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Course: GATE
Computer Science Engineering(CS)

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MULTIPLE SUBJECT : ENGINEERING MATHEMATICS + GENERAL APTITUDE (GATE - 2019) - REPORTS

OVERALL ANALYSIS | COMPARISON REPORT | SOLUTION REPORT

ALL(33) | CORRECT(0) | INCORRECT(0) | SKIPPED(33)

Q. 1

The following excerpt appeared in a newspaper report in 2010.
"The Union Budget is likely to be presented on February 26, two days ahead of the _____ date. Finance Minister Pranab Mukherjee indicated this to journalists during a lunch hosted by him at his residence in New Delhi on Saturday. "
The word that best fills the blank in the above sentence is

Have any Doubt ?

A critical

B conventional — Correct Option

Solution :
(b)

C suitable

D convenient

QUESTION ANALYTICS +

Q. 2

Choose the option which is the antonym of the underlined word. I was upset by his hostile attitude.

Have any Doubt ?

A friendly — Correct Option

Solution :
(a)

B positive

C negative

D inimical

QUESTION ANALYTICS +

Q. 3

Choose the word most similar in meaning to "obeisance"

Have any Doubt ?

A respect — Correct Option

Solution :
(a)

B censure

C condemnation

D bulky

QUESTION ANALYTICS +

Q. 4

A volleyball coach will select the members of a six-player team from among 10 players, including Jignesh and Praneet. If the six players are chosen at random, the probability that the coach chooses a team that includes both Jignesh and Praneet is

Have any Doubt ?

A $\frac{1}{9}$

B $\frac{1}{6}$

C $\frac{2}{9}$

D $\frac{1}{3}$ — Correct Option

Solution :

(d)
There are 4 spots left after selecting Jignesh and Praneet in the team. There are 8 players available to fill in the 4 positions. It can be done in ${}^8C_4$ ways (favourable event).
The total number of ways of selecting 6 out of 10 players is given by ${}^{10}C_6$ ways.

Therefore, ${}^8C_4 / {}^{10}C_6 = \frac{1}{3}$

QUESTION ANALYTICS

Q. 5

The area of an equilateral triangle that has an altitude of length 48 units is

Have any Doubt ?

A $48\sqrt{3}$ sq. units

B $192\sqrt{3}$ sq. units

C $384\sqrt{3}$ sq. units

D $768\sqrt{3}$ sq. units — Correct Option

Solution :
(d)
When we drop an altitude in an equilateral triangle we create two 30 – 60 – 90 right triangles in which the altitude is opposite the 60 degree angle; thus, the altitude = side$\frac{\sqrt{3}}{2}$, thus:

$$\text{side}\frac{\sqrt{3}}{2} = 48$$

$$\text{side} = \frac{96}{\sqrt{3}}$$

We may recall that the area formula for an equilateral triangle is $\frac{(\text{side}^2\sqrt{3})}{4}$, thus:

$$\text{Area} = \frac{\left[\left(\frac{96}{\sqrt{3}}\right)^2\sqrt{3}\right]}{4} = \frac{3072\sqrt{3}}{4} = 768\sqrt{3} \text{ sq. units}$$

QUESTION ANALYTICS

Q. 6

In a certain sequence, the term a_n is given by the formula $a_n = k + \frac{n}{2}$, where k is a constant. If the sum of all the terms from a_1 to a_{20} inclusive equals 70, the value of k is

Have any Doubt ?

