

Statistics

Question 1.

If the variance of the data is 121 then the standard deviation of the data is

- (a) 121
- (b) 11
- (c) 12
- (d) 21

Answer: (b) 11

Given, variance of the data = 121

Now, the standard deviation of the data = $\sqrt{121}$
= 11

Question 2.

The mean deviation from the mean for the following data: 4, 7, 8, 9, 10, 12, 13 and 17 is

- (a) 2
- (b) 3
- (c) 4
- (d) 5

Answer: (b) 3

Mean = $(4 + 7 + 8 + 9 + 10 + 12 + 13 + 17)/10 = 80/10 = 8$

$|x_i - \text{mean}| = |4 - 10| + |7 - 10| + |8 - 10| + |9 - 10| + |10 - 10| + |12 - 10| + |13 - 10| + |17 - 10|$
 $= 6 + 3 + 2 + 1 + 0 + 2 + 3 + 7 = 24$

Now, mean deviation from mean = $24/8 = 3$

Question 3.

The mean of 1, 3, 4, 5, 7, 4 is m the numbers 3, 2, 2, 4, 3, 3, p have mean m – 1 and median q.

Then, p + q =

- (a) 4
- (b) 5
- (c) 6
- (d) 7

Answer: (d) 7

The mean of 1, 3, 4, 5, 7, 4 is m

$$\Rightarrow (1 + 3 + 4 + 5 + 7 + 4)/6 = m$$

$$\Rightarrow m = 24/6$$

$$\Rightarrow m = 4$$

The numbers 3, 2, 2, 4, 3, 3, p have mean $m - 1$

$$\Rightarrow (3 + 2 + 2 + 4 + 3 + 3 + p)/7 = m - 1$$

$$\Rightarrow (17 + p)/7 = 4 - 1$$

$$\Rightarrow (17 + p)/7 = 3$$

$$\Rightarrow 17 + p = 7 \times 3$$

$$\Rightarrow 17 + p = 21$$

$$\Rightarrow p = 21 - 17$$

$$\Rightarrow p = 4$$

The numbers 3, 2, 2, 4, 3, 3, p have median q .

$\Rightarrow$ The numbers 2, 2, 3, 3, 3, 4, 4 have median q

$$\Rightarrow (7 + 1)/2 \text{ th term} = q$$

$$\Rightarrow 4\text{th term} = q$$

$$\Rightarrow q = 3$$

$$\text{Now } p + q = 4 + 3 = 7$$

Question 4.

If the difference of mode and median of a data is 24, then the difference of median and mean is

(a) 12

(b) 24

(c) 8

(d) 36

Answer: (a) 12

Given the difference of mode and median of a data is 24

$$\Rightarrow \text{Mode} - \text{Median} = 24$$

$$\Rightarrow \text{Mode} = \text{Median} + 24$$

$$\text{Now, Mode} = 3 \times \text{Median} - 2 \times \text{Mean}$$

$$\Rightarrow \text{Median} + 24 = 3 \times \text{Median} - 2 \times \text{Mean}$$

$$\Rightarrow 24 = 3 \times \text{Median} - 2 \times \text{Mean} - \text{Median}$$

$$\Rightarrow 24 = 2 \times \text{Median} - 2 \times \text{Mean}$$

$$\Rightarrow \text{Median} - \text{Mean} = 24/2$$

$$\Rightarrow \text{Median} - \text{Mean} = 12$$

Question 5.

The coefficient of variation is computed by

- (a) $S.D./Mean \times 100$
- (b) $S.D./Mean$
- (c) $Mean./S.D \times 100$
- (d) $Mean/S.D.$

Answer: (b) $S.D./Mean$

The coefficient of variation = $S.D./Mean$

Question 6.

The geometric mean of series having mean = 25 and harmonic mean = 16 is

- (a) 16
- (b) 20
- (c) 25
- (d) 30

Answer: (b) 20

The relationship between Arithmetic mean (AM), Geometric mean (GM) And Harmonic mean (HM) is

$$GM^2 = AM \times HM$$

Given $AM = 25$

$HM = 16$

$$\text{So } GM^2 = 25 \times 16$$

$$\Rightarrow GM = \sqrt{(25 \times 16)}$$

$$= 5 \times 4$$

$$= 20$$

So, Geometric mean = 20

Question 7.

