testbook

NIMCET

NIMCET 2018 Official Paper

120 mins | 480 marks | 120 questions

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English

NIMCET 2018 Previous Year Paper

120 Questions

Que. 1 What is the value of $6 + \log_{\frac{1}{4}}\left(\frac{1}{\sqrt{2}}\sqrt{1-\frac{1}{\sqrt{2}}\sqrt{1-\frac{1}{\sqrt{2}}\sqrt{1-\frac{1}{\sqrt{2}}\ldots\infty}}}\right)$?

1. 6
2. $\frac{13}{2}$
3. 4
4. $\frac{25}{4}$

Testbook Solution Correct Option **- 2**

Concept:

- If $a^x = y$, we say $\log_a y = x$.
- The solution to the quadratic equation $ax^2 + bx + c = 0$ is given by: $x = \frac{-b\pm\sqrt{b^2-4ac}}{2a}$.

Calculation:

Let $x = \frac{1}{\sqrt{2}}\sqrt{1-\frac{1}{\sqrt{2}}\sqrt{1-\frac{1}{\sqrt{2}}\sqrt{1-\frac{1}{\sqrt{2}}\ldots\infty}}}$

$\Rightarrow x = \frac{1}{\sqrt{2}}\sqrt{1-\left(\frac{1}{\sqrt{2}}\sqrt{1-\frac{1}{\sqrt{2}}\sqrt{1-\frac{1}{\sqrt{2}}\ldots\infty}}\right)}$

$\Rightarrow x = \frac{1}{\sqrt{2}}\sqrt{1-x}$

Squaring both sides, we get:

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

$\Rightarrow 2x^2 + x - 1 = 0$

$\Rightarrow 2x^2 + 2x - x - 1 = 0$

$\Rightarrow 2x(x + 1) - (x + 1) = 0$

$\Rightarrow (x + 1)(2x - 1) = 0$

$\Rightarrow x + 1 = 0$ OR $2x - 1 = 0$

$\Rightarrow x = -1$ OR $x = \frac{1}{2}$

Discarding $x = -1$, the value of x is $\frac{1}{2}$.

$\therefore 6 + \log_{\frac{1}{4}}\left(\frac{1}{\sqrt{2}}\sqrt{1-\frac{1}{\sqrt{2}}\sqrt{1-\frac{1}{\sqrt{2}}\sqrt{1-\frac{1}{\sqrt{2}}\ldots\infty}}}\right)$

$= 6 + \log_{\frac{1}{4}}\left(\frac{1}{2}\right)$

Let $\log_{\frac{1}{4}}\left(\frac{1}{2}\right) = m$.

$\Rightarrow \left(\frac{1}{4}\right)^m = \frac{1}{2}$

$\Rightarrow \left(\frac{1}{2}\right)^{2m} = \left(\frac{1}{2}\right)^1$

$\Rightarrow 2m = 1$

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

$\therefore$ The required value is: $6 + m$

$= 6 + \frac{1}{2}$

$= \frac{13}{2}$.

Que. 2 The function $f(x) = \log\left(x + \sqrt{x^2 + 1}\right)$ is:

1. An even function.
2. An odd function.
3. A periodic function.
4. Neither an even nor an odd function.

Testbook Solution Correct Option **- 2**

Concept:

- A function f(x) is:
  - Even, if f(-x) = f(x).
  - Odd, if f(-x) = -f(x).
  - Periodic, if f(np ± x) = f(x), for some number p and n ∈ Z.
- log a + log b = log (ab).
- log 1 = 0.

Calculation:

We have $f(x) = \log\left(x + \sqrt{x^2 + 1}\right)$.

$\Rightarrow f(-x) = \log\left(-x + \sqrt{x^2 + 1}\right)$.

Now, $f(x) + f(-x) = \log\left(x + \sqrt{x^2 + 1}\right) + \log\left(-x + \sqrt{x^2 + 1}\right)$

$= \log\left[\left(x + \sqrt{x^2 + 1}\right)\left(-x + \sqrt{x^2 + 1}\right)\right]$

$= \log\left[\left(\sqrt{x^2 + 1}\right)^2 - x^2\right]$

$= \log 1$

$= 0$

$\Rightarrow$ f(-x) = -f(x).

$\therefore$ f(x) is an **odd function**.

Que. 3 Two persons A and B agree to meet on 20th April 2018 between 6 P.M. and 7 P.M., with the understanding that they will wait no longer than 20 minutes for the other. What is the probability that they meet?

1. $\frac{5}{9}$
2. $\frac{7}{9}$
3. $\frac{2}{9}$

4. $\frac{4}{9}$

Testbook Solution Correct Option **- 1**

Concept:

Meeting Probabilities: Given n independent random variables, each evenly distributed over the interval 0 to 1, the probability that all n are within q fraction of each other (for any q < 1), is: $P_n = nq^{n-1} - (n-1)q^n$.

Calculation:

In the given question, n = 2, and for them to be within 20 mins of each other in a span of 60 mins, $q = \frac{20}{60} = \frac{1}{3}$.

The required probability is:

$\Rightarrow P_2 = 2\left(\frac{1}{3}\right)^{2-1} - (2-1)\left(\frac{1}{3}\right)^2$

$\Rightarrow P_2 = \frac{2}{3} - \frac{1}{9}$

$\Rightarrow P_2 = \frac{5}{9}$

The probability that both A and B will meet is $\frac{5}{9}$.

Que. 4 Three numbers a, b and c are chosen at random (simultaneously) from among the numbers 1, 2, 3, ..., 99. The probability that $a^3 + b^3 + c^3 - 3abc$ is divisible by 3, is

1. $\frac{3\times{}^{33}C_3+\left({}^{33}C_1\right)^3}{{}^{99}C_3}$
2. $\frac{3\times{}^{33}C_3-\left({}^{33}C_1\right)^3}{{}^{99}C_3}$
3. $\frac{2\times{}^{33}C_3+\left({}^{33}C_1\right)^3}{{}^{99}C_3}$
4. $\frac{2\times{}^{33}C_3-\left({}^{33}C_1\right)^3}{{}^{99}C_3}$

Testbook Solution Correct Option **- 1**

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.
- **Basic Principle of Counting:** If there are m ways for happening of an event A, and corresponding to each possibility there are n ways for happening of event B, then the total number of different possible ways for happening of events A and B are:
  - Either event A alone **OR** event B alone: **m + n**.
  - Both event A **AND** event B together: **m × n**.
- The number of ways in which r distinct objects can be selected from a group of n distinct objects, is: ${}^nC_r = \frac{n!}{r!(n-r)!}$.
- If a number is divided by n, then the possible standard remainders are: 0, 1, 2, ..., (n - 1).

Calculation:

If a number is divided by 3, the possible remainders when a number are 0, 1 and 2.

From 1 to 99, there are 33 numbers with remainders 0, 1 and 2 each.

Consider the divisibility of the expression $a^3 + b^3 + c^3 - 3abc$ by 3.

3abc is always divisible by 3 for any values of a, b and c.

	Remainder when divided by 3		
x	0	1	2
x^3	0	1	2

Now $a^3 + b^3 + c^3$ will be divisible by 3 if:

(All three have the same remainders) OR (One of them has remainder 0, one has remainder 1 and one has remainder 2)

Number of possibilities will be:

$n(A) = 3 \times {}^{33}C_3 + ({}^{33}C_1)^3$

The total number of ways of selecting any three numbers is: $N = {}^{99}C_3$.

The required probability is: $\frac{n(A)}{N} = \frac{3\times{}^{33}C_3+({}^{33}C_1)^3}{{}^{99}C_3}$.

Que. 5 A and B play a game where each is asked to select a number from 1 to 25. If the two numbers match, both of them win a prize. The probability that they will not win a prize in a single trial, is:

1. $\frac{1}{25}$
2. $\frac{24}{25}$
3. $\frac{2}{25}$
4. None of these.

Testbook Solution Correct Option **- 2**

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.
- P(not A) = 1 - P(A).
- **Basic Principle of Counting:** If there are m ways for happening of an event A, and corresponding to each possibility there are n ways for happening of event B, then the total number of different possible ways for happening of events A and B are:
  - Either event A alone **OR** event B alone: **m + n**.
  - Both event A **AND** event B together: **m × n**.

Calculation:

The total number of possible pairs of selected numbers = N = 25 × 25 = 625.

If the numbers match, then both the numbers should be (1, 1), (2, 2), ... and so on.

Let's say that A is the event that both the selected numbers match.

The number of possible cases where the numbers match = n(A) = 25.

And. $P(A) = \frac{n(A)}{N} = \frac{25}{625} = \frac{1}{25}$.

∴ Probability that the numbers will not match = 1 - P(A) = $\frac{24}{25}$.

Hence, the probability of not winning a prize is $\frac{24}{25}$.

Que. 6 The quadratic equation whose roots are $\sin^2 18°$ and $\cos^2 36°$, is:

1. $16x^2 - 12x + 1 = 0$
2. $16x^2 + 12x + 1 = 0$
3. $16x^2 - 12x - 1 = 0$
4. $16x^2 + 12x - 1 = 0$

Testbook Solution Correct Option **- 1**

Concept:

- **Trigonometric Values:**

  $\sin 18° = \frac{\sqrt{5}-1}{4}$.

  $\cos 36° = \frac{\sqrt{5}+1}{4}$.

- The quadratic equation whose roots are α and β is given by:

  $(x - \alpha)(x - \beta) = 0$

  $\Rightarrow x^2 - (\alpha + \beta)x + \alpha\beta = 0$

Calculation:

Let's say that the roots of the quadratic equation are $\alpha = \sin^2 18°$ and $\beta = \cos^2 36°$.

$\alpha = \sin^2 18° = \left(\frac{\sqrt{5}-1}{4}\right)^2 = \frac{6-2\sqrt{5}}{16} = \frac{3-\sqrt{5}}{8}$.

$\beta = \cos^2 36° = \left(\frac{\sqrt{5}+1}{4}\right)^2 = \frac{6+2\sqrt{5}}{16} = \frac{3+\sqrt{5}}{8}$.

Now, $\alpha + \beta = \frac{3-\sqrt{5}}{8} + \frac{3+\sqrt{5}}{8} = \frac{3}{4}$.

And, $\alpha\beta = \left(\frac{3-\sqrt{5}}{8}\right)\left(\frac{3+\sqrt{5}}{8}\right) = \frac{9-5}{64} = \frac{1}{16}$.

∴ The required equation is:

$x^2 - (\alpha + \beta)x + \alpha\beta = 0$

$\Rightarrow x^2 - (\frac{3}{4})x + \frac{1}{16} = 0$

On multiplying by 16, we get:

$\Rightarrow$ **$16x^2 - 12x + 1 = 0$**.

Additional Information

- $\sin 18° = \frac{\sqrt{5}-1}{4}$.
- $\cos 36° = \frac{\sqrt{5}+1}{4}$.
- $\sin 36° = \sqrt{\frac{5-\sqrt{5}}{8}}$.
- $\cos 18° = \sqrt{\frac{5+\sqrt{5}}{8}}$.

Que. 7 Sum to infinity of a geometric is twice the sum of first two terms. Then what are the possible values of the common ratio?

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

Testbook Solution Correct Option **- 1**

Concept:

- **Geometric Progression (GP):** The series of numbers where the ratio of any two consecutive terms is the same, is called a Geometric Progression.
- A Geometric Progression of n terms with first term a and common ratio r is represented as: a, ar, ar^2, ar^3, ..., ar^{n-2}, ar^{n-1}
- The sum of the first n terms of a GP is: $S_n = a\left(\frac{r^n-1}{r-1}\right)$.
- If $|r| < 1$, then $S_\infty = \frac{a}{1-r}$.

Calculation:

Let the first term of the GP be a and the common ratio be r.

According to the question:

$S_\infty = 2(a + ar)$

$\Rightarrow \frac{a}{1-r} = 2a(1+r)$

$\Rightarrow (1+r)(1-r) = \frac{1}{2}$

$\Rightarrow 1 - r^2 = \frac{1}{2}$

$\Rightarrow r^2 = \frac{1}{2}$

$\Rightarrow r = \pm\frac{1}{\sqrt{2}}$

Hence, the possible values of the common ratio are $\pm\frac{1}{\sqrt{2}}$.

Que. 8 Suppose that m and n are fixed numbers such that the m^{th} term of an HP is equal to n and the n^{th} term is equal to m, $(m \neq n)$. Then the $(m + n)^{th}$ term is:

1. $\frac{m+n}{mn}$
2. $\frac{mn}{m+n}$
3. $\frac{m+n}{n}$
4. $\frac{m+n}{m}$

Testbook Solution Correct Option **- 2**

Concept:

- **Harmonic Progression (HP):** The series of numbers where the reciprocals of the terms are in Arithmetic Progression, is called a Harmonic Progression.
- **Arithmetic Progression (AP):** The series of numbers where the difference of any two consecutive terms is the same, is called an Arithmetic Progression.

If a be the first term, d be the common difference and n be the number of terms of an AP, then the sequence can be written as follows:

a, a + d, a + 2d, ..., a + (n - 1)d

The n^{th} term of the AP is: $a_n = a + (n - 1)d$.

Calculation:

Every term an HP is the reciprocal of the corresponding terms of an AP.

Let a be the first term and d be the common difference of the AP.

According to the question:

$T_m = n$

$\Rightarrow \frac{1}{a+(m-1)d} = n$

$\Rightarrow a + (m - 1)d = \frac{1}{n}$ ... (1)

$T_n = m$

$\Rightarrow \frac{1}{a+(n-1)d} = m$

$\Rightarrow a + (n - 1)d = \frac{1}{m}$ ... (2)

Subtracting equation (2) from equation (1), we get:

$(m - n)d = \frac{1}{n} - \frac{1}{m}$

$\Rightarrow d = \frac{1}{mn}$ ... (3)

Substituting this value of d in any of the equations (1) or (2), we get:

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

$\Rightarrow a = \frac{1}{n} - \frac{m-1}{mn}$

$\Rightarrow a = \frac{1}{mn}$ ... (4)

The $(m + n)^{th}$ term of the AP will be:

$a_{m+n} = a + (m + n - 1)d$

Using the values in equations (3) and (4), we get:

$\Rightarrow a_{m+n} = \frac{1}{mn} + (m + n - 1)\left(\frac{1}{mn}\right)$

$\Rightarrow a_{m+n} = \frac{m+n}{mn}$

And the $(m + n)^{th}$ term of the HP will be:

$T_{m+n} = \frac{1}{a_{m+n}} = \frac{mn}{m+n}$.

Que. 9 If A is an invertible skew-symmetric matrix, then A^{-1} is a:

1. Symmetric matrix.
2. Skew-symmetric matrix.
3. Zero matrix.
4. Identity matrix.

Testbook Solution Correct Option **- 2**

Concept:

- A **skew-symmetric** (or anti-symmetric or anti-metric) matrix is a square matrix A = [a_{ij}] such that $a_{ij} = -a_{ji}$ for every i, j.
- The transpose of a skew-symmetric matrix equals its negative: $A^T = -A$.
- The inverse of the transpose of a matrix is equal to the transpose of its inverse: $(A^T)^{-1} = (A^{-1})^T$.

Calculation:

Since A is an skew-symmetric matrix, we must have:

$A^T = -A$

Because A is given to be invertible, on taking the inverse of both sides, we get:

$(A^T)^{-1} = (-A)^{-1}$

We also know that $(A^T)^{-1} = (A^{-1})^T$.

$\therefore (A^{-1})^T = -(A^{-1})$

Since the transpose of A^{-1} is equal to its negative, A^{-1} is a **skew-symmetric matrix**.

Additional Information

- The elements on the diagonal of a skew-symmetric matrix are zero. i.e. $a_{ij} = 0$, for i = j.
- For a n×n skew-symmetric matrix A: $\det(A^T) = \det(-A) = (-1)^n \det(A)$.
- All odd dimension skew symmetric matrices are singular as their determinants are always zero.

Que. 10 If the mean of the squares of the first n natural numbers is 11, then n is equal to:

1. $-\frac{13}{2}$
2. 11
3. 5
4. 4

Testbook Solution Correct Option **- 3**

Concept:

- **Average/Mean:** Mean of 'n' observations = $\bar{x} = \frac{\text{Sum of Observations}}{n} = \frac{\sum_{i=1}^{n} x_i}{n}$.
- Sum of the squares of the first n natural numbers = $\sum n^2 = \frac{n(n+1)(2n+1)}{6}$.

Calculation:

We know that the sum of the squares of the first n natural numbers = $\frac{n(n+1)(2n+1)}{6}$.

$\therefore$ Mean of the squares of the first n natural numbers = $\frac{\frac{n(n+1)(2n+1)}{6}}{n} = \frac{(n+1)(2n+1)}{6}$.

According to the question: Mean = 11.

$\Rightarrow \frac{(n+1)(2n+1)}{6} = 11$

$\Rightarrow 2n^2 + n + 2n + 1 = 66$

$\Rightarrow 2n^2 + 3n - 65 = 0$

$\Rightarrow 2n^2 + 13n - 10n - 65 = 0$

$\Rightarrow n(2n + 13) - 5(2n + 13) = 0$

$\Rightarrow (2n + 13)(n - 5) = 0$

$\Rightarrow 2n + 13 = 0$ OR $n - 5 = 0$

$\Rightarrow n = -\frac{13}{2}$ OR $n = 5$.

Since n is a count, n = **5**.

Check: Sum of the squares of the first 5 natural numbers = $1^2 + 2^2 + 3^2 + 4^2 + 5^2 = 1 + 4 + 9 + 16 + 25 = 55$.

Mean = $55 \div 5 = 11$.

Additional Information

- Sum of the first n natural numbers = $\sum n = \frac{n(n+1)}{2}$.
- Sum of the cubes of the first n natural numbers = $\sum n^3 = \left[\frac{n(n+1)}{2}\right]^2$.

Que. 11 The set of points where $f(x) = \frac{x}{1+|x|}$ is differentiable, is:

1. $(-\infty, -1) \cup (1, \infty)$
2. $(-\infty, \infty)$
3. $(0, \infty)$
4. $(-\infty, 0) \cup (0, \infty)$

Testbook Solution Correct Option - **2**

Concept:

- **Differentiability of a Function:** A function f(x) is differentiable at x = a in its domain if its derivative is continuous at a.
  This means that f'(a) must exist, or equivalently: $\lim_{x\to a^+} f'(x) = \lim_{x\to a^-} f'(x) = \lim_{x\to a} f'(x) = f'(a)$.
- The **Modulus Function** '| |' is defined as: $|x| = \begin{cases} x, & x \geq 0 \\ -x, & x < 0 \end{cases}$.

Calculation:

By using the definition of modulus function, the given function can be written as: $f(x) = \begin{cases} \frac{x}{1+x}, & x > 0 \\ 0, & x = 0 \\ \frac{x}{1-x}, & x < 0 \end{cases}$.

Since the expressions for f(x) change for $x > 0$ and $x < 0$, let us compare the limits of the derivatives as $x \to 0$.

For $x > 0$, $f(x) = \frac{x}{1+x}$.

$\Rightarrow f'(x) = x\left[\frac{d}{dx}\left(\frac{1}{1+x}\right)\right] + \left(\frac{d}{dx}x\right)\frac{1}{1+x}$

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

$\Rightarrow f'(x) = \frac{1}{(1+x)^2}$

$\Rightarrow \lim_{x\to 0^+} f'(x) = 1$.

Similarly, for $x < 0$, $f(x) = \frac{x}{1-x}$.

$\Rightarrow \lim_{x\to 0^-} f'(x) = \lim_{x\to 0^-} \frac{1}{(1-x)^2} = 1.$

Since $\lim_{x\to 0^+} f'(x) = \lim_{x\to 0^-} f'(x) = 1$, the function f(x) is differentiable at x = 0, and f'(0) = 1.

Also, $\lim_{x\to \infty^+} f'(x) = \lim_{x\to \infty^-} f'(x) = 0$.

∴ The function is differentiable in **(-∞, ∞)**, i.e. it is differentiable everywhere.

Que. 12 $\int_0^{\pi} x\, f(\sin x)\, dx$ is equal to:

1. $\pi \int_0^{\pi/2} f(\sin x)\, dx$
2. $\frac{\pi}{2} \int_0^{\pi/2} f(\sin x)\, dx$
3. $\pi \int_0^{\pi/2} f(\cos x)\, dx$
4. $\frac{\pi}{2} \int_0^{\pi} f(\cos x)\, dx$

Testbook Solution Correct Option **- 1**

Concept:

- $\int_a^b f(x)\, dx = \int_a^b f(a + b - x)\, dx.$
- If f(x) = f(2a - x), then $\int_0^{2a} f(x)\, dx = 2\int_0^a f(x)\, dx.$
- sin (-θ) = -sin θ.
- sin (nπ + θ) = $(-1)^n$ sin θ.