A –1.75 — Correct Option

Solution :
(a)
Let's examine a few terms:

$$a_1 = k + \frac{1}{2}$$

$$a_2 = k + \frac{2}{2}$$

$$a_3 = k + \frac{3}{2} \qquad \ldots a_{20} = k + \frac{20}{2}$$

$$\text{So, total sum} = \left(k + \frac{1}{2}\right) + \left(k + \frac{2}{2}\right) + \left(k + \frac{3}{2}\right) + \ldots + \left(k + \frac{20}{2}\right)$$

$$= 20k + \frac{1}{2} + \frac{2}{2} + \frac{3}{2} + \ldots + \frac{20}{2}$$

$$= 20k + \left(\frac{1}{2}\right)(1 + 2 + 3 \ldots + 20)$$

Sum of first n integers formula : $1 + 2 + 3 + 4 + \ldots n = \frac{n(n+1)}{2}$

Applying this formula to the sum 1 + 2 + 3 + ... + 20, we get

$$= 20k + \left(\frac{1}{2}\right)\left[(20)\frac{21}{2}\right]$$

$$= 20k + 105$$

We're told that this sum equals 70, so ....

$$70 = 20k + 105$$

Subtract 105 from both sides : $-35 = 20k$
Divide both sides by 20 to get: $-1.75 = k$

B –1.6

C –1.5

D –1.4

QUESTION ANALYTICS

Q. 7

The inverse of the 2×2 matrix $\begin{bmatrix} 2 & 3 \\ 6 & 8 \end{bmatrix}$ is

Have any Doubt ?

A $\begin{bmatrix} 3 & -1 \\ -4 & 3/2 \end{bmatrix}$

B $\begin{bmatrix} -4 & 3/2 \\ 3 & -1 \end{bmatrix}$ Correct Option

Solution :
(b)

Inverse of $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix}^{-1} = \frac{1}{ad - bc}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

$$\therefore \quad \begin{bmatrix} 2 & 3 \\ 6 & 8 \end{bmatrix}^{-1} = \frac{1}{16 - 18}\begin{bmatrix} 8 & -3 \\ -6 & 2 \end{bmatrix}$$

$$= \frac{1}{-2}\begin{bmatrix} 8 & -3 \\ -6 & 2 \end{bmatrix} = \begin{bmatrix} -4 & 3/2 \\ 3 & -1 \end{bmatrix}$$

C $\begin{bmatrix} 6 & -2 \\ -8 & 3 \end{bmatrix}$

D $\begin{bmatrix} 4 & -3/2 \\ -3 & 1 \end{bmatrix}$

QUESTION ANALYTICS +

Q. 8

The value of the function $f(x) = \lim_{x \to 0} \frac{2x^3 + 3x^2}{4x^3 - 5x^2}$ is

Have any Doubt ?

A $\frac{-3}{5}$ Correct Option

Solution :
(a)

$$f(x) = \lim_{x \to 0}\left[\frac{2x^3 + 3x^2}{4x^3 - 5x^2}\right]$$

Since this has $\frac{0}{0}$ form, limit can be found by repeated application of L'Hospitals rule.

$$f(x) = \lim_{x \to 0}\left[\frac{6x^2 + 6x}{12x^2 - 10x}\right]$$

$$= \lim_{x \to 0}\left[\frac{12x + 6}{24x - 10}\right] = \left[\frac{12 \times 0 + 6}{24 \times 0 - 10}\right] = \frac{-6}{10}$$

$$= \frac{-3}{5}$$

B 0

C ∞

D $\frac{3}{5}$

QUESTION ANALYTICS +

Q. 9

An equation can be defined in form of a determinant as

$$\begin{vmatrix} x & m & n & 1 \\ a & x & n & 1 \\ a & b & x & 1 \\ a & b & c & 1 \end{vmatrix} = 0$$

The roots of the equations are

Have any Doubt ?