When tested the lives (in hours) of 5 bulbs were noted as follows: 1357, 1090, 1666, 1494, 1623.

The mean of the lives of 5 bulbs is

- (a) 1445
- (b) 1446
- (c) 1447
- (d) 1448

Answer: (b) 1446

Given, lives (in hours) of 5 bulbs were noted as follows: 1357, 1090, 1666, 1494, 1623

$$\text{Now, mean} = (1357 + 1090 + 1666 + 1494 + 1623)/5$$

$$= 7230/5$$
$$= 1446$$

Question 8.

Mean of the first n terms of the A.P. $a + (a + d) + (a + 2d) + \dots$ is

- (a) $a + nd/2$
- (b) $a + (n - 1)d$
- (c) $a + (n - 1)d/2$
- (d) $a + nd$

Answer: (c) $a + (n - 1)d/2$

Mean of the first n terms of the A.P. $\{a + (a + d) + (a + 2d) + \dots + a + (n-1)d\}/n$

$$= (n/2)\{2a + (n - 1)d\}/n$$

$$= (1/2)\{2a + (n - 1)d\}$$

$$= a + (n - 1)d/2$$

Question 9.

The mean of a group of 100 observations was found to be 20. Later on, it was found that three observations were incorrect, which was recorded as 21, 21 and 18. Then the mean if the incorrect observations are omitted is

- (a) 18
- (b) 20
- (c) 22
- (d) 24

Answer: (b) 20

Given mean of 100 observations is 20

Now

$$\sum x_i/100 = 20 \quad (1 \leq i \leq 100)$$

$$\Rightarrow \sum x_i = 100 \times 20$$

$$\Rightarrow \sum x_i = 2000$$

3 observations 21, 21 and 18 are recorded incorrectly.

$$\text{So } \sum x_i = 2000 - 21 - 21 - 18$$

$$\Rightarrow \sum x_i = 2000 - 60$$

$$\Rightarrow \sum x_i = 1940$$

Now new mean is

$$\sum x_i/100 = 1940/97 = 20$$

So, the new mean is 20

Question 10.

If covariance between two variables is 0, then the correlation coefficient between them is

- (a) nothing can be said
- (b) 0
- (c) positive
- (d) negative

Answer: (b) 0

The relationship between the correlation coefficient and covariance for two variables as shown below:

$$r_{(x, y)} = \text{COV}(x, y) / \{s_x \times s_y\}$$

$r_{(x, y)}$ = correlation of the variables x and y

$\text{COV}(x, y)$ = covariance of the variables x and y

s_x = sample standard deviation of the random variable x

s_y = sample standard deviation of the random variable y

Now given $\text{COV}(x, y) = 0$

Then $r_{(x, y)} = 0$

Question 11.

The mean of 1, 3, 4, 5, 7, 4 is m the numbers 3, 2, 2, 4, 3, 3, p have mean $m - 1$ and median q.

Then, $p + q =$

- (a) 4
- (b) 5
- (c) 6
- (d) 7

Answer: (d) 7

The mean of 1, 3, 4, 5, 7, 4 is m

$$\Rightarrow (1 + 3 + 4 + 5 + 7 + 4)/6 = m$$

$$\Rightarrow m = 24/6$$

$$\Rightarrow m = 4$$

The numbers 3, 2, 2, 4, 3, 3, p have mean $m - 1$

$$\Rightarrow (3 + 2 + 2 + 4 + 3 + 3 + p)/7 = m - 1$$

$$\Rightarrow (17 + p)/7 = 4 - 1$$

$$\Rightarrow (17 + p)/7 = 3$$

$$\Rightarrow 17 + p = 7 \times 3$$

$$\Rightarrow 17 + p = 21$$

$$\Rightarrow p = 21 - 17$$

$$\Rightarrow p = 4$$

The numbers 3, 2, 2, 4, 3, 3, p have median q.

