Question1

The mean and variance of seven observations are 8 and 16 respectively. If five of the observations are $2, 4, 10, 12, 14$, then the product of remaining two observations is MHT CET 2024 (16 May Shift 2)

Options:

A. 45

B. 44

C. 48

D. 40

Answer: C

Solution:

Let the unknown numbers be x and y.

$$\text{Mean } = 8$$
$$\Rightarrow \frac{2+4+10+12+14+x+y}{7} = 8$$
$$\Rightarrow x+y = 14 \ldots(i)$$
$$\text{Variance } = 16$$
$$\Rightarrow \frac{2^2+4^2+10^2+12^2+14^2+x^2+y^2}{7}$$

$$-(\text{ mean })^2 = 16$$

$$\Rightarrow 460+x^2+y^2 = 7\left[16+(8)^2\right]$$
$$\Rightarrow 460+x^2+y^2 = 560$$
$$\Rightarrow x^2+y^2 = 100 \ldots(ii)$$

Solving (i) and (ii), we get

$$x=6, y=8 \text{ or } x=8, y=6$$

$\therefore$ Product $= 48$

Question2

If the sum of the deviations of 50 observations from 30 is 50 , then the mean of these observations is MHT CET 2024 (16 May Shift 1)

Options:

A. 30

B. 51

C. 50

D. 31

Answer: D

Solution:

Let the observations be

$x_1, x_2, x_3, \dots x_{50}$

Then, $\sum_{i=1}^{50}(x_i - 30) = 50$

$$\Rightarrow \sum_{i=1}^{50} x_i - (30 \times 50) = 50$$

$$\Rightarrow \sum_{i=1}^{50} x_i = 1550$$

Mean $= \frac{\sum_{i=1}^{50} x_i}{n} = \frac{1550}{50} = 31$

Question3

A box contains 15 green and 10 yellow balls. If 10 balls are randomly drawn, one by one, with replacement, then the variance of the number of green balls drawn is MHT CET 2024 (16 May Shift 1)

Options:

A. 6

B. 4

C. $\frac{6}{25}$

D. $\frac{12}{5}$

Answer: D

Solution:

Probability of green ball $(p) = \frac{15}{25} = \frac{3}{5}$

Probability of yellow ball $(q) = \frac{10}{25} = \frac{2}{5}$

Also, $n = 10$

$$\therefore \quad \text{Variance} = npq = 10\left(\frac{3}{5}\right)\left(\frac{2}{5}\right) = \frac{12}{5}$$

Question4

Variance of first n natural numbers is ______. MHT CET 2024 (15 May Shift 2)

Options:

A. $n^2 - \frac{1}{12}$

B. $\frac{(n-1)^2}{12}$

C. $\frac{n^2}{12} - 1$

D. $\frac{n^2-1}{12}$

Answer: D

Solution:

$$\sigma^2 = \frac{1}{n}(1^2 + 2^2 + 3^2 + \ldots + n^2) - \left(\frac{1+2+3+\ldots+n}{n}\right)^2$$

$$= \frac{1}{n}\left(\frac{n(n+1)(2n+1)}{6}\right) - \left(\frac{n(n+1)}{2n}\right)^2$$
$$= \frac{(n+1)(2n+1)}{6} - \left(\frac{n+1}{2}\right)^2$$
$$= \frac{n+1}{2}\left(\frac{2n+1}{3} - \frac{n+1}{2}\right)$$
$$= \frac{n+1}{2}\left(\frac{n-1}{6}\right)$$
$$= \frac{n^2-1}{12}$$

Question5

The mean of the numbers $a, b, 8, 5, 10$ is 6 and the variance is $6 \cdot 8$. Then which of the following gives possible values of a and b ? MHT CET 2024 (15 May Shift 1)

Options:

A. $\mathrm{a} = 3,\ \mathrm{b} = 4$

B. $\mathrm{a} = 0,\ \mathrm{b} = 7$

C. $\mathrm{a} = 5,\ \mathrm{b} = 2$

D. $\mathrm{a} = 1,\ \mathrm{b} = 6$

Answer: A

Solution:

$$\text{Mean } = 6$$
$$\therefore \quad \frac{a+b+8+5+10}{5} = 6$$
$$\Rightarrow a + b = 7$$
$$\Rightarrow (a-6) = (1-b)\ldots(i)$$
$$6.80 = \frac{\sum (x_i - \bar{x})^2}{n}$$
$$\Rightarrow 6.80 = \frac{(a-6)^2 + (b-6)^2 + 4 + 1 + 16}{5}$$

$$\Rightarrow 34 = (a-6)^2 + (b-6)^2 + 21$$
$$\Rightarrow (a-6)^2 + (b-6)^2 = 13$$
$$\Rightarrow (1-b)^2 + (b-6)^2 = 13..[From(i)]$$
$$\Rightarrow b^2 - 2b + 1 + b^2 - 12b + 36 = 13$$
$$\Rightarrow 2b^2 - 14b + 24 = 0$$
$$\Rightarrow b^2 - 7b + 12 = 0$$
$$\Rightarrow b = 3, 4$$
$$\therefore \quad b = 3 \Rightarrow a = 4 \text{ and}$$
$$b = 4 \Rightarrow a = 3$$

Question6

If for some $x \in \mathbb{R}^+ \cup \{0\}$, the frequency distribution of the marks obtained by 20 students in a test is,

Marks:	2	3	5	7
Frequency:	$(x+1)^2$	$2x-5$	x^2-3x	x

then the mean of the marks is

MHT CET 2024 (11 May Shift 2)

Options:

A. 3.0

B. 2.8

C. 2.5

D. 3.2

Answer: B

Solution:

$$\begin{aligned} &\text{Here, } \Sigma f_i = (x+1)^2 + 2x - 5 + x^2 - 3x + x \\ &= 2x^2 + 2x - 4 \\ &\sum f_i x_i = 2(x+1)^2 + 3(2x-5) + 5\left(x^2 - 3x\right) + 7x \\ &= 7x^2 + 2x - 13 \end{aligned}$$

$$\begin{aligned} &N = 20 \\ &\Rightarrow \sum f_i = 20 \\ &\Rightarrow 2x^2 + 2x - 4 = 20 \\ &\Rightarrow x = -4, 3 \\ &\Rightarrow x = 3 \end{aligned}$$

$\ldots [\because x \in R^+ \cup \{0\}]$

Now mean

$$\begin{aligned} (\bar{x}) &= \frac{\sum f_i x_i}{N} \\ &= \frac{7(3)^2 + 2(3) - 13}{20} \end{aligned}$$

$= 2.8$

Question7

In an experiment with 15 observations for x, the following results were available $\sum x^2 = 2830, \sum x = 170$. One observation 20 was found to be wrong and was replaced by the correct value 30 . Then the corrected variance is MHT CET 2024 (11 May Shift 1)

Options:

A. 78

B. 210

C. 225

D. 88

Answer: A

Solution:

Given: $\sum x=170$ and $\sum x^2=2830$

Corrected sum

$$\sum x=170-20+30=180$$
$$\sum x^2=2830-400+900=3330$$

$\therefore$ Corrected variance

$$=\left(\frac{\sum x^2}{n}\right)-\left(\frac{\sum x}{n}\right)^2$$
$$=\left(\frac{3330}{15}\right)-\left(\frac{180}{15}\right)^2$$
$$=222-144=78$$