A independent of a, b, c

B $a + m + n, b + m + n, c + m + n$

C $a, b + m, c + n$

D independent of m, n Correct Option

Solution :
(d)

$$\begin{vmatrix} x & m & n & 1 \\ a & x & n & 1 \\ a & b & x & 1 \end{vmatrix} = 0$$

$$\begin{vmatrix} a & b & c & 1 \end{vmatrix}$$

$R_1 \to R_1 - R_2,\ R_2 \to R_2 - R_3,\ R_3 \to R_3 - R_4$

$$\begin{vmatrix} x-a & m-x & 0 & 0 \\ 0 & x-b & n-x & 0 \\ 0 & b & x-c & 0 \\ a & b & c & 1 \end{vmatrix} = 0$$

$$\Delta = (x-a)(x-b)(x-c) = 0$$

$$x = a, b, c$$

QUESTION ANALYTICS

Q. 10

Fifteen coupons are numbered from 1 to 15. Seven coupons are selected at random one at a time with replacement. What is the probability that the largest number appearing on a selected coupon is 9?

Have any Doubt ?

A $\left(\frac{9}{16}\right)^7$

B $\left(\frac{8}{15}\right)^7$

C $\frac{{}^{15}C_7}{(15)^7}$

D $\left(\frac{3}{5}\right)^7$ Correct Option

Solution :
(d)
Since there is replacement

Probability of selecting any coupon = $\frac{1}{15}$

Probability of selecting coupon numbered less than number 9 = $\frac{9}{15}$

Probability of selecting 7 coupons

$$= \frac{9}{15} \times \frac{9}{15} \times \ldots 7 \text{ times}$$

$$= \left(\frac{9}{15}\right)^7 = \left(\frac{3}{5}\right)^7$$

QUESTION ANALYTICS

Q. 11

Fardeen can do a job in 6 days and Kanan can do the same job in 8 days. They both undertake the job for ₹ 1280. With the help of Meena, they finished it in 3 days. The money in rupees paid to Meena is _____

Have any Doubt ?

160 (158 - 162) Correct Option

Solution :
160 (158 - 162)

Rate of doing work for Fardeen = $\frac{1}{6}$ and for Kanan = $\frac{1}{8}$

Also, as Time × Rate = Work

We have

$$3 \times \left[\frac{1}{6} + \frac{1}{8} + r_{meena}\right] = 1 \text{ unit of work}$$

Thus, $r_{\text{Meena}} = \frac{1}{3} - \left(\frac{1}{6} + \frac{1}{8}\right)$

$\Rightarrow$ $r_{\text{Meena}} = \frac{1}{24}$

Thus, work done by Meena in 3 days : $3 \times \frac{1}{24} = \frac{1}{8}$ units of work, and as the payment is directly proportional to the work done, the payment for her = $\frac{1280}{8} = ₹160$

QUESTION ANALYTICS

Q. 12

The member of odd divisors of 3600 is _____.

Have any Doubt ?

9 Correct Option

Solution :
(9)
The odd divisors are 1, 3, 5, 9, 15, 25, 45, 75 and 225.

QUESTION ANALYTICS

The probability of getting a "tail" in a single toss of a biased coin is 0.2. The coin is tossed respectively till a "tail" is obtained. If the tosses are independent, then the probability of getting "tail" for the first time in the fourth toss is _____.

Have any Doubt ?

0.1024 (0.0920 - 0.1126) — Correct Option

Solution :
0.1024 (0.0920 - 0.1126)

$$P(T) = 0.2$$
$$P(H) = 0.8$$

Since all tosses are independent

So, probability of getting tail for the first time in 4th toss is

$$= P(H)\,P(H)\,P(H)\,P(T)$$
$$= 0.8 \times 0.8 \times 0.8 \times 0.2$$
$$= 0.1024$$

QUESTION ANALYTICS

Q. 14

Newton-Raphson method is used to compute a root of the equation 2x2 + 5x – 9 = 0 with 4.5 as the initial value. The approximation after one iteration is _____.

Have any Doubt ?