⇒ The numbers 2, 2, 3, 3, 3, 4, 4 have median q

⇒ $(7 + 1)/2$ th term = q

⇒ 4th term = q

⇒ $q = 3$

Now $p + q = 4 + 3 = 7$

Question 12.

In a series, the coefficient of variation is 50 and standard deviation is 20 then the arithmetic mean is

(a) 20

(b) 40

(c) 50

(d) 60

Answer: (b) 40

Given, in a series, the coefficient of variation is 50 and standard deviation is 20

⇒ $(\text{standard deviation}/\text{AM}) \times 100 = 50$

⇒ $20/\text{AM} = 50/100$

⇒ $20/\text{AM} = 1/2$

⇒ $\text{AM} = 2 \times 20$

⇒ $\text{AM} = 40$

So, the arithmetic mean is 40

Question 13.

The coefficient of correlation between two variables is independent of

(a) both origin and the scale

(b) scale but not origin

(c) origin but not scale

(d) neither scale nor origin

Answer: (a) both origin and the scale

The coefficient of correlation between two variables is independent of both origin and the scale.

Question 14.

The geometric mean of series having mean = 25 and harmonic mean = 16 is

(a) 16

(b) 20

(c) 25

(d) 30

Answer: (b) 20

The relationship between Arithmetic mean (AM), Geometric mean (GM) And Harmonic mean (HM) is

$$GM^2 = AM \times HM$$

Given AM = 25

HM = 16

$$\text{So } GM^2 = 25 \times 16$$

$$\Rightarrow GM = \sqrt{(25 \times 16)}$$

$$= 5 \times 4$$

$$= 20$$

So, Geometric mean = 20

Question 15.

One of the methods of determining mode is

- (a) Mode = 2 Median – 3 Mean
- (b) Mode = 2 Median + 3 Mean
- (c) Mode = 3 Median – 2 Mean
- (d) Mode = 3 Median + 2 Mean

Answer: (c) Mode = 3 Median – 2 Mean

We can calculate the mode as

$$\text{Mode} = 3 \text{ Median} - 2 \text{ Mean}$$

Question 16.

If the correlation coefficient between two variables is 1, then the two least square lines of regression are

- (a) parallel
- (b) none of these
- (c) coincident
- (d) at right angles

Answer: (c) coincident

If the correlation coefficient between two variables is 1, then the two least square lines of regression are coincident

Question 17.

The mean and variance of 7 observations are 8 and 16, respectively. If five of the observations are 2, 4, 10, 12, 14. then the remaining two observations are

- (a) 4, 6
- (b) 6, 8

- (c) 8, 10
(d) 10, 12

Answer: (b) 6, 8

Given mean and variance of 7 observations are 8 and 16.

Five observations are 2, 4, 10, 12, 14.

Let the other two observations are x and y.

So 7 observations are : 2, 4, 10, 12, 14, x, y

Now

$$\text{Mean} = (2 + 4 + 10 + 12 + 14 + x + y)/7$$

$$\Rightarrow 8 = (2 + 4 + 10 + 12 + 14 + x + y)/7$$

$$\Rightarrow 8 \times 7 = 2 + 4 + 10 + 12 + 14 + x + y$$

$$\Rightarrow 56 = 42 + x + y$$

$$\Rightarrow x + y = 56 - 42$$

$$\Rightarrow x + y = 14 \dots\dots\dots 1$$

Again Given variance = 16

$$\Rightarrow (1/7) \times \sum (x_i - \text{mean})^2 = 16 \quad (7 \leq i \leq 7)$$

$$\Rightarrow \sum (x_i - \text{mean})^2 = 16 \times 7$$

$$\Rightarrow \sum (x_i - \text{mean})^2 = 112$$

$$\Rightarrow \{(2 - 8)^2 + (4 - 8)^2 + (10 - 8)^2 + (12 - 8)^2 + (14 - 8)^2 + (x - 8)^2 + (y - 8)^2\} = 112$$