Question8

The mean and variance of 7 observations are 8 and 16 respectively. If first five observations are $2,4,10,12,14$, then absolute difference of remaining two observations is MHT CET 2024 (10 May Shift 2)

Options:

A. 1

B. 2

C. 3

D. 4

Answer: B

Solution:

Let the unknown numbers be x and y. Mean $=8$

$$\Rightarrow \frac{2+4+10+12+14+x+y}{7}=8$$
$$\Rightarrow x+y=14\ldots(i)$$
$$\text{Variance }=16$$
$$\Rightarrow \frac{2^2+4^2+10^2+12^2+14^2+x^2+y^2}{7}$$
$$\Rightarrow 460+x^2+y^2=7\left[16+(8)^2\right]$$
$$\Rightarrow 460+x^2+y^2=560$$
$$\Rightarrow x^2+y^2=100\ldots(ii)$$

Solving (i) and (ii), we get

$x=6, y=8$ or $x=8, y=6$

$\therefore$ Required absolute difference $=|x-y|=2$

Question9

Mean and variance of six observations are 6 and 12 respectively. If each observation is multiplied by 3 , then new variance of the resulting observations is MHT CET 2024 (10 May Shift 1)

Options:

A. 288

B. 36

C. 18

D. 108

Answer: D

Solution:

When each item of a data is multiplied by λ, Variance is multiplied by λ^2.

$$\therefore \quad \text{New variance } = 3^2 \times 12 = 9 \times 12 = 108$$

Question10

The variance of 20 observations is 5. If each observation is multiplied by 3 and then 8 is added to each number, then variance of resulting observations is MHT CET 2024 (09 May Shift 2)

Options:

A. 35

B. 55

C. 25

D. 45

Answer: D

Solution:

- Variance Calculation:

- Given: Variance $= 5$ for 20 observations.

- Each observation is multiplied by 3: Variance gets multiplied by $3^2 =$

- New variance:

$$\text{New variance } = 9 \times 5 = 45$$

- Adding 8 to each observation does not change the variance.

- Final variance: 45.
Answer: 45, which matches the solution shown.

Question11

The mean and the standard deviation of 10 observations are 20 and 2 respectively. Each of these 10 observations is multiplied by p and then reduced by q, where $p \neq 0$ and $q \neq 0$. If the new mean and new standard deviation (s.d.) become half of the original values, then q is equal to MHT CET 2024 (09 May Shift 1)

Options:

A. -20

B. -5

C. 10

D. -10

Answer: A

Solution:

$\text{Mean} = 20$ and $\text{SD} = 2, \text{n} = 10$

If each observation is multiplied by p and then reduced by q.

New Mean $= \bar{x}_1 = \text{p}\bar{x} - \text{q}$

$$10 = p(20) - q$$
$$\Rightarrow 20p - q = 10 \ldots (i)$$

New $\text{SD} = \sigma_1 = |\text{p}|\sigma$

Squaring on both sides,

$$\Rightarrow 1 = \text{p}^2 \times 4$$
$$\Rightarrow \text{p}^2 = \frac{1}{4}$$
$$\Rightarrow \text{p} = \pm\frac{1}{2}$$

From (i)

When, $\text{p} = \frac{-1}{2}, \text{q} = -20$

When, $\text{p} = \frac{1}{2}, \text{q} = 0$

Question12

The mean and variance of seven observations are 8 and 16 respectively. If 5 of the observations are $2, 4, 10, 12, 14$, then the square root of product of remaining two observations is MHT CET 2024 (04 May Shift 2)

Options:

A. $4\sqrt{3}$

B. $3\sqrt{3}$

C. $2\sqrt{3}$

D. $5\sqrt{3}$

Answer: A

Solution:

Let the unknown numbers be x and y.

$$\begin{aligned} & \text{Mean } = 8 \\ & \Rightarrow \frac{2+4+10+12+14+x+y}{7}=8 \\ & \Rightarrow x+y=14 \ldots(i) \\ & \text{Variance } = 16 \\ & \Rightarrow \frac{2^2+4^2+10^2+12^2+14^2+x^2+y^2}{7} \end{aligned}$$

$$-(\text{ mean })^2=16$$

$$\begin{aligned} & \Rightarrow 460+x^2+y^2=7\left[16+(8)^2\right] \\ & \Rightarrow 460+x^2+y^2=560 \\ & \Rightarrow x^2+y^2=100 \ldots(ii) \end{aligned}$$

Solving (i) and (ii), we get

$$\begin{aligned} & x=6, y=8 \text{ or } x=8, y=6 \\ \therefore \quad & \text{Product } = 48 \\ \therefore \quad & \sqrt{\text{Product }}=\sqrt{48}=4 \sqrt{3} \end{aligned}$$

Question13

The variance of first 50 even natural numbers is MHT CET 2024 (04 May Shift 1)

Options:

A. 833

B. 473

C. $\frac{437}{4}$

D. $\frac{833}{4}$

Answer: A

Solution:

$$\begin{aligned} & \text{Variance } =\frac{\sum x_{\mathrm{i}}^2}{\mathrm{n}}-(\bar{x})^2 \\ & =\frac{\left(2^2+4^2+\ldots+100^2\right)}{50}-\left(\frac{2+4+\ldots+100}{50}\right)^2 \\ & =\frac{4\left(1^2+2^2+\ldots .+50^2\right)}{50}-(51)^2 \\ & =4\left(\frac{50 \times 51 \times 101}{50 \times 6}\right)-(51)^2 \\ & =3434-2601 \\ & =833 \end{aligned}$$

Question14

For the probability distribution

X:	−2	−1	0	1	2	3
p(x):	0·1	0·2	0·2	0·3	0·15	0·05

Then the $\mathrm{Var}(\mathrm{X})$ is

(Given :

$(0.25)^2 = 0.0625, (0.35)^2 = 0 \cdot 1225, (0.45)^2 = 0 \cdot 2025)$

MHT CET 2024 (03 May Shift 2)

Options:

A. 0.8275

B. 1.1225

C. 1.8275

D. $2 \cdot 0725$

Answer: C

Solution:

$$\begin{aligned} E(X) =& (-2)(0.1) + (-1)(0.2) + 0(0.2) + (1)(0.3) \\ & + 2(0.15) + 3(0.05) \\ =& -0.2 - 0.2 + 0 + 0.3 + 0.3 + 0.15 \\ =& 0.35 \end{aligned}$$

$$\begin{aligned} \therefore \quad \mathrm{Var}(\mathrm{X}) &= \mathrm{E}\left(\mathrm{X}^2\right) - [\mathrm{E}(\mathrm{X})]^2 \\ &= (-2)^2(0.1) + (-1)^2(0.2) + 0^2(0.2) \\ &+ 1^2(0.3) + 2^2(0.15) + 3^2(0.05) - (0.35)^2 \\ &= 0.4 + 0.2 + 0 + 0.3 + 0.6 \end{aligned}$$

$$\begin{aligned} &= 1.95 - (0.35)^2 \\ &= 1.95 - 0.1225 \\ &= 1.8275 \end{aligned}$$