2.15 (1.95 - 2.35) — Correct Option

Solution :
2.15 (1.95 - 2.35)

The equation is $f(x) = 2x^2 + 5x - 9 = 0$

Newton-Raphson iteration equation is

$$x_1 = x_0 - \left[\frac{f(x_0)}{f'(x_0)}\right]$$

$$f(x_0) = 2x_0^2 + 5x_0 - 9$$
$$f'(x_0) = 4x_0 + 5$$

$$\therefore \quad x_1 = x_0 - \left[\frac{2x_0^2 + 5x_0 - 9}{4x_0 + 5}\right]$$

$$= \frac{4x_0^2 + 5x_0 - 2x_0^2 - 5x_0 + 9}{4x_0 + 5}$$

$$= \frac{2x_0^2 + 9}{4x_0 + 5}$$

Put $x_0 = 4.5$ (as given)

$$x_1 = \frac{2 \times (4.5)^2 + 9}{4 \times (4.5) + 5} = 2.15$$

QUESTION ANALYTICS

Q. 15

Given the matrices $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 2 & 4 \\ 6 & 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 2 \\ 4 \\ -2 \end{bmatrix}$, the product $B^T AB$ is _____.

Have any Doubt ?

-20 (-21 - -19) — Correct Option

Solution :
-20 (-21 - -19)

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 2 & 4 \\ 6 & 2 & 1 \end{bmatrix} \text{ and } B = \begin{bmatrix} 2 \\ 4 \\ -2 \end{bmatrix}$$

$$B^T AB = \begin{bmatrix} 2 & 4 & -2 \end{bmatrix} \begin{bmatrix} 1 & 2 & 3 \\ 1 & 2 & 4 \\ 6 & 2 & 1 \end{bmatrix} \begin{bmatrix} 2 \\ 4 \\ -2 \end{bmatrix}$$

$$= \begin{bmatrix} -6 & 8 & 20 \end{bmatrix} \begin{bmatrix} 2 \\ 4 \\ -2 \end{bmatrix}$$

$$= -12 + 32 - 40 = -20$$

QUESTION ANALYTICS

Q. 16

The volume V under the plane z = 2x + 5y and over the rectangle R : $1 \le x \le 2,\ 0 \le y \le 3$ is _____.

Have any Doubt ?

31.5 (31 - 32) — Correct Option

Solution :
31.5 (31 - 32)

$$V = \iint_R (2x + 5y)\,dA$$

$$= \int_0^3 \int_1^2 (2x + 5y)\,dx\,dy$$

$$= \int_0^3 \Big|^2$$

$$= \int_0^1 (x^2 + 5yx)\Big|_1 dy$$

$$= \int_0^3 [(4 + 10y) - (1 + 5y)]dy$$

$$= \int_0^3 (3 + 5y)dy = \left(3y + \frac{5y^2}{2}\right)\Big|_0^3$$

$$= 9 + \frac{45}{2} = 31.5$$

QUESTION ANALYTICS

Q. 17

Choose the word most similar in meaning to "sundry"

Have any Doubt ?

A various — Correct Option

Solution :
(a)

B single

C cold

D parched

QUESTION ANALYTICS

Q. 18

Choose the word most similar in meaning to "lackadaisical"

Have any Doubt ?

A lethargic — Correct Option

Solution :
(a)

B interested

C attitude

D energetic

QUESTION ANALYTICS

Q. 19

Pipe A fills a tank of capacity 700 litres at the rate of 40 litres a minute. Another pipe B fills the same tank at the rate of 30 litres a minute. A pipe at the bottom of the tank drains the tank at the rate of 20 litres a minute. If pipe A is kept open for a minute and then closed and pipe B is open for a minute and then closed and then pipe C is open for a minute and then closed and the cycle is repeated, when will the tank be full?

Have any Doubt ?

A 42 minutes

B 14 minutes

C 39 minutes

D 40 minutes 20 seconds — Correct Option

Solution :
(d)

In three minutes net gain is 40 + 30 – 20 = 50 litres;
After 13 cycles (13 × 3 = 39 minutes) net gain will be 13 × 50 = 650 litres.
Then in 1 minute pipe A will add 40 litres, 10 litres to be filled;

Then to fill 10 litres pipe B will need $\frac{10}{30} = \frac{1}{3}$ min

So total time $39 + 1 + \frac{1}{3} = 40\frac{1}{3}$ min

QUESTION ANALYTICS

Q. 20

On dividing a certain number by 5, 7 and 8 successively, the remainders obtained are 2, 3 and 4 respectively. When the number is divided by 8, 7 and 5, the respective remainders will be

Have any Doubt ?

