Statistics

Question1

Variance of the following continuous frequency distribution is

Class Interval	Frequency
$0 - 4$	1
$4 - 8$	2
$8 - 12$	2
$12 - 16$	1

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Options:

A.

16

B.

$\frac{44}{3}$

C.

23

D.

$\frac{22}{3}$

Answer: B

Solution:

Class interval	Frequency (f_i)	x_i	$f_i x_i$	$f_i x_i^2$
$0-4$	1	2	2	4
$4-8$	2	6	12	72
$8-12$	2	10	20	200
$12-16$	1	14	14	196
	$\sum f_i = N$ $= 6$		$\sum f_i x_i$ $= 48$	$\sum f_i x_i^2$ $= 472$

So, mean $(\bar{x}) = \dfrac{\sum f_i x_i}{N} = \dfrac{48}{6} = 8$

and variance $(\sigma^2) = \dfrac{\sum f_i x_i^2}{N} - (\bar{x})^2$

$= \dfrac{472}{6} - 8^2 = \dfrac{236}{3} - 64$

$= \dfrac{236 - 192}{3} = 44/3$

Question2

The mean deviation from the median for the following data is

x_1	9	3	7	2	5
f_1	1	6	2	8	4

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Options:

A.

$\dfrac{94}{21}$

B.

$\dfrac{12}{7}$

C.

$\dfrac{10}{7}$

D.

$\frac{100}{21}$

Answer: C

Solution:

x_i	f_i	cf	$\lvert x_i - 3 \rvert$	$f_i \lvert x_i - 3 \rvert$
2	8	8	1	8
3	6	14	0	0
5	4	18	2	8
7	2	20	4	8
9	1	21	6	6

$$\Rightarrow \quad N = 21 \Rightarrow \frac{N}{2} = 10.5$$

$\therefore$ Median $= M = 3$

and Mean deviation about median

$$= \frac{\sum f_i \lvert x_i - M \rvert}{\sum f_i} = \frac{30}{21} = \frac{10}{7}$$

Question3

The mean deviation about the mean for the following data is

Class Interval	$0-2$	$2-4$	$4-6$	$6-8$	$8-10$
Frequency	1	3	4	1	2

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Options:

A.

3

B.

$\frac{20}{11}$

C.

$\frac{40}{11}$

D.

2

Solution:

Class interval	0-2	2-4	4-6	6-8	8-10
Frequency	1	3	4	1	2

CI	x_i	f_i	$x_i f_i$	$x_i - \bar{x}$	$f_i |x_i - \bar{x}|$
0-2	1	1	1	-4	+4
2-4	3	3	9	-2	+6
4-6	5	4	20	0	0
6-8	7	1	7	2	2
8-10	9	2	18	4	8

$$\sum f_i = 11, \sum f_i x_i = 55$$
$$\bar{X} = \frac{\sum f_i x_i}{\sum f_i} = \frac{55}{11} = 5$$
$$\sum f_i |x_i - \bar{x}| = 20$$
$\therefore$ Mean deviation about mean is
$$\frac{\sum f_i |x_i - \bar{x}|}{\sum f_i} = \frac{20}{11}$$

Question4

Let $x_1, x_2, \ldots, x_{11}$ be the observations satisfying $\sum_{i=1}^{11} (x_i - 4) = 22$ and $\sum_{i=1}^{11} (x_i - 4)^2 = 154$. If the mean and variance of the

observations are α and β, then the quadratic equation having the roots $\frac{\alpha}{\beta}$ and $\frac{\beta}{\alpha}$ is

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Options:

A.

$15x^2 - 16x + 15 = 0$

B.

$15x^2 - 34x + 15 = 0$

C.

$x^2 - 16x + 60 = 0$

D.

