11. Statistics

Exercise 11.1

1 A. Question

Find the range and coefficient of range of the following data.

59, 46, 30, 23, 27, 40, 52, 35, 29

Answer

Given the set of data 59, 46, 30, 23, 27, 40, 52, 35, 29.

Let the maximum value in the data set be denoted by x_{max} and minimum by x_{min}

Range = Maximum value in the data set – Minimum value in the data set

$= x_{max} - x_{min}$

$= 59 - 23$

$= 36$

∴ Range R = 36

Let the Coefficient of Range be denoted by s.

$s = \dfrac{x_{max} - x_{min}}{x_{max} + x_{min}}$

$= \dfrac{59 - 23}{59 + 23}$

$= \dfrac{36}{82}$

$= 0.439 \approx 0.44$

∴ s = 0.44

1 B. Question

Find the range and coefficient of range of the following data.

41.2, 33.7, 29.1, 34.5, 25.7, 24.8, 56.5, 12.5

Answer

Given the set of data 41.2, 33.7, 29.1, 34.5, 25.7, 24.8, 56.5, 12.5.

Let the maximum value in the data set be denoted by x_{max} and minimum by x_{min}

Range = Maximum value in the data set – Minimum value in the data set

$= x_{max} - x_{min}$

$= 56.5 - 12.5$

$= 44$

∴ Range R = 44

Let the Coefficient of Range be denoted by s.

$s = \dfrac{x_{max} - x_{min}}{x_{max} + x_{min}}$

$= \dfrac{56.5 - 12.5}{56.5 + 12.5}$

$= \dfrac{44}{69}$

= 0.637≈0.64

∴ s = 0.64

2. Question

The smallest value of a collection of data is 12 and the range is 59. Find the largest value of the collection of data.

Answer

Given x_{min} = 12, R = 59

Range R = x_{max} - x_{min}

Substituting the given terms into the above formula, we get

R = x_{max} - x_{min}

59 = x_{max} - 12

⟹ x_{max} = 59 + 12 = 71

3. Question

The largest of 50 measurements is 3.84 kg. If the range is 0.46 kg, find the smallest measurement.

Answer

Given x_{max} = 3.84kg, R = 0.46kg

Range R = x_{max} - x_{min}

Substituting the given terms into the above formula, we get

R = x_{max} - x_{min}

0.46 = 3.84- x_{min}

⟹ x_{min} = 3.84 - 0.46 = 3.38kg

4. Question

The standard deviation of 20 observations is √5. If each observation is multiplied by 2, find the standard deviation and variance of the resulting observations.

Answer

Let the observations be x_1, x_2, x_3....x_{20}

Given SD = $\sqrt{5}$

Formula for SD = $\sqrt{\dfrac{\Sigma(x_i - \bar{x})^2}{N}}$

Where N = 20, SD = $\sqrt{5}$

If each observation is multiplied by 2, we get new set of observations.

Let the new observations be y_1, y_2, y_3....y_{20}

New Standard Deviation SD' = $\sqrt{\dfrac{\Sigma(y_i - \bar{y})^2}{N}}$

We know that $\bar{y} = \dfrac{\Sigma y_i}{N}$ and $\bar{x} = \dfrac{\Sigma x_i}{N}$

But $y_i = 2x_i$

Therefore, $\bar{y} = \dfrac{\Sigma 2x_i}{N} = 2\dfrac{\Sigma x_i}{N} = 2\bar{x}$

Substituting in the SD' formula,

$SD' = \sqrt{\dfrac{\Sigma(2x_i - 2\bar{x})^2}{N}}$

$= \sqrt{\dfrac{2\Sigma(x_i - \bar{x})^2}{N}}$

$= 2 \times SD = 2\sqrt{5}$

Formula relating SD and Variance is Variance = SD^2

So Variance = $(2\sqrt{5})^2 = 20$

5. Question

Calculate the standard deviation of the first 13 natural numbers.