Calculation:

Let $I = \int_0^{\pi} x\, f(\sin x)\, dx.$

Using $\int_a^b f(x)\, dx = \int_a^b f(a + b - x)\, dx$, we get:

$\Rightarrow I = \int_0^{\pi} (\pi - x)\, f[\sin(\pi - x)]\, dx$

$\Rightarrow I = \int_0^{\pi} \pi\, f(\sin x)\, dx - \int_0^{\pi} x\, f(\sin x)\, dx$

$\Rightarrow 2I = \pi \int_0^{\pi} f(\sin x)\, dx$

Since f[sin (π - x)] = f(sin x), using $\int_0^{2a} f(x)\, dx = 2\int_0^a f(x)\, dx$, we get:

$\Rightarrow 2I = 2\pi \int_0^{\pi/2} f(\sin x)\, dx$

$\Rightarrow I = \pi \int_0^{\pi/2} f(\sin x)\, dx.$

Additional Information

A function f(x) is:

- Even, if f(-x) = f(x). And $\int_{-a}^{a} f(x)\, dx = 2\int_0^a f(x)\, dx.$
- Odd, if f(-x) = -f(x). And $\int_{-a}^{a} f(x)\, dx = 0.$

Que. 13 Let $f : R \to R$ be defined by $f(x) = \begin{cases} x + 2 & \text{if } x < 0 \\ |x - 2| & \text{if } x \geq 0 \end{cases}$. Find $\int_{-2}^{3} f(x)\, dx.$

1. 0.5
2. 2.5
3. 4.5
4. 6.5

Testbook Solution Correct Option **- 3**

Concept:

- **Definite Integral:** If $\int f(x)dx = g(x) + C$, then $\int_a^b f(x)\,dx = [g(x)]_a^b = g(b) - g(a)$.
- If $a \le c \le b$, then $\int_a^b f(x)\,dx = \int_a^c f(x)\,dx + \int_c^b f(x)\,dx$.
- $\int x^n\,dx = \frac{x^{n+1}}{n+1} + C$.

Calculation:

The given function can be summarized as follows:

x	$x < 0$	$0 \le x \le 2$	$2 \le x$
f(x)	x + 2	2 - x	x - 2

Since the given function is a multi-valued function, let us separate the given definite integral into parts where the expressions of the function are different:

$\int_{-2}^{3} f(x)\,dx = \int_{-2}^{0} f(x)\,dx + \int_{0}^{2} f(x)\,dx + \int_{2}^{3} f(x)\,dx$

$= \int_{-2}^{0} (x+2)\,dx + \int_{0}^{2} (2-x)\,dx + \int_{2}^{3} (x-2)\,dx$

$= \left[\frac{x^2}{2} + 2x\right]_{-2}^{0} + \left[2x - \frac{x^2}{2}\right]_{0}^{2} + \left[\frac{x^2}{2} - 2x\right]_{2}^{3}$

$= [0 - (2-4)] + [4 - 2 - 0)] + \left[\frac{9}{2} - 6 - (2-4)\right]$

$= 2 + 2 + \frac{9}{2} - 4$

$=$ **4.5**

Que. 14 Slope of the two lines $6x^2 - xy - 2y^2 = 0$ differ by:

1. $\frac{5}{2}$
2. $\frac{7}{2}$
3. $\frac{7}{5}$
4. -1

Testbook Solution Correct Option **- 2**

Concept:

- For a pair of lines $ax^2 + 2hxy + by^2 = 0$:
  Sum of the slopes is: $-\frac{2h}{b}$.
  Product of the slopes is: $\frac{a}{b}$.
- $(a - b)^2 = (a + b)^2 - 4ab$.

Calculation:

The given equation of the pair of lines is $6x^2 - 2xy - 2y^2 = 0$.

Comparing this with the general equation of a pair of lines $ax^2 + 2hxy + by^2 = 0$, we have:

$a = 6$, $2h = -1$ and $b = -2$.

Let the slopes of the lines be p and q.

Product of slopes is: $\frac{a}{b}$.

$\Rightarrow pq = \frac{6}{-2} = -3$ ... (1)

Sum of slopes is: $-\frac{2h}{b}$.

$\Rightarrow p + q = -\frac{-1}{-2} = -\frac{1}{2}$ ... (2)

Now, $(p - q)^2 = (p + q)^2 - 4pq$.

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

$\Rightarrow (p - q)^2 = \left(-\frac{1}{2}\right)^2 - 4(-3)$

$\Rightarrow (p - q)^2 = \frac{1}{4} + 12 = \frac{49}{4}$

$\Rightarrow p - q = \pm\frac{7}{2}$

∴ The difference between the slopes of both the lines is $\frac{7}{2}$.

Additional Information

The angle θ, between the pair of lines $ax^2 + 2hxy + by^2 = 0$, is given by: $\tan\theta = \frac{2\sqrt{h^2 - ab}}{a+b}$.

Que. 15 If the radius of the circle changes at the rate of $-\frac{2}{\pi}$ m/sec, at what rate does the circle's area change when the radius is 10 m?

1. 40 m^2/sec
2. 30 m^2/sec
3. -30 m^2/sec
4. -40 m^2/sec

Testbook Solution Correct Option **- 4**

Concept:

- The area of a circle with r units, is: πr^2 sq. units.
- The rate of change of the value of a function f(x) with respect to a variable t, is given by: $\frac{d}{dt}f(x)$.
- **Chain Rule of Derivatives:** $\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$.
- $\frac{d}{dx}x^n = nx^{n-1}$.

Calculation:

Let's say that the radius of the circle is r meters and let t be the time in seconds.

It is given that $\frac{dr}{dt} = -\frac{2}{\pi}$ m/sec.

Now, Area of the circle: $A = \pi r^2$ m^2.

Using the chain rule of derivatives:

$\frac{dA}{dt} = \frac{dA}{dr} \times \frac{dr}{dt}$

$\Rightarrow \frac{dA}{dt} = 2\pi r \times \frac{-2}{\pi}\ m^2/sec$

$\Rightarrow \frac{dA}{dt} = -4r\ m^2/sec$

When the radius is 10 m, the rate of change of area will be: **-40 m^2/sec**.

NOTE: A negative value of the rate of change indicates a decrease.

Que. 16 The point of intersection of the circle $x^2 + y^2 + 10x - 12y + 51 = 0$ and the line $3y + x = 3$ is:

1. (-6, 3)
2. (3, -6)
3. (6, -3)
4. (-3, 6)

Testbook Solution Correct Option **- 1**

Concept:

Two curves f(x, y) = 0 and g(x, y) = 0 cut/touch at a point P(a, b) if f(a, b) = g(a, b) = 0.

Calculation:

Let the circle $f(x, y) = x^2 + y^2 + 10x - 12y + 51 = 0$ and the line $g(x, y) = 3y + x - 3 = 0$ intersect at a point P(a, b).

$\therefore g(a, b) = 0$

$3b + a - 3 = 0$

$\Rightarrow a = 3 - 3b$ ... (1)

And, $f(a, b) = 0$

$\Rightarrow a^2 + b^2 + 10a - 12b + 51 = 0$

Using equation (1), we get:

$\Rightarrow (3 - 3b)^2 + b^2 + 10(3 - 3b) - 12b + 51 = 0$

$\Rightarrow 9 - 18b + 9b^2 + b^2 + 30 - 30b - 12b + 51 = 0$

$\Rightarrow 10b^2 - 60b + 90 = 0$

$\Rightarrow b^2 - 6b + 9 = 0$

$\Rightarrow (b - 3)^2 = 0$

$\Rightarrow b = 3$

And, using equation (1):

$a = 3 - 3\times3 = 3 - 9 = -6$.

Therefore, the given curves intersect at point **(-6, 3)**.

Que. 17 The number of the solutions of the equation $\sin x + \sin 5x = \sin 3x$, lying in the interval $[0, \pi]$, is:

1. 4
2. 6
3. 5
4. 2

Testbook Solution Correct Option **- 2**

Concept:

- $\sin(A \pm B) = \sin A \cos B \pm \sin B \cos A$.
- $\sin 2A + \sin 2B = 2 \sin(A + B) \cos(A - B)$.
- $\cos(2n\pi + \theta) = \cos \theta$.

Calculation:

$\sin x + \sin 5x = \sin 3x$

Using $\sin 2A + \sin 2B = 2 \sin(A + B) \cos(A - B)$, we get:

$2 \sin 3x \cos 2x = \sin 3x$

$\Rightarrow \sin 3x (2 \cos 2x - 1) = 0$

$\Rightarrow \sin 3x = 0$ OR $2 \cos 2x - 1 = 0$

CASE 1: $\sin 3x = 0 = \sin n\pi$, $n \in Z$.

$\Rightarrow x = \frac{n\pi}{3}$

$\Rightarrow x = \ldots, 0, \frac{\pi}{3}, \frac{2\pi}{3}, \pi, \ldots$

CASE 2: $2 \cos 2x - 1 = 0$

$\Rightarrow \cos 2x = \frac{1}{2} = \cos\left(2n\pi \pm \frac{\pi}{3}\right)$, $n \in Z$.

$\Rightarrow x = n\pi \pm \frac{\pi}{6} = (6n \pm 1)\frac{\pi}{6}$

$\Rightarrow x = \ldots, \frac{\pi}{6}, \frac{5\pi}{6}, \ldots$

Therefore, there are **6** possible values of x in the interval $[0, \pi]$.

Additional Information

Trigonometric Ratios for Allied Angles:

- $\sin(-\theta) = -\sin \theta$.
- $\cos(-\theta) = \cos \theta$.
- $\sin(2n\pi + \theta) = \sin \theta$.
- $\cos(2n\pi + \theta) = \cos \theta$.
- $\sin(n\pi + \theta) = (-1)^n \sin \theta$.
- $\cos(n\pi + \theta) = (-1)^n \cos \theta$.
- $\sin\left[(2n + 1)\frac{\pi}{2} + \theta\right] = (-1)^n \cos \theta$.
- $\cos\left[(2n + 1)\frac{\pi}{2} + \theta\right] = (-1)^n (-\sin \theta)$.

Que. 18 In an acute angled ΔABC, the least value of $\sec A + \sec B + \sec C$ is:

1. 6
2. 8
3. 3
4. 2

Testbook Solution Correct Option **- 1**

Concept:

- If $A + B + C = \pi$, then $\cos A + \cos B + \cos C \leq \frac{3}{2}$.
- **AM-HM Inequality:** $AM \geq HM$.

For three numbers a, b and c:

$\Rightarrow \frac{a+b+c}{3} \geq \frac{3}{\frac{1}{a}+\frac{1}{b}+\frac{1}{c}}$

Calculation:

For the three angles of a ΔABC, A + B + C = π.

$\therefore \cos A + \cos B + \cos C \leq \frac{3}{2}$

$\Rightarrow \frac{1}{\cos A+\cos B+\cos C} \geq \frac{2}{3}$ ... (1)

Using the AM-HM inequality:

$\frac{\sec A+\sec B+\sec C}{3} \geq \frac{3}{\frac{1}{\sec A}+\frac{1}{\sec B}+\frac{1}{\sec C}}$

$\Rightarrow \sec A + \sec B + \sec C \geq \frac{9}{\cos A+\cos B+\cos C}$

Using equation (1), we get:

$\Rightarrow \sec A + \sec B + \sec C \geq 6$

Therefore, the least value of sec A + sec B + sec C is **6**.

Additional Information

- **AM-GM-HM Inequality:** AM ≥ GM ≥ HM.

  For three numbers a, b and c:

  $\Rightarrow \frac{a+b+c}{3} \geq \sqrt[3]{abc} \geq \frac{3abc}{ab+bc+ca}$

Que. 19 Let P = {θ: sin θ - cos θ = √2 cos θ} and Q = {θ: sin θ + cos θ = √2 sin θ} be two sets. Then:

1. P ⊂ Q and Q - P ≠ 0.
2. P ⊄ Q.
3. Q ⊄ P.
4. P = Q.

Testbook Solution Correct Option **- 4**

Concept:

- $\tan\theta = \frac{\sin\theta}{\cos\theta}$.

Calculation:

Consider the relation in the set P = {θ: sin θ - cos θ = √2 cos θ}.

sin θ - cos θ = √2 cos θ

Dividing both sides by cos θ, we get:

tan θ - 1 = √2

⇒ tan θ = √2 + 1

∴ P = {θ: tan θ = √2 + 1} ... (1)

Consider the relation in the set Q = {θ: sin θ + cos θ = √2 sin θ}.

$\sin\theta + \cos\theta = \sqrt{2}\sin\theta$

Dividing both sides by $\cos\theta$, we get:

$\tan\theta + 1 = \sqrt{2}\tan\theta$

$\Rightarrow \tan\theta = \frac{1}{\sqrt{2}-1} = \frac{1}{\sqrt{2}-1} \times \frac{\sqrt{2}+1}{\sqrt{2}+1} = \frac{\sqrt{2}+1}{2-1} = \sqrt{2}+1$

$\therefore Q = \{\theta: \tan\theta = \sqrt{2}+1\}$ ... (2)

Comparing equations (1) and (2), we have:

P = Q.

Que. 20 If $\frac{\tan x}{2} = \frac{\tan y}{3} = \frac{\tan z}{5}$ and $x + y + z = \pi$, then the value of $\tan^2 x + \tan^2 y + \tan^2 z$ is:

1. $\frac{38}{3}$
2. $\frac{3}{8}$
3. $\frac{11}{4}$
4. None of these.

Testbook Solution Correct Option **- 1**

Concept:

Trigonometric Identities:

- $\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$.
- $\tan(n\pi + \theta) = \tan\theta$.
- $\tan(-\theta) = -\tan\theta$

Calculations:

It is given that $\frac{\tan x}{2} = \frac{\tan y}{3} = \frac{\tan z}{5} = k$ (say).

$\therefore \tan x = 2k$, $\tan y = 3k$ and $\tan z = 5k$.

It is also given that $x + y + z = \pi$.

$\Rightarrow x + y = \pi - z$

$\Rightarrow \tan(x + y) = \tan[\pi + (-z)]$

$\Rightarrow \frac{\tan x + \tan y}{1 - \tan x \tan x} = \tan(-z) = -\tan z$

$\Rightarrow \tan x + \tan y = -\tan z + \tan x \tan y \tan z$

$\Rightarrow \tan x + \tan y + \tan z = \tan x \tan y \tan z$

Substituting the values in terms of k from the above result, we get:

$2k + 3k + 5k = (2k)(3k)(5k)$

$\Rightarrow 10k = 30k^3$

$\Rightarrow k^2 = \frac{1}{3}$.

Now, $\tan^2 x + \tan^2 y + \tan^2 z$

$= (2k)^2 + (3k)^2 + (5k)^2$

$= 4k^2 + 9k^2 + 25k^2$

$= 38k^2$

$= \frac{38}{3}$.

Additional Information

Trigonometric Ratios for Allied Angles:

- $\sin(-\theta) = -\sin\theta$.
- $\cos(-\theta) = \cos\theta$.
- $\sin(n\pi + \theta) = (-1)^n \sin\theta$.
- $\cos(n\pi + \theta) = (-1)^n \cos\theta$.
- $\sin\left[(2n+1)\frac{\pi}{2} + \theta\right] = (-1)^n \cos\theta$.
- $\cos\left[(2n+1)\frac{\pi}{2} + \theta\right] = (-1)^n (-\sin\theta)$.

Que. 21 The circles whose equations are $x^2 + y^2 + c^2 = 2ax$ and $x^2 + y^2 + c^2 = 2by$, will touch one another externally if:

1. $\frac{1}{b^2} + \frac{1}{c^2} = \frac{1}{a^2}$
2. $\frac{1}{c^2} + \frac{1}{a^2} = \frac{1}{b^2}$
3. $\frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{c^2}$
4. None of these.

Testbook Solution Correct Option **- 3**

Concept:

- The equation of a circle with center at O(a, b) and radius r, is given by: $(x - a)^2 + (y - b)^2 = r^2$.
- If two circles touch each other externally, then the distance between their centers is equal to the sum of their radii.
- **Distance Formula:** The distance 'd' between two points (x_1, y_1) and (x_2, y_2) is obtained by using the Pythagoras' Theorem:

  $d^2 = (x_1 - x_2)^2 + (y_1 - y_2)^2$

Calculation:

The equation of the first circle is:

$C_1 \rightarrow x^2 + y^2 + c^2 = 2ax$

$\Rightarrow x^2 + y^2 - 2ax = -c^2$

$\Rightarrow x^2 - 2ax + a^2 + y^2 = -c^2 + a^2$

$\Rightarrow (x - a)^2 + (y - 0)^2 = \left(\sqrt{a^2 - c^2}\right)^2$

$\Rightarrow$ Center is $O_1(a, 0)$ and radius is $r_1 = \sqrt{a^2 - c^2}$.

Similarly, for the second circle $C_2 \rightarrow x^2 + y^2 + c^2 = 2by$:

$\Rightarrow$ Center is $O_2(0, b)$ and radius is $r_2 = \sqrt{b^2 - c^2}$.

Since the two circles touch each other externally, we must have:

Distance between O_1 and $O_2 = r_1 + r_2$

$\Rightarrow \sqrt{a^2 + b^2} = \sqrt{a^2 - c^2} + \sqrt{b^2 - c^2}$

Squaring both sides, we get:

$\Rightarrow a^2 + b^2 = a^2 - c^2 + b^2 - c^2 + 2\sqrt{(a^2 - c^2)(b^2 - c^2)}$

$\Rightarrow c^2 = \sqrt{(a^2 - c^2)(b^2 - c^2)}$

Squaring both sides again, we get:

$\Rightarrow c^4 = (a^2 - c^2)(b^2 - c^2)$

$\Rightarrow c^4 = a^2b^2 - a^2c^2 - c^2b^2 + c^4$

$\Rightarrow a^2b^2 = a^2c^2 + c^2b^2$

On dividing by $a^2b^2c^2$, we get:

$\Rightarrow \frac{1}{c^2} = \frac{1}{a^2} + \frac{1}{b^2}$.

Additional Information

For two circles C_1 and C_2 with centers O_1 and O_2 and radii r_1 and r_2:

- If $O_1O_2 > r_1 + r_2$, then the circles are outside each other.
- If $O_1O_2 = r_1 + r_2$, then the circles touch each other externally.
- If $|r_1 - r_2| < O_1O_2 < r_1 + r_2$, then the circles intersect at two points.
- If $O_1O_2 = |r_1 - r_2|$, then the circles touch each other internally.
- If $O_1O_2 < |r_1 - r_2|$, then the smaller circle is inside the bigger one.

Que. 22 The locus of the ortho-center of the triangle formed by the lines $(1 + p)x - py + p(1 + p) = 0$, $(1 + q)x - qy + q(1 + q) = 0$ and $y = 0$, where $p \neq q$, is:

1. A hyperbola.
2. A parabola.
3. An ellipse.
4. A straight line.

Testbook Solution Correct Option **- 4**

Concept:

- Ortho-center of a triangle is the point of concurrence of its altitudes (heights).
- The equation of the line passing through a point (a, b), perpendicular to the line passing through (x_1, y_1) and (x_2, y_2), is:
  $(x_2 - x_1)x + (y_2 - y_1)y = (x_2 - x_1)a + (y_2 - y_1)b$

Calculation:

Let's say that the lines are:

$L1 \rightarrow (1 + p)x - py + p(1 + p) = 0$

$L2 \rightarrow (1 + q)x - qy + q(1 + q) = 0$

$L3 \rightarrow y = 0$

Multiplying L_1 by q and L_2 by p and subtracting will give us:

$x(q + pq - p - pq) + (pq + p^2q - pq - pq^2) = 0$

$\Rightarrow x(q - p) + pq(p - q) = 0$

$\Rightarrow x = pq$.

Substituting this in either L_1 or L_2, we will get:

$(1 + p)(pq) - py + p(1 + p) = 0$

$\Rightarrow y = (1 + p)(1 + q)$

Therefore:

L_1 and L_2 intersect at A[pq, (1 + p)(1 + q)].

L1 and L3 intersect at B(-p, 0).

L2 and L3 intersect at C(-q, 0).

Using the formula for line perpendicular to two points:

Equation of altitude from A:

$(-q + p)x + (0)y = (-q + p)(pq) + (0)(1 + p)(1 + q)$

$\Rightarrow x = pq$ ... (1)

Equation of altitude from B:

$(pq + q)x + [(1 + p)(1 + q) - 0]y = (pq + q)(-p) + [(1 + p)(1 + q) - 0](0)$

$\Rightarrow q(1 + p)x + (1 + p)(1 + q)y = (-pq)(1 + p)$

$\Rightarrow qx + (1 + q)y + pq = 0$ ... (2)

To find the ortho-center, we solve the equations (1) and (2) of the two altitudes:

$q(pq) + (1 + q)y + pq = 0$

$\Rightarrow (1 + q)y + pq(1 + q) = 0$

$\Rightarrow y = -pq$

$\therefore$ The co-ordinates of the ortho-center are $x = pq$ and $y = -pq$.

The locus of the ortho-center will be $x + y = 0$, which is **a straight line**.

Additional Information

If (x_1, y_1), (x_2, y_2) and (x_3, y_3) be the three vertices of a triangle and a, b, c be the lengths of the sides opposite to these vertices respectively, then the co-ordinates of the:

- **Centroid** are given by: $\left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}\right)$.
- **In-center** are given by: $\left(\frac{ax_1+bx_2+cx_3}{a+b+c}, \frac{ay_1+by_2+cy_3}{a+b+c}\right)$.

Que. 23 Equation of the common tangent, with positive slope, to the circle $x^2 + y^2 - 8x = 0$ as well as to the hyperbola $\frac{x^2}{9} - \frac{y^2}{4} = 1$, is:

1. $2x - \sqrt{5}y - 20 = 0$
2. $2x - \sqrt{5}y + 4 = 0$
3. $3x - 4y + 8 = 0$

4. $4x - 3y + 4 = 0$

Testbook Solution Correct Option **- 2**

Concept:

- The equation of a line, with slope m, is: $y = mx + c$.
- The distance between a point $P(x_1, y_1)$ and the line $ax + by + c = 0$ is given by: Distance $= \frac{|ax_1+by_1+c|}{\sqrt{a^2+b^2}}$.
- The equation of a circle with center at O(a, b) and radius r, is given by: $(x - a)^2 + (y - b)^2 = r^2$.
- **Tangent to a Hyperbola:** If the line $y = mx + c$ touches the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, then $c^2 = a^2m^2 - b^2$.