A 3, 3, 2

B 3, 4, 2

C 5, 3, 2 — Correct Option

Solution :
(c)
Here, the concept is of successive division
i.e. the no is first divided by 5 and it leaves remainder 2 and quotient is let x,
therefore we have number = $5x + 2$ ...(i)
and then the quotient x is divided by 7 and the remainder is 3
so, we have x in the form of $x = 7y + 3$
and then the quotient y is divided by 8 and the remainder is 4

so, we have x in the form of $y = 8z + 4$
putting this value of x and y in (i) above, we get

$$\text{number} = 5(7(8z + 4) + 3) + 2$$
$$\Rightarrow \quad \text{number} = 5(56z + 31) + 2$$
$$\Rightarrow \quad \text{number} = 280z + 157$$

when this number will be divided by 8, we will get remainder = 5
when this quotient will be divided by 7, we will get remainder = 3
when this quotient will be divided by 5, we will get remainder = 2

D 5, 4, 3

QUESTION ANALYTICS +

Q. 21

ABC Corp has a total of 630 employees who have to be arranged in rows for a group photograph session. Each row contains three fewer employees than the row in front of it. What number of rows is not possible?

Have any Doubt ?

A 3

B 4

C 5

D 6 Correct Option

Solution :
(d)
Let n be the number of employees in the least populated row. The subsequent rows will have $n + 3$, $n + 6$, $n + 9$ ... etc employees.
Option A, the distribution will be n, $n + 3$, $n + 6 \Rightarrow n + n + 3 + n + 6 = 630 \Rightarrow n$ = Integer. Possible
Option B, the distribution will be n, $n + 3$, $n + 6$, $n + 9 \Rightarrow n + n + 3 + n + 6 + n + 9 = 630 \Rightarrow$ n = Integer. Possible
Option C, the distribution will be n, $n + 3$, $n + 6$, $n + 9$, $n + 12 \Rightarrow n + n + 3 + n + 6 + n + 9 + n + 12$ $= 630 \Rightarrow$ n = Integer. Possible
Option D, the distribution will be n, $n + 3$, $n + 6$, $n + 9$, $n + 12$, $n + 15 \Rightarrow n + n + 3 + n + 6 + n + 9 +$ $n + 12 + n + 15 = 630 \Rightarrow$ n ≠ Integer. Not Possible.

QUESTION ANALYTICS +

Q. 22

If $f(a) = 2, f'(a) = 1, g(a) = -1, g'(a) = 2$, then $\lim_{x \to a} \frac{g(x)f(a) - g(a)f(x)}{x - a}$ is _____.

Have any Doubt ?

A 5 Correct Option

Solution :
(a)

$$\lim_{x \to a} \frac{g(x)f(a) - g(a)f(x)}{x - a}$$

$$\lim_{x \to a} \frac{g(x)f(a) - g(a)\cdot f(a) + g(a)\cdot f(a) - g(a)\cdot f(x)}{x - a}$$

$$\lim_{x \to a} \frac{f(a)\cdot[g(x) - g(a)] - g(a)[f(x) - f(a)]}{x - a}$$

$$\lim_{x \to a} \frac{f(a)\cdot[g(x) - g(a)]}{x - a} - \lim_{x \to a} \frac{g(a)[f(x) - f(a)]}{x - a}$$

$$f(a) \times g'(a) - g(a) \times f'(a) = 2 \times 2 - 1 \times (-1)$$
$$= 5$$

Alternate Solution:
Applying L'Hospitals rule

$$\lim_{x \to a} \frac{g'(x)f(a) - g(a)f'(x)}{1}$$

$$f(a) \times g'(a) - g(a) \times f'(a) = 2 \times 2 - 1 \times (-1)$$
$$= 5$$

B 15

C 10

D -1

QUESTION ANALYTICS +

Q. 23

An examiner imposes on an average 7 number of penalties daily on students with bad handwriting. Assume that the number of penalties on different days is independent and follows a Poisson distribution. The probability that there will be less than 5 penalties in a day is

Have any Doubt ?

