like E also and the paper setters do not like to ask about F as he was written a book on F, but he likes F and also the paper contained a question on A and generally modern poets figure in the question papers in alternate years.

3. F can not be the answer because the paper setters do not like to ask about F as he was written a book on F, but he likes F.

4.H can not be the answer because the paper setters do not like to ask about F as he was written a book on F, but he likes F and those who like F like E also.

Hence, 'E' is the correct answer.

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120 Questions

Que. 1	Correct Option - 4
Que. 2	Correct Option - 3
Que. 3	Correct Option - 4
Que. 4	Correct Option - 2
Que. 5	Correct Option - 1
Que. 6	Correct Option - 4
Que. 7	Correct Option - 1
Que. 8	Correct Option - 4
Que. 9	Correct Option - 2
Que. 10	Correct Option - 3
Que. 11	Correct Option - 2
Que. 12	Correct Option - 2
Que. 13	Correct Option - 3
Que. 14	Correct Option - 1
Que. 15	Correct Option - 1
Que. 16	Correct Option - 2
Que. 17	Correct Option - 1
Que. 18	Correct Option - 1
Que. 19	Correct Option - 4
Que. 20	Correct Option - 3
Que. 21	Correct Option - 3
Que. 22	Correct Option - 2
Que. 23	Correct Option - 1
Que. 24	Correct Option - 4
Que. 25	Correct Option - 2

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Que. 26	Correct Option - 4
Que. 27	Correct Option - 2
Que. 28	Correct Option - 2
Que. 29	Correct Option - 4
Que. 30	Correct Option - 2
Que. 31	Correct Option - 1
Que. 32	Correct Option - 3
Que. 33	Correct Option - 4
Que. 34	Correct Option - 3
Que. 35	Correct Option - 4
Que. 36	Correct Option - 1
Que. 37	Correct Option - 1
Que. 38	Correct Option - 4
Que. 39	Correct Option - 3
Que. 40	Correct Option - 4
Que. 41	Correct Option - 3
Que. 42	Correct Option - 4
Que. 43	Correct Option - 1
Que. 44	Correct Option - 3
Que. 45	Correct Option - 2
Que. 46	Correct Option - 3
Que. 47	Correct Option - 3
Que. 48	Correct Option - 4
Que. 49	Correct Option - 2
Que. 50	Correct Option - 1
Que. 51	Correct Option - 3

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Que. 52	Correct Option - 1
Que. 53	Correct Option - 1
Que. 54	Correct Option - 4
Que. 55	Correct Option - 1
Que. 56	Correct Option - 3
Que. 57	Correct Option - 1
Que. 58	Correct Option - 1
Que. 59	Correct Option - 2
Que. 60	Correct Option - 1
Que. 61	Correct Option - 4
Que. 62	Correct Option - 2
Que. 63	Correct Option - 1
Que. 64	Correct Option - 4
Que. 65	Correct Option - 3
Que. 66	Correct Option - 4
Que. 67	Correct Option - 1
Que. 68	Correct Option - 2
Que. 69	Correct Option - 3
Que. 70	Correct Option - 1
Que. 71	Correct Option - 2
Que. 72	Correct Option - 2
Que. 73	Correct Option - 2
Que. 74	Correct Option - 3
Que. 75	Correct Option - 1
Que. 76	Correct Option - 3
Que. 77	Correct Option - 3
Que. 78	

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	Correct Option - 1
Que. 79	Correct Option - 1
Que. 80	Correct Option - 3
Que. 81	Correct Option - 4
Que. 82	Correct Option - 3
Que. 83	Correct Option - 2
Que. 84	Correct Option - 2
Que. 85	Correct Option - 2
Que. 86	Correct Option - 3
Que. 87	Correct Option - 4
Que. 88	Correct Option - 3
Que. 89	Correct Option - 2
Que. 90	Correct Option - 1
Que. 91	Correct Option - 1
Que. 92	Correct Option - 3
Que. 93	Correct Option - 2
Que. 94	Correct Option - 4
Que. 95	Correct Option - 1
Que. 96	Correct Option - 3
Que. 97	Correct Option - 2
Que. 98	Correct Option - 4
Que. 99	Correct Option - 1
Que. 100	Correct Option - 2
Que. 101	Correct Option - 1
Que. 102	Correct Option - 2
Que. 103	Correct Option - 2
Que. 104	

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	Correct Option - 3
Que. 105	Correct Option - 1
Que. 106	Correct Option - 3
Que. 107	Correct Option - 2
Que. 108	Correct Option - 1
Que. 109	Correct Option - 3
Que. 110	Correct Option - 4
Que. 111	Correct Option - 4
Que. 112	Correct Option - 1
Que. 113	Correct Option - 4
Que. 114	Correct Option - 2
Que. 115	Correct Option - 4
Que. 116	Correct Option - 2
Que. 117	Correct Option - 1
Que. 118	Correct Option - 3
Que. 119	Correct Option - 4
Que. 120	Correct Option - 2

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