  The equation of the tangent is: $y = mx \pm \sqrt{a^2m^2 - b^2}$. Either of the lines is the equation of the tangent but not both.

Calculation:

The equation of the circle can be written as $(x - 4)^2 + y^2 = 4^2$.

Comparing with the general form of a circle, we have center O(4, 0) and radius r = 4.

The equation of the given hyperbola can be written as $\frac{x^2}{3^2} - \frac{y^2}{2^2} = 1$.

Comparing with the general form of a hyperbola, we have a = 3 and b = 2.

The equation of the tangent to this hyperbola will have the form:

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

$\Rightarrow y = mx \pm \sqrt{9m^2 - 4}$

Since this line is a tangent to the circle as well, we must have:

Distance from the center O(4, 0) of the circle to the tangent $y = mx \pm \sqrt{9m^2 - 4}$ = radius (r = 4) of the circle.

Using the formula for the distance of a point from a line, we get:

$\frac{|m(4)+(-1)(0)\pm\sqrt{9m^2-4}|}{\sqrt{m^2+(-1)^2}} = 4$

$\Rightarrow \left|4m \pm \sqrt{9m^2 - 4}\right| = 4\sqrt{m^2 + 1}$

On squaring both sides, we get:

$\Rightarrow 16m^2 \pm 8m\sqrt{9m^2 - 4} + 9m^2 - 4 = 16m^2 + 16$

$\Rightarrow \pm 8m\sqrt{9m^2 - 4} = 20 - 9m^2$

Squaring again, we get:

$\Rightarrow 64m^2(9m^2 - 4) = 400 + 81m^4 - 360m^2$

$\Rightarrow 576m^4 - 256m^2 = 400 + 81m^4 - 360m^2$

$\Rightarrow 495m^4 + 104m^2 - 400 = 0$

$\Rightarrow m^2 = \frac{-104\pm\sqrt{104^2-4(495)(-400)}}{2\times495}$

$\Rightarrow m^2 = \frac{-104\pm\sqrt{802816}}{990}$

$\Rightarrow m^2 = \frac{-104\pm896}{990}$

Discarding the negative value of m^2:

$\Rightarrow m^2 = \frac{-104+896}{990} = \frac{4}{5}$

Since the slope is given to be positive, we get:

$\Rightarrow m = \frac{2}{\sqrt{5}}$

$\therefore$ Equation of the tangent will be:

$y = mx \pm \sqrt{9m^2 - 4}$

$\Rightarrow y = \frac{2}{\sqrt{5}}x \pm \sqrt{9\left(\frac{4}{5}\right) - 4}$

$\Rightarrow y = \frac{2}{\sqrt{5}}x \pm \frac{4}{\sqrt{5}}$

$\Rightarrow 2x - \sqrt{5}y \pm 4 = 0.$

Additional Information

- The slope (m) of the tangent at a point P(a, b) to a curve y = f(x), is given by: $m = \left(\frac{dy}{dx}\right)_{x=a,y=b}$.
- **Tangent to a Parabola:** The equation of the tangent to the parabola $y^2 = 4ax$, at a point (x_1, y_1), is given by: $yy_1 = 2a(x + x_1)$.
  Normal to a Parabola: The equation of the normal to the parabola $y^2 = 4ax$, at a point (x_1, y_1), is given by: $2a(y - y_1) = (-y_1)(x - x_1)$.
- **Tangent to a Circle:** The equation of the tangent to the circle $x^2 + y^2 = r^2$ at a point (x_1, y_1), is given by: $xx_1 + yy_1 = r^2$.

  Normal to a Circle: The equation of a normal to the circle $x^2 + y^2 = r^2$ at a point (x_1, y_1), is given by: $yx_1 - xy_1 = 0$.
- **Tangent to an Ellipse:** The equation of the tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, at a point (x_1, y_1), is given by: $\frac{xx_1}{a^2} + \frac{yy_1}{b^2} = 1$.

  Normal to an Ellipse: The equation of the normal to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, at a point (x_1, y_1), is given by: $\frac{xx_1}{a^2} - \frac{yy_1}{b^2} = 1$.
- **Tangent to a Hyperbola:** The equation of the tangent to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, at a point (x_1, y_1), is given by: $\frac{xx_1}{a^2} - \frac{yy_1}{b^2} = 1$.

  Normal to a Hyperbola: The equation of the normal to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, at a point (x_1, y_1), is given by: $\frac{a^2x}{x_1} + \frac{b^2y}{y_1} = a^2 + b^2$.

Que. 24 The area enclosed between the curves $y^2 = x$ and $y = |x|$ is:

1. $\frac{2}{3}$ sq. units
2. 1 sq. units
3. $\frac{1}{6}$ sq. units
4. $\frac{1}{3}$ sq. units

Testbook Solution Correct Option **- 3**

Concept:

- **Area under a curve:**

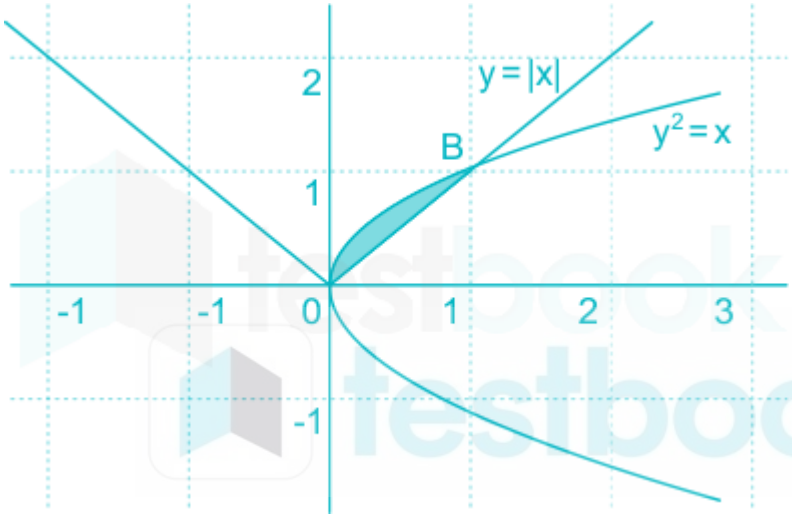
The area under the function y = f(x) from x = a to x = b and the x-axis is given by the definite integral $\left|\int_a^b f(x)\,dx\right|$, for curves which are entirely on the same side of the x-axis in the given range.

If the curves are on both the sides of the x-axis, then we calculate the areas of both the sides separately and add them.

- Two curves f(x, y) = 0 and g(x, y) = 0 cut/touch at a point (a, b) if f(a, b) = g(a, b) = 0.
- **Definite integral:**
  If $\int f(x)\,dx = g(x) + C$, then $\int_a^b f(x)\,dx = [g(x)]_a^b = g(b) - g(a)$.
- $\int x^n\,dx = \frac{x^{n+1}}{n+1} + C$.

Calculation:

On solving for the common points of the curves $y^2 = x$ and $y = |x|$, we find that they intersect at the points (1, 1) and (0, 0), as shown below:



The required area is:

(Area under $y = \sqrt{x}$ from 0 to 1) - (Area under y = x from 0 to 1)

$= \left|\int_0^1 \sqrt{x}\,dx\right| - \left|\int_0^1 x\,dx\right|$

$= \left[\frac{x^{\frac{1}{2}+1}}{\frac{1}{2}+1}\right]_0^1 - \left[\frac{x^{1+1}}{1+1}\right]_0^1$

$= \frac{2}{3}[1 - 0] - \frac{1}{2}[1 - 0]$

$= \frac{1}{6}$.

Mistake Point

Put the values of x in the limits for the integration of y = f(x) and put the values of y in the limits for the integration of x = f(y).

The above question can also be solved as: $\left|\int_0^1 y\,dy\right| - \left|\int_0^1 y^2\,dy\right|$. The order of the functions is changed because we are looking at f(y) now (horizontal area instead of vertical, between the curves and the y-axis).

Que. 25 Equation of the line perpendicular to x - 2y = 1 and passing through (1, 1) is:

1. x + 2y = 3

2. x + y = 2
3. y = 2x + 3
4. y = -2x + 3

Testbook Solution Correct Option **- 4**

Concept:

- If two lines $y = m_1x + c_1$ and $y = m_2x + c_2$ are perpendicular to each other, then $m_1 \times m_2 = -1$.
- If a point P(a, b) lies on a curve f(x, y) = 0, then f(a, b) = 0.

Calculation:

Let us first find out the slope (m_2) of the second line.

The equation of the first line is x - 2y = 1.

It can be written as $y = \frac{1}{2}x - \frac{1}{2}$. Therefore, $m_1 = \frac{1}{2}$.

Now, $m_1 \times m_2 = -1$

$\Rightarrow \frac{1}{2} \times m_2 = -1$

$\Rightarrow m_2 = -2$

$\therefore$ The equation of the second line can be written as y = -2x + c.

Since this line passes through (1, 1), we must have:

1 = (-2)(1) + c

$\Rightarrow$ c = 3.

Hence, the equation of the line is **y = -2x + 3**.

Additional Information

If two lines $y = m_1x + c_1$ and $y = m_2x + c_2$ are parallel to each other, then $m_1 = m_2$.

In the other form, for two lines $a_1x + b_1y = c_1$ and $a_2x + b_2y = c_2$:

- If the lines are **parallel**, then $\frac{a_1}{b_1} = \frac{a_2}{b_2} \Rightarrow a_1b_2 - a_2b_1 = 0$.
- If the lines are **perpendicular**, then $\frac{a_1}{b_1} = -\frac{b_2}{a_2} \Rightarrow a_1a_2 + b_1b_2 = 0$.

Que. 26 If $A = \begin{bmatrix} 0 & 5 \\ 0 & 0 \end{bmatrix}$ and $f(x) = 1 + x + x^2 + \ldots + x^{16}$, then $f(A) =$

1. 0
2. $\begin{bmatrix} 1 & 5 \\ 0 & 1 \end{bmatrix}$
3. $\begin{bmatrix} 1 & 5 \\ 0 & 0 \end{bmatrix}$
4. $\begin{bmatrix} 0 & 5 \\ 1 & 1 \end{bmatrix}$

Testbook Solution Correct Option **- 2**

Calculation:

Here, $f(x) = 1 + x + x^2 + \ldots + x^{16}$,

So, f(A) = I + A + A^2 + ... + A^{16}

$A^2 = \begin{bmatrix} 0 & 5 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} 0 & 5 \\ 0 & 0 \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

$A^2 = A^3 = \ldots = A^{16} = 0$

So, f(A) = I + A + A^2 + ... + A^{16}

$= \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} + \begin{bmatrix} 0 & 5 \\ 0 & 0 \end{bmatrix} + \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

$= \begin{bmatrix} 1 & 5 \\ 0 & 1 \end{bmatrix}$

Hence, option (2) is correct.

Que. 27 9 balls are to be placed in 9 boxes and 5 of the balls cannot fit into 3 small boxes. The number of ways of arranging one ball in each of the boxes is

1. 18720
2. 18270
3. 17280
4. 12780

Testbook Solution Correct Option **- 3**

Concept:

Number of ways of arranging n identical items in r ways is given ${}^{n}_{r}P = \frac{n!}{(n-r)!}$

Calculation:

Total number of balls are 9, and total number of boxes are also 9

5 balls cannot fit into 3 small boxes, this means that these 5 balls can only fit into 6 remaining balls.

so number of ways of arranging 5 balls in 6 boxes is:

${}^{6}_{5}P = \frac{(6)!}{(6-5)!}$

$= 6!$

= 720 ways

Now, remaining 4 balls fits into 4 remaining boxes.

Number of ways of arranging 4 balls in 4 boxes is 4! = 24 ways

So total number of ways is 720 × 24 = 17280

Que. 28 Which of the following functions is the inverse of itself?

1. $f(x) = \frac{(1-x)}{1+x}$
2. $f(x) = 3^{\log x}$
3. $f(x) = 3^{x(x+1)}$
4. None of these

Testbook Solution Correct Option **- 1**

Concept:

Finding the Inverse of a Function

1. First, replace f(x) with y
2. Replace every x with a y and replace every y with an x

Example: f(x) = x

Let, f(x) = y ⇒ $f^{-1}(y) = x$. Now, determine $f^{-1}(x)$ by replacing every y with x

Calculation:

$1.f(x) = \frac{(1-x)}{1+x}$

Let, f(x) = y ⇒ $x = f^{-1}(y)$

So, $y = \frac{(1-x)}{1+x}$

Now, replace every x with a y and replace every y with an x

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

(1+y) x = 1 - y

⇒ x + xy + y = 1

⇒ x + y (x + 1) - 1 = 0

y = (1-x)/(1+x)

$f^{-1}(x) = (1-x)/(1+x) = f(x)$

So, $f(x) = \frac{(1-x)}{1+x}$ is the inverse of itself.

Hence, option (1) is correct.

Que. 29 A student council has 10 members. From this one President, one Vice-President, one Secretary, one Joint-Secretary and two Executive Committee members have to be elected. In how many ways this can be done?

1. 151200
2. 75600
3. 37800
4. 18900

Testbook Solution Correct Option **- 1**

Concept:

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

Calculations:

Given, A student council has 10 members. From this one President, one Vice-President, one Secretary, one Joint-Secretary and two Executive Committee members have to be elected.

⇒ 6 members are elected out of 10 members.

Number of ways to be elected 6 members out of 10 members = $^{10}P_{6}$

$= \frac{10!}{(10-6)!}$

$= \frac{10!}{4!}$

$= \frac{4! \times 5 \times 6 \times 7 \times 8 \times 9 \times 10}{4!}$

= 151200

Que. 30 In a survey where 100 students reported which subjects they like, 32 students in total liked Mathematics, 38 students liked Business and 30 students liked Literature. Moreover 7 students liked both Mathematics and Literature, 10 students liked both Mathematics and Business, 8 students liked both Business and Literature, 5 students liked all three subjects.

Then the number of people who liked exactly one subject is

1. 60
2. 65
3. 70
4. 78

Testbook Solution Correct Option **- 2**

Concept:

Number of elements present in exactly only one set

n(A) + n(B) + n(C) – 2 × [n(A ∩ B) + n(B ∩ C) + n(A ∩ C)] + 3 × n(A ∩ B ∩ C)]

Calculations:

Given, U : Total number of students.

n(U) = 100

M : Student who liked mathematics

n(M) = 32

B : Student who liked Business

n(B) = 38

L : Student who liked Literature

n(B) = 30

Moreover, students liked both Mathematics and Literature = n(M ∩ L) = 7

students liked both Mathematics and Business = n(M ∩ B) = 10

students liked both Business and Literature = n(B ∩ L) = 8

students liked all three subjects = n(M ∩ B ∩ L) = 5

Now, number of people who liked exactly one subject

= n(M) + n(B) + n(L) – 2 × [n(M ∩ B) + n(B ∩ L) + n(M ∩ L)] + 3 × n(M ∩ B ∩ L)]

= 32 + 38 + 30 - 2 (10 + 8 + 7) + 3(5)

= 65

Hence, option (2) is correct.

Que. 31 If A and B are two events and $P(A \cup B) = \frac{5}{6}, P(A \cap B) = \frac{1}{2}$, P(A) = 2/3 then A and B are two events which are

1. Dependent

2. Independent
3. Mutually exclusive
4. Equally likely

Testbook Solution Correct Option **- 4**

Concept:

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

In **equally likely events**, the probabilities of each event are equal.

Calculation:

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$\Rightarrow P(B) = 5/6 + 1/2 - 2/3$

$= 2/3$

Here, $P(A) = P(B)$

So, A and B are **equally likely events**

Hence, option (4) is correct.

Que. 32 If $a_1, a_2, a_3, \ldots, a_n$ are positive real numbers whose product is a fixed number C, then the minimum value of $a_1 + a_2 + \ldots + a_n$ is

1. $\frac{n(2c)^1}{n}$
2. $\frac{(n+1)C^1}{n}$
3. $n(C)^{1/n}$
4. $((n+1)(2c)^1/n$

Testbook Solution Correct Option **- 3**

Concept:

Arithmatic mean(AM), $A = \sum \frac{x_i}{n}$, x_i = data set value, n = number of values

Geometric mean(GM), $G = (x_1 \times x_1 \times \cdots x_n)^{\frac{1}{n}}$

AM ≥ GM

Calculation:

Here, $a_1 \times a_2 \times \cdots a_n = C$

$AM \geq GM$

$\Rightarrow (\frac{a_1+a_2+\cdots+a_n}{n}) \geq ((a_1 \times a_2 \times \cdots a_n)^{\frac{1}{n}})$

$\Rightarrow (a_1 + a_2 + \cdots + a_n) \geq ((C)^{\frac{1}{n}}) \times n$

So, the minimum value of $a_1 + a_2 + \ldots + 2a_n$ is $n(C)^{1/n}$

Hence, option (3) is correct.

Que. 33

If a, b, c are the roots of equation $x^3 - 3x^2 + 3x + 7 = 0$, then the value of $\begin{vmatrix} 2bc - a^2 & c^2 & b^2 \\ c^2 & 2ac - b^2 & a^2 \\ b^2 & a^2 & 2ab - c^2 \end{vmatrix}$ is

1. 9
2. 27
3. 81
4. 0

Testbook Solution Correct Option **- 4**

Concept:

If a, b, and c are the roots of the cubic equation $ax^3 + bx^2 + cx + d = 0$,then

- $a + b + c = -\frac{b}{a}$
- $ab + bc + ca = \frac{c}{a}$
- $abc = -\frac{d}{a}$

Calculation:

Given: a, b, c are the roots of equation $x^3 - 3x^2 + 3x + 7 = 0$

⇒ a + b + c = 3

⇒ ab + bc + ca = 3

⇒ abc = -7

The determinant $\begin{vmatrix} 2bc - a^2 & c^2 & b^2 \\ c^2 & 2ac - b^2 & a^2 \\ b^2 & a^2 & 2ab - c^2 \end{vmatrix}$ can be written as $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix} \begin{vmatrix} -a & -b & -c \\ c & a & b \\ b & c & a \end{vmatrix}$

$\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix} \begin{vmatrix} -a & -b & -c \\ c & a & b \\ b & c & a \end{vmatrix} = (3abc - a^3 - b^3 - c^3)(3abc - a^3 - b^3 - c^3)$

$= (3abc - a^3 - b^3 - c^3)^2$

Also, $(a + b + c)^3 = a^3 + b^3 + c^3 + 3(a + b + c)(ab + bc + ca) - 3abc$

Now substitute the values, a + b + c = 3, ab + bc + ca = 3, and abc = -7

$(3)^3 = a^3 + b^3 + c^3 + 3(3)(3) - 3(-7)$

$27 = a^3 + b^3 + c^3 + 27 + 21$

$a^3 + b^3 + c^3 = -21$

So the value of the determinant is, $(3abc - (a^3 + b^3 + c^3)) = (3 \times (-7) - (-21))$

⇒ $(3abc - (a^3 + b^3 + c^3)) = -21 + 21 = 0$

Que. 34 The coefficient of x^n in the expansion of $(1 - 2x + 3x^2 - 4x^3 + \ldots \text{ to } \infty - n)$ is

1. $\frac{(2n)!}{n!(n-1)!}$
2. $\frac{(2n)!}{[(n-1)!]^2}$

3. $\frac{(2n)!}{(n!)^2}$
4. none of these

Testbook Solution Correct Option **- 3**

Concept:

$(x + y)^n = nC_0\, x^n + nC_1\, x^{n-1} \cdot y + nC_2\, x^{n-2} \cdot y^2 + \ldots + nC_n\, y^n$

$(1+x)^{-2} = 1 - 2x + 3x^2 - 4x^3 + \ldots$

Calculation:

Here, $[1 - 2x + 3x^2 - 4x^3 + \ldots \text{ to } \infty]^{-n}$

$= ((1 + x)^{-2})^{-n}$

$= (1 + x)^{2n}$

$= 2nC_0\, x^{2n} + 2nC_1\, x^{2n-1} \cdot (1)^1 + \ldots 2nC_n\, x^{2n-n} + \ldots + 2nC_{2n}(x)^0(1)^{2n}$

So, coefficient of $x^n = 2nCn = \frac{2n!}{(2n-n)!n!}$

$= \frac{(2n)!}{(n!)^2}$

Hence, option (3) is correct.