Question15

A student scores the following marks in five tests : $54, 45, 41, 43, 57$. His score is not known for the sixth test. If the mean score is 48 in six tests, then the standard deviation of marks in six tests is MHT CET 2024 (03 May Shift 2)

Options:

A. $\frac{100}{\sqrt{3}}$

B. $\frac{10}{\sqrt{3}}$

C. $\frac{100}{3}$

D. $\frac{10}{3}$

Answer: B

Solution:

Let students' sixth test score be x,

$\therefore$ Mean $= 48$

$\Rightarrow \frac{54+45+41+43+57+x}{6} = 48$

$\Rightarrow x = 48$

$\therefore$ Standard deviation

$= \sqrt{\frac{1}{n}\sum(x_i - \bar{x})^2}$

$= \sqrt{\frac{1}{6} \times [(6^2 + (-3)^2 + (-7)^2 + (-5)^2 + (9)^2)]}$

$= \sqrt{\frac{200}{6}}$

$= \frac{10}{\sqrt{3}}$

Question16

The mean of n observations is $\bar{x}$. If three observations $n+1, n-1, 2n-1$ are added such that mean remains same, then value of n is MHT CET 2024 (03 May Shift 1)

Options:

A. $\frac{2\bar{x}+1}{3}$

B. $\frac{3\bar{x}-1}{4}$

C. $\frac{3\bar{x}+1}{4}$

D. $\frac{\bar{x}+1}{4}$

Answer: C

Solution:

Let the n observations be $x_1, x_2, \ldots, x_n$

$\therefore$ According to have given condition; we get

$\frac{x_1 + x_2 + \ldots + x_n}{n}$

$= \frac{x_1 + x_2 + \ldots + x_n + n + 1 + n - 1 + 2n - 1}{n+3}$

$\therefore \bar{x} = \frac{x_1 + x_2 + \ldots + x_n + 4n - 1}{n+3}$

$\therefore \bar{x} = \frac{\left(\frac{x_1 + x_2 + \ldots + x_n}{n}\right) + 4n - 1}{n+3}$

$\therefore \bar{x} = \frac{n\bar{x} + 4n - 1}{n+3}$

$\therefore n\bar{x} + 3\bar{x} = n\bar{x} + 4n - 1$

$\therefore 3\bar{x} = 4n - 1$

$\therefore n = \frac{3\bar{x}+1}{4}$

Question17

Consider three observations a, b and c such that $b = a + c$. If the standard deviation of $a+2,\ b+2, c+2$ is d, then what holds true. MHT CET 2024 (02 May Shift 2)

Options:

A. $b^2 = 3\left(a^2 + c^2 + d^2\right)$

B. $b^2 = a^2 + c^2 + 3\,d^2$

C. $b^2 = 3\left(a^2 + c^2\right) - 9d^2$

D. $b^2 = 3\left(a^2 + c^2\right) + 9\,d^2$

Answer: C

Solution:

Mean of a, b, c is

$$\bar{x} = \frac{a+b+c}{3}$$
$$\Rightarrow \bar{x} = \frac{2b}{3}$$

$\therefore [\because b = a + c]$

S.D. of $a+2, b+2, c+2 = S$. D. of a, b, c

$$\therefore \quad d = \sqrt{\frac{a^2+b^2+c^2}{3} - \left(\frac{2b}{3}\right)^2}$$
$$\Rightarrow d^2 = \frac{a^2+b^2+c^2}{3} - \frac{4b^2}{9}$$
$$\Rightarrow d^2 = \frac{3\left(a^2+b^2+c^2\right) - 4b^2}{9}$$
$$\Rightarrow 9d^2 = 3\left(a^2+c^2\right) - b^2$$
$$\Rightarrow b^2 = 3\left(a^2+c^2\right) - 9d^2$$

Question18

The mean of 100 obseryations is 50 and their standard deviation is 5 , then the sum of all squares of all the observations is MHT CET 2024 (02 May Shift 1)

Options:

A. 252500

B. 250500

C. 250000

D. 255000

Answer: A

Solution:

$\bar{x} = 50,\ \text{Standard deviation } = 5$
$\text{n} = 100$
$\text{Mean } \bar{x} = 50$

$\Rightarrow \frac{\sum x_{\mathrm{i}}}{100}=50$
$\Rightarrow \sum x_{\mathrm{i}}=5000$

Now, standard deviation $=\sqrt{\frac{\sum x_i^2}{\mathrm{n}}-\left(\frac{\sum x_{\mathrm{i}}}{\mathrm{n}}\right)^2}$

$\Rightarrow 5=\sqrt{\frac{\sum x_{\mathrm{i}}^2}{100}-\left(\frac{5000}{100}\right)^2}$

$\Rightarrow 25=\frac{\sum x_i^2}{100}-(50)^2$

$\Rightarrow \frac{\sum x_i^2}{100}=25+2500$

$\Rightarrow \sum x_i^2=252500$

Question19

If both mean and variance of 50 observations $x_1, x_2, \ldots, x_{50}$ are equal to 16 and 256 respectively, then mean of $(x_1-5)^2,(x_2-5)^2, \ldots \ldots,(x_{50}-5)^2$ is MHT CET 2023 (14 May Shift 2)

Options:

A. 357

B. 367

C. 377

D. 387

Answer: C

Solution:

$$\text{Mean }=\frac{\sum x_i}{n}$$
$$\Rightarrow 16=\frac{\sum x_{\mathrm{i}}}{50}$$
$$\Rightarrow \sum x_{\mathrm{i}}=800$$
$$\text{Variance }=\frac{\sum x_{\mathrm{i}}^2}{\mathrm{n}}-(\bar{x})^2$$
$$\Rightarrow 256=\frac{\sum x_{\mathrm{i}}^2}{50}-(16)^2$$
$$\Rightarrow \frac{\sum x_{\mathrm{i}}^2}{50}=512$$
$$\Rightarrow \sum x_{\mathrm{i}}^2=25600$$

$$\text{New mean } = \frac{\sum (x_i - 5)^2}{n}$$

$$= \frac{\sum x_i^2 - 10\sum x_i + \sum 25}{50}$$

$$= \frac{25600 - 10(800) + 25(50)}{50}$$

$$= \frac{18850}{50}$$

$$= 377$$

Question20

The variance of 20 observations is 5 . If each observation is multiplied by 2 , then variance of resulting observations is MHT CET 2023 (14 May Shift 1)

Options:

A. 5

B. 10

C. 4

D. 20

Answer: D

Solution:

When each term of a data is multiplied by λ, variance is multiplied by $\lambda^2 \therefore$ New variance $= 2^2 \times 5 = 20$

Question21

Variance of first $2n$ natural numbers is MHT CET 2023 (13 May Shift 2)

Options:

A. $\frac{4n^2+1}{12}$

B. $\frac{(2n-1)^2}{12}$

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

D. $\frac{4n^2-1}{12}$

Answer: D

Solution:

$$\sigma^2 = \frac{1}{2n}\left[1^2+2^2+3^2+\ldots+(2n)^2\right] - \left(\frac{1+2+3+\ldots+2n}{2n}\right)^2$$

$$= \frac{1}{2n}\left[\frac{2n(2n+1)(4n+1)}{6}\right] - \left[\frac{1}{2n}\times\frac{2n(2n+1)}{2}\right]^2$$

$$= \frac{(2n+1)(4n+1)}{6} - \left(\frac{2n+1}{2}\right)^2$$

$$= \frac{2n+1}{2}\left(\frac{4n+1}{3} - \frac{2n+1}{2}\right)$$

$$= \frac{2n+1}{2}\left(\frac{2n-1}{6}\right)$$

$$= \frac{4n^2-1}{12}$$

Question22

The raw data $x_1, x_2, \ldots\ldots, x_{\mathrm{n}}$ is an A.P. with common difference d and first term 0. $\bar{x}$ and σ^2 are mean and variance of $x_{\mathrm{i}}, \mathrm{i}=1,2,\ldots\ldots\mathrm{n}$, then σ^2 is MHT CET 2023 (13 May Shift 1)

Options:

A. $\frac{(n^2+1)d^2}{24}$

B. $\frac{(\mathrm{n}^2-1)\mathrm{d}^2}{24}$

C. $\frac{(\mathrm{n}^2+1)\mathrm{d}^2}{12}$

D. $\frac{(\mathrm{n}^2-1)\mathrm{d}^2}{12}$

Answer: D

Solution:

$$\bar{x} = \frac{x_1+x_2+\ldots+x_{\mathrm{n}}}{\mathrm{n}} = \frac{\frac{\mathrm{n}}{2}\left[2x_1+(\mathrm{n}-1)\mathrm{d}\right]}{\mathrm{n}} = \frac{(\mathrm{n}-1)\mathrm{d}}{2}$$

$$\begin{aligned}\sum x_i^2 &= x_1^2+x_2^2+\ldots+x_n^2 \\ &= 0+d^2+(2d)^2+\ldots+[(n-1)d]^2 \\ &= d^2\left[1+2^2+3^2+\ldots+(n-1)^2\right] \\ &= d^2\left[\frac{n(n-1)(2n-1)}{6}\right] \\ \sigma^2 &= \frac{1}{n}\sum x_i^2-(\bar{x})^2 \\ &= \frac{d^2(n-1)(2n-1)}{6}-\left[\frac{(n-1)d}{2}\right]^2 \\ &= \frac{d^2(n-1)}{2}\left(\frac{2n-1}{3}-\frac{n-1}{2}\right) \\ &= \frac{d^2(n-1)}{2}\left(\frac{n+1}{6}\right)=\frac{\left(n^2-1\right)d^2}{12}\end{aligned}$$

Question23

For 20 observations of variable x, if $\sum\left(x_i-2\right)=20$ and $\sum\left(x_i-2\right)^2=100$, then the standard deviation of variable x is MHT CET 2023 (12 May Shift 2)

Options:

A. 2

B. 3

C. 4

D. 9

Answer: A

Solution:

Note that standard derivation is independent of change of origin. $\therefore$ S.D. of x_i = S.D. of $\left(x_i-2\right)$

$$\therefore \quad \text{S.D. of } \left(x_i-2\right)=\sqrt{\frac{1}{n}\sum_i^{20}\left(x_i-2\right)^2-\left[\frac{\sum\left(x_i-2\right)}{n}\right]^2}$$

$$= \sqrt{\frac{100}{20} - (1)^2}$$
$$= 2$$
$$\Rightarrow \text{Required S.D} = 2$$

Question24

If the variance of the numbers $-1, 0, 1, \mathrm{k}$ is 5 , where $\mathrm{k} > 0$, then k is equal to MHT CET 2023 (12 May Shift 1)

Options:

A. $2\sqrt{\frac{10}{3}}$

B. $2\sqrt{6}$

C. $4\sqrt{\frac{5}{3}}$

D. $\sqrt{6}$

Answer: B

Solution:

$$\text{Variance } = \frac{1}{\mathrm{n}} \sum_{\mathrm{i}=1}^{\mathrm{n}} x_i^2 - \bar{x}^2$$

$$\text{Here, } \mathrm{n} = 4 \text{ and variance } = 5$$

$$\therefore \quad 5 = \frac{1}{4}\left[(-1)^2 + (0)^2 + (1)^2 + \mathrm{k}^2\right] - \left(\frac{-1+0+1+\mathrm{k}}{4}\right)^2$$

$$\therefore \quad 5 = \frac{2+\mathrm{k}^2}{4} - \frac{\mathrm{k}^2}{16}$$

$$\therefore \quad 80 = 8 + 4\mathrm{k}^2 - \mathrm{k}^2$$

$$\therefore \quad 3\mathrm{k}^2 = 72$$

$$\therefore \quad \mathrm{k}^2 = 24$$

$$\therefore \quad \mathrm{k} = 2\sqrt{6} \qquad \ldots[\because \mathrm{k} > 0]$$

Question25

If both mean and variance of 50 observations $x_1, x_2, \ldots\ldots, x_{50}$ are equal to 16 and 256 respectively, then mean of $(x_1 - 5)^2, (x_2 - 5)^2, \ldots\ldots(x_{50} - 5)^2$ is MHT CET 2023 (11 May Shift 2)

Options:

A. 357

B. 387

C. 377

D. 397

Answer: C

Solution:

Given that $\mathrm{n}=50, \bar{x}=16$ and ${\sigma_x}^2=256$

$$\therefore \quad \sigma_x^2=\frac{1}{\mathrm{n}}\left(\sum_{i=1}^{50} x_i^2\right)-(\bar{x})^2$$
$$\therefore \quad 256=\frac{1}{50}\left(\sum_{i=1}^{50} x_i^2\right)-256$$
$$\therefore \quad \frac{1}{50}\left(\sum_{i=1}^{50} x_i^2\right)=512$$
$$\therefore \quad \sum_{i=1}^{50} x_i^2=25600$$

$$\text{Now} \sum_{i=1}^{5}\left(x_i-5\right)^2=\sum_{i=1}^{50} x_i^2+25 \times 50-10 \sum_{i=1}^{5} x_i$$
$$=25600+1250-8000$$

... [From (i) and (ii)]

≤ 18850

$$\therefore \quad \text{Required Mean }=\frac{\sum_{i=1}^{50}\left(x_i-5\right)^2}{50}=\frac{18850}{50}=377$$

Question26

If variance of $x_1, x_2 \ldots \ldots, x_{\mathrm{n}}$ is σ_x^2, then the variance of $\lambda x_1, \lambda x_2, \ldots \ldots, \lambda x_n(\lambda \neq 0)$ is MHT CET 2023 (11 May Shift 1)

Options:

A. $\lambda \cdot \sigma_x$

B. $\lambda \cdot \sigma_x^2$

C. $\lambda^2 \cdot \sigma_x$

D. $\lambda^2 \cdot \sigma_x^2$

Answer: D

Solution:

When each item of a data is multiplied by λ, variance is multiplied by $\lambda^2 . \therefore \quad$ New variance $=\lambda^2 \cdot \sigma_x^2$

Question27

Mean and variance of six observations are 8 and 16 respectively. If each observation is multiplied by 3 , then new variance of the resulting observations is MHT CET 2023 (10 May Shift 2)