Answer

To find $\bar{x}$

Formula for $\bar{x} = \dfrac{\Sigma x_i}{N}$

$= \dfrac{1+2+3+4+5+6+7+8+9+10+11+12+13}{13} = \dfrac{91}{13} = 7$

x_i	$x_i - \bar{x}$	$(x_i - \bar{x})^2$
1	1 - 7 = - 6	36
2	2 - 7 = - 5	25
3	3 - 7 = - 4	16
4	4 - 7 = - 3	9
5	5 - 7 = - 2	4
6	6 - 7 = - 1	1
7	7 - 7 = 0	0
8	8 - 7 = 1	1
9	9 - 7 = 2	4
10	10 - 7 = 3	9
11	11 - 7 = 4	16
12	12 - 7 = 5	25
13	13 - 7 = 6	36
N = 13		$\Sigma(x_i - \bar{x})^2 = 182$

$SD = \sqrt{\dfrac{\Sigma(x_i - \bar{x})^2}{N}}$

$= \sqrt{\dfrac{182}{13}} = 3.74$

6 A. Question

Calculate the standard deviation of the following data.

10, 20, 15, 8, 3, 4

Answer

To find $\bar{x}$

Formula for $\bar{x} = \dfrac{\Sigma x_i}{N}$

$$= \frac{10 + 20 + 15 + 8 + 3 + 4}{6} = \frac{60}{6} = 10$$

x_i	$x_i - \bar{x}$	$(x_i - \bar{x})^2$
10	10 - 10 = 0	0
20	20 - 10 = 10	100
15	15 - 10 = 5	25
8	8 - 10 = -2	4
3	3 - 10 = -7	49
4	4 - 10 = -6	36
N = 6		$\Sigma(x_i - \bar{x})^2 = 214$

$$SD = \sqrt{\frac{\Sigma(x_i - \bar{x})^2}{N}}$$

$$= \sqrt{\frac{214}{6}} = 5.97$$

6 B. Question

Calculate the standard deviation of the following data.

38, 40, 34 ,31, 28, 26, 34

Answer

To find $\bar{x}$

Formula for $\bar{x} = \frac{\Sigma x_i}{N}$

$$= \frac{38 + 40 + 34 + 31 + 28 + 26 + 34}{7} = \frac{231}{7} = 33$$

x_i	$x_i - \bar{x}$	$(x_i - \bar{x})^2$
38	5	25
40	7	49
34	1	1
31	-2	4
28	5	25
26	-7	49
34	1	1
N = 7		$\Sigma(x_i - \bar{x})^2 = 154$

$$SD = \sqrt{\frac{\Sigma(x_i - \bar{x})^2}{N}}$$

$$= \sqrt{\frac{154}{7}} = 4.69$$

7. Question

Calculate the standard deviation of the following data.

X	3	8	13	18	23
Y	7	10	15	10	8

Answer

x_i	y_i	x_iy_i	$d = x_i - \bar{x}$ $= x_i - 13.2$	d^2	y_id	y_id^2
3	7	21	- 10.2	104.04	- 71.4	728.28
8	10	80	- 5.2	27.04	- 52	270.4
13	15	195	0.2	0.04	3	0.6
18	10	180	4.8	23.04	48	230.4
23	8	184	9.8	96.04	78.4	768.32
	$\sum y = 50$	$\sum x_iy_i = 660$			$\sum y_id = 6$	$\sum y_id^2 = 1998$

To find $\bar{x}$

Formula for $\bar{x} = \dfrac{\Sigma x_iy_i}{\Sigma y}$

$= \dfrac{660}{50} = 13.2$

$SD = \sqrt{\dfrac{\Sigma y_id^2}{\Sigma y}}$

$= \sqrt{\dfrac{1998}{50}}$

$= 6.32$

8. Question

The number of books bought at a book fair by 200 students from a school are given in the following table.