A 0.279

B 0.173 — Correct Option

Solution :
(b)

Mean $\lambda = 7$

$$P(x<5) = P(x=0)+P(x=1)+P(x=3)+P(x=4)$$

$$= \frac{e^{-7}7^0}{0!}+\frac{e^{-7}7^1}{1!}+\frac{e^{-7}7^2}{2!}+\frac{e^{-7}7^3}{3!}+\frac{e^{-7}7^4}{4!}$$

$$= e^{-7}\left[1+7+\frac{49}{2}+\frac{343}{6}+\frac{2401}{24}\right] = 0.173$$

C 0.345

D 0.048

QUESTION ANALYTICS

Q. 24

The value of $\lim_{x\to\pi/2} \tan x \log_e \sin x$ is

Have any Doubt ?

A 0 — Correct Option

Solution :
(a)

$$\lim_{x\to\pi/2} \tan x \log_e \sin x$$

$$\lim_{x\to\pi/2} = \frac{\log_e \sin x}{\cot(x)} \qquad \left[\frac{0}{0}\text{ form}\right]$$

Using L′ Hospital's Rule

$$\lim_{x\to\pi/2} \frac{\frac{\cos x}{\sin x}}{-\text{cosec}^2 x}$$

$$\lim_{x\to\pi/2} -\frac{\cos x}{\sin x}\times\sin^2 x$$

$$\lim_{x\to\pi/2} -\cos x\cdot\sin x = 0$$

B 1

C ∞

D doesn't exists

QUESTION ANALYTICS

Q. 25

A 3×3 matrix is defined as

$$A=\begin{bmatrix} 3-x & 2 & 2 \\ 2 & 4-x & 1 \\ -2 & -4 & -1-x \end{bmatrix}$$

The values of x required for which A^{-1} can't be determined will be

Have any Doubt ?

A 0, 3 — Correct Option

Solution :
(a)

For A^{-1} to be non existent, $|A| = 0$

$$|A| = \begin{vmatrix} 3-x & 2 & 2 \\ 2 & 4-x & 1 \\ -2 & -4 & -1-x \end{vmatrix} = 0$$

$R_2 \to R_2 + R_3$

$$\begin{vmatrix} 3-x & 2 & 2 \\ 0 & -x & -x \\ -2 & -4 & -1-x \end{vmatrix} = 0$$

$$(-x)\begin{vmatrix} 3-x & 2 & 2 \\ 0 & 1 & 1 \\ -2 & -4 & -1-x \end{vmatrix} = 0$$

$R_1 \to R_1 - 2R_2$

$$(-x)\begin{vmatrix} 3-x & 0 & 0 \\ 0 & 1 & 1 \\ -2 & -4 & -1-x \end{vmatrix} = 0$$

$$(-x)\,(3-x(-1-x+4)) = 0$$

$(-x)(3-x)(3-x) = 0$

$x = 0, 3, 3$

B 0, 1 , 3

C 0, –1, 4

D 1, –1, 3

QUESTION ANALYTICS +

Q. 26

Given that $A = \begin{bmatrix} -10 & -3 \\ 4 & 0 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ the value of A^3 is

Have any Doubt ?