Que. 35 Let α, β be the roots of the equation $x^2 - px + r = 0$ and $\frac{\alpha}{2}, \beta$ be the roots of the equation $x^2 - qx + r = 0$. Then the value of r is

1. $\frac{2}{9}(p - q)(2q - p)$
2. $\frac{2}{9}(q - p)(2q - p)$
3. $\frac{2}{9}(q - 2p)(2q - p)$
4. $\frac{2}{9}(2p - q)(2q - p)$

Testbook Solution Correct Option **- 1**

Concept:

We know that, if α_1, α_2 be the roots of the quadratic equation $ax^2 + bx + c = 0$ then

$\alpha_1 + \alpha_2 = \frac{-b}{a}$ and $\alpha_1 \cdot \alpha_2 = \frac{c}{a}$

Calculations:

We know that, if α_1, α_2 be the roots of the quadratic equation $ax^2 + bx + c = 0$ then

$\alpha_1 + \alpha_2 = \frac{-b}{a}$ and $\alpha_1 \cdot \alpha_2 = \frac{c}{a}$

Given, α, β be the roots of the equation $x^2 - px + r = 0$

$\Rightarrow \alpha\beta = r$ and $\alpha + \beta = p$ .... (1)

Also, $\frac{\alpha}{2}, 2\beta$ be the roots of the equation $x^2 - qx + r = 0$

$\Rightarrow \alpha\beta = r$ and $\frac{\alpha}{2} + 2\beta = q$

$\Rightarrow \alpha + 4\beta = 4q$ .... (2)

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

$\Rightarrow 3\beta = 2q - p$

$\Rightarrow \beta = \frac{2q - p}{3}$

Put the value of β in equation (1) , we get

$\Rightarrow \alpha = p - \frac{2q - p}{3}$

$\Rightarrow \alpha = \frac{2p - 2q}{3}$

We have, $r = \alpha\beta$

$\Rightarrow r = \frac{2p - 2q}{3} \frac{2q - p}{3}$

$\Rightarrow r = \frac{2}{9}(p - q)(2q - p)$

Hence, if α, β be the roots of the equation $x^2 - px + r = 0$ and $\frac{\alpha}{2}, \beta$ be the roots of the equation $x^2 - qx + r = 0$.

Then the value of r is $\frac{2}{9}(p - q)(2q - p)$

Que. 36 The number of natural numbers which are smaller than 2×10^8 and which contains only the digits 1 and 2 is

1. 786
2. 666
3. 766
4. 1066

Testbook Solution Correct Option **- 3**

Concept:

The total number of natural numbers which are smaller than 2×10^8 and which contains only the digits 1 and 2 is the sum of natural numbers which contains only the digits 1 and 2 of 1 digit , 2 digit , 3 digit , 4 digit, 5 digit , 6 digit , 7 digit , 8, digit, 9 digit.

Calculations:

Given Number is $2 \times 10^8 = 20,00,00,000$ i.e 9 digit number.

To find the total number of natural numbers which are smaller than 2×10^8 and which contains only the digits 1 and 2 is the sum of natural numbers which contains only the digits 1 and 2 of 1 digit , 2 digit , 3 digit , 4 digit, 5 digit , 6 digit , 7 digit , 8, digit, 9 digit.

Natural numbers which contains only the digits 1 and 2 of 1 digit = 1, 2 = 2^1

Natural numbers which contains only the digits 1 and 2 of 2 digits = 11, 12, 21, 22 = 4 = 2^2

Natural numbers which contains only the digits 1 and 2 of 3 digits = 111, 112, 121, 122, 222, 221, 212, 211 = 8 = 2^3

continue in this way

Natural numbers which contains only the digits 1 and 2 of 4 digits = 2^4

Natural numbers which contains only the digits 1 and 2 of 5 digits = 2^5

Natural numbers which contains only the digits 1 and 2 of 6 digits = 2^6

Natural numbers which contains only the digits 1 and 2 of 7 digits = 2^7

Natural numbers which contains only the digits 1 and 2 of 8 digits = 2^8

Natural numbers which contains only the digits 1 and 2 of 9 digit i.e. 20,00,00,000 = $\frac{2^9}{2} = 2^8$

Now,

The total number of natural numbers which are smaller than 2×10^8 and which contains only the digits 1 and 2

$= 2^1 + 2^2 + 2^3 + 2^4 + 2^5 + 2^6 + 2^7 + 2^8 + 2^8$

$= 766$

Que. 37 If $\lim\limits_{x\to\infty}\left(1+\frac{a}{x}+\frac{b}{x^2}\right)^{2x} = e^2$, then the value of a and b are

1. a ∈ R, b = 2
2. a = 1, b ∈ R
3. a ∈ R, b ∈ R
4. None of these

Testbook Solution Correct Option **- 2**

Concept:

The limit of indeterminate form 1^∞ is calculated as follows: $\lim_{x\to a} f(x)^{g(x)} = e^{\lim_{x\to a}(f(x)-1)(g(x))}$

Calculation:

$\lim\limits_{x\to\infty}\left(1+\frac{a}{x}+\frac{b}{x^2}\right)^{2x} = e^{\lim_{x\to\infty}\left(1+\frac{a}{x}+\frac{b}{x^2}-1\right)(2x)}$

$e^{\lim_{x\to\infty}\left(2a+\frac{2b}{x}\right)} = e^2$

⇒ $e^2 = e^{2a}$

⇒ 2a = 2

⇒ a = 1 and b can take any real value because any real number divided by infinity is zero.

Hence, a = 1 and b ∈ R

Que. 38 If $f(x) = \sin^5 x + \sin^3 x$ and $g(x) = \cos^6 x + \sin^3 x$, then the value of $\int_0^{\pi/2}[f(x)+f(-x)][g(x)+g(-x)]dx$ is

1. 0
2. > 1
3. 0 and 1
4. less than 0

Testbook Solution Correct Option **- 1**

Concept:

- sin x is an odd function so, sin(-x) = -sin x
- cos x is an even function so, cos(-x) = cos x

Calculation:

Given, $f(x) = \sin^5 x + \sin^3 x$ and $g(x) = \cos^6 x + \sin^3 x$

f(-x) = $-\sin^5 x - \sin^3 x$ and g(-x) = $\cos^6 x - \sin^3 x$

[f(x) + f(-x)] = $\sin^5 x + \sin^3 x - \sin^5 x - \sin^3 x$ ⇒ [f(x) + f(-x)] = 0

$[g(x) + g(- x)] = 2 \times \cos^6 x$

$\int_0^{\pi/2} [f(x) + f(-x)][g(x) + g(-x)]dx$

$\int_0^{\pi/2} (0) \times (2cos^6 x)dx = 0$

Que. 39 $\frac{d^2x}{dy^2}$ equals

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

Testbook Solution Correct Option **- 4**

Concept:

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

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

Calculation:

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

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

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

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

Hence, option (4) is correct.

Que. 40 Differential coefficient of $\log_{10} x$ with respect to $\log_x 10$ is

1. $-\frac{(\log x)^2}{(\log 10)^2}$
2. $\frac{(\log_{10} x)^2}{(\log 10)^2}$

3. $\frac{(\log_x 10)^2}{(\log 10)^2}$
4. $-\frac{(\log 10)^2}{(\log x)^2}$

Testbook Solution Correct Option - **1**

Concept:

$\log_a x = \frac{\log x}{\log a}$

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

Calculation:

Let $y = \log_{10} x$ and $z = \log_x 10$

We have to find the value of $\frac{dy}{dz}$

$yz = \frac{\log x}{\log 10} \cdot \frac{\log 10}{\log x} = 1$

$\Rightarrow y = \frac{1}{z}$

$\Rightarrow \frac{dy}{dz} = -\frac{1}{z^2} = -y^2 = -(\log_{10} x)^2$

$= -\frac{(\log x)^2}{(\log 10)^2}$

Hence, option (1) is correct.

Que. 41 f(x) = x + |x| is continuous for

1. $x \in (-\infty, \infty)$
2. $x \in (-\infty, \infty) - \{0\}$
3. only $x > 0$
4. No value of x

Testbook Solution Correct Option - **1**

Concept:

If $f(x) = f_1(x) + f_2(x)$ and

$f_1(x)$ and $f_2(x)$ are continuous function then f(x) is continuous function.

Calculations:

Given function is f(x) = x + |x|

$\Rightarrow$f(x) = $f_1(x) + f_2(x)$ where $f_1(x) = x$ and $f_2(x) = |x|$

Here, $f_1(x) = x$ is continuous function at $x \in (-\infty, \infty)$

$f_2(x) = |x|$ is continuous function at $x \in (-\infty, \infty)$

$\Rightarrow$f(x) is continuous function at $x \in (-\infty, \infty)$

Hence, $f(x) = x + |x|$ is continuous for $x \in (-\infty, \infty)$

Que. 42 If $\vec{a}, \vec{b}$ and $\vec{c}$ are unit vectors, then $|a-b|^2 + |b-c|^2 + |c-a|^2$ does not exceed

1. 4
2. 9
3. 8
4. 6

Testbook Solution Correct Option **- 2**

Concept:

A unit vetor is a vector whose magnitude is 1.

Calculation:

Given that $|a-b|^2+|b-c|^2+|c-a|^2$,

since a, b, and c are unit vectors so $a^2 = b^2 = c^2 = 1$

Expanding the above expression,

$(a^2 + b^2 - 2ab) + (b^2 + c^2 - 2bc) + (c^2 + a^2 - 2ac)$

$\Rightarrow 2(a^2 + b^2 + c^2) - (2ab + 2bc + 2ac)$

$\Rightarrow 2(1+1+1)-\{(a + b + c)^2 - (a^2 + b^2 + c^2)\}$

$\Rightarrow 6 - \{(a + b + c)^2 - (1+1+1)\}$

$\Rightarrow 9 - (a + b + c)^2 < 9$

Que. 43 The vector $\vec{a} = \alpha\hat{i} + 2\hat{j} + \beta\hat{k}$ lies in the plane of the vector $\vec{b} = \hat{i} + \hat{j}$ and $\vec{c} = \hat{j} + \hat{k}$ and bisects the angle between $\vec{b}$ and $\vec{c}$. Then, which one of the following gives possible values of α and β ?

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

Testbook Solution Correct Option **- 4**

Concept:

If two or more vectors lie on the same plane than they are called coplanar vector and satisfies the conditions

$\left[\vec{a}\vec{b}\vec{c}\right] = 0.$

$$\begin{vmatrix} a_x & a_y & a_z \\ b_x & b_y & b_z \\ c_x & c_y & c_z \end{vmatrix} = 0$$

Calculation:

$\left[\vec{a}\vec{b}\vec{c}\right] = 0$

$$\begin{vmatrix} \alpha & 2 & \beta \\ 1 & 1 & 0 \\ 0 & 1 & 1 \end{vmatrix} = 0$$

$\alpha + \beta = 2$

Also, $\vec{a}$ bisects the angle between $\vec{b}$ and $\vec{c}$.

$$\vec{a} = \frac{\lambda}{\sqrt{2}}\left(\hat{b} + \hat{c}\right)$$
$$= \frac{\lambda}{\sqrt{2}}\left(\hat{i} + 2\hat{j} + \hat{k}\right)$$

On comparing with $\vec{a} = \alpha\hat{i} + 2\hat{j} + \beta\hat{k}$,

We get, $\lambda = \sqrt{2}$, $\alpha = 1$, and $\beta = 1$

Que. 44 Forces $4\hat{i} - 3\hat{j} + 7\hat{k}$ and $-2\hat{i} + 2\hat{j} - 8\hat{k}$ are acting on a particle and displaced it from the point (5, 7, 1) to (2, 5, -6), then the work done by the force is

1. 25
2. 9
3. 15
4. 7

Testbook Solution Correct Option **- 3**

Concept:

The work done by the force is given as follows:

$W = \vec{F} \cdot \vec{d}$

Here, F is the force vector and d is the displacement vector.

Calculation:

Net force acting on the particle is calculated as follows:

$\vec{F_1} = 4\hat{i} - 3\hat{j} + 7\hat{k}$ and $\vec{F_2} = -2\hat{i} + 2\hat{j} - 8\hat{k}$

$\vec{F} = \vec{F_1} + \vec{F_2}$

$\vec{F} = 2\hat{i} - \hat{j} - \hat{k}$

Displacement vector is calculated as follows:

$\vec{d} = (2-5)\,\hat{i} + (5-7)\,\hat{j} + (-6-1)\,\hat{k}$

$= -3\hat{i} - 2\hat{j} - 7\hat{k}$

Now,

$W = \vec{F} \cdot \vec{d}$

$W = \left(2\hat{i} - \hat{j} - \hat{k}\right)\left(-3\hat{i} - 2\hat{j} - 7\hat{k}\right)$

$= -6 + 2 + 7$

$= 3J$

Que. 45 A bird is flying in a straight line with velocity vector $10\hat{i} + 6\hat{j} + \hat{k}$, measured in km/hr. If starting point is (1, 2, 3), how much time does it to take to reach a point in space that is 13 meter high from the ground?

1. 600 seconds
2. 360 seconds
3. 36 seconds
4. 60 seconds

Testbook Solution Correct Option **- 3**

Concept:

Velocity vector $x\hat{i} + y\hat{j} + z\hat{k}$ mean the velocity in x direction is x km/hr, velocity in y direction is y km/hr, and velocity in z direction is z km/hr.

Calculation:

The velocity vector of the bird is given as $10\hat{i} + 6\hat{j} + \hat{k}$ in km/hr.

The velocity of the bird in z direction is 1 km/hr or $\frac{10}{36} m/s$

The initial position of the bird is (1, 2, 3) and the final height of the bird is 13 m.

So, total height covered by bird is 13m - 3m = 10m

Time required to reach that height is calculated as follows:

time = distance/speed

$$time = \frac{10m}{(10/36)\, m/s}$$

$$= 36s$$

Que. 46 The value of $\cot\left(\text{cosec}^{-1}\frac{5}{3} + \tan^{-1}\frac{2}{3}\right)$ is

1. 6/17
2. 3/17
3. 4/17
4. 5/17

Testbook Solution Correct Option **- 1**

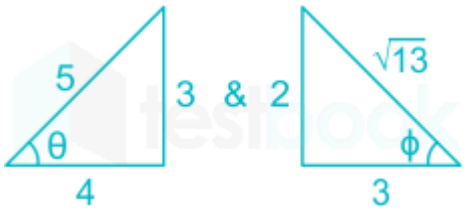
Concept:

$$\cot(\theta + \phi) = \frac{(\cot\phi)(\cot\theta) - 1}{(\cot\theta) + (\cot\phi)}$$

Calculations:

Consider $\text{cosec}^{-1}\frac{5}{3} = \theta$ and $\tan^{-1}\frac{2}{3} = \phi$

$\Rightarrow \text{cosec}\ \theta = \frac{5}{3}$ and $\tan\ \phi = \frac{2}{3}$



From Figure, we have

$\Rightarrow \cot\theta = \frac{4}{3}$ and $\cot\ \phi = \frac{3}{2}$

Now, consider $\cot\left(\text{cosec}^{-1}\frac{5}{3} + \tan^{-1}\frac{2}{3}\right)$

$$\Rightarrow \cot(\theta + \phi) = \frac{(\cot\phi)(\cot\theta) - 1}{(\cot\theta) + (\cot\phi)}$$

$$\Rightarrow \cot(\theta + \phi) = \frac{(\frac{4}{3})(\frac{3}{2}) - 1}{(\frac{4}{3}) + (\frac{3}{2})}$$

$\Rightarrow \cot(\theta + \phi) = \frac{6}{17}$

Hence, The value of $\cot\left(\text{cosec}^{-1}\frac{5}{3} + \tan^{-1}\frac{2}{3}\right)$ is 6/17

Que. 47 If sin θ = 3 sin (θ + 2α), then the value of tan (θ + α) + 2 tan α is

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

Testbook Solution Correct Option **- 4**

Concept:

componendo and dividendo formula, we have

$\frac{a}{b} = \frac{a+b}{a-b}$

Trigonometric formula:

sin C + sin D = - 2sin (C+ D).sin (C - D)

sin C - sin D = 2sin (C+ D).sin (C - D)

Calculations:

Given, sin θ = 3 sin (θ + 2α)

$\Rightarrow \frac{\sin\theta}{\sin(\theta + 2\alpha)} = \frac{3}{1}$

By componendo and dividendo formula, we have

$\Rightarrow \frac{\sin\theta + \sin(\theta + 2\alpha)}{\sin\theta - \sin(\theta + 2\alpha)} = \frac{3+1}{3-1}$

We know that,

sin C + sin D = - 2sin (C+ D).sin (C - D)

sin C - sin D = 2sin (C+ D).sin (C - D)

$\Rightarrow \frac{-2\sin(\theta + 2\alpha)\cos\alpha}{2\cos(\theta + 2\alpha)\sin\alpha} = 2$

$\Rightarrow -\tan(\theta + 2\alpha)\cot\alpha = 2$

$\Rightarrow -\tan(\theta + 2\alpha) = 2\tan\alpha$

$\Rightarrow \tan(\theta + 2\alpha) + 2\tan\alpha = 0$

Que. 48 In a triangle ABC, ∠A = 90° and D is mid-point of AC. The value of $BC^2 - BD^2$ is equal to

1. AD^2
2. $2AD^2$
3. $3AD^2$
4. $4AD^2$

Testbook Solution Correct Option **- 1**

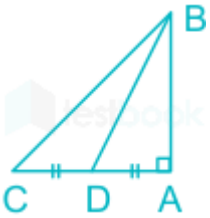
Concept:

The **Pythagorean** equation relates the sides of a right triangle in a simple way, so that if the lengths of any two sides are known the length of the third side can be found.

Calculations:

Given, in a triangle ABC, ∠A = 90° and D is mid-point of AC.

⇒ $(AC)^2 = 2(AD)^2$ ....(1)



By Pythagorean theorem, we have

⇒ $BC^2 = AB^2 + AC^2$

From equation (1), we have

⇒ $BC^2 = AB^2 + 2(AD)^2$

And $BD^2 = AB^2 + AD^2$

Consider, $(BC)^2 - (BD)^2 = (AB)^2 + 2(AD)^2 - (AB^2 + AD^2)$

⇒ $(BC)^2 - (BD)^2 = (AD)^2$

Que. 49 Through any point (x, y) of a curve which passed through the origin, lines are drawn parallel to the coordinate axes. The curve given that divides the rectangle formed by the two lines and the axes into two areas, one of which is twice the other, represents a family of

1. circles
2. parabolas
3. hyperbolas
4. straight line

Testbook Solution Correct Option **- 2**

Calculation:

Let y = f(x) is the equation of the curve such that y = 0 for x = 0.

A rectangle is made with length and breadth as x and y respectively.

This rectangle divides the curve y = f(x) in two halves, area of one half is double the area of other half.

Area of the rectangle is xy. So area of the one half is $xy - \int_0^x ydx$

Area of another half is $\int_0^x ydx$

Following the condition gven in the question,

$$xy - \int_0^x ydx = 2\int_0^x ydx$$

$$xy = 3\int_0^x ydx$$

Now, differentiating the equation with respect to x as follows:

$$y + x\frac{dy}{dx} = 3y$$
$$\frac{dy}{dx} = \frac{2y}{x}$$

On further calculation,

$$\frac{1}{2}\frac{dy}{y} = \frac{dx}{x}$$

On integrating both sides, we get,

$$\frac{1}{2}\ln y = \ln x + \ln c$$
$$\ln y = 2\ln x + \ln c$$

Or, $y = cx^2$, here c is some arbitrary constant.

This equation represents the family of parabolas passing through origin.

Que. 50 A line through (4, 2) meets the coordinate axes at P and Q. Then the locus of the circumference of ΔOPQ is

1. $\frac{1}{x} + \frac{1}{y} = 2$
2. $\frac{2}{x} + \frac{1}{y} = 1$
3. $\frac{1}{x} + \frac{2}{y} = 1$
4. $\frac{1}{x} + \frac{1}{y} = \frac{1}{2}$

Testbook Solution Correct Option - **2**

Concept:

The intercept form of a line is written as follows:

$$\frac{x}{P} + \frac{y}{Q} = 1$$

Here, P and Q are the x-intercept and y-intercept respectively.

Calculation:

Let (h, k) is the arbitrary coordinate of the circumcenter of the triangle OPQ.

As it can be observed that two coordinate axes are acting as the two side of the triangle, so the triangle is right triangle and the circumcenter is the midpoint of sides.

$$(h, k) = \left(\frac{P+0}{2}, \frac{0+Q}{2}\right)$$
$$= \left(\frac{P}{2}, \frac{Q}{2}\right)$$

h = P/2 ⇒ P = 2h

Similarly, k = Q/2 means Q = 2k

The equation of the line $\frac{x}{P} + \frac{y}{Q} = 1$ can be rewritten as:

$$\frac{x}{2h} + \frac{y}{2k} = 1$$

Now, this line passes through (4, 2), so it will satisfy the equation of line.

$$\frac{4}{2h} + \frac{2}{2k} = 1$$

$\frac{2}{h} + \frac{1}{k} = 1$

Now to find the locus replace (h, k) with (x, y).

$\frac{2}{x} + \frac{1}{y} = 1$

Que. 51 In a city, 40% of the adults are illiterate while 85% of the children are literate. If the ratio of the adults to that of the children is 2 : 3, then what percent of the population is literate?

1. 20%
2. 25%
3. 50%
4. 75%

Testbook Solution Correct Option **- 4**

Given:

40% of the adults are illiterate

85% of the children are literate

the ratio of the adults to that of the children is 2 : 3

Formula Used:

%literate population = total literate population/total population × 100

Calculation:

Let the total population be 500

The ratio of the adults to that of the children is 2 : 3

Let the number of adults be 2x and,

Number of children be 3x

⇒ 2x + 3x = 500

⇒ 5x = 500

⇒ x = 500/5

⇒ x = 100

Number of adults = 2x

⇒ 2 × 100 = 200

40% of the adults are illiterate

i.e. 60% are literate

⇒ 60/100 × 200

⇒ 120

Out of 200 adults, 120 are literate.

Number of children = 3x

⇒ 3 × 100 = 300

85% of the children are literate.

⇒ 85/100 × 300

⇒ 255

Out of 300 children, 255 are literate.