Options:

A. 16

B. 48

C. 24

D. 144

Answer: D

Solution:

When each item of a data is multiplied by λ, variance is multiplied by λ^2.

$$\begin{aligned} \therefore \quad \text{New variance } &= 3^2 \times 16 \\ &= 9 \times 16 \\ &= 144 \end{aligned}$$

Question28

The variance, for first six prime numbers greater than 5 , is MHT CET 2023 (10 May Shift 1)

Options:

A. 27

B. 28

C. 15

D. 20

Answer: B

Solution:

First six prime numbers greater than 5 are 7,11 , 13, 17, 19, 23.

$$\text{Variance } \left(\sigma^2\right) = \frac{1}{\mathrm{n}}\left(\sum_{\mathrm{i}=1}^{\mathrm{n}} x_{\mathrm{i}}^2\right) - (\bar{x})^2$$

$$\therefore \quad \sigma^2 = \frac{1}{6}\left(7^2 + 11^2 + 13^2 + 17^2 + 19^2 + 23^2\right)$$

$$-\left(\frac{7+11+13+17+19+23}{6}\right)^2$$

$$= \frac{1518}{6} - \left(\frac{90}{6}\right)^2$$

$$= 253 - 225$$

$$= 28$$

Question29

If the mean and S.D. of the data $3, 5, 7, \mathrm{a}, \mathrm{b}$ are 5 and 2 respectively, then a and b are the roots of the equation MHT CET 2023 (09 May Shift 2)

Options:

A. $x^2 - 10x + 18 = 0$

B. $2x^2 - 20x + 19 = 0$

C. $x^2-10x+19=0$

D. $x^2-20x+18=0$

Answer: C

Solution:

Mean $=5$ ... [Given]

$$\therefore \quad \text{Mean } = \frac{\sum_{i=1}^{n} x_i}{n}$$
$$\Rightarrow 5=\frac{3+5+7+a+b}{5}$$
$$\Rightarrow a+b=10 \ldots (i)$$

$$\text{S.D. } = 2\ldots [Given]$$
$$\therefore \quad \text{S.D. } = \sqrt{\frac{\sum x_1^2}{n}-(\bar{x})^2}$$
$$\Rightarrow (2)^2=\frac{3^2+5^2+7^2+a^2+b^2}{5}-(5)^2$$
$$\Rightarrow 4=\frac{83+a^2+b^2}{5}-25$$
$$\Rightarrow a^2+b^2=62\ldots (ii)$$

...[Given]

Now, (i) $\Rightarrow a+b=10$

Squaring both sides, we get

$$(a+b)^2=100$$
$$a^2+2ab+b^2=100$$
$$38=2ab\ldots [From(ii)]$$
$$\therefore \quad ab=19$$

Note that the required quadratic equation is expressed as

$$x^2-(a+b)x+ab=0$$
$$\therefore \quad x^2-10x+19=0$$

Question30

Two cards are drawn successively with replacement from a well shuffled pack of 52 cards, then mean of number of queens is MHT CET 2023 (09 May Shift 2)

Options:

A. $\frac{1}{13}$

B. $\frac{1}{169}$

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

D. $\frac{4}{169}$

Answer: C

Solution:

Total number of cards $= 52$

Total number of queens $= 4$

Probability of getting a queen

$P(\text{ queen }) = \frac{4}{52} = \frac{1}{13}$

Probability of not getting a queen

$\mathrm{P}(\text{ non queen }) = \frac{48}{52} = \frac{12}{13}$

Let X be a random variable such that $\mathrm{X} =$ number of queens in 2 draws

Case I: No queens are drawn $(X = 0)$ $\mathrm{P}(\mathrm{X} = 0) = \mathrm{P}($ non queen $) \times \mathrm{P}($ non queen $)$

$= \frac{12}{13} \times \frac{12}{13} = \frac{144}{169}$

Case II: One queen is drawn $(\mathrm{X} = 1)$ $\mathrm{P}(\mathrm{X} = 1) = \mathrm{P}($ non queen and queen $)$ or $\mathrm{P}($ queen and non queen)

$$= \frac{12}{13} \times \frac{1}{13} + \frac{1}{13} \times \frac{12}{13}$$
$$= \frac{24}{169}$$

Case III: Two queens are drawn $(\mathrm{X} = 2)$

$$\begin{aligned} \mathrm{P}(\mathrm{X} = 2) = \mathrm{P}(\text{ queen }) \times \mathrm{P}(\text{ queen }) \\ = \frac{1}{13} \times \frac{1}{13} \\ = \frac{1}{169} \end{aligned}$$

Required Mean is

$$\begin{aligned} \mathrm{E}(\mathrm{X}) &= \sum x \cdot \mathrm{P}(x) \\ &= 0 \times \frac{144}{169} + 1 \times \frac{24}{169} + 2 \times \frac{1}{169} \\ &= \frac{26}{169} \\ \mathrm{E}(\mathrm{X}) &= \frac{2}{13} \end{aligned}$$

Question31

The standard deviation of the following distribution

$C.I.$	$0-6$	$6-12$	$12-18$
$\mathrm{f_i}$	2	4	6

is MHT CET 2023 (09 May Shift 1)

Options:

A. $5\sqrt{2}$

B. $\sqrt{5}$

C. $2\sqrt{5}$

D. 20

Answer: C

Solution:

$C.I.$	f_i	x_i	x_i^2	$f_i x_i$	$f_i x_i^2$
$0-6$	2	3	9	6	18
$6-12$	4	9	81	36	324
$12-18$	6	15	225	90	1350
Total	**12**			**132**	**1692**

Here $\sum f_i = 12, \sum f_i x_i = 132, \sum f_i x_i^2 = 1692$

$$\therefore \quad V(X) = \frac{1692}{12} - \left(\frac{132}{12}\right)^2 = 141 - 121 = 20$$

$\therefore$ Standard deviation $= \sqrt{20} = 2\sqrt{5}$

Question32

In an experiment with 15 observations on x, we have $\sum x^2 = 2830, \sum x = 170$. One observation that was 20 was found to be wrong and was replaced by the correct value 30 , then the corrected variance is MHT CET 2022 (11 Aug Shift 1)

Options:

A. 177.33

B. 188.66

C. 80.33

D. 78

Answer: D

Solution:

$$\text{Correct variance } = \frac{\sum x^2 - 20^2 + 30^2}{15} - \left(\frac{\sum x - 20 + 30}{15}\right)^2$$

$$= \frac{2830 - 400 + 90}{15} - \left(\frac{170 - 20 + 30}{15}\right)^2$$

$$= 222 - 144 = 78$$

Question33

The sum of 10 values is 12 and the sum of their squares is 16.9 , then their standard deviation (S, D) is MHT CET 2022 (10 Aug Shift 2)

Options:

A. 0.05

B. 5

C. 0.5

D. 0.005

Answer: C

Solution:

Given $\sum x=12, \sum x^2=16.9$ and $n=10$

$$\because \text{ S.D. } =\sqrt{\frac{\sum x^2}{n}-\left(\frac{\sum x}{n}\right)^2}=\sqrt{\frac{16.9}{10}-\left(\frac{12}{10}\right)^2}$$
$$=\sqrt{\frac{169-144}{100}}=\frac{5}{10}=0.5$$