A $88A + 120I$ Correct Option

Solution :

(a)

$$A = \begin{bmatrix} -10 & -3 \\ 4 & 0 \end{bmatrix} \text{ and } I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

Characteristic equation of A is

$$= \begin{vmatrix} -10-\lambda & -3 \\ 4 & 0-\lambda \end{vmatrix} = 0$$

$(-10 - \lambda)(-\lambda) + 12 = 0$

$\Rightarrow \quad \lambda^2 + 10\lambda + 12 = 0$

So, $A^2 + 10A + 12I = 0$ (by Cayley Hamilton theorem)

$\Rightarrow \quad A^2 = -10A - 12I$

Multiplying by A on both sides, we have

$A^3 = -10A^2 - 12A$

$\Rightarrow \quad A^3 = -10(-10A - 12I) - 12A$

$= 88A + 120I$

B $88A + 110I$

C $77A + 120I$

D $77A + 110I$

QUESTION ANALYTICS +

Q. 27

Amit put half of his savings in a savings account that pays an annual simple interest and half in a savings account that pays an annual compound interest. After two years he earned ₹120 and ₹126 from the simple interest account and the compound interest account respectively. If the interest rates for both accounts were the same, the amount of Amit's initial total savings is ₹ _____.

Have any Doubt ?

1200 (1150 - 1250) Correct Option

Solution :

1200 (1150 - 1250)

₹120 is simple interest for 2 years. ₹60 is 1 year SI. 126-120 = ₹6 is the interest on the first year interest of ₹60.

That implies the rate of interest is 10%

for 10% the interest is 6 and principal is 60

for 100% the principal is 600

Therefore, the total investment is 2 × 600 = ₹1200

QUESTION ANALYTICS +

Q. 28

There are 2 bars of gold-silver alloy. One bar has 2 parts of gold to 5 parts of silver. The other has 3 parts of gold to 5 parts of silver. If both bars are melted together to get a 20 kg bar with the final gold to silver ratio of 5 : 11, the weight of the first bar is _____ kg.

Have any Doubt ?

14 (13.5 - 14.5) Correct Option

Solution :

14 (13.5 - 14.5)

In the 20 kg bar,

Gold constitutes $\frac{5}{16} \times 20 = \frac{25}{4}$ of the mixture

Silver constitutes $\frac{11}{16} \times 20 = \frac{55}{4}$ of the mixture

Now,

Let G/S ratio in Bar 1 of the solution be $2a : 5a$

Let G/S ratio in Bar 2 of the solution be $3b : 5b$

Therefore,

$2a + 3b = 25/4$ and $5a + 5b = 55/4$

Solving for the above you get,

$b = 3/4$ and $a = 2$

Now weight of the first bar = $2a + 5a = 7 \times 2 = 14$ kg

QUESTION ANALYTICS

Q. 29

A classroom has two analog (12-hour format) clocks, one on the east wall and one on the west wall. The clock on the east wall loses 25 seconds per hour, and the clock on the west wall gains 20 seconds per hour. If the clocks begin displaying the same time, they will next display the same time again in _____ days.

Have any Doubt ?

40 (39 - 41) — Correct Option

Solution :
40 (39 - 41)

The clocks can show same time again only when their cumulative difference is 12 hours, since one is gaining and the other is losing.

For every 1 hour, the relative difference is 45 seconds (25 +20)

If 45 seconds difference is created in 1 hour

Then 12 hours difference is created in $\frac{(12 \times 3600)}{45} = 960$ hours = 40 days

QUESTION ANALYTICS

Q. 30

Let the random variable X follows binomial distribution with $B(5, p)$ such that $P(X = 2) = 2P(X = 3)$, then the variance of X is _____. (Upto 3 decimal places)

Have any Doubt ?

1.111 (1.01 -1.18) — Correct Option

Solution :
1.111 (1.01 -1.18)

X follows binomial distribution with $n = 5$ and p is unknown.