Total literate = 120 + 255

⇒ Total literate = 375

%literate population = total literate population/total population × 100

⇒ %literate population = 375/500 × 100

⇒ %literate population = 75%

∴ 75% population is literate

Que. 52 There are 50 students admitted to a nursery class. Some students can speak only English and some can speak only Hindi.10 students can speak both English and Hindi. If the number of students who can speak English is 21, then how many students can speak Hindi, how many can speak only Hindi, and how many can speak only English?

1. 21, 11 and 29 respectively
2. 28, 18 and 22 respectively
3. 37, 27 and 13 respectively
4. 39, 29 and 11 respectively

Testbook Solution Correct Option **- 4**

There are 50 students admitted to a nursery class. Some students can speak only English and some can speak only Hindi.

10 students can speak both English and Hindi.

If the number of students who can speak English is 21.

So, the number of students who can speak only English = (21 – 10) = 11

Number of students who can speak Hindi = (50 – 21) = 39

Number of students who can speak only Hindi = (39 – 10) = 29

Therefore, students can speak Hindi, who can speak only Hindi, and who can speak only English are 39, 29 and 11 respectively.

Hence, '39, 29 and 11 respectively' is the correct answer.

Que. 53 The last digit of the number obtained by multiplying the numbers 81 × 82 × 83 × 85 × 86 × 87 × 88 × 89 will be

1. 0
2. 9
3. 7
4. 2

Testbook Solution Correct Option **- 1**

Given:

81 × 82 × 83 × 85 × 86 × 87 × 88 × 89

Concept Used:

To find the last digit number in a multiplication,

multiply only digit place numbers of a given series.

Calculation:

81 × 82 × 83 × 85 × 86 × 87 × 88 × 89

⇒ Multiplying 1×2×3×5×...

⇒ We will get zero '0' at the digit place

∴ **We will obtain 0 at the digit place after multiplying the given numbers.**

Que. 54 It has been reported in recent years that a very large number of seats in the engineering colleges in the country remain vacant at the end of the admission session.

Which of the following may be the probable cause of the above effect?

1. There has been a considerable decrease in hiring of engineering graduates due to economic slowdown in the recent years.
2. Students have always preferred to complete graduation in three years time instead of four years for engineering.
3. The govt. has recently decided to provide post qualification, professional training to all engineering graduates at its own cost.
4. None of these

Testbook Solution Correct Option **- 1**

Due to lack of job, it is possible that student's do not take admission in engineering colleges

Hence, 'option 1' is the correct answer.

Que. 55 At what time, in minutes, between 3 o'clock and 4o'clock, both the needles will coincide each other?

1. $5\frac{1}{11}$
2. $12\frac{4}{11}$
3. $13\frac{4}{11}$
4. $16\frac{4}{11}$

Testbook Solution Correct Option **- 4**

At 3 o'clock, the minute hand is 15 minute spaces apart from the hour hand.

To be coincident, it must gain 15 minute spaces.

55 minutes are gained in 60 minutes.

So, 15 minutes are gained in $\frac{60}{55}$ × 15 minutes

= $\frac{180}{11}$ minutes

= $16\frac{4}{11}$ minutes

So, the needles will coincide each other at $16\frac{4}{11}$ past 3.

Hence, '$16\frac{4}{11}$ is the correct answer.

Que. 56 If $\log_3 2$, $\log_3(2^x - 5)$, $\log_3(2^x - \frac{7}{2})$ are in arithmetic progression, then the value of x is equal to

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

Testbook Solution Correct Option **- 3**

Concept:

If **a, b and c are in AP**, then 2b = a + c

Logarithmic formula:

- $n \times \log_a b = \log_a (b)^n$, where $a \neq 1$
- $\log_a (b \times c) = \log_a b + \log_a c$, where $a \neq 1$
- $\log_a b = \log_a c \Rightarrow b = c$

Calculation:

Given: $\log_3 2$, $\log_3(2^x - 5)$, $\log_3(2^x - \frac{7}{2})$ are in AP.

Let $a = \log_3 2$, $b = \log_3(2^x - 5)$ and $c = \log_3(2^x - \frac{7}{2})$

As we know, If **a, b and c are in AP**, then 2b = a + c .... (1)

By substituting the values of a, b and c in the equation (1), we get

$\Rightarrow 2 \times \ln_3(2^x - 5) = \ln_3 2 + \ln_3\left(2^x - \frac{7}{2}\right)$

By using log property, we get

$\Rightarrow \ln_3 (2^x - 5)^2 = \ln_3\left(2 \times \left(2^x - \frac{7}{2}\right)\right)$

$\Rightarrow (2^x - 5)^2 = \left(2^{x+1} - 7\right)$ .... (2)

Let $y = 2^x$ and substituting in the equation (2), we get

$\Rightarrow (y - 5)^2 = (2y - 7)$

$\Rightarrow y^2 - 12y + 32 = 0$

$\Rightarrow y = 4$ or 8

Case-1: If $y = 4$ and by substituting $y = 2^x \Rightarrow 2^x = 4 = 2^2 \Rightarrow x = 2$.

Case-2: If $y = 8$ and by substituting $y = 2^x \Rightarrow 2^x = 8 = 2^3 \Rightarrow x = 3$.

When $x = 2$, $\ln(2^x - 5) = \ln_3(-1)$ which is not defined.

Hence, x = 3.

Que. 57 Let n be the number of different 5 digits numbers, divisible by 4 that can be formed with the digits 1, 2, 3, 4, 5 and 6 , with no digit being repeated. What is the value of n?

1. 144
2. 168
3. 192
4. 222

Testbook Solution Correct Option **- 3**

Concept:

Divisibility rule of 4: If the last two digits of a number are divisible by 4, then that number is divisible by 4.

Permutation: Permutation is defined as an arrangement of r things that can be done out of total n things. This is denoted by ${}^nP_r$: $\left({}^nP_r = \frac{n!}{(n-r)!}\right)$

Calculation:

Given digits are 1, 2, 3, 4, 5 and 6

As we know, a number is divisible by 4, the last 2 digits must be divisible by 4.

So, Number of possible last 2 digits will be {12,16, 24, 32, 36, 52, 56, 64}

Number of ways of selecting 1 of these number = ${}^8C_1$ =8 ways

We have already taken the last 2 digits, therefor n = 6 - 2 = 4

So, Number of digits to be filled is 3 = $^4P_3$

= 4 × 3 × 2

= 24

Now,

Total number of 5 digits number which will be divisible by 4

= (Number of ways of selecting 1st 3 digits) × (Number of ways of selecting last 2 digits)

= 24 × 8

= 192

Que. 58 Let S be the set of integers x such that

i. $100 \leq x \leq 200$

ii. x is odd and

iii. x is divisible by 3 but not by 7

How many elements does S contain?

1. 16
2. 12
3. 11
4. 13

Testbook Solution Correct Option **- 4**

Given:

x is odd

x is divisible by 3 but not by 7

$100 \leq x \leq 200$

Calculation:

Numbers that are divisible by 3 and not by 7,

And also $100 \leq x \leq 200$ are,

⇒ [(by 3) – (by 6) – (by 21) + (by 42)]

Numbers $100 \leq x \leq 200$ that are divisible by 3,

⇒ 200/3 - 100/3

⇒ 66 – 33

⇒ 33

Numbers $100 \leq x \leq 200$ that are divisible by 6,

⇒ 200/6 – 100/6

⇒ 33 – 16

⇒ 17

Numbers $100 \leq x \leq 200$ that are divisible by 21,

⇒ 200/21 – 100/21

⇒ 9 – 4

⇒ 5

Numbers $100 \leq x \leq 200$ that are divisible by 42,

⇒ 200/42 – 100/42

⇒ 4 – 2

⇒ 2

[(by 3) – (by 6) – (by 21) + (by 42)]

⇒ 33 – 17 – 5 + 2

⇒ 13

∴ S will contain 13 terms.

Que. 59 Two pipes A and B can fill a cistern in 37.5 minutes and 45 minutes respectively. Both pipes are opened. The cistern will be filled in just half an hour, if the B is turned off after

1. 5 minutes
2. 9 minutes
3. 10 minutes
4. 15 minutes

Testbook Solution Correct Option **- 2**

Given:

$Pipe_A$ can fill the tank in 37.5 minutes

$Pipe_B$ can fill the tank in 45 minutes

A cistern is filled in 1/2 hour i.e. 30 minutes

Formula Used:

The capacity of cistern = LCM of time taken by $Pipe_A$ and $Pipe_B$

The efficiency of Pipe = Capacity of cistern/time taken to fill the cistern

Calculation:

The capacity of cistern = LCM of time taken by $Pipe_A$ and $Pipe_B$

⇒ The capacity of cistern = LCM of 37.5 minutes and 45 minutes

⇒ The capacity of cistern = 225 units

The efficiency of Pipe = Capacity of cistern/time taken to fill the cistern

⇒ The efficiency of $Pipe_A$ = Capacity of cistern/time taken to fill the cistern by $Pipe_A$

⇒ The efficiency of $Pipe_A$ = 225/37.5

⇒ The efficiency of $Pipe_A$ = 6

The efficiency of $Pipe_B$ = Capacity of cistern/time taken to fill the cistern by $Pipe_B$

⇒ The efficiency of $Pipe_B$ = 225/45

⇒ The efficiency of $Pipe_B$ = 5

The cistern filled in just half an hour

⇒ $Pipe_A$ runs for 30 minutes

⇒ 6× 30 = 180 units

i.e. 180 units filled by $Pipe_A$ in 30 minutes

Remaining cistern filled by B,

⇒ Remaining quantity = 225 - 180

⇒ Remaining quantity = 45 units

To fill the 45 units $Pipe_B$ will have to run for,

⇒ Quantity/ Efficiency of $Pipe_B$ = total time taken by $Pipe_B$

⇒ total time taken by $Pipe_B$ = 45/5

⇒ total time taken by $Pipe_B$ = 9 minutes

∴ **$Pipe_B$ is turned off after 9 minutes.**

Que. 60 Three persons A, B and C wear shirts of Black, Blue and Orange colours (not necessarily in the order) and pants of green, yellow and orange (not necessarily in that order). No person wore shirt and pant of the same colour. Further, it is given that,

1. A did not wear shirt of black colour.
2. B did not wear shirt of blue colour.
3. C did not wear shirt of orange colour.
4. A did not wear pant of green colour.
5. B wore pant of orange colour

What were the colours of the pant and shirt worn by C respectively?

1. Orange and Black
2. Green and Blue
3. Yellow and Blue
4. Yellow and Black

Testbook Solution Correct Option **- 2**

1. A did not wear shirt of black colour.
2. B did not wear shirt of blue colour.
3. C did not wear shirt of orange colour.
4. A did not wear pant of green colour.
5. B wore pant of orange colour

As no person wore shirt and pant of the same colour, B wore Shirt of Black colour.

So, C wore shirt of Blue colour and A wore shirt of Orange colour.

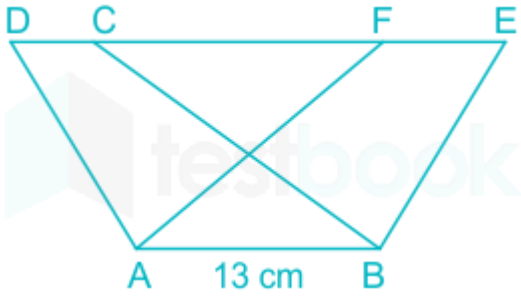
As A cannot wear pant of Green colour, C wears pant of Green colour and A wears pant of Yellow colour.

Persons	Shirt	Pant
A	Black Orange	Green Yellow
B	Blue Black	Orange
C	Orange Blue	Green

So, the colours of the pant and shirt worn by C respectively are Green and Blue.

Hence, 'Green and Blue' is the correct answer.

Que. 61 In the figure given below, if the area of parallelogram ABCD is 208 cm^2, what is the height of the parallelogram ABEF?



1. 15 cm
2. 15.5 cm
3. 16 cm
4. 16.5 cm

Testbook Solution Correct Option **- 3**

Given:

Area of parallelogram ABCD is 208 cm^2

Formula used:

Area of parallelogram = base × height

Calculation:

Parallelogram ABCD and Parallelogram ABEF,

Are in Parallelogram ABED

⇒ height of both parallelograms is the same

Area of parallelogram ABCD is 208 cm^2

⇒ AB × h = 208

⇒ h = 208/AB

⇒ h = 208/13

⇒ h = 16

height of both parallelograms is the same

∴ Height of Parallelogram ABEF is 16 cm

Que. 62 If the first and the third letters in the group DISTRIBUTION are interchanged and also the second and the fourth letter, the fifth and the seventh and so on, then which of the following would be the seventh letter from the left?

1. U
2. R
3. B
4. T

Testbook Solution Correct Option **- 2**

According to given conditions,

Hence, 'R' is the correct answer.

Que. 63 In the below series, you will be looking at the letter pattern, diagram pattern, or number pattern. Fill the blank at the end of the series.

JAK, KBL, LCM, MDN, _____

1. OEP
2. NEO
3. MEN
4. PFQ

Testbook Solution Correct Option **- 2**

The pattern followed here is:

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

According to the alphabetical positions of the letters,

Hence, 'NEO' is the correct answer.

Que. 64 A caterpillar crawls up a pole of 75 inches high, starting from the ground. Each day, it crawls up 5 inches and each night it slides down 4 inches. When will it reach the top of the pole?

1. End of 70 days
2. End of 71 days
3. End of 72 days
4. End of 73 days

Testbook Solution Correct Option **- 2**

Given:

A caterpillar crawls up a pole 75 inches high, starting from the ground. Each day it crawls up 5 inches and each night it slides down 4 inches.

Calculation:

⇒ distance crawl up by caterpillar in day = 5 inches

⇒ distance crawl by caterpillar slides in night = -4 inches [- sign shows distance crawls when sliding]

⇒ distance crawled by caterpillar in 1st day i.e. (day + night) = (5 - 4) = 1 inch

⇒ distance crawled by caterpillar in 70th day = 70 inches

⇒ distance crawled by caterpillar in 71st day during day time = (70 + 5) = 75 inches

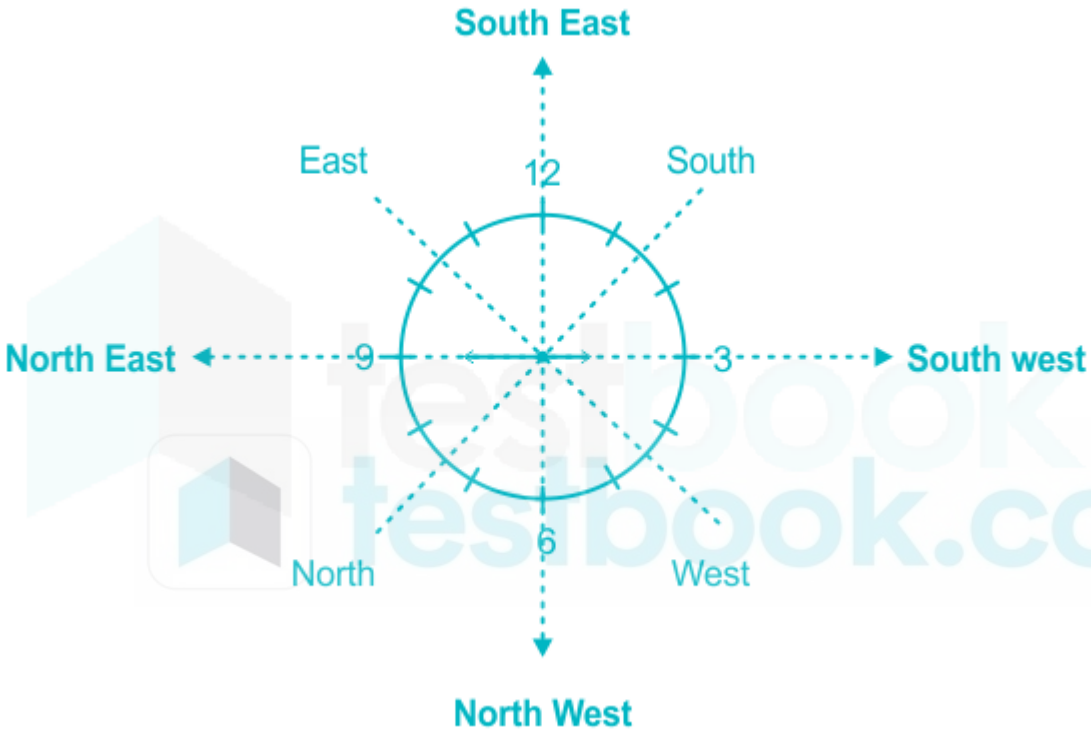
∴ It will first reach the top of the pole on the 71st day

Que. 65 The time on the watch is quarter to three, If the minute hand points of North - East, in which direction does the hour hand point?

1. North - West
2. South - West
3. South - East
4. North - East

Testbook Solution Correct Option **- 2**

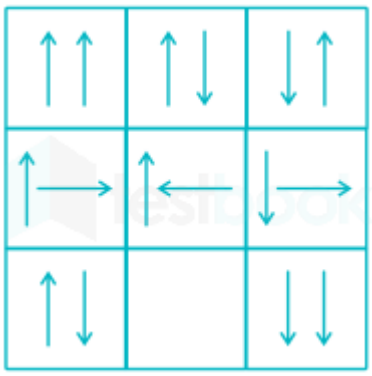
At quarter to three, the hour hand and minute hand are almost at an angle of 180 .



Thus if the minute hand points of North - East, then the hour-hand will be opposite to that of North – East i.e, the hour hand will point to South – West.

Hence, 'South - West' is the correct answer.

Que. 66



Which of the following figures fits into blank part of the above matrix?

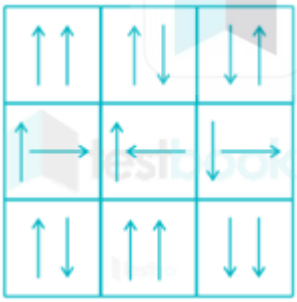
1. 
a)
2. 
b)
3. 
c)
4. 
d)

Testbook Solution Correct Option **- 1**

The figure that fits into blank part of the above matrix is shown below:

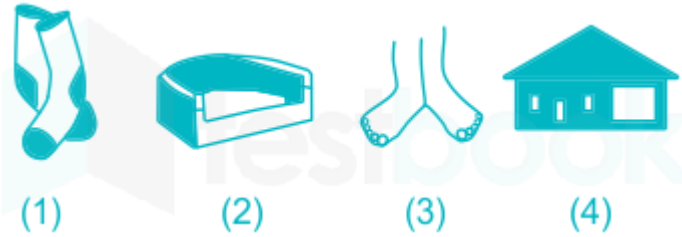
If we go through row wise right element get inverted 1^{st} to 2^{nd} figure and left element is same and from 3^{rd} to 4^{th} both element get inverted. Similar pattern followed by 2^{nd} row.

So, In third row right element gets inverted from 1^{st} to second figure.



Hence, 'option 2' is the correct answer.

Que. 67 Choose the picture that would go in the empty box so that the two bottom pictures are related in the same way as the top are related?



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

Testbook Solution Correct Option **- 2**

The picture that would go in the empty box so that the two bottom pictures are related in the same way as the top are related is shown below:

T-shirt and Shoes are clothing article.

Similarly,

Rack and couch are furniture.

Hence, 'option 2' is the correct answer.

Que. 68 Decide which of the given conclusions logically follow from the given statement(s)

Statements:

Some codes are secrets.

All secrets are puzzles.

Conclusions:

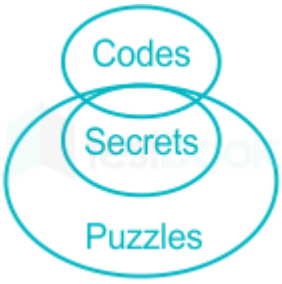
I. All secrets being codes is a possibility.

II. Atleast some puzzles are codes.

1. Only conclusion I is true
2. Only conclusion II is true
3. Either conclusion I or II is true
4. Both conclusion I or II are true

Testbook Solution Correct Option **- 4**

The least possible venn diagram is:



I. All secrets being codes is a possibility. → True (As, All secret are code is definitely false)

II. Atleast some puzzles are codes. → True (This is definitely true)

Hence, both I and II follows.

Que. 69 Decide which of the given conclusions logically follow from the given statement(S)

Statement:

Some metals are alloys.

No metal is a stone.

Conclusions:

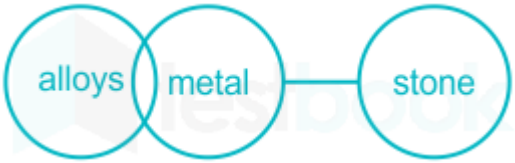
I. No alloy is stone.