Question34

If both mean and the standard deviation of 50 observations $x_1, x_2, \ldots, x_{50}$ are equal to 16 , then mean of $(x_1-5)^2,(x_2-5)^2, \ldots \ldots ., (x_{50}-5)^2$ is MHT CET 2022 (08 Aug Shift 2)

Options:

A. 378

B. 377

C. 357

D. 397

Answer: B

Solution:

$\vec{x}=16$ and S.D. $=16$

if we subtract 5 from each observations mean will become $16-5=11$ and S.D. remains unchanged i.e., 16

$$\Rightarrow \sqrt{\frac{\sum\left(x_i-5\right)^2}{50}-11^2}=16$$
$$\Rightarrow \frac{\sum\left(x_i-5\right)^2}{50}=256+121=377$$

hence, the required mean is 377

Question35

The variance of first 10 multiples of 3 is MHT CET 2022 (07 Aug Shift 2)

Options:

A. 74.15

B. 73.15

C. 74.25

D. 70.15

Answer: C

Solution:

$$=\frac{\sum x_i^2}{n}-(\bar{x})^2=\frac{3^2+6^2+9^2+\ldots\ldots+30^2}{10}-\left(\frac{3+6+9+\ldots\ldots+30}{10}\right)^2$$

$$=\frac{3^2\left(1^2+2^2+3^2\ldots .0^2\right)}{10}-3^2\left(\frac{1+2+3+\ldots\ldots+10}{10}\right)^2$$

$$\text{Variance } =\frac{9\times 10\times 11\times 21}{6\times 10}-9\times\left(\frac{10\times 11}{2\times 10}\right)^2=\frac{33\times 21}{2}-\frac{9\times 121}{4}$$

$$=\frac{99}{4}(14-11)$$

$$=\frac{99\times 3}{4}=24.75\times 3=74.25$$

Question36

If the standard deviation of first n natural numbers is 2 , then the value of n is MHT CET 2022 (07 Aug Shift 1)

Options:

A. 7

B. 5

C. 4

D. 6

Answer: A

Solution:

$$\text{S.D. }=\sqrt{\frac{\sum x_i^2}{n}-(\bar{x})^2}$$

$$\Rightarrow 2=\sqrt{\frac{\sum n^2}{n}-\left(\frac{\sum n}{n}\right)^2}$$

$$\Rightarrow 4=\frac{n(n+1)(2n+1)}{6n}-\left(\frac{n(n+1)}{2n}\right)^2$$

$$\Rightarrow 4=\frac{n+1}{2}\left\{\frac{2n+1}{3}-\frac{n+1}{2}\right\}$$

$$\Rightarrow 4=\frac{n+1}{2}\left(\frac{n-1}{6}\right)$$

$$\Rightarrow n^2=49\Rightarrow n=7$$

Question37

The variance and mean of 15 observations are respectively 6 and 10 . If each observation is increase by 8 then the new variance and new mean of resulting observations are respectively MHT CET 2022 (06 Aug Shift 2)

Options:

A.

14,10

B.

14,18

C.

6,18

D.

6,10

Answer: C

Solution:

The new mean will be increased by 8

i.e., new mean becomes 10 + 8 = 18

But, new variance will remain unchanged

Hence, new variance = 6

Question38

In an experiment with 15 observations the results were available and $\sum X^2 = 2830, \sum X = 170$, one observation that was 20 , was found wrong and was replaced by the correct value 30 , then the corrected variance is MHT CET 2022 (06 Aug Shift 1)

Options:

A. 78.00

B. 188.66

C. 83.30

D. 177.33

Answer: A

Solution:

$$\text{correct } \Sigma x^2 = 2830 - 20^2 + 30^2 = 3330$$
$$\text{correct } \Sigma x = 170 - 20 + 30 = 180$$

$$\text{correct variance } = \frac{1}{15} \Sigma x^2 - \left(\frac{1}{15} \Sigma x\right)^2$$

$$= \frac{1}{15} \times 3330 - \left(\frac{1}{15} \times 180\right)^2$$

$$= 222 - 144$$

$$= 78$$

Question39

In a pizza hut, the following distribution is found for the daily demand of pizzas.

No. of Pizzas	5	6	7	8	9	10
Probability	0.07	0.2	0.3	0.3	0.07	0.06

Then expected daily demand and variance are respectively

MHT CET 2022 (05 Aug Shift 2)

Options:

A. 7.28 and 1.52

B. 1.52 and 7.28

C. 7.28 and 54.52

D. 7.28 and 53

Answer: A

Solution:

x_i	P_i	$P_i x_i$	$P_i x_i^2$
5	0.07	0.35	1.75
6	0.2	1.2	7.2
7	0.3	2.1	14.7
8	0.3	2.4	19.2
9	0.07	0.63	5.67
10	0.6	0.6	6.0
		$\Sigma P_i x_i = 7.28$	$\Sigma P_i x_i^2 = 54.52$

Mean $= \Sigma P_i x_i = 7.28$

and variance $= \Sigma P_i x_{i^2} - (\Sigma P_i x_i)^2 = 54.52 - 53 = 1.52$

Question40

The means of 5 observations is 4.4 and variance is 8.24 . If three of the five observations are 1,2 and 6 , then the values of other two observations are MHT CET 2022 (05 Aug Shift 2)

Options:

A. 5,7

B. 4,9

C. 3,9

D. 4,8

Answer: B

Solution:

Let the two observation be x and y

$$1+2+6+x+y=5\times 4.4=22$$
$$\Rightarrow x+y=13$$

Also $\frac{1^2+2^2+6^2+x^2+y^2}{5}-(4.4)^2=8.24$

$$\Rightarrow \frac{41+x^2+y^2}{5}=8.24+19.36=27.60$$
$$\Rightarrow x^2+y^2=138-41$$
$$\Rightarrow x^2+(13-x)^2=97$$
$$\Rightarrow x^2-13x+36=0$$
$$\Rightarrow x=4,9$$

$\Rightarrow y=9,4$

Question41

If for some positive $x\hat{I}R$, the frequency distribution of the marks obtained by 20 students in a certain test, is as follows

Marks	2	3	5	7
Frequency	$(x+1)^2$	$2x-5$	x^2-3x	x

Then the mean of the marks is

MHT CET 2022 (05 Aug Shift 1)

Options:

A. 3.0

B. 2.5

C. 2.8

D. 3.2

Answer: C

Solution:

Here, total number of students $= 20$

$$\Rightarrow (x+1)^2 + (2x-5) + (x^2-3x) + x = 20$$
$$\Rightarrow 2x^2 + 2x - 4 = 20$$
$$\Rightarrow x^2 + x - 12 = 0$$
$$\Rightarrow (x+4)(x-3) = 0$$
$$\text{But } x = 3[\text{ as } x > 0]$$

Now required mean $=$

$$\frac{2\times(3+1)^2 + 3\times(2\times3-5) + 5\times(3^2-3\times3) + 7\times3}{20}$$
$$= \frac{2\times16 + 3\times1 + 5\times0 + 7\times3}{20}$$
$$= 2.8$$