$12x^2 - 25x + 20 = 0$

Answer: B

Solution:

$$\sum_{i=1}^{11} (x_i - 4) = 22$$

$$\Rightarrow \quad \sum_{i=1}^{11} x_i - 4 \times 11 = 22$$

$$\Rightarrow \quad \sum_{i=1}^{11} x_i = 66$$

So, mean $(\bar{x}) = \frac{66}{11} = 6$ and \qquad\qquad\qquad ...(i)

$\sum_{i=1}^{11} (x_i - 4)^2 = 154$

$\because \quad x_i - \bar{x} = x_i - 6$
$\qquad\qquad = (x_i - 4) - 2$
$\therefore \quad [x_i - \bar{x}]^2 = [(x_i - 4) - 2]^2$
$\qquad\qquad = (x_i - 4)^2 - 4(x_i - 4) + 4$

So, $\sum_{i=1}^{11} (x_i - \bar{x})^2 = \sum_{i=1}^{11} (x - 4)^2$

$$-4 \sum_{i=1}^{11} (x_i - 4) + 11 \times 4$$

$$= 154 - 4 \times 22 + 44 = 110$$

$Variance\ (\sigma) = \dfrac{1}{n} \sum (x_i - \bar{x})^2$

$$= \dfrac{1}{11} \times 110 = 10$$

Thus, $\alpha = 6, \beta = 10$

Therefore, $\dfrac{\alpha}{\beta} + \dfrac{\beta}{\alpha} = \dfrac{6}{10} + \dfrac{10}{6} = \dfrac{3}{5} + \dfrac{5}{3}$

$= \dfrac{9+25}{15} = 34/15 = $ Sum of roots

and $\dfrac{\alpha}{\beta} \cdot \dfrac{\beta}{\alpha} = 1 = $ product of roots

Hence, the quadratic is

$$x^2 - \left(\dfrac{34}{15}\right)x + 1 = 0$$

$\Rightarrow 15x^2 - 34x + 15 = 0$

Question5

The mean and variance of the observations $x_1, x_2, x_3 \ldots x_{15}$ are respectively 2 and 4 . If the mean and variance of the observations $y_1, y_2 \ldots, y_{10}$ are respectively 2 and 5 , then the variance of the observations $x_1, x_2 \ldots, x_{15}, y_1, y_2 \ldots, y_{10}$ is

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Options:

A.

6.5

B.

5.3

C.

3.4

D.

4.4

Answer: D

Solution:

Use formula for combined variance

Let $n_1 = 15, \mu_1 = 2, \sigma_1^2 = 4$

$n_2 = 10, \mu_2 = 2, \sigma_2^2 = 5$

$$\text{Combined mean } = \mu = \frac{n_1\mu_1 + n_2\mu_2}{n_1 + n_2}$$
$$= \frac{15 \times 2 + 10 \times 2}{25} = 2$$

Combined variance $= \sigma^2$

$$= \frac{n_1\sigma_1^2 + n_2\sigma_2^2 + n_1(\mu_1-\mu)^2 + n_2(\mu_2-\mu)^2}{n_1 + n_2}$$

Since, $\mu_1 = \mu_2 = $ the last two terms becomes zero.

So, $\sigma^2 = \frac{15 \times 4 + 10 \times 5}{25} = \frac{60 + 50}{25} = \frac{110}{25}$

$= 4.4$

Question6

Variance of the following discrete frequency distribution is

Class Interval	$0-2$	$2-4$	$4-6$	$6-8$	$8-10$
Frequency	2	3	5	3	2

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Options:

A.

$\frac{463}{15}$

B.

$\frac{838}{15}$

C.

$\frac{44}{5}$

D.

$\frac{88}{15}$

Answer: D

Solution:

Class interval	Frequency	x_i	$f_i x_i$
0 − 2	2	1	2
2 − 4	3	3	9
4 − 6	5	5	25
6 − 8	3	7	21
8 − 10	2	9	18
	$\Sigma f_i = 15$		75

Mean $(\mu) = \dfrac{75}{15} = 5$

$$\sigma^2 = \frac{\Sigma(x_i - \mu)^2 \cdot f_i}{N}$$

$$= \frac{32 + 12 + 0 + 12 + 32}{15} = \frac{88}{15}$$

Question7

The following data represents the frequency distribution of 20 observations

x_i	3	4	5	8	10	11
f_i	$\alpha + 2$	$(\alpha - 1)^2$	4	$\alpha - 1$	2	α

Then, its mean deviation about the mean is

Options:

A.