Given that $P(X = 2) = 2P(X = 3)$

$$^nC_2 p^2 q^{n-2} = 2\left(^nC_3 p^3 q^{n-3}\right)$$

$$^5C_2 p^2 q^3 = 2\left(^5C_3 p^3 q^2\right)$$

$$10p^2q^3 = 2\left(10p^3q^2\right)$$

$$\Rightarrow \quad 10p^2q^3 = 20p^3q^2$$

$$\Rightarrow \quad \frac{p^2q^3}{p^3q^2} = 2$$

$$\Rightarrow \quad \frac{q}{p} = 2, \qquad q = 2p$$

We know that $p + q = 1$

$$\Rightarrow \quad p + 2p = 1$$

$$\Rightarrow \quad 3p = 1$$

$$\Rightarrow \quad p = \frac{1}{3}$$

$$\Rightarrow \quad n = 5, \quad p = \frac{1}{3}$$

$$\therefore \quad q = \frac{2}{3}$$

$$\text{Variance} = npq$$

$$= 5\left(\frac{1}{3}\right)\left(\frac{2}{3}\right) = \frac{10}{9} = 1.111$$

QUESTION ANALYTICS

Q. 31

The probability density function of a random variable x is

$$f(x) = \frac{x}{3}\left(9 - x^2\right) \text{ for } 0 \le x \le 3 = 0$$

The mean, μ_x of the random variable is _____.

Have any Doubt ?

10.8 (10.5 - 11.3) — Correct Option

Solution :
10.8 (10.5 - 11.3)

$$f(x) = \begin{cases} \frac{x}{3}(9 - x^2), & 0 \le x \le 3 \\ 0, & \text{otherwise} \end{cases}$$

$$\mu_x = \int_0^3 x\, f(x)\, dx$$

$$\therefore \quad \text{mean } (\mu_x) = \int_0^3 x \frac{x}{3}(9 - x^2)\, dx = \int_0^3 \left(3x^2 - \frac{x^4}{3}\right) dx$$

$$= \left[x^3 - \frac{x^5}{15}\right]_0^3 = 27 - \frac{243}{15} = 10.8$$

QUESTION ANALYTICS

Q. 32

A bag contains 30 tickets numbered 1, 2, 3, . . ., upto 30. Among them 5 are drawn at random and arranged in ascending order $t_1 < t_2 < t_3 < t_4 < t_5$. The probability of t_4 being 25 (upto 2 decimal places) is _____. (Upto 3 decimal places)

Have any Doubt ?

0.071 (0.070 - 0.080) — Correct Option

Solution :

0.071 (0.070 - 0.080)

5 cards can be choosen from 30 cards in $^{30}C_5$ ways.

$\therefore$ Total number of outcomes = $^{30}C_5$

Assume t_4 is 25. There are 24 cards preceding 25.

t_1, t_2 and t_3 can be choosen from these 24 cards $^{24}C_3$ ways.

t_5 should be greater than 25.

Number of such cards = 5

$\therefore$ Number of ways of choosing t_5 = $^5C_1$

$\therefore$ Favourable outcomes = $^{24}C_3 \times {}^5C_1$

$\therefore$ Required probability = $\frac{^{24}C_3 \times {}^5C_1}{^{30}C_5} = \frac{(24\times23\times22\times5\times5!)}{(30\times29\times28\times27\times26\times6)} = \frac{7286400}{102604320} = 0.0710$

QUESTION ANALYTICS +

Q. 33

If mean and standard deviation of a binomial distribution are 3 and $\frac{3}{2}$ respectively, then binomial distribution is $(q+p)^n$. The value of n is _____.

Have any Doubt ?

12 — Correct Option

Solution :

12

$$np = 3$$

$$npq = \sigma^2 = \left(\frac{3}{2}\right)^2 = \frac{9}{4}$$

from here

$$q = \frac{3}{4}$$

$$p = \left(1-\frac{3}{4}\right) = \frac{1}{4}$$

$$n\times\frac{3}{4}\times\frac{1}{4} = \frac{9}{4}$$

$$n = 12$$

QUESTION ANALYTICS +