Question42

For the set of 50 observation, the sum of their squares is 3050 , their arithmetic mean is 6 . Hence the standard deviation of these observations is MHT CET 2021 (24 Sep Shift 2)

Options:

A. 5

B. 3

C. 4

D. 6

Answer: A

Solution:

We have $\mathrm{n} = 50, \Sigma \mathrm{x}_i^2 = 3050, \overline{\mathrm{x}} = 6$

$$\text{S.D. } = \sqrt{\frac{1}{n}\Sigma x_i^2 - (\bar{x})^2}$$
$$= \sqrt{\frac{3050}{50} - (6)^2} = \sqrt{61-36} = \sqrt{25} = 5$$

Question43

If the standard deviation of data is 12 and mean is 72 , then coefficient of variation is MHT CET 2021 (24 Sep Shift 1)

Options:

A. 15.67%

B. 14.67%

C. 13.67%

D. 16.67%

Answer: D

Solution:

$$\text{Coefficient of variation } = \frac{\text{Standard Deviation}}{\text{Mean}} \times 100$$

$$\frac{12}{72} \times 100\% = 16.67\%$$

Question44

Given that total of 16 values is 528 and sum of the squares of deviation from 33 is 9158 . The variance is MHT CET 2021 (23 Sep Shift 2)

Options:

A. 562.73

B. 570.375

C. 574.375

D. 572.375

Answer: D

Solution:

We have $n = 16, \Sigma x_i = 528$, and $\frac{528}{16} = 33 \Rightarrow \bar{x} = 33$ and $\Sigma(x_i - \bar{x})^2 = 9158$

Variance $= \frac{1}{n}\Sigma(x_i - \bar{x})^2 = \frac{9158}{16} = 527.375$

Question45

The arithmetic mean of marks in Mathematics for four divisions A, B, C and D were 80, 75, 70 and 72 respectively. Their standard deviations were $12, 6, 8$ and and 10 respectively. Then, division——— has more uniformity. MHT CET 2021 (23 Sep Shift 1)

Options:

A. D

B. B

C. C

D. A

Answer: B

Solution:

$$\text{We know that C.V. } = \frac{\text{Standard Deviation}}{\text{Mean}}$$

$$\therefore (\text{ C.V. })_A = \frac{12}{18} = 0.15 \text{ and } (\text{ C.V. })_B = \frac{6}{75} = 0.08$$

$$(\text{ C.V. })_C = \frac{8}{70} = 0.11 \text{ and } (\text{ C.V. })_D = \frac{10}{72} = 0.14$$

C.V. is the least for division B.

Question46

Following data shows the information about marks obtained in Physics, Chemistry, Mathematics and Biology by 100 students in a class. Then ______

	Physics	Chemistry	Mathematics	Biology
Mean	20	25	23	27
S.D.	3	2	4	5

subject shows the highest variability in marks
MHT CET 2021 (22 Sep Shift 2)

Options:

A. Mathematics

B. Chemistry

C. Biology

D. Physics

Answer: C

Solution:

$$\text{We know that Coefficient of Variation } = \frac{\text{Standard Deviation}}{\text{mean}}$$

$$\therefore \quad (\text{ C.V. })_{\text{Physics}} = \frac{3}{20} = 0.15 \text{ and } (\text{ C.V. })_{\text{Chemistry}} = \frac{2}{25} = 0.08$$

$$(\text{C.V. })_{\text{Mathematics}} = \frac{4}{23} = 0.174 \text{ and } (\text{C.V. })_{\text{Biology}} = \frac{5}{27} = 0.185$$

Question47

A random variable $X \sim B(n, p)$, if values of mean and variance of X are 18,12 respectively, then n =
MHT CET 2021 (22 Sep Shift 1)

Options:

A. 54

B. 18

C. 12

D. 55

Answer: A

Solution:

We have $np = 18$ and $npq = 12$

$$\therefore q=\frac{12}{18}=\frac{2}{3} \quad \Rightarrow p=1-\frac{2}{3}=\frac{1}{3}$$
$$\therefore n\left(\frac{1}{3}\right)=18 \quad \Rightarrow n=54$$

Question48

If the variance of the data $2,4,5,6,8,17$ is 23.33 , then the variance of $4,8,10,12,16,34$ will be MHT CET 2021 (22 Sep Shift 1)

Options:

A. 93.32

B. 25.33

C. 23.33

D. 48.66

Answer: A

Solution:

We find that each element of new data is 2 times of each element in old data.

Variance of old data $=23.33$

$\therefore$ variance of new data $=(23.33)(2)^2=93.32$

Question49

The mean of five observation is 4 and their variance is 5.2. If three of these observations are 1,2 and 6 , then the other two are MHT CET 2021 (21 Sep Shift 2)

Options:

A. 2 and 9

B. 3 and 8

C. 4 and 7

D. 5 and 6

Answer: C

Solution:

We have $n = 5$, $\bar{x} = 4$ and $\sigma^2 = 5.2$

Let the 5 observations be 1, 2, 6, a, b

$\therefore\ 4 = \dfrac{1+2+6+a+b}{5} \quad \Rightarrow a + b = 11 \qquad (1)$

Variance $= \dfrac{\Sigma(x_i - \bar{x})^2}{n}$

$\therefore\ 5.2 = \dfrac{(1-4)^2 + (2-4)^2 + (6-4)^2 + (a-4)^2 + (b-4)^2}{5}$

$\therefore\ 26 = 9 + 4 + 4 + (a-4)^2 + (b-4)^2 = 9 \qquad \ldots (2)$

From (1), we get $b = 11 - a$ and substituting value of b in (2),

we write $(a-4)^2 + (7-a)^2 = 9 \Rightarrow a = 4, 7 \Rightarrow (a, b)$ are 4 and 7.

Question50

For $X \sim B(n, p)$, if $p = 0.6, E(X) = 6$, then $\operatorname{Var}(X) =$ MHT CET 2021 (21 Sep Shift 2)

Options:

A. 6.6

B. 24

C. 2.4

D. 6

Answer: C

Solution:

We have $p = 0.6$ and $np = 6 \Rightarrow n = 10$

$$\therefore \operatorname{Var}(X) = \mathrm{npq} = (10)(0.6)(0.4) = 2.4$$

Question51

In a meeting 60% of the members favour and 40% oppose a certain proposal. A member is selected at random and we take $X = 0$ if the opposed and $X = 1$ if he is in favour, then Var $X =$ MHT CET 2021 (21 Sep Shift 1)

Options:

A. 0.36

B. 0.24

C. 0.6

D. 0.06

Answer: B

Solution:

From the given data, we write

x_i	p_i	$x_i p_i$	$p_i x_i^2$
0	0.4	0	0
1	0.6	0.6	0.6
Total		0.6	0.6

$$\text{Variance } = \Sigma p_i x_i^2 - \left(\sum p_i x_i\right)^2 = 0.6 - (0.6)^2 = 0.6 - 0.36 = 0.24$$

Question52

For two data sets each of size 5 , the variance are given to be 4 and 5 and the corresponding means are given to be 2 and 4 respectively. The variance of the combined data set is MHT CET 2021 (21 Sep Shift 1)

Options:

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

B. $\frac{5}{2}$

C. $\frac{11}{2}$

D. $\frac{15}{2}$

Answer: C

Solution:

We have $n_1 = 5, \sigma_1{}^2 = 4, \bar{x}_1 = 2$ and $n_2 = 5, \sigma_2{}^2 = 5, \bar{x}_2 = 4$

here combined mean $= \bar{x}_c = \frac{(5)(2)+(5)(4)}{(5)+(5)} = 3$

$$d_1 = \bar{x}_1 - \bar{x}_c = 2 - 3 = 1 \text{ and } d_2 = \bar{x}_2 - \bar{x}_c = 4 - 3 = 1$$

Combined variance $=$

$$= \frac{n_1\left(\sigma_1^2 + d_1^2\right) + n_2\left(\sigma_2^2 + d_2^2\right)}{n_1 + n_2} = \frac{5(4+1) + 5(5+1)}{5+5} = \frac{11}{2}$$

Question53

If the sum of mean and variance of a binomial distribution for 5 trials is 1.8 , then probability of a success is MHT CET 2021 (20 Sep Shift 2)

Options:

A. 0.2

B. 0.6

C. 0.4

D. 0.8

Answer: A

Solution:

We have $np + npq = 1.8$, where $n = 5$

$$\begin{aligned}
&\therefore \mathrm{np}(1+\mathrm{q}) = 1.8 \Rightarrow 5\mathrm{p}[1+(1-\mathrm{p})] = 1.8 \\
&\therefore 5\mathrm{p}(2-\mathrm{p}) = 1.8 \Rightarrow 10\mathrm{p} - 5\mathrm{p}^2 = 1.8 \text{ i.e. } \\
&5\mathrm{p}^2 - 10\mathrm{p} + 1.8 = 0 \Rightarrow 5\mathrm{p}^2 - 9\mathrm{p} - \mathrm{p} + 1.8 = 0 \\
&\therefore 5\mathrm{p}(\mathrm{p}-1.8) - 1(\mathrm{p}-1.8) = 0 \Rightarrow (5\mathrm{p}-1)(\mathrm{p}-1.8) = 0 \\
&\therefore \mathrm{p} = \frac{1}{5}, 1.8 \text{ but } \mathrm{p} \leq 1 \Rightarrow \mathrm{p} = \frac{1}{5} = 0.2
\end{aligned}$$

Question54

If the variance of the numbers $2, 3, 11$ and x is $\frac{49}{4}$, then the values of x are MHT CET 2021 (20 Sep Shift 2)

Options:

A. $6, \frac{14}{3}$

B. $4, \frac{13}{5}$

C. $6, \frac{16}{3}$

D. $6, \frac{14}{5}$

Answer: A

Solution:

Mean of given number is $\frac{2+3+11+x}{4}$ i.e. $\frac{16+x}{4}$

$$\begin{aligned}
&\text{Variance } = \frac{1}{\mathrm{n}} \sum (\mathrm{x_i} - \overline{\mathrm{x}})^2 \\
&\therefore \frac{49}{4} = \frac{1}{4}\left[\left(\frac{16+\mathrm{x}}{4} - 2\right)^2 + \left(\frac{16+\mathrm{x}}{4} - 3\right)^2 + \left(\frac{16+\mathrm{x}}{4} - 11\right)^2 + \left(\frac{16+\mathrm{x}}{4} - \mathrm{x}\right)^2\right] \\
&\therefore 49 = \frac{(8+\mathrm{x})^2}{16} + \frac{(4+\mathrm{x})^2}{16} + \frac{(\mathrm{x}-28)^2}{16} + \frac{(16-3\mathrm{x})^2}{16} \\
&\therefore (49)(16) = \left(64 + \mathrm{x}^2 + 16\mathrm{x}\right) + \left(16 + \mathrm{x}^2 + 8\mathrm{x}\right)
\end{aligned}$$

$$+ \left(x^2 - 56x + 784\right) + \left(256 + 9x^2 - 96x\right)$$

$$\therefore 784 = 12x^2 - 128x + 80 + 784 + 256$$

$$\therefore 12x^2 - 128x + 336 = 0$$

$$\Rightarrow 3x^2 - 32x + 84 = 0$$

$$\therefore x = \frac{32 \pm \sqrt{(32)^2 - (4)(3)(84)}}{2(3)} = \frac{32 \pm \sqrt{1024 - 1008}}{6} = \frac{32 \pm 4}{6}$$

$$\therefore x = \frac{36}{6} \text{ or } x = \frac{28}{6}$$

$$\Rightarrow x = 6, \frac{14}{3}$$

Question55

If 1 is added to first 10 natural numbers, then variance of the numbers so obtained is MHT CET 2021 (20 Sep Shift 1)

Options:

A. 8.25

B. 3.87

C. 6.5

D. 2.87

Answer: A

Solution:

We have to find variance of numbers $2, 3, 4, \ldots, 11$.

Here $\bar{x} = \frac{2+3+4+\ldots+11}{10} = \frac{65}{10} = 6.5$

Variance $= \frac{\sum (x_i - \bar{x})^2}{n}$

$$= \frac{[(-4.5)^2 + (-3.5)^2 + (-2.5)^2 + (-1.5)^2 + (-0.5)^2 + (0.5)^2 + (1.5)^2 + (2.5)^2 + (3.5)^2 + (4.5)^2]}{10}$$

$$= \frac{2(20.25 + 12.25 + 6.25 + 2.25 + 0.25)}{10} = \frac{41.25}{5} = 8.25$$

Question56

A die is thrown 100 times, then the standard deviation of getting an even number is MHT CET 2020 (14 Oct Shift 1)

Options:

A. 10

B. 5

C. 20

D. 15

Answer: B

Solution:

Let x denote the number of succeses in 100 Then x follows binomial distribution with $n = 1008$
$p = y_2, q = \frac{1}{2}$

$\therefore$ variance of $x = npq = 100 \times \frac{1}{2} \times \frac{1}{2} = 25$

$\begin{array}{l}\text{Standard} \\ \text{Deviation}\end{array} = \sqrt{\text{vatiance}} = \sqrt{25}$

$= 5$

Question57

A random variable X takes the values $0, 1, 2$. Its mean is $1 \cdot 2$. If $\mathrm{P}(\mathrm{X} = 0) = 0.3$,

then $\mathrm{P}(\mathrm{X} = 1) =$

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Options:

A. 0.1

B. 0.5

C. 0.2

D. 0.4

Answer: C

Solution:

Random variable

$$\begin{aligned}
&x \text{ takes } = 0, 1, 2 \\
&\sum x_i P(x_i) = \text{ Mean} \\
&1.2 = (0 * 0.3) + 1 \times P(x = 1) + 2 \times P(x = 2) \\
&P(x = 1) + 2P(x = 2) = 1.2 \rightarrow (1) \\
&P(x = 1) + P(x = 2) + P(x = 0) = 1 \\
&P(x = 1) + P(x = 2) = 0.7 \rightarrow (2)
\end{aligned}$$

By Solving (1) \& (2)

$$\begin{aligned}
&P(x = 2) = 0.5 \\
&P(x = 1) = 0.2.
\end{aligned}$$