No. of books	0	1	2	3	4
No of students	35	64	68	18	15

Calculate the standard deviation.

Answer

x_i	y_i	x_iy_i	$d = x_i - \bar{x}$ $= x_i - 1.57$	d^2	y_id	y_id^2
0	35	0	- 1.57	2.4649	- 54.95	86.2715
1	64	64	- 0.57	0.3249	- 36.48	20.7936
2	68	136	0.43	0.1849	29.24	12.5732
3	18	54	1.43	2.0449	25.74	36.8082
4	15	60	2.43	5.9049	36.45	88.5735
	$\sum y = 200$	$\sum x_iy_i = 314$			$\sum y_id = 0$	$\sum y_id^2 = 245.02$

To find $\bar{x}$

Formula for $\bar{x} = \dfrac{\Sigma x_iy_i}{\Sigma y}$

$= \dfrac{314}{200} = 1.57$

$SD = \sqrt{\dfrac{\Sigma y_id^2}{\Sigma y}}$

$= \sqrt{\dfrac{245.02}{200}}$

$= 1.107$

9. Question

Calculate the variance of the following data

X	2	4	6	8	10	12	14	16
y	4	4	5	15	8	5	4	5

Answer

x_i	y_i	x_iy_i	$d = x_i - \bar{x}$ $= x_i - 9$	d^2	y_id	y_id^2
2	4	8	- 7	49	- 28	196
4	4	16	- 5	25	- 20	100
6	5	30	- 3	9	- 15	45
8	15	120	- 1	1	- 15	15
10	8	80	1	1	8	8
12	5	60	3	9	15	45
14	4	56	5	25	20	100
16	5	80	7	49	35	245
	$\sum y = 50$	$\sum x_iy_i = 450$			$\sum y_id = 0$	$\sum y_id^2 = 754$

To find $\bar{x}$

Formula for $\bar{x} = \dfrac{\sum x_iy_i}{\sum y}$

$= \dfrac{450}{50} = 9$

$SD = \sqrt{\dfrac{\sum y_id^2}{\sum y}}$

$= \sqrt{\dfrac{754}{50}}$

$= 3.88$

To find Variance

Variance $= SD^2$

$= 3.88^2 = 15.058$

10. Question

The time (in seconds) taken by a group of people to walk across a pedestrian crossing is given in the table below.

Time (in sec.)	5 - 10	10 - 15	15 - 20	20 - 25	25 - 20
No. of people	4	8	15	12	11

Calculate the variance and standard deviation of the data.

Answer

t	x_i = Midpoint	y_i	x_iy_i	$d = x_i - \bar{x}$ $= x_i - 19.3$	d^2	y_id	y_id^2
5 - 10	7.5	4	30	- 11.8	139.24	- 47.2	556.96
10 - 15	12.5	8	100	- 6.8	46.24	- 54.4	369.92
15 - 20	17.5	15	262.5	- 1.8	3.24	- 27	48.6
20 - 25	22.5	12	270	3.2	10.24	38.4	122.88
25 - 30	27.5	11	302.5	8.2	67.24	90.2	739.64
		$\sum y = 50$	$\sum x_iy_i = 965$			$\sum y_id = 0$	$\sum y_id^2 = 1838$

To find $\bar{x}$

Formula for $\bar{x} = \dfrac{\Sigma x_i y_i}{\Sigma y}$

$= \dfrac{965}{50} = 19.3$

$SD = \sqrt{\dfrac{\Sigma y_i d^2}{\Sigma y}}$

$= \sqrt{\dfrac{1838}{50}}$

$= 6.063$

To find Variance

Variance $= SD^2$

$= 6.063^2 = 36.76$

11. Question

A group of 45 house owners contributed money towards green environment of their street. The amount of money collected is shown in the table below.

Amount (₹)	0 - 20	20 - 40	40 - 60	60 - 80	80 - 100
No. of house owners	2	7	12	19	5

Calculate the variance and standard deviation.