3

B.

2.4

C.

2.7

D.

2.9

Answer: C

Solution:

We have, $\Sigma f = 20$

$\therefore \quad (\alpha + 2) + (\alpha - 1)^2 + 4 + (\alpha - 1) + 2 + \alpha = 20$

$\Rightarrow \quad \alpha^2 + \alpha - 12 = 0$

$\quad\quad (\alpha + 4)(\alpha - 3) = 0 \Rightarrow \alpha = +3, -4$

$\therefore \quad \alpha = 3 \quad\quad\quad [\because \alpha \neq -4]$

x_i	f_i	$f_i x_i$	$|x_i - \bar{x}|$	$f \cdot |x_i - \bar{x}|$
3	5	15	3	15
4	4	16	2	8
5	4	20	1	4
8	2	16	2	4
10	2	20	4	8
11	3	33	5	15
	20	120		$\sum |x_i - \bar{x}| = 54$

$$\bar{x} = \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{120}{20} = 6$$

$$\text{MD} = \frac{\Sigma f_i |x_i - \bar{x}|}{\Sigma f} = \frac{54}{20} = 2.7$$

Question8

If the variance of the first n natural numbers is 10 and the variance of the first m even natural numbers is 16 , then $n : m =$

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Options:

A.

9 : 5

B.

7 : 3

C.

11 : 7

D.

5 : 8

Answer: C

Solution:

Variance of Ist n natural number is

$$= \frac{n^2 - 1}{12} = 10 \qquad \ldots(i)$$

and variance of Ist m even natural number is

$$\frac{m^2 - 1}{3} = 16 \qquad \ldots(iii)$$

On solving Eqs. (i) and (ii), we get

$n^2 = 121$ and $m^2 = 49$

$n : m = 11 : 7$

Question9

The variance of ungrouped data $2, 12, 3, 11, 5, 10, 6, 7,$ **is**

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Options:

A.

11.875

B.

11

C.

12

D.

10.765

Answer: C

Solution:

Given, $2, 12, 3, 11, 5, 10, 6, 7$

$$\text{Mean } \bar{x} = \frac{56}{8} = 7$$

$$\Sigma(x_i - \bar{x})^2 = 25 + 25 + 16 + 16 + 4 + 9 + 1 + 0$$
$$= 96$$

$$\text{var}(x) = \frac{(x_i - \bar{x})^2}{n} = \frac{96}{8} = 12$$

Question10

If the mean of the data $7, 8, 9, 7, 8, 7, \lambda$ **and 8 is 8 , then variance of the data is equal to**

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Options:

A. 2

B. 7/8

C. 9/8

D. 1

Answer: D

Solution:

To find the variance of the data set $7, 8, 9, 7, 8, 7, \lambda, 8$ with a mean of 8, follow these steps:

First, solve for λ:

$$\frac{7+8+9+7+8+7+\lambda+8}{8} = 8$$

Simplify the equation:

$$\frac{54+\lambda}{8} = 8$$

Multiply both sides by 8:

$$54 + \lambda = 64$$

Solve for λ:

$$\lambda = 64 - 54 = 10$$

Next, calculate the variance using the formula:

$$\text{Variance} = \frac{\Sigma x_i^2}{8} - \bar{x}^2$$

Where Σx_i^2 is the sum of squares of each data point:

$$\Sigma x_i^2 = 7^2 + 8^2 + 9^2 + 7^2 + 8^2 + 7^2 + 10^2 + 8^2$$
$$= 49 + 64 + 81 + 49 + 64 + 49 + 100 + 64$$
$$= 520$$

Calculate the variance:

$$\frac{520}{8} - 8^2 = 65 - 64 = 1$$

Thus, the variance of the data set is 1.