II. Atleast some alloys are metals

1. Neither conclusion I nor II is true
2. Only Conclusion II is true
3. Only Conclusion I is true
4. Both Only Conclusion I and II are true

Testbook Solution Correct Option **- 2**

The least possible venn diagram is:



I. No alloy is stone. → False (It can be possible, but it is not definite)

II. Atleast some alloys are metals → True (It is definite)

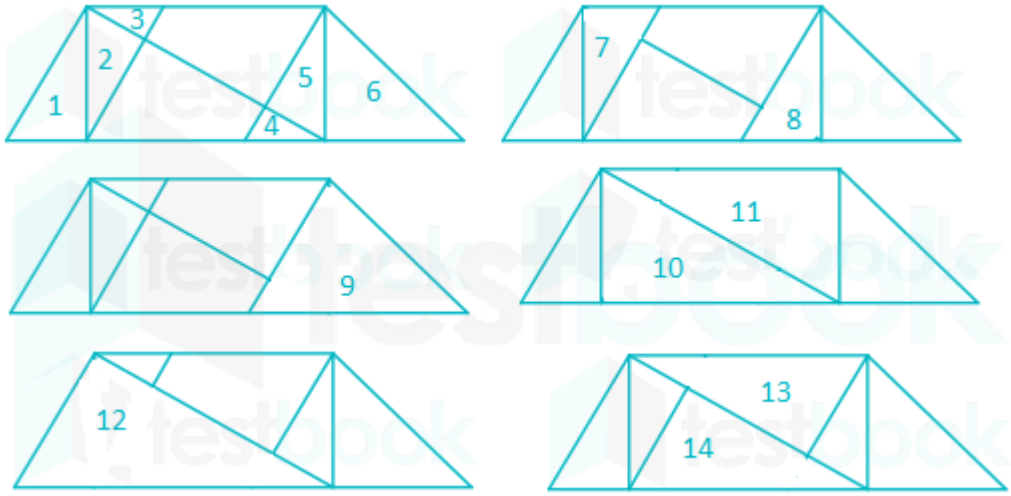
Hence, only Conclusion II is true.

Que. 70 Find the number of triangles in the given picture?

1. 10
2. 12
3. 14
4. 16

Testbook Solution Correct Option **- 3**

The number of triangles in the given picture is shown below:



Hence, '14' is the correct answer.

Que. 71 **Statements:**

All mangoes are golden in colour.

No golden-coloured things are cheap.

Conclusions:

I) All mangoes are cheap

II) Golden-coloured mangoes are not cheap.

1. Only conclusion I follows
2. Only conclusion II follows
3. Either I or II follows
4. Neither I nor II follows

Testbook Solution Correct Option **- 2**

I) All mangoes are cheap → False (As, all mangoes are golden in colour and No golden-coloured things are cheap → No mangoes are cheap)

II) Golden-coloured mangoes are not cheap. → True (It is definite)

Hence, only conclusion II follows.

Que. 72 By selling an article, what is the profit percent gained?

I) 5% discount is given on the list price.

II) If the discount is not given, 20% profit is gained.

III) The cost price of the articles is Rs. 5,000.

1. Only I and II
2. Only II and III
3. Only I and III
4. All of I, II and III

Testbook Solution Correct Option **- 1**

Given:

I) 5% discount is given on the list price.

II) If the discount is not given, 20% profit is gained.

III) The cost price of the articles is Rs. 5,000.

Calculation:

Let the list price of a product be Rs.100

By the 1st statement,

5% discount on the list price.

⇒ Selling price = 95% × list price

⇒ Selling price = 95/100 × 100

⇒ Selling price = 95

By the second statement,

If the discount is not given, 20% profit is gained.

⇒ 100 = 120

⇒ 1 = 120/100

⇒ Selling price is 95

⇒ Selling price = 95 × 120/100

⇒ Selling price = 114

∴ 14% profit

∴ **Statement I and II are enough to find profit percent.**

Que. 73 Decide which of the given conclusions logically follows from the given statement(s).

Statement:

All politicians are honest.

All honest are fair.

Conclusions:

I) Some honest are politicians

II) No honest is politician

III) Some fair are politicians

IV) All fair are politicians

1. None follows
2. Only I and IV follow
3. Only I and II follow
4. Only I and III follow

Testbook Solution Correct Option **- 4**

The least possible venn diagram is:

I) Some honest are politicians → True (It is definite)

II) No honest is politician → False (It is definite)

III) Some fair are politicians → True (It is definite)

IV) All fair are politicians → False (It can be possible but it is not definite)

Hence, only I and II follow.

Que. 74 Forty students watched films A, B and C over a week. Each student watched either only one film or all three. Thirteen students watched film A, sixteen students watched film B and nineteen students watched film C. How many students watched all three films?

1. 0
2. 2
3. 4
4. 8

Testbook Solution Correct Option **- 4**

Forty students watched films A, B and C over a week. Each student watched either only one film or all three.

Thirteen students watched film A, sixteen students watched film B and nineteen students watched film C.

Number of students who watched all three films = (13 + 16 + 19) – 40

= 48 – 40

= 8

Hence, '8' is the correct answer.

Que. 75 Two bus tickets from city A to B and three tickets from city A to C cost Rs. 77, but three tickets from city A to B and two tickets from city A to C cost Rs. 73. What are the fares for cities B and C from A?

1. Rs. 4, Rs. 23
2. Rs. 13. Rs. 17
3. Rs. 15, Rs. 14
4. Rs. 17, Rs. 13

Testbook Solution Correct Option **- 2**

Given:

2 bus tickets from city A to B + 3 bus tickets from city A to C cost Rs.77

3 bus tickets from city A to B + 2 bus tickets from city A to C cost Rs.73

Calculation:

Let the price of a bus ticket from city A to B be Rs.x

And the price of a bus ticket from city A to C be Rs.y

⇒ 2x + 3y = 77 ------(1)

And,

⇒ 3x + 2y = 73 ------(2)

Now solve the simultaneous equations,

Multiplying 1st equation by 2 and 2nd equation by 3,

⇒ 4x + 6y = 154 ------(3)

And

⇒ 9x + 6y = 219 ------(4)

Subtracting equation 3 from equation 4,

⇒ (9x + 6y) - (4x + 6y) = 219 - 154

⇒ 9x + 6y - 4x - 6y = 65

⇒ 5x = 65

⇒ x = 65\5

⇒ x = 13

Using the above value of x in 1st equation,

⇒ 2x + 3y = 77

⇒ 2(13) + 3y = 77

⇒ 26 + 3y = 77

⇒ 3y = 77 – 26

⇒ 3y = 51

⇒ y = 51/3

⇒ y = 17

∴ The price of a bus ticket from city A to B is Rs.13

And,

The price of a bus ticket from city A to C is Rs.17

Que. 76 Decide which of the assumptions is implicit in the statement and choose your answer accordingly.

Statement:

"Buy pure and natural honey of company X." - An advertisement in a newspaper.

Assumptions:

I. Artificial honey can be prepared.

II. People do not mind paying more for pure and natural honey.

III. No other company supplies pure honey.

1. Only I is implicit
2. Only I and II are implicit
3. Only I and III are implicit
4. All are implicit

Testbook Solution Correct Option **- 1**

I. Artificial honey can be prepared.

It is suggested through the statement as “Buy pure and natural honey” is stated in the advertisement.

II. People do not mind paying more for pure and natural honey.

It is not implicit in the statement as the statements has no mention of price.

III. No other company supplies pure honey.

It is not implicit in the statement as the statements does not mentions any such information.

Hence, only I is implicit.

Que. 77 Choose the conclusion which logically follows from the given statement(S)

Statement:

All scientist working in America are talented.

Some Indian scientists are working in America.

Conclusions:

1. None of Indian scientists is talented.

2. Some talented Indian scientists have migrated to America.

3. All talented scientists are Indians.

4. Some Indian scientists are talented.

The conclusion(s) correctly drawn is/are

1. 1 only
2. 2 only
3. 2 and 3
4. 2 and 4

Testbook Solution Correct Option **- 4**

1. None of Indian scientists is talented. → False (As, All scientist working in America are talented and Some Indian scientists are working in America. → Some Indian scientists are talented)

2. Some talented Indian scientists have migrated to America. → True (As, All scientist working in America are talented and Some Indian scientists are working in America. → Some talented Indian scientists have migrated to America)

3. All talented scientists are Indians. → False (As, All scientist working in America are talented and Some Indian scientists are working in America. → Some Indian scientists are talented)

4. Some Indian scientists are talented → True (As, All scientist working in America are talented and Some Indian scientists are working in America. → Some Indian scientists are talented)

Hence, '2 and 4' is the correct answer.

Que. 78 One New York publisher has estimated that 50,000 to 60,000 people in the United States want an anthology that includes the complete works of William Shakespeare. And what accounts for this renewed interest in Shakespeare? As scholars point out, his psychological insights into both male and female characters are amazing even today.

This paragraph best supports that statement that

1. Shakespeare's characters are more interesting than fictional characters today
2. People even today are interested in Shakespeare's work because of the characters.
3. Academic scholars are putting together an anthology of Shakespeare's work
4. New Yorkers have a renewed interested in the work of Shakespeare

Testbook Solution Correct Option **- 2**

And what accounts for this renewed interest in Shakespeare?

The last sentence in the paragraph clearly gives idea that the interest in Shakespeare is due to the development of his characters.

Hence, 'option 2' is the correct answer.

Que. 79 A runs $1\frac{2}{3}$ times as fast as B. If A gives B a start of 80 m, how far must the winning post be so that A and B might reach it at the same time?

1. 200 m
2. 400 m
3. 300 m
4. 160 m 80.

Testbook Solution Correct Option **- 1**

Given:

A runs $1\frac{2}{3}$ times as fast as B

A gives B a start of 80 m

Formula Used:

Speed = Distance/Time

Calculation:

A runs $1\frac{2}{3}$ times as fast as B

⇒ A = 5/3 B

⇒ A/B = 5/3

So the ratio of speeds of A and B is 5: 3

⇒Let the speed of A and B be 5x and 3x

Let the distance be covered by B be 'L'

⇒Then distance covered by A = 'L + 80'

They both reach at the same time.

⇒ $\frac{L}{3x} = \frac{L+80}{5x}$

⇒ 5x.L = 3x.L + 240x

⇒ 5x.L – 3x.L = 240x

⇒ 2x.L = 240x

⇒ L = 240/2

⇒ L = 120

A will cover the total distance

⇒ 120 + 80 = 200 meter.

∴ **The winning post will be 200 meters long.**

Que. 80 Two men and three boys can do a piece of work in ten days; while three men and two boys can do the same work in eight days. In how many days can two men and one boy do the work?

1. 12.5
2. 9
3. 9.5
4. 8.5

Testbook Solution Correct Option **- 1**

Given:

2 men + 3 boys completed work in 10days.

3 men + 2 boys completed work in 8 days.

Formula Used:

$\frac{m1.d1.t1.e1}{w1.c1} = \frac{m2.d2.t2.e2}{w2.c2}$

m = number of total men, women, and boys, etc.

d = number of days required to complete a work

t = number of working hours in a day

e = efficiency of total men, women, and boys, etc.

w = total units of work

c = units of consumption

Calculation:

$\frac{m1.d1.t1.e1}{w1.c1} = \frac{m2.d2.t2.e2}{w2.c2}$

⇒ (2 men + 3 boys) × 10 = (3 men + 2 boys) × 8

⇒ 20 men + 30 boys = 24 men + 16 boys

⇒ 14 boys = 4 men

⇒ 7 boys = 2 men

Efficiency of 1 man and 1 boy is 7 and 2 respectively.

Now two men and one boy do the same work,

Let the number of days be x

⇒ (2 men + 3 boys) × 10 = (2 men + 1 boy) × x days

⇒ 20 men + 30 boys = (2 men + 1 boy) × x days

⇒ 20(7) + 30(2) = {2(7)+1(2)}× x days

⇒ 140 + 60 = (14 + 2)× x days

⇒ 200 = 16 × x days

⇒ x days = 200/16

⇒ x days = 12.5 days

∴ 2 men and 1 boy will complete the same work in 12.5 days.

Que. 81 How many numbers between 1 and 1000 are divisible by all number 2, 3, 4, 5 and 6?

1. 16
2. 32
3. 17
4. 33

Testbook Solution Correct Option **- 1**

Given:

divisible by 2,3,4,5 and 6

Concept Used:

LCM of given numbers will be divisible by all given numbers.

Formula Used:

t_n = a +(n-1).d

where,

t_n = last term

a = first term

n = total terms

d = difference between two consecutive terms

Calculation:

LCM of 2,3,4,5 and 6 is 60

⇒ given range = 1 to 1000

⇒ 1st number in the series is 60

and the last number will be 960

⇒ Terms will be 60,120,180,___,960.

⇒ As the above series in AP

⇒ To find the total numbers in AP,

we have

$t_n = a + (n-1).d$

⇒ $960 = 60 + (n-1) \times 60$

⇒ $960 = 60 + 60n - 60$

⇒ $960 = 60n$

⇒ $n = 960/60$

⇒ $n = 16$

∴ 16 numbers will be there.

Que. 82 There are 8436 steel balls, each with radius of 1 centimeter, stacked in pile, with 1 ball on top, 3 balls in the second layer, 6 in the third layer 10 in the fourth and so on. The number of horizontal layers in the pile is

1. 34
2. 38
3. 36
4. 32

Testbook Solution Correct Option **- 3**

GIven:

Total steel Balls: 8436

Calculations:

Balls stacked in pile

Layers	Number of Balls	Logic
First	1	+2
Second	3	+3
Third	6	+4
Fourth	10	+5
Fifth	15	+6
Sixth	21	+7

According to question,

For any layer, the starting number, a =1

Difference, d= 2–1 = 3–2 = 4–3 = 1

Sn = (n/2)(2 + (n-1)) —(1)

A table can be made as follows based on equation. (1).

Cumulative sum = Sum of balls stacked upto (n-1) th layer + Sum of balls in n th lay

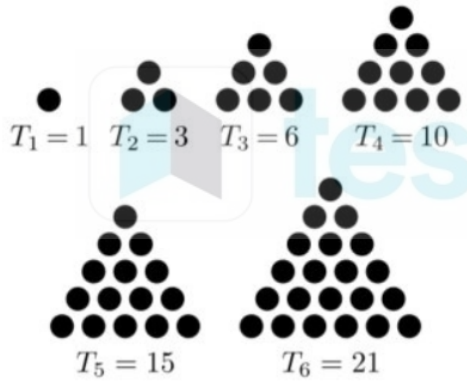
Layer	No. of balls	Cumulative sum
1	1	1
2	3	4
3	6	10
4	10	20
5	15	35
6	21	56
7	28	84
8	36	120
9	45	165
10	55	220
11	66	286
12	78	364
13	91	455
14	105	560
15	120	680
16	136	816
17	153	969
18	171	1140

Layer	No. of balls	Cumulative sum
19	190	1330
20	210	1540
21	231	1771
22	253	2024
23	276	2300
24	300	2600
25	325	2925
26	351	3276
27	378	3654
28	406	4060
29	435	4495
30	465	4960
31	496	5456
32	528	5984
33	561	6545
34	595	7140
35	630	7770
36	666	8436

Balls in first layer + Summision of remaining laters = 8436

After stacking layer 36, we find that 8436 balls are utilized.

Additional Information



The first six triangular numbers

Shortcut Trick

Triangular Number,T =n(n+1)(2n+1)/6

T = 8436

n(n+1)(2n+1)=6T

$2n^3 + 3n^2 + n = 50616$

$2n^3 + 3n^2 + n - 50616 = 0$

(x−28) is a root.

Que. 83 A body travels from A to B in 10s with a speed of 50 km/h and returns with a speed of 100 km/h in 5s. The average speed and the average velocity for the whole journey is

1. 17.5 m/s - 1, 0 km/h
2. 16.5 m/s - 1, 0 km/h
3. 15.5 m/s - 1, 0 km/h

4. 18.5 m/s - 1, 0 km/h

Testbook Solution Correct Option **- 4**

Given:

From A to B in 10s with a speed of 50 km/h.

Returns with a speed of 100 km/h in 5s

Formula Used:

Speed = distance/time

Average speed = total distance/total time

m/s = 5/18 × km/hr

Calculation:

From A to B in 10s with a speed of 50 km/h.

m/s = 5/18 × km/hr

⇒ 5/18 ×50

⇒ 125/9m/s

Distance = speed × time

⇒ Distance = 125/9 × 10

⇒ Distance = 1250/9 meters

Returns with a speed of 100 km/h in 5s

m/s = 5/18 × km/hr

⇒ 5/18 ×100

⇒ 250/9m/s

Distance = speed × time

⇒ Distance = 250/9 × 5

⇒ Distance = 1250/9 meters

Average speed = total distance/total time

$\Rightarrow$Average speed $= \frac{\frac{1250}{9} + \frac{1250}{9}}{10 + 5}$

$\Rightarrow$Average speed $= \frac{\frac{2500}{9}}{15}$

⇒Average speed = 2500/(15×9)

⇒Average speed = 2500/135

⇒Average speed = 18.5m/s

∴ **Average speed is 18.5m/s**

Que. 84 Find the odd one out.

1. DEHG
2. RSVU
3. JKNM
4. LMQP

Testbook Solution Correct Option **- 4**

The pattern followed here is:

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

According to the alphabetical positions of the letters,

1) DEHG → D + 1 = E; E + 3 = H; H – 1 = G

2) RSVU → R + 1 = S; S + 3 = V; V – 1 = U

3) JKNM → J + 1 = K; K + 3 = N; N – 1 = M

4) LMQP → L + 1 = M; M + 4 = Q; Q – 1 = P

Hence, 'LMQP' is the odd one out.

Que. 85 Find out the wrong number in the following series.

15, 16, 34, 105, 424, 2124, 12756

1. 16
2. 34
3. 424
4. 2124

Testbook Solution Correct Option **- 4**

The logic is:

(15 × 1) + 1 = 16

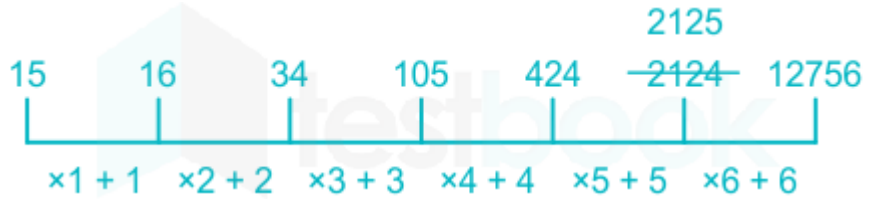
(16 × 2) + 2 = 34

(34 × 3) + 3 = 105

(105 × 4) + 4 = 424

(424 × 5) + 5 = 2125 ≠ 2124

(2125 × 6) + 6 = 12756



Hence, '2124' is the wrong term in the series.

Que. 86 My mother is twice as old as my brother. I am five years younger to my brother but three years older to my sister. If my sister is twelve years of age, how old is my mother?

1. 24
2. 30
3. 40
4. 50

Testbook Solution Correct Option **- 3**

My mother is twice as old as my brother.

Let the age of my brother be 'a' years.

So, age of my mother = 2a

I am five years younger to my brother.

So, my age = a - 5

And three years older to my sister.

So, age of my sister = (a – 5) – 3 = a - 8

If my sister is twelve years of age.

According to question,

a – 8 = 12

⇒ a = 12 + 8

⇒ a = 20

Age of my mother = 2a

= 2 × 20

= 40 years

Hence, '40' is the correct answer.

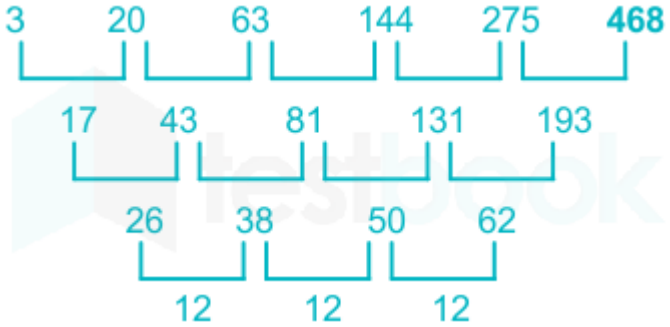
Que. 87 Find the missing term in teh series.

3, 20, 63, 144, 275, _____

1. 354
2. 468
3. 548
4. 554

Testbook Solution Correct Option - **2**

The logic is:



Hence, '468' is the correct answer.

Que. 88 **Directions:** Questions are based on the following passage:

Nine individuals Z, Y, X, W, V, U, T, S and R are the only candidates who can serve on three Committees A, B and C and each candidate should serve on exactly one of the Committees.

Committee A should consist of exactly one member more than Committee B. It is possible that there are no members of Committee C. Among Z, Y and X none can serve on Committee A. Among W, V and U none can serve on Committee B. Among T, S and R none can serve on Committee C.

In case T and Z are the individuals serving on Committee B, how many of the nine individuals should serve on Committee C?

1. 3

2. 4
3. 5
4. 6

Testbook Solution Correct Option **- 2**

1. Nine individuals Z, Y, X, W, V, U, T, S and R are the only candidates who can serve on three Committees A, B and C and each candidate should serve on exactly one of the Committees.

2. Committee A should consist of exactly one member more than Committee B.

3. It is possible that there are no members of Committee C.

4. Among Z, Y and X none can serve on Committee A.

5. Among W, V and U none can serve on Committee B.

6. Among T, S and R none can serve on Committee C.

Committee	Can Serve	Cannot Serve
A		Z, Y, X
B		W, V, U
C		T, S, R

In case T and Z are the individuals serving on Committee B.

Committee	Can Serve	Cannot Serve
A		Z, Y, X
B	T, Z	W, V, U
C		T, S, R

So, number of members in committee A = 3 (From point 2)

So, members among the nine individuals should serve on Committee C = 9 – (3 + 2)

= 9 – 5

= 4

Hence, '4' is the correct answer.

Que. 89 In case T, S and X are the only individuals serving on Committee B, the membership of Committee C should be

1. Z and Y
2. Z and W
3. Y and V
4. X and V

Testbook Solution Correct Option **- 1**

1. Nine individuals Z, Y, X, W, V, U, T, S and R are the only candidates who can serve on three Committees A, B and C and each candidate should serve on exactly one of the Committees.