$$\Rightarrow \{(-6)^2 + (-4)^2 + (2)^2 + (4)^2 + (6)^2 + x^2 + 64 - 16x + y^2 + 64 - 16y\} = 112$$

$$\Rightarrow \{36 + 16 + 4 + 16 + 36 + x^2 + y^2 + 64 + 64 - 16(x + y)\} = 112$$

$$\Rightarrow \{108 + x^2 + y^2 + 128 - (16 \times 14)\} = 112 \quad (\text{since } x + y = 14)$$

$$\Rightarrow \{108 + x^2 + y^2 + 128 - 224\} = 112$$

$$\Rightarrow x^2 + y^2 + 236 - 224 = 112$$

$$\Rightarrow x^2 + y^2 + 12 = 112$$

$$\Rightarrow x^2 + y^2 = 112 - 12$$

$$\Rightarrow x^2 + y^2 = 100 \dots\dots\dots 2$$

Squaring equation 1, we get

$$(x + y)^2 = 196$$

$$\Rightarrow x^2 + y^2 + 2xy = 196$$

$$\Rightarrow 100 + 2xy = 196$$

$$\Rightarrow 2xy = 196 - 100$$

$$\Rightarrow 2xy = 96$$

$$\Rightarrow xy = 96/2$$

$$\Rightarrow xy = 48 \dots\dots\dots 3$$

$$\text{Now } (x - y)^2 = x^2 + y^2 - 2xy$$

$$= 100 - 2 \times 48$$

$$= 100 - 96$$

$$= 4$$

$$\Rightarrow x - y = \sqrt{4}$$

$$\Rightarrow x - y = 2, -2$$

case 1: when $x - y = 2$ and $x + y = 14$

After solving it, we get $x = 8, y = 6$

case 2: when $x - y = -2$ and $x + y = 14$

After solving it, we get $x = 6, y = 8$

So, the two numbers are 6 and 8

Question 18.

Range of a data is calculated as

- (a) Range = Max Value – Min Value
- (b) Range = Max Value + Min Value
- (c) Range = (Max Value – Min Value)/2
- (d) Range = (Max Value + Min Value)/2

Answer: (a) Range = Max Value – Min Value

Range of a data is calculated as

Range = Max Value – Min Value

Question 19.

Mean deviation for n observations $x_1, x_2, \dots, x_n$ from their mean x is given by

- (a) $\sum(x_i - x)$ where $(1 \leq i \leq n)$
- (b) $\{\sum|x_i - x|\}/n$ where $(1 \leq i \leq n)$
- (c) $\sum(x_i - x)^2$ where $(1 \leq i \leq n)$
- (d) $\{\sum(x_i - x)^2\}/n$ where $(1 \leq i \leq n)$

Answer: (b) $\{\sum|x_i - x|\}/n$ where $(1 \leq i \leq n)$

Mean deviation for n observations $x_1, x_2, \dots, x_n$ from their mean x is calculated as

$\{\sum|x_i - x|\}/n$ where $(1 \leq i \leq n)$

Question 20.

If the mean of the following data is 20.6, then the value of p is

x: 10 15 p 25 35

f: 3 10 25 7 5

- (a) 30
- (b) 20
- (c) 25
- (d) 10

Answer: (b) 20

$$\text{Mean} = \frac{\sum f_i \times x_i}{\sum f_i}$$

$$\Rightarrow 20.6 = (10 \times 3 + 15 \times 10 + p \times 25 + 25 \times 7 + 35 \times 5) / (3 + 10 + 25 + 7 + 5)$$

$$\Rightarrow 20.6 = (30 + 150 + 25p + 175 + 175) / 50$$

$$\Rightarrow 20.6 = (530 + 25p) / 50$$

$$\Rightarrow 530 + 25p = 20.6 \times 50$$

$$\Rightarrow 530 + 25p = 1030$$

$$\Rightarrow 25p = 1030 - 530$$

$$\Rightarrow 25p = 500$$

$$\Rightarrow p = 500 / 25$$

$$\Rightarrow p = 20$$

So, the value of p is 20