Answer

a	x_i = Midpoint	y_i	$x_i y_i$	$d = x_i - \bar{x}$ $= x_i - 58$	d^2	$y_i d$	$y_i d^2$
0 - 20	10	2	20	- 48	2304	- 96	4608
20 - 40	30	7	210	- 28	784	- 196	5488
40 - 60	50	12	600	- 8	64	- 96	768
60 - 80	70	19	1330	12	144	228	2736
80 - 100	90	5	450	32	1024	160	5120
		$\sum y = 45$	$\sum x_i y_i$ $= 2610$			$\sum y_i d$ $= 0$	$\sum y_i d^2$ $= 18720$

To find $\bar{x}$

Formula for $\bar{x} = \dfrac{\Sigma x_i y_i}{\Sigma y}$

$= \dfrac{2610}{45} = 58$

$SD = \sqrt{\dfrac{\Sigma y_i d^2}{\Sigma y}}$

$= \sqrt{\dfrac{18720}{45}}$

$= 20.39$

To find Variance

Variance $= SD^2$

$= 20.39^2 = 416$

12. Question

Find the variance of the following distribution.

Class interval	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49
Frequency	15	25	28	12	12	8

Answer

CI	x_i = Midpoint	y_i	$x_i y_i$	$d = x_i - \bar{x}$ $= x_i - 32.25$	d^2	$y_i d$	$y_i d^2$
20 - 24	22	15	330	- 10.25	105.0625	- 153.75	1575.938
25 - 29	27	25	675	- 5.25	27.5625	- 131.25	689.0625
30 - 34	32	28	896	- 0.25	0.0625	- 7	1.75
35 - 39	37	12	444	4.75	22.5625	57	270.75
40 - 44	42	12	504	9.75	95.0625	117	1140.75
45 - 49	47	8	376	14.75	217.5625	118	1740.5
		$\sum y$ = 100	$\sum x_i y_i$ = 3225			$\sum y_i d$ = 0	$\sum y_i d^2$ = 5418.75

To find $\bar{x}$

Formula for $\bar{x} = \dfrac{\sum x_i y_i}{\sum y}$

$= \dfrac{3225}{100} = 32.25$

$SD = \sqrt{\dfrac{\sum y_i d^2}{\sum y}}$

$= \sqrt{\dfrac{5418.75}{100}}$

$= 7.361$

To find Variance

Variance $= SD^2$

$= 7.361^2 = 54.19$

13. Question

Mean of 100 items is 48 and their standard deviation is 10. Find the sum of all the items and the sum of the squares of all the items.

Answer

Mean of 100 items $\bar{x} = 48$

Standard deviation $SD = 10$

To find : $\sum x$ and $\sum x^2$

To find $\sum x$:

Formula for $\bar{x} = \dfrac{\sum x}{N}$

$= 48 = \dfrac{\sum x}{100}$

$\Rightarrow$ Sum of all the items $\sum x = 4800$

To find $\sum x^2$:

$$SD^2 = \left(\frac{\Sigma x^2}{N}\right) - \left(\frac{\Sigma x}{N}\right)^2$$

$$100 = \left(\frac{\Sigma x^2}{100}\right) - 48^2$$

$$\Rightarrow \Sigma x^2 = 240400$$

14. Question

The mean and standard deviation of 20 items are found to be 10 and 2 respectively. At the time of checking it was found that an item 12 was wrongly entered as 8. Calculate the correct mean and standard deviation.

Answer

Mean of 20 items $\bar{x}$ = 10

SD of 10 items = 2

Wrong Value = 8

Correct Value = 12

To find Mean:

Formula for $\bar{x} = \frac{\Sigma x}{N}$

$= 10 = \frac{\Sigma x}{20}$

$\Rightarrow$ Sum of all the items $\Sigma x = 200$

This value is wrong since item 12 was wrongly entered as 