2. Committee A should consist of exactly one member more than Committee B.

3. It is possible that there are no members of Committee C.

4. Among Z, Y and X none can serve on Committee A.

5. Among W, V and U none can serve on Committee B.

6. Among T, S and R none can serve on Committee C.

Committee	Can Serve	Cannot Serve

A		Z, Y, X
B		W, V, U
C		T, S, R

In case T, S and X are the only individuals serving on Committee B.

Committee	Can Serve	Cannot Serve
A		Z, Y, X
B	T, S, X	W, V, U
C		T, S, R

So, the number of persons serving on Committee A = 4 (From point 2)

Individuals serving in Committee A are R, V, U and W.

And Individuals serving in Committee C are Z and Y.

Committee	Can Serve	Cannot Serve
A	R, V, U, W	Z, Y, X
B	T, S, X	W, V, U
C	Z, Y	T, S, R

Hence, 'Z and Y' is the correct answer.

Que. 90 In case R is the only individual serving on Committee B, which among the following should serve on Committee A?

1. W and S
2. V and T
3. U ans S
4. T and S

Testbook Solution Correct Option **- 4**

1. Nine individuals Z, Y, X, W, V, U, T, S and R are the only candidates who can serve on three Committees A, B and C and each candidate should serve on exactly one of the Committees.

2. Committee A should consist of exactly one member more than Committee B.

3. It is possible that there are no members of Committee C.

4. Among Z, Y and X none can serve on Committee A.

5. Among W, V and U none can serve on Committee B.

6. Among T, S and R none can serve on Committee C.

Committee	Can Serve	Cannot Serve
A		Z, Y, X
B		W, V, U
C		T, S, R

In case R is the only individual serving on Committee B.

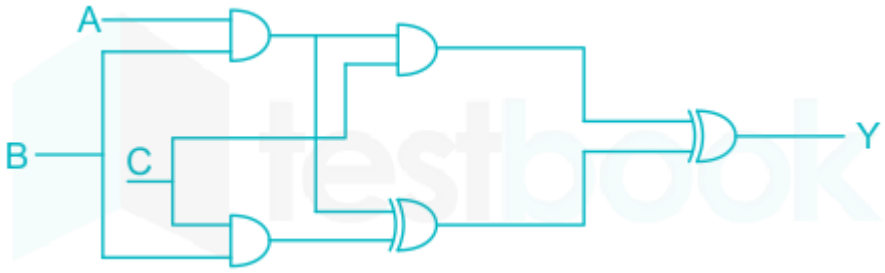
So, only 2 individuals can serve on Committee A. (From point 2)

Committee	Can Serve	Cannot Serve

A	T, S	Z, Y, X
B	R	W, V, U
C		T, S, R

Then T and S should serve on Committee A as it is the only position left for T and S.
Hence, 'T and S' is the correct answer.

Que. 91



1. A + B + C
2. A(B + C)
3. B(C + A)
4. C(A + B)

Testbook Solution Correct Option **- 3**
The correct answer is **B(C + A)**.

Key-Points

- Y = ABC □ AB □ BC = AB (C □ 1) □ BC
- = AB C □ BC = B (A C □ C)
- = B[AC C + A C . C]
- = B[(A + C) C+A C]
- = B [A C + C + A C]
- = B [C + A C]
- = B [C + A] □ Y
- = B (A + C)

Que. 92 Which one of the following expression does NOT represent exclusive NOR of x and y?

1. $xy + \bar{x}\,\bar{y}$
2. $x \oplus \bar{y}$
3. $\bar{x} \oplus y$
4. $\bar{x} \oplus \bar{y}$

Testbook Solution Correct Option **- 4**
The correct answer $\bar{x} \oplus \bar{y}$.

Key-Points

- In solution x'=$\bar{x}$, and y'= $\bar{y}$.
- By Definition of XNOR, x\odot y = x' y' + xy

- So Option-A is correct.
- Also by Definition of XOR, x\oplus y = x' y + xy'
- Option-B is x\oplus y' = x' y' + x(y')' = x' y' + xy = x\odot y
- So Option-B is also correct.
- Option-C is x' \oplus y = (x')' y + x' y' = x' y' + xy = x\odot y
- Option-C is also correct.
- Option-D x'⊕y' = x"y' + x'y" = xy' + x'y = x⊕y ≠ x⊙y
- Therefore option (D) is false.

Que. 93 If a signal passing through a gate is initiated by sending low into one of the inputs and the output is high, the gate is

1. NOR
2. NAND
3. AND
4. OR

Testbook Solution Correct Option **- 2**
The correct answer **NAND.**

Key-Points

- NOR GATE means if any of the INPUT is HIGH OUTPUT is LOW.
- But here condition is ONE of the INPUT is low and the OUTPUT should be HIGH.
- It is not valid in NOR GATE.
- SO NAND-GATE will satisfy the above condition in all cases.
A	B	AND	NAND	OR	NOR
0	0	0	1	0	1
0	1	0	1	1	0
- From the above table, we can say the answer is NAND-GATE(By-Default A=0 and B=0 or 1, o/p of NAND-GATE is HIGH only).

Important Point

NAND gate: Output is high if any of the input is low. The truth table for the NAND gate is:

A	B	Output
1	1	0
1	0	1
0	1	1
0	0	1

Que. 94 Given $\sqrt{(224)_r} = (13)_r$, then the value of the radix is

1. 10
2. 8
3. 5
4. 6

Testbook Solution Correct Option **- 3**
The correct answer is **5**.

Key-Points

Above equation can be written as: $(224)r = ((13)r)^2$
Step 1:
Converting to decimal number:
The left side of the equation:
4 will multiply by r0, 2 will multilpy by r1 and 2 will multiply by r^2 i.e $2r^2 + 2r1 + 4r0$
Right side of the equation
3 will multiply by r0and 1 will multiply by i.e $(1r^2 + 3r0)^2$
Step 2:
Now, LHS = RHS
$2r^2 + 2r + 4 = (r + 3)^2$ (because any number with exponential value 0 consider as 1)
$r^2 – 4r – 5 = 0$ (apply formaula $(a + b)^2$ where a is r and b is 3)
Root of the above equation is 5, -1.
Therefore radix = 5.

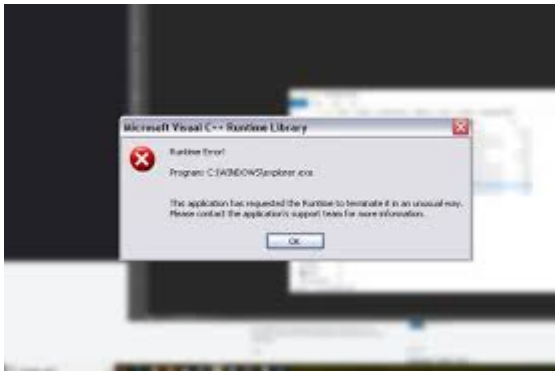
Que. 95 What type of errors are not detected by assembler?

1. Syntax error
2. Run time error
3. Logical Error
4. All of these

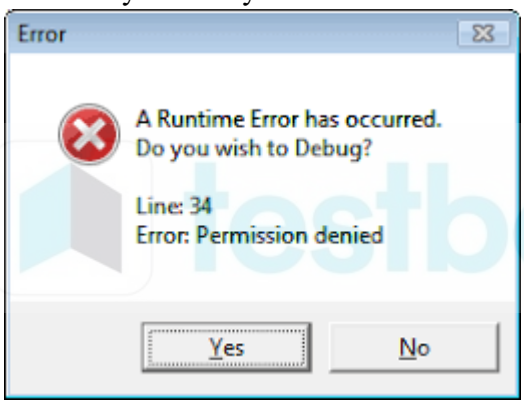
Testbook Solution Correct Option **- 3**
The correct answer **Logical Error.**

Key-Points

- A logic error (or logical error) **is a mistake in a program's source code** that results in incorrect or unexpected behavior.
- It is a type of runtime error that may simply produce the **wrong output or may cause a program to crash while running**.
- Logic errors cause a program to work incorrectly.
- For example, **in PHP, when "if ($i=1) {…}" is incorrectly entered instead of "if ($i==1) {….}," the former means "becomes" while the latter means "is equal to."**
    - The incorrect if statement would always return TRUE as assigning 1 to the variable $i.
    - In the correct version, though, the statement only returns TRUE when the value of variable $i is equal to 1.
- The syntax in the incorrect case is perfectly correct as per the language.
- The code would compile successfully without producing any syntax errors.
- During runtime of the code, the resultant output may be wrong, thus showing that a certain logic error has occurred.
- **Logic errors tend to be hidden in the source code and can typically be harder to determine and debug, unlike syntax errors that are recognized at compile time.**

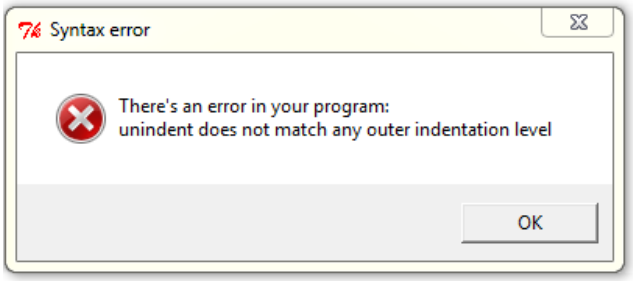


Additional Information

- A runtime error is a program error that occurs while the program is running.
  - The term is used in contrast to other types of program errors, such as syntax errors and compile-time errors.
  - A runtime error is a memory leak.
  - This type of error causes a program to continually use up more RAM while the program is running.
  - A memory leak may be due to an infinite loop, not deallocating unused memory, or other reasons.
  - 

- The syntax error is a **compile-time error.**
  - During the compilation, the **syntax** is passed into the token and formed the **parser tree**.
  - Compile-time error whenever **source code is converted into machine code.**
  - Syntax analysis or parsing is the second phase of a compiler.
  - Computer programs must follow strict syntax to compile correctly, any aspects of the code that do not conform to the syntax of the programming language will produce a syntax error.
  - Unlike logic errors, which are errors in the flow or logic of a program, syntax errors are small grammatical mistakes, sometimes limited to a single character.
  - For example, a missing semicolon at the end of a line or an extra bracket at the end of a function may produce a syntax error.
  - In the PHP code below, the second closed bracket would result in a syntax error since there is only one open bracket in the function.

```
File  Edit  Format  Run  Options  Windows  Help
a = 0
while a < 10:
    a = a + 1
    if a > 5:
        print(a, ">", 5)
    elif a <= 7:
        print(a, "<=", 7)
    else:
        print("Neither test was true")
```



Que. 96 Consider the equation $(43)_x = (y3)_8$ where x and y are unknown. The number of possible solution is

1. 4
2. 5
3. 6
4. 7

Testbook Solution Correct Option **- 2**

The correct answer is **5.**

Key-Points

$(43)_x = (y3)_8$

Since a number with base k can only have digits from 0 to (k-1), we can conclude

x > 5
y < 7
Now, the original equation, when converted to decimal base gives:
4x^1 + 3x^0 =y(8^1) + 3(8^0)
4x + 3 = 8y +3
X= 2y
So, we have the following constraints :
x>=5y<=7x=2y
where x,y are integers
The set of values of (x,y) that satisfy these constraints are:
x=6,y=3
x=8,y=4
x=10,y=5
x=12,y=6
x=14,y=7
So total solutions are 5.

Que. 97 Let the memory access time is 10 milliseconds and cache access time is 10 microseconds. Assume the cache hit ratio of 15%. The effective memory access time is

1. 2 milliseconds
2. 1.5 milliseconds
3. 1.85 microseconds
4. 1.85 milliseconds

Testbook Solution Correct Option **- 4**
The correct answer is **2 milliseconds.**

Key-Points

- ETA-Effective access time
- CMT-Cache memory time
- MMT- Main memory time
- **Given**-:
- CMT=10micro sec= 10*10^-6sec=10*10^-3 msec
- MMT=10 msec
- Hit ratio =15%
- EAT=(hit ratio)*(CMT +MMT)+(1-hit)*(CMT+2*MMT) …. (1)
- Putting values in equation (1)…
- EAT=15/100(0.001+10)+85/100(0.001+2*10)
- EAT=1.85msec

Que. 98 What are the values of R_1 and R_2 respectively in the expression $(235)_{R1} = (565)_{10} = (1065)_{R2}$?

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

Testbook Solution Correct Option **- 2**
The correct answer **16, 8.**

Key-Points

- (235)R1 = (565)10 = (1065)R2 …….(1)
- (235) R1 = 2R1^2 + 3R1 + 5 = 565 ……(2)
- By solving quadratic equation (2) we get..
- R1= 16 & -17.5
- Since radix cannot be negative so ignore 17.5
- Hence **R1=16**
- Putting value of R1 in (1) we get -:
- $(235)16 = (1065)_{R2}$
- 2*16^2+3*16^1+5*16^0=1* R2^3 + 0* R2^2 + 6* R2^1 + 5* R2^0
- 512+48+5= R2^3+6R2+ 5
- 560= R2^3+6R2
- R2^3+6R2-560=0
- By solving above cubic equation we get-:
- R2 = 8
- R2 = -4 + i * 7.34847
- R2 = -4 - i * 7.34847
- Radix cannot be imaginary number so ignoring imaginary numbers
- We get R2 = 8
- From options we can see option B) is correct answer. Where R1 =16 and R2 =8.

Que. 99 What is the minimal from of Karnaugh map shown below? (Assume that x denotes a don't care term)

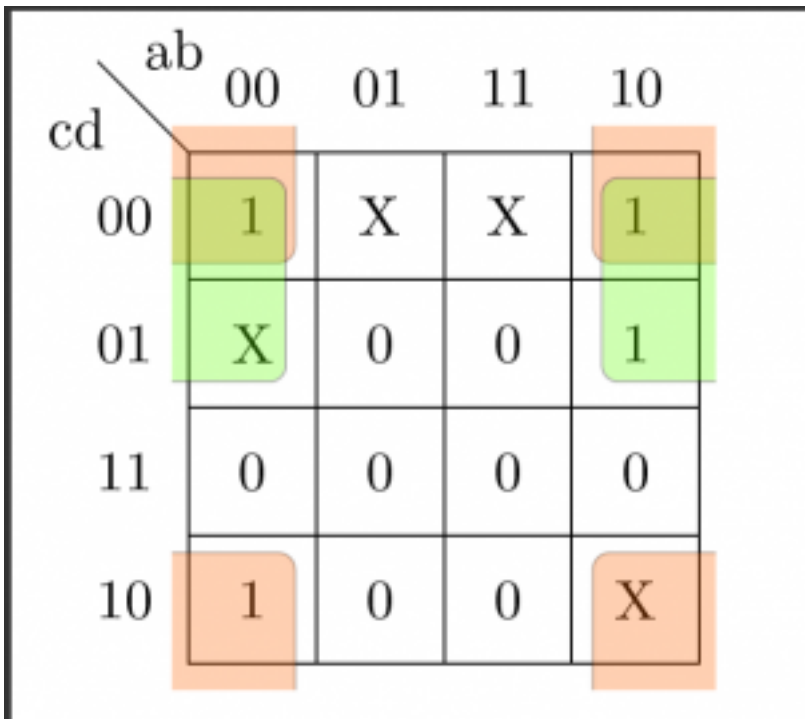
cd \ ab	00	01	11	10
00	1	x	x	1
01	x			1
11				
10	1			x

1. $\overline{b}\,\overline{b}$
2. $\overline{b}\,\overline{d} + \overline{b}\,\overline{c}$
3. $\overline{b}\,\overline{d} + \overline{a}\,\overline{d}\,\overline{c}\,\overline{d}$
4. $\overline{b}\,\overline{d} + \overline{b}\,\overline{c} + \overline{c}\,\overline{d}$

Testbook Solution Correct Option **- 2**
The correct answer is $\overline{b}\,\overline{d} + \overline{b}\,\overline{c}$.

Key-Points

- There are two prime implicants in the following K-Map-



Prime Implicant highlighted in Green =$\overline{b}\,\overline{c}$
Prime Implicant highlighted in Orange =$\overline{b}\,\overline{d}$
So the Boolean expression is-**$\overline{b}\,\overline{d} + \overline{b}\,\overline{c}$.**

Additional Information

- In many digital circuits and practical problems, we need to find expression with **minimum variables**.
- We can minimize **Boolean expressions of 3, 4 variables** very easily using K-map without using any Boolean algebra theorems.
- K-map can take two forms **Sum of Product (SOP) and Product of Sum (POS)** according to the need of the problem.
- K-map is a table-like representation but it gives more information than TRUTH TABLE.
- We fill the grid of **K-map with 0's and 1's** then solve it by making groups.
- Steps to solve expression using K-map-In many digital circuits and practical problems,
    - We need to find expression with **minimum variables.**
- We can minimize **Boolean expressions of 3, 4 variables very easily using K-map without using any Boolean algebra theorems.**
- K-map can take two forms **Sum of Product (SOP) and Product of Sum (POS)** according to the need of the problem.
- **K-map is a table-like representation but it gives more information than TRUTH TABLE.**
- We fill the grid of K-map with **0's and 1's** then solve it by making groups.
- Select K-map according to the number of variables
    - Identify **minterms or max terms** as given in the problem.
    - For **SOP put 1's in blocks of K-map** respective to the minterms (0's elsewhere).
    - For **POS put 0's in blocks of K-map** respective to the max terms(1's elsewhere).
    - Make rectangular groups containing total terms in the power of two like 2,4,8 ..(except 1) and try to cover as many elements as you can in one group.
    - From the groups made in step 5 find the product terms and sum them up for SOP form.

Que. 100

In order to store floating numbers in computer using the normalized represetation and 32 - bit single precision, the number of bits used for exponent and fraction are _____ , _____ respectively.

1. 11, 21
2. 16, 15
3. 16, 16
4. 8, 23

Testbook Solution Correct Option **- 4**
The correct answer is **8,23.**

Key-Points

- According to IEEE 754 Standards, IEEE 754 has 3 basic components
- **The Sign of Mantissa** –
  - This is as simple as the name. 0 represents a positive number while 1 represents a negative number.
- **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.
- **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.
- **For a single-precision IEEE 754 floating-point Standard**
  - The sign is of 1 bit.
  - Exponent is of 8 bits
  - The mantissa is of 23 bits.
  - That total combines into 32-bits.

Que. 101 Change the speech:

"If you don't keep quiet I shall shoot you", he said to her in a calm voice.

1. He warned her to shoot if she didn't keep quite calmly.
2. He said calmly that I shall shoot you if you don't be quiet.
3. He warned her calmly that he would shoot her if she didn't keep quiet.
4. Calmly he warned her that be quite or else he will have to shoot her.

Testbook Solution Correct Option **- 3**
The correct answer is 'He warned her calmly that he would shoot her if she didn't keep quiet'.

Key-Points

- The given question is in **Direct Speech.** As per the question we have to change it into **Indirect Speech.**
- The process of transformation as follows:
  - The tone of the given sentence is a warning. Hence, **"warned"** will be used instead of **said to.**
  - **Comma and inverted commas** will be removed.
  - **'That' conjunction** will be used.
  - **'Shall'** will be changed into **'Would'.**
  - **'Don't' will be changed into 'didn't'.**
- Therefore, the correct answer is **Option 3.**

Correct Answer: *He warned her calmly that he would shoot her if she didn't keep quiet.*

Que. 102 Choose the correct spelling for the word given below.

1. Cieling
2. Cealing
3. Ceiling
4. Ceeling

Testbook Solution Correct Option **- 3**
The correct answer is **'Ceiling'.**

Key-Points

- In the given question **'Ceiling'** is the correct spelling. The meaning of it as follows:
- **Ceiling:** an upper limit, usually relating to money.
  - *Example: They have imposed a **ceiling** on pay rises.*
- Therefore, the correct answer is **Option 3.**

Correct Answer: *Ceiling.*

Que. 103 **Select the pair of words, which are related in the same way as the capitalized words are related to each other.**

BUTTERFLY: FREEDOM

1. Frog: Tadpole
2. Self reliant: Buoyant
3. Alga: Lichens
4. Chicken: Rooster

Testbook Solution Correct Option **- 2**
The correct answer is **'Self-reliant: Buoyant'.**

Key-Points

- We know that Round the world, butterflies are seen as the departed souls of our ancestors.
- Indigenous people recognize the chrysalis as the soul trapped inside the body.
- The emergence of the adult butterfly symbolizes **the freedom of the soul upon death.**
- Hence, Both Butterfly and Freedom are inter-related.
- The same way **'Self-reliant' is related to the word 'Buoyant'.**
- Both are of similar meaning.
- Therefore, the correct answer is **Option 2.**

Correct Answer: *Self-reliant: Buoyant.*

Que. 104 **Which of the following is the closest in meaning to the word,**
'Clown'

1. Idiot
2. Dunce

3. Don
4. Jester

Testbook Solution Correct Option **- 4**
The correct answer is '**Jester**'.