Question11

Based on the following statements, choose the correct option.

Statement I The variance of the first n even natural numbers is $\frac{n^2-1}{4}$.

Statement II The difference between the variance of the first 20 even natural numbers and their arithmetic mean is 112 .

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Options:

A. Both Statements are true and II is a correct explanation of I

B. Both Statements are true but II is not a correct explanation of 1

C. Statement I is true and Statement II is false

D. Statements I is false and Statement II is true

Answer: D

Solution:

Sum of first n even natural number

$$
\begin{aligned}
&= 2 + 4 + 6 + \ldots \\
&= 2(1 + 2 + 3 + \ldots) \\
&= 2 \times \frac{n(n+1)}{2} = n(n+1)
\end{aligned}
$$

$\therefore \quad$ Mean $= \frac{n(n+1)}{n} = (n+1)$

We know that variance $= \frac{1}{n}(\Sigma x_1)^2 - (\bar{x})^2$

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

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

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

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

$\therefore$ Difference between the variance of the first n even natural numbers any arithmetic mean
$= \frac{399}{3} - 21 = 112$

So, statement I is false and II is true.

Question12

If $x_1, x_2, x_3, \ldots x_n$ are n observations such, that $\Sigma(x_i + 2)^2 = 28n$ and $\Sigma(x_1 - 2)^2 = 12n$, then the variance is

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Options:

A. 12

B. 14

C. 16

D. 20

Answer: A

Solution:

Given the equations:

$\Sigma(x_i + 2)^2 = 28n$

$\Sigma(x_i - 2)^2 = 12n$

Let's start by expanding and simplifying each equation.

First equation:

$$\Sigma(x_i + 2)^2 = \Sigma(x_i^2 + 4x_i + 4)$$
$$= \Sigma x_i^2 + 4\Sigma x_i + 4n$$
$$= 28n$$

Second equation:

$$\Sigma(x_i - 2)^2 = \Sigma(x_i^2 - 4x_i + 4)$$
$$= \Sigma x_i^2 - 4\Sigma x_i + 4n$$
$$= 12n$$

Let's introduce the following notation:

$$S = \Sigma x_i$$

$$S_2 = \Sigma x_i^2$$

Using these, we can set up the system of equations:

$$S_2 + 4S + 4n = 28n$$

$$S_2 - 4S + 4n = 12n$$

Subtract the second equation from the first:

$$(S_2 + 4S + 4n) - (S_2 - 4S + 4n) = 28n - 12n$$
$$8S = 16n$$
$$S = 2n$$

Substituting $S = 2n$ back into the first equation:

$$S_2 + 4(2n) + 4n = 28n$$
$$S_2 + 8n + 4n = 28n$$
$$S_2 = 28n - 12n$$
$$S_2 = 16n$$

Now, to find the variance σ^2, use the formula:

$$\sigma^2 = \frac{1}{n}\Sigma(x_i - \mu)^2$$
$$= \frac{1}{n}\Sigma x_i^2 - \mu^2$$

Since $\Sigma x_i = S = 2n$, the mean μ is:

$$\mu = \frac{\Sigma x_i}{n} = \frac{2n}{n} = 2$$

Therefore, the variance is:

$$\sigma^2 = \frac{1}{n} \times 16n - 2^2$$
$$= 16 - 4$$
$$= 12$$

Question13

The coefficient of variation for the frequency distribution is

x_i	4	3	1
f_i	1	3	5

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Options:

A. $\frac{50}{\sqrt{3}}$

B. $\frac{125}{2\sqrt{3}}$

C. $\frac{100}{3\sqrt{2}}$

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

Answer: D

Solution:

Given frequency distribution

x_i	4	3	1
f_L	1	3	5

x_i	f_i	$f_i x_i$	$(x_i - \bar{x})$	$(x_i - \bar{x})^2$	$f_i(x_i - \bar{x})^2$
4	1	4	2	4	4
3	3	9	1	1	3
1	5	5	-1	1	5
	$\Sigma_i = 9$	$\Sigma \sum_i x_i = 18$			12

$\therefore$ Mean $\bar{x} = \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{18}{9} = 2$

Now, standard deviation

$\sigma = \sqrt{\frac{\Sigma f_i (x_i - \bar{x})^2}{\Sigma f_i}} = \sqrt{\frac{12}{9}} = \frac{2}{\sqrt{3}}$

So, coefficient of variance $= \frac{\sigma}{\bar{x}} \times 100$

$= \frac{2}{\sqrt{3}} \times \frac{1}{2} \times 100 = \frac{100}{\sqrt{3}}$

Question14

Mean deviation about the mean for the following data is

Class Interval	$0-6$	$6-12$	$12-18$	$18-24$	$24-30$
Frequency	1	2	3	2	1

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Options:

A. 5

B. $16/3$

C. 6

D. $19/3$

Answer: B

Solution:

Mean $A = 15, h = 6$

Class Interval	Mid value x_i	Frequency	$d_i = \frac{x_i - 15}{6}$	fd_i	$x_i - \bar{x}$	$\frac{f_i}{x_i - x}$
$0-6$	3	1	-2	-2	12	12
$6-12$	9	2	-1	-2	6	12
$12-18$	15	3	0	0	0	0
$18-24$	21	2	1	2	6	12
$24-30$	27	1	2	2	12	12
		$N = 9$		0	36	48

Mean, $\bar{X} = A + h\left(\frac{1}{N}\Sigma f_i d_i\right) = 15 + 6\left[\frac{1}{9}(0)\right]$

$\bar{X} = 15$

Mean-deviation about mean

$= \frac{1}{N}\sum f_i \left|x_i - \bar{X}\right| = \frac{1}{9} \times 48$

$= \frac{1}{9} \times 48 = \frac{16}{3}$

Question15

If the mean deviation about the mean is m and variance is σ^2 for the following data, then $m + \sigma^2 =$

x	1	3	5	7	9
f	4	24	28	16	8

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Options:

A. 8

B. 7.2

C. $\frac{28}{5}$

D. 6

Answer: D

Solution:

Given data is

x	1	3	5	7	9
f	4	24	28	16	8

Now, $\bar{x} = \frac{4+72+140+112+72}{80}$

$= \frac{400}{80} = 5$

Thus, mean deviation about mean is $m = \frac{4\times4+24\times2+28\times0+16\times2+8\times4}{80} = \frac{8}{5}$

and $\sigma^2 = \frac{4\times4^2+24\times2^2+28\times0^2+16\times(-2)^2+8\times(-4)^2}{80} = \frac{22}{5}$

Now, $m + \sigma^2 = \frac{8}{5} + \frac{22}{5} = \frac{30}{5} = 6$

Question16

x and y are the arithmetic means of the runs of two batsmen A and B in 10 innings respectively and σ_A, σ_B are the standard deviations of their runs in them. If batsman A is more consistent than B, then he is also a higher run scorer only when

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Options:

A. $0 < \frac{\sigma_A}{\sigma_B} < \frac{\bar{x}}{\bar{y}}, \frac{\bar{x}}{\bar{y}} > 1$

B. $\frac{\bar{x}}{\bar{y}} > \frac{\sigma_A}{\sigma_B} > 1$

C. $\frac{\bar{x}}{\bar{y}} < \frac{\sigma_A}{\sigma_B} < 1$

D. $\frac{x}{y} > 1, 1 \leq \frac{\bar{x}}{\bar{y}} < \frac{\sigma_A}{\sigma_B}$

Answer: A

Solution:

Given that $\bar{x}$ and $\bar{y}$ are the arithmetic means of the runs for batsmen A and B, respectively, and σ_A and σ_B represent the standard deviations of their runs.