Key-Points

- The closest meaning of the given word **'Clown' is 'Jester'.**
- **Clown: someone who behaves in a silly way, often intentionally.**
  - *Example: Left alone, the class threw books, pulled faces, and generally **clowned.***
- **Jester: a man in the past whose job was to tell jokes and make people laugh.**
  - *Example: However, several aspects of his history suggest a more specialized role, one that combined the activities of cleric, scholar, musician, and **jester.***
- By reading the above definitions we can infer that both words are similar. Therefore the correct answer is **Option 4.**

Correct Answer: *Jester.*

Additional Information

- The meaning of the other words given in the options as follows:
  - **Idiot: a stupid person or someone who is behaving in a stupid way.**
    Example: Some idiot left the tap running in the bathroom and there's water everywhere.
  - **Dunce: a person who is slow to learn or stupid, especially at school.**
    Example: Fabrice treated him like a dunce in front of customers.
  - **Don: a university teacher, especially a senior member of a college at Oxford or Cambridge.**

Que. 105 **Fill in the blank choosing the correct word.**

The vote will have to be laid _____ until next week.

1. on
2. in
3. over
4. from

Testbook Solution Correct Option **- 2**
The correct answer is '**in**'.

Key-Points

- In the given fill in the blank, the correct answer is '**in**'. It is a Phrasal Verb.
- **Lay in: to put (something of future use or value) in a safe or secret place.**
  - *Example: We'd better lay in plenty of food in case we're cut off when it snows.*
- **'Laid' is the second form of 'Lay'.**
- Therefore, the correct answer is **Option 2.**

Correct Answer: *in.*

Confusion Points

- **Lie: Lie is a verb and means to rest or recline and it does not require a direct object.**
  - **Base form: Lie**
  - **Past tense: Lay**
  - **Past Participle: Lain.**
    Example: I often lie down on the floor when my backaches.
- **Lay: Lay is a verb meaning to place something down, and thus, it requires a direct object.**
  - **Base form: Lay.**
  - **Past Tense: Laid.**
  - **Past Participle: Laid.**
    Example: I lay my suitcase on the table when I come home every day.

Que. 106 Fill in the blank choosing the correct question tag.

He has done his duty, _____

1. Shouldn't he?
2. Hasn't he?
3. Won't he?
4. Has he?

Testbook Solution Correct Option **- 2**
The correct answer is **'Hasn't he?'**

Key-Points

- In the given fill in the blank **Option 2 i**s correct.
- **We know that A positive statement is followed by a negative question tag whereas, a negative statement is followed by a positive question tag.**
  - *Example: Jack is from Spain, isn't he?*
  - *Example: They aren't funny, are they?*
- Therefore, the correct answer is **Option 2.**

Correct Answer: *Hasn't he?*

Additional Information

- When the statement contains a word with **a negative meaning**, **the question tag needs to be positive.**
  - *Example: He hardly ever speaks, does he?*

Que. 107 Choose one of the options that is most nearly same as meaning of the word

'Epitome'.

1. Final verdict
2. Climax
3. Essence
4. Tombstone

Testbook Solution Correct Option **- 3**
The correct answer '**Essence**'.

Key-Points

- The word with a similar meaning to the given word **'Epitome' is 'Essence'.**
- **Epitome: the typical or highest example of stated quality, as shown by a particular person or thing.**
  - *Example: He was the **epitome** of the fashionable gentleman.*
- **Essence: the basic or most important idea or quality of something.**
  - *Example: The **essence** of his argument was that education should continue throughout life.*
- By reading the above definitions we can infer that the correct answer is **Option 3.**

Correct Answer: *Essence.*

Additional Information

- The meaning of the other words given in the option as follows:
  - **Verdict: an opinion or decision made after judging the facts that are given, especially one made at the end of a trial.**
    *Example: The jury reached a unanimous **verdict** of guilty.*
  - **Climax: the most important or exciting point in a story or situation, especially when this happens near the end.**
    *Example: The **climax** of the air show was a daring flying display.*
  - **Tombstone: a gravestone.**
    *Example: By that time, each family had its own burial zone where there were **tombstones** for couples and individuals.*

Que. 108 Which collocation goes with the word 'Aware'?

1. rightly
2. fully
3. nearly
4. exactly

Testbook Solution Correct Option **- 2**
The correct answer is '**fully**'.

Key-Points

- We know that when **'fully'** is added before **'aware'** only then it makes that meaningful word.
- **Fully Aware: knowing that something exists, or having knowledge or experience of a particular thing.**
  - *Example: He is **fully aware** of our business.*
- Therefore, the correct answer is **Option 2.**

Correct Answer: *fully.*

Mistake Point

- We tend to go for other options but it would be wrong because when we can **'rightly, nearly, or exactly'** they don't make any meaningful word.
- Therefore, the correct answer is **Option 2.**

Que. 109 Identify the underlined part which has an error.

He couldn't cope up with the hot climate of the place any longer.

1. couldn't
2. cope up
3. climate
4. any longer

Testbook Solution Correct Option **- 2**
The correct answer is '**cope up**'.

Key-Points

- **The erroneous Part 'cope up' should be 'cope'.**
- **We know that the word 'cope' is followed by 'with'.**
- Therefore, the correct answer is **Option 1.**

Correct Answer: *He couldn't cope.*

Mistake Point

- It is always **'cope with'**, never **'cope Up with'**, which is used wrongly quite often.
- It is possible that this mistake of inserting **'up'** is due to some confusion with **"keep /put up with".**
- **"Put up with"** is a synonymous phrasal verb, referring to a difficult situation that a person is somehow trying to cope with /manage.

Que. 110 Choose the correct appropriate word to fill in the blank from the given alternatives.

The _____ pittance the widow receives from the government cannot keep her from poverty.

1. Meager
2. Indulgent
3. Meticulous
4. Magnanimous

Testbook Solution Correct Option **- 1**
The correct answer is '**Meager**'.

Key-Points

- In the given fill in the blank, the most appropriate answer is **Option 1.** The meaning of this word as follows:
- **Meager: (of amounts or numbers) very small or not enough.**
  - *Example: The prisoners existed on a meager diet.*
- Due to very small help, the widow can keep her from poverty.
- By reading the above definitions we can infer that the correct answer is **Option 1.**

Correct Answer: *Meager.*

Additional Information

- The meaning of the other words given in the option as follows:
  - **Indulgent: allowing someone to have or do what they want, especially when this is not good for them.**
    *Example: He had been a strict father but was **indulgent** towards his grandchildren.*
  - **Meticulous: very careful and with great attention to every detail.**
    *Example: Many hours of **meticulous** preparation have gone into writing the book.*
  - **Magnanimous: very kind and generous towards an enemy or someone you have defeated.**
    *Example: The team's manager was **magnanimous** in victory, and praised the losing team.*

Que. 111 **Fill in the blank choosing the correct option.**

The other boys or Henry _____ to blame.

1. is
2. are
3. were
4. will

Testbook Solution Correct Option - **1**

The correct answer is '**is**'.

Key-Points

- In the given fill in the blank, the '**is**' is grammatically correct.
- When two subjects in a sentence are connected with **"either...or, not...only, neither...nor, no...or, not... or, or, then verb should be used according to the nearest subject.**
- **In the given sentence 'Henry' is the nearest subject. And it is singular.**
- Therefore, a singular helping verb should be used.

Correct Answer: *is.*

Additional Information

- When two subjects are connected with **'as well as, with, along with, together with, in addition to, except, rather than, accompanied by, nothing but, etc.',** then the **helping verb** should be used according to the **first subject** of the sentence.
- Example:
  - *The Captain **along with** the sailors were drowned.* ✗
  - *The Captain **along with** the sailors was drowned.* ✓

Que. 112 **In the question, the word "Echo" is used in four different ways, numbered A to D.**

Choose the option in which the usage of the word is inappropriate.

1. The crowd cheered to the echo in the football match.
2. I started to feel nostalgic as I stood in the old neighborhood that echoed with my childhood.
3. A loud thunder echo hit the tallest building.
4. My thoughts echoed with the sounds of spring.

Testbook Solution Correct Option **- 1**
The correct answer is **The crowd cheered to the echo in the football match.**

Key-Points

- The use of '**echo**' in **the first Option** is incorrect.
- **Echo(V): If a sound echoes or a place echoes with a sound, you hear the sound again because you are in a large, empty space.**
  - *Example: The sound of footsteps **echoed** around the hall.*
- **Echo(N): a sound that is heard after it has been reflected off a surface such as a wall or a cliff.**
  - *Example: Thick carpet would reduce the **echo** in this hallway.*
- It should be **cheer(one) to the echo.** Its meaning is **'To vocally support or encourage one.'**
- **In the given sentence pronoun after 'cheer' is not used. Therefore this makes the sentence wrong. Hence, 'echo' used in the first sentence is wrong.**
  - *Example: The fans really cheered us to the **echo** in the championship game.*

Que. 113 The sentences given below when properly sequenced form a coherent paragraph. Each sentence is labeled with a letter.

Choose the most logical order of sentences from the given choices to construct a coherent paragraph.

P: It refers to those times when there is no war or fight among nations.

Q: Many people argue that war is a necessary evil and the only process of solving international disputes.

R: Peace means complete freedom from disturbance.

S: Once the world starts believing that wars are unnecessary, they decide to abolish war completely.

T: But in reality, war happens only because people are not ready to settle disputes in a peaceful manner.

1. TSROP
2. RTQPS
3. SPTQR
4. QTRPS

Testbook Solution Correct Option **- 4**
The correct answer is **QTRPS**.

Key-Points

- Only **Part Q** can be the first answer because the first statement of **a sentence jumble question is usually a general statement, noun, most, once, a universal fact, many, or starting of an incident, etc.**
- **The given question starts with many and it is a general statement also.**
- **Part T** is explicitly connected with **Part Q.**
- **Part T** ends with **'peaceful'.** And **Part R** explains what is the meaning of '**peace**'.
- Therefore**, Part T** is followed by **Part R.**
- **Part R** is connected with **Part P.**
- Lastly, **Part S** should be used.
- Therefore, the correct answer is **Option 4.**

Correct Answer: *QTRPS.*

Que. 114 **Read the following passage and answer questions 114 to 116 based on it.**

I do not wish to cast aspersions on the corporate takeover. On the contrary, it is a key facilitator of creative destruction and doubtless the most effective remaining means by which shareholder voices can mold a corporation. But while the change in management is often necessary, you cannot effectively run a corporation with differing authoritative voices espousing opposing corporation goals. It has to be one or the other. If the boards are riven with conflicting interests, corporate governance will suffer. If directors cannot agree with the CEO's strategy, they should replace him. Corporate dissonance, of course, is unavoidable in periods of transition. But it is not a value to be pursued for its own sake. A cacophony produces only red ink.

What according to the author facilitates creative destruction?

1. Corporatism
2. Modernism
3. Terrorism
4. Cosmopolitanism

Testbook Solution Correct Option **- 1**
The correct answer is '**Corporatism**'.

Key-Points

- The given passage is about **'Corporate Dissonance'.**
- In the given passage the first line clearly says that '**Corporatism is a key facilitator of creative destruction**'.
- The meaning of '**Corporatism**' as follows:
- **Corporatism: Corporatism is a political ideology that advocates the organization of society by corporate groups, such as agricultural, labour, military, scientific, or guild associations, on the basis of their common interests.**
- Therefore, the correct answer is **Option 1.**

Que. 115 Which of the following words used in the passage reinforces the idea contained in the word, 'DISSONANCE'

1. Aspersions
2. Cacophony
3. Strategy
4. Transition

Testbook Solution Correct Option **- 2**
The correct answer is '**Cacophony**'.

Key-Points

- The most appropriate word that is connected with **'Dissonance' is 'Cacophony'.**
- **Dissonance: a combination of sounds or musical notes that are not pleasant when heard together.**
  - *Example: However, the complex **dissonances** we have seen suggest otherwise.*
- **Cacophony: an unpleasant mixture of loud sounds.**

- *Example: As we entered the farmyard we were met with a **cacophony** of animal sounds.*
- By reading the above definitions we can infer that the correct answer is '**Cacophony**'.

Correct Answer: *Cacophony.*

Additional Information

- The meaning of the other words given in the option as follows:
  - **Aspersions: an attack on the reputation or integrity of someone or something.**
    *Example: I don't think anyone is casting **aspersions** on you.*
  - **Strategy: a detailed plan for achieving success in situations such as war, politics, business, industry, or sport, or the skill of planning for such situations.**
    *Example: The president held an emergency meeting to discuss military **strategy** with the Pentagon yesterday.*
  - **Transition: a change from one form or type to another, or the process by which this happens.**
    *Example: The health-care system is in **transition** at the moment.*

Que. 116 What according to the author makes corporate governance suffer?

1. Conflicting strategies of executives
2. Conflicting interests of customers
3. Conflicting interests of statemen
4. Conflicting interests of the board of directors

Testbook Solution Correct Option **- 4**
The correct answer is **'Conflicting interests of the board of directors'.**

Key-Points

- The given passage is about Corporate Dissonance.
- **The last third line of the given passage talks about what makes corporate governance suffer.**
- The line *"If the boards are riven with conflicting interests, corporate governance will suffer..."* clearly tells us what makes corporate governance suffer.
- Here, the word boards refer to the Directors.
- Therefore, the correct answer is **Option 4.**

Correct Answer: *Conflicting interests of the board of directors.*

Que. 117 **Find the synonym that is most nearly similar in meaning to the word:**
'Debacle'

1. Catastrophe
2. Dandy
3. Corker
4. Opulence

Testbook Solution Correct Option **- 1**
The correct answer is '**Catastrophe**'.

Key-Points

- The exact synonym of the given word **'Debacle' is 'Catastrophe'.**
- **Debacle: a complete failure, especially because of bad planning and organization.**
  - *Example: The collapse of the company was described as the greatest financial debacle in US history.*
- **Catastrophe: a sudden event that causes very great trouble or destruction.**
  - *Example: They were warned of the ecological **catastrophe** to come.*
- By reading the above definitions we can infer that the correct answer is **Option 1.**

Correct Answer: *Catastrophe.*

Additional Information

- The meaning of the other words given in the options as follows:
  - **Dandy: a man, especially in the past, who dressed in expensive, fashionable clothes and was very interested in his own appearance.**
    *Example: I'm tired of pretending life is just **dandy** when it's not.*
  - **Corker: a person or thing that is especially good, attractive, or funny.**
    *Example: She told an absolute **corker** of a story about a priest she'd mistaken for an ex-lover.*
  - **Opulence: the quality of being expensive and luxurious.**
    *Example: He says living in such **opulence** makes him uneasy.*

Que. 118 Choose the phrasal verb that means,

'To spend time doing unimportant things instead of doing necessary things'.

1. fake out
2. faff about
3. fade out
4. fall apart

Testbook Solution Correct Option **- 2**
The correct answer is '**Faff about**'.

Key-Points

- The exact Phrasal Verb of the given statement is 'faff about. Its meaning as follows:
- **Faff about: to spend your time doing a lot of things that are not important instead of the thing that you should be doing.**
  - *Example: I wish you'd stop faffing about and do something useful!*
- Hence, by reading the above definitions we can infer that the correct answer is **Option 2.**

Correct Answer: *Faff about.*

Additional Information

- The meaning of the other Phrasal Verbs given in the option as follows:

- **Fade out: If the picture or sound of a film or recording fades out or someone fades it out, it becomes gradually weaker.**
- **Fall apart: to break into pieces.**

Que. 119 Which of the following is closed to the meaning of the word,

'Impolitic'

1. Impolite
2. Intolerant
3. Incongruous
4. Injudicious

Testbook Solution Correct Option **- 4**

The correct answer is '**Injudicious**'.

Key-Points

- The exact synonym of the given word **'Impolitic' is 'Injudicious'.**
- **Impolitic: If words or actions are impolitic, they are unwise and likely to cause offence or problems, especially in social situations.**
  - *Example: I thought it **impolitic** to ask any questions about her ex-husband.*
- **Injudicious: showing bad judgment.**
  - *Example: He had given some **injudicious** remarks.*
- By reading the above definitions we can infer that the correct answer is **Option 4.**

Correct Answer: *Injudicious.*

Additional Information

- The meaning of the other words given in the options as follows:
  - **Impolite: rude.**
    *Example: It is **impolite** to point at people.*
  - **Intolerant: disapproving of or refusing to accept ideas or ways of behaving that are different from your own.**
    *Example: She can be very **intolerant** of students who don't understand what she's talking about.*
  - **Incongruous: unusual or different from what is around or from what is generally happening.**
    *Example: The new computer looked **incongruous** in the dark book-filled library.*

Que. 120 Choose an option to replace the phrase given in bold.

The bank has hired a consultant who **will look into** any issues which arise during the merger.

1. is looking over
2. will be looked over
3. will look out
4. No correction required

Testbook Solution Correct Option **- 4**

The correct answer is '**No correction required**'.

Key-Points

- In the given sentence the phrasal verb **'look into'** is contextually correct. The meaning of it as follows:
- **Look into: to examine the facts about a problem or situation.**
  - *Example: We're **looking into** the possibility of merging the two departments.*
- Therefore, by reading the above definitions we can infer that the correct answer is **Option 4.**

Correct Answer: *No correction required.*

Additional Information

- The meaning of the other Phrasal Verbs used in the options as follows:
  - **Look over: to quickly examine something.**
    *Example: I had a few minutes before the meeting to **look over** what he'd written.*
  - **Lookout: to watch what is happening and be careful.**
    *Example: The police have warned shopkeepers to **look out** for forged notes.*

120 Questions

Que. 1	Correct Option - 2
Que. 2	Correct Option - 2
Que. 3	Correct Option - 1
Que. 4	Correct Option - 1
Que. 5	Correct Option - 2
Que. 6	Correct Option - 1
Que. 7	Correct Option - 1
Que. 8	Correct Option - 2
Que. 9	Correct Option - 2
Que. 10	Correct Option - 3
Que. 11	Correct Option - 2
Que. 12	Correct Option - 1
Que. 13	Correct Option - 3
Que. 14	Correct Option - 2
Que. 15	Correct Option - 4
Que. 16	Correct Option - 1
Que. 17	Correct Option - 2
Que. 18	Correct Option - 1
Que. 19	Correct Option - 4
Que. 20	Correct Option - 1
Que. 21	Correct Option - 3
Que. 22	Correct Option - 4
Que. 23	Correct Option - 2
Que. 24	Correct Option - 3
Que. 25	Correct Option - 4

Que. 26	Correct Option - 2
Que. 27	Correct Option - 3
Que. 28	Correct Option - 1
Que. 29	Correct Option - 1
Que. 30	Correct Option - 2
Que. 31	Correct Option - 4
Que. 32	Correct Option - 3
Que. 33	Correct Option - 4
Que. 34	Correct Option - 3
Que. 35	Correct Option - 1
Que. 36	Correct Option - 3
Que. 37	Correct Option - 2
Que. 38	Correct Option - 1
Que. 39	Correct Option - 4
Que. 40	Correct Option - 1
Que. 41	Correct Option - 1
Que. 42	Correct Option - 2
Que. 43	Correct Option - 4
Que. 44	Correct Option - 3
Que. 45	Correct Option - 3
Que. 46	Correct Option - 1
Que. 47	Correct Option - 4
Que. 48	Correct Option - 1
Que. 49	Correct Option - 2
Que. 50	Correct Option - 2
Que. 51	Correct Option - 4

Que. 52	Correct Option - 4
Que. 53	Correct Option - 1
Que. 54	Correct Option - 1
Que. 55	Correct Option - 4
Que. 56	Correct Option - 3
Que. 57	Correct Option - 3
Que. 58	Correct Option - 4
Que. 59	Correct Option - 2
Que. 60	Correct Option - 2
Que. 61	Correct Option - 3
Que. 62	Correct Option - 2
Que. 63	Correct Option - 2
Que. 64	Correct Option - 2
Que. 65	Correct Option - 2
Que. 66	Correct Option - 1
Que. 67	Correct Option - 2
Que. 68	Correct Option - 4
Que. 69	Correct Option - 2
Que. 70	Correct Option - 3
Que. 71	Correct Option - 2
Que. 72	Correct Option - 1
Que. 73	Correct Option - 4
Que. 74	Correct Option - 4
Que. 75	Correct Option - 2
Que. 76	Correct Option - 1
Que. 77	Correct Option - 4
Que. 78	

	Correct Option - 2
Que. 79	Correct Option - 1
Que. 80	Correct Option - 1
Que. 81	Correct Option - 1
Que. 82	Correct Option - 3
Que. 83	Correct Option - 4
Que. 84	Correct Option - 4
Que. 85	Correct Option - 4
Que. 86	Correct Option - 3
Que. 87	Correct Option - 2
Que. 88	Correct Option - 2
Que. 89	Correct Option - 1
Que. 90	Correct Option - 4
Que. 91	Correct Option - 3
Que. 92	Correct Option - 4
Que. 93	Correct Option - 2
Que. 94	Correct Option - 3
Que. 95	Correct Option - 3
Que. 96	Correct Option - 2
Que. 97	Correct Option - 4
Que. 98	Correct Option - 2
Que. 99	Correct Option - 2
Que. 100	Correct Option - 4
Que. 101	Correct Option - 3
Que. 102	Correct Option - 3
Que. 103	Correct Option - 2
Que. 104	

	Correct Option - 4
Que. 105	Correct Option - 2
Que. 106	Correct Option - 2
Que. 107	Correct Option - 3
Que. 108	Correct Option - 2
Que. 109	Correct Option - 2
Que. 110	Correct Option - 1
Que. 111	Correct Option - 1
Que. 112	Correct Option - 1
Que. 113	Correct Option - 4
Que. 114	Correct Option - 1
Que. 115	Correct Option - 2
Que. 116	Correct Option - 4
Que. 117	Correct Option - 1
Que. 118	Correct Option - 2
Que. 119	Correct Option - 4
Que. 120	Correct Option - 4