Since Batsman A is more consistent than Batsman B, we have:

$\sigma_A < \sigma_B \Rightarrow \frac{\sigma_A}{\sigma_B} < 1$

Additionally, we know that if Batsman A is a higher run scorer than Batsman B, then:

$\bar{x} > \bar{y} \Rightarrow \frac{\bar{x}}{\bar{y}} > 1$

Combining both conditions, we get:

$0 < \frac{\sigma_A}{\sigma_B} < \frac{\bar{x}}{\bar{y}} \quad \text{and} \quad \frac{\bar{x}}{\bar{y}} > 1$

This indicates that Batsman A scores more runs only when the ratio of the standard deviations is less than the ratio of the arithmetic means, with the latter being greater than 1.

Question17

If m and M denote the mean deviations about mean and about median respectively of the data $20, 5, 15, 2, 7, 3, 11$, then the mean deviation about the mean of m and M is

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Options:

A. $\frac{1}{7}$

B. $\frac{38}{7}$

C. $\frac{36}{7}$

D. $\frac{37}{7}$

Answer: A

Solution:

We have, $20, 5, 15, 2, 7, 3, 11$.

$$
\begin{aligned}
\text{Mean} &= \frac{20 + 5 + 15 + 2 + 7 + 3 + 11}{7} \\
&= \frac{63}{7} = 9
\end{aligned}
$$

Data in ascending order $= 2, 3, 5, 7, 11,$

$15, 20$

Median = 7

$m = $ Mean deviations about means

$$
\begin{aligned}
&= \frac{\begin{array}{c}|20 - 9| + |5 - 9| + |15 - 9| + |2 - 9| \\ +|7 - 9| + |3 - 9| + |11 - 9|\end{array}}{7} \\
&= \frac{11 + 4 + 6 + 7 + 2 + 6 + 2}{7} = \frac{38}{7}
\end{aligned}
$$

$M = $ Mean deviation about median

$$
\begin{aligned}
M &= \frac{\begin{array}{c}|20 - 7| + |5 - 7| + |15 - 7| + |2 - 7| \\ +|7 - 7| + |3 - 7| + |11 - 7|\end{array}}{7} \\
&= \frac{13 + 2 + 8 + 5 + 0 + 4 + 4}{7} = \frac{36}{7}
\end{aligned}
$$

Mean of m and $M = \left(\frac{38}{7} + \frac{36}{7}\right)\frac{1}{2} = \frac{37}{7}$

MD (Mean of m and M)

$$= \frac{1}{2} \left\{ \left| \frac{36}{7} - \frac{37}{7} \right| + \left| \frac{38}{7} - \frac{37}{7} \right| \right\}$$

$$= \frac{1}{2} \times \frac{2}{7} = \frac{1}{7}$$

Question18

For a set of observations, if the coefficient of variation is 25 and mean is 44 , then the variance is

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Options:

A. 11

B. 121

C. 110

D. 19

Answer: B

Solution:

To find the variance given the coefficient of variation (CV) and the mean, we can use the following relationship:

The formula for the coefficient of variation (CV) is given by:

$$\text{CV} = \frac{\sigma}{\mu} \times 100$$

where σ is the standard deviation and μ is the mean.

In this problem, the coefficient of variation is 25, and the mean (μ) is 44. Substituting these values into the equation, we have:

$$\frac{\sigma}{44} \times 100 = 25$$

Solving for σ, we get:

$$\sigma = \frac{25 \times 44}{100} = 11$$

The variance (σ^2) is the square of the standard deviation:

$$\sigma^2 = 11^2 = 121$$

Therefore, the variance is 121.

Question19

If the mean deviation of the data
$1, 1 + d1 + 2d, \ldots, 1 + 100d, (d > 0)$ **from their mean is 255, then 'd' is equal to**

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Options:

A. 10.1

B. 10.2

C. 10.3

D. 10.4

Answer: A

Solution:

Mean $\bar{x} = \dfrac{\text{Sum of quantities}}{n}$

$= \dfrac{\frac{n}{2}(a+l)}{n}$ [l = last team]

$= \dfrac{1}{2}(a + l) = \dfrac{1}{2}(1 + 1 + 100d)$
$= 1 + 50d$

$\text{MD} = \dfrac{1}{n}\Sigma |x_i - \bar{x}|$

$\Rightarrow 255 = \dfrac{1}{101}[50d + 49d + 48d + \ldots + d + 0 + d + \ldots + 50d]$

$\Rightarrow 255 = \dfrac{2d}{101}\left[\dfrac{50 \times 51}{2}\right]$

$d = \dfrac{255 \times 101}{50 \times 51} = 10.1$

Question20

If the mean of the data $p, 6, 6, 7, 8, 11, 15, 16$**, is 3 times** p**, then the mean deviation of the data from its mean is**

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Options:

A. 2.25

B. 3.75

C. 4.4

D. 2.5

Answer: B

Solution:

Given, data of number are $p, 6, 6, 7, 8, 11, 15$ and 16.

$$\text{Mean } \bar{x} = \frac{\text{Sum of all observations}}{\text{Total number of observations}}$$

$$= \frac{p + 6 + 6 + 7 + 8 + 11 + 15 + 16}{8}$$

$$\Rightarrow \quad \frac{69 + p}{8} = 3p \quad \text{(given)}$$

$$\Rightarrow \quad 24p - p = 69 \Rightarrow 23p = 69$$

$$\Rightarrow \quad p = 3$$

So given data is $3, 6, 6, 7, 8, 11, 15, 16$ and mean is 9.

So, the mean deviation

$$= \frac{\begin{array}{c}|3-9| + |6-9| + |6-9| + |7-9| + |8-9| \\ + |11-9| + |15-9| + |16-9|\end{array}}{8}$$

$$= \frac{6 + 3 + 3 + 2 + 1 + 2 + 6 + 7}{8} = \frac{30}{8} = 3.75$$

Question21

The mean deviation about the mean for the following data.

$5, 6, 7, 8, 6, 9, 13, 12, 15$ is

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Options:

A. 1.55

B. 2.88

C. 3.89

D. 5

Answer: B

Solution:

Mean,

$$\bar{x} = \frac{5 + 6 + 7 + 8 + 6 + 9 + 13 + 12 + 15}{9}$$
$$= \frac{81}{9} = 9$$

Deviation, $x_i - \bar{x}$:

$5 - 9, 6 - 9, 7 - 9, 8 - 9, 6 - 9, 9 - 9, 13 - 9, 12 - 9, 15 - 9$
$\Rightarrow -4, -3, -2, -1, -3, 0, 4, 3, 6$
$|x_i - \bar{x}| : 4, 3, 2, 1, 3, 0, 4, 3, 6$

$$\text{MD} = \frac{\sum\limits_{i=1}^{9} |x_i - \bar{x}|}{9}$$
$$= \frac{4 + 3 + 2 + 1 + 3 + 0 + 4 + 3 + 6}{9}$$
$$= \frac{26}{9} = 2.88$$

Question22

If the mean of a data x is 10 and if all the observations are multiplied by 2, then the mean of new data is

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Options:

A. 30

B. 15

C. 50

D. 20

Answer: D

Solution:

Let data be

$x_1, x_2, x_3, \ldots, x_n$

Given that,

$$\frac{x_1 + x_2 + x_3 + \ldots + x_n}{n} = 10$$
$$\Rightarrow \quad x_1 + \ldots + x_n = 10n$$

When all observation multiplied by 2, we obtain new data as $2x_1, 2x_2, \ldots, 2x_n$ then

$$\text{Mean } = \frac{2x_1 + 2x_2 + \ldots + 2x_n}{n}$$
$$= \frac{2(x_1 + \ldots + x_n)}{n} = \frac{2(10n)}{n} = 20$$

Question23

The mean deviation from the mean of the set of observation $-1, 0, 4$ is

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Options:

A. 3

B. 1

C. -2

D. 2

Solution:

Mean $= \frac{-1+0+4}{3} = 1$

Deviation $= |-1-1|, |0-1|, |4-1| = 2, 1, 3$

Mean deviation $= \frac{2+1+3}{3} = 2$

Question24

Let an angle of a triangle is $60°$. If the variance of the angles of the triangle is $1014°$, then the other two angles are

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Options:

A. $23°$ and $97°$

B. $22°$ and $68°$

C. $21°$ and $99°$

D. $20°$ and $100°$

Solution:

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

$1014 = \frac{60^2 + a^2 + b^2}{3} - 60^2$

$10242 = a^2 + b^2$ ..... (i)

$a + b = 120$ .... (ii)

From Eqs. (i) and (ii), we get

a = 21 and b = 99

Question25

For the random variable X with probability distribution is given by the table

$X = x$	0	1	2	3
$P(X = x)$	K	$K + \frac{1}{7}$	$2K$	$\frac{2}{5}$

The mean of X is

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Options:

A. $\frac{31}{35}$

B. $\frac{57}{35}$

C. $\frac{63}{35}$

D. $\frac{67}{35}$

Answer: D

Solution:

$\Sigma P(X = r) = 1$

$K + K + \dfrac{1}{7} + 2K + \dfrac{2}{5} = 1 \Rightarrow 4K = \dfrac{3}{5} - \dfrac{1}{7}$

$4K = \dfrac{16}{35} \Rightarrow K = \dfrac{4}{35}$

$\propto = \dfrac{\Sigma P_i X_i}{\Sigma P_i} = \Sigma P_i X_i = K + \dfrac{1}{7} + 4K + \dfrac{6}{5}$

$= 5K + \dfrac{47}{35} = 5\left(\dfrac{4}{35}\right) + \dfrac{47}{35} = \dfrac{67}{35}$

Question26

The mean and variance of n observations $x_1, x_2, x_3, \ldots x_n$ are **5 and 0 respectively. If $\sum_{i=1}^{n} x_i^2 = 400$, then the value of n is equal to**

Options:

A. 80

B. 25

C. 20

D. 16

Answer: D

Solution:

Mean $\bar{x} = 5$ and $\Sigma x^2 = 400$

$$\because \text{var}(x) = 0$$

$$\because \text{var}(x) = \frac{1}{n} \sum_{i=1}^{n} (x_i - \bar{x})^2$$

$$0 = \frac{1}{n} \left[\sum_{i=1}^{i} x_i^2 + \sum_{i=1}^{i} \bar{x}^2 - 2\bar{x} \sum_{i=1}^{i} x_i \right]$$

$$0 = \frac{1}{n} [40 + 25n - 2 \times 5 \times n\bar{x}]$$

$$0 = \frac{1}{n} [400 + 25n - 50n]$$

$$\Rightarrow \quad \frac{400}{n} = 25$$

$$\Rightarrow \quad n = 16$$

Question27

The variance of the variates 112, 116, 120, 125 and 132 about their AM is

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Options:

A. 58.8

B. 60

C. 48.8

D. 61.8

Answer: C

Solution:

x	$(x - \bar{x})^2$
112	81
116	25
120	1
125	16
132	121
$\Sigma x = 605$	$\Sigma(x - \bar{x})^2 = 244$

$$\text{Mean} = \bar{x} = \frac{605}{5} = 121$$

$$\text{Variance} = \frac{\Sigma(x - \bar{x})^2}{n} = \frac{244}{5} = 48.8$$

Question28

Which of the following set of data has least standard deviation?

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Options:

A. 10, 20, 30, 40

B. 2, 4, 6, 8

C. 3, 6, 9, 12

D. 1, 2, 3, 4

Answer: D

Solution:

Clearly, difference of values from arithmetic mean is least in option (d).

$\Rightarrow$ Option (d) has least standard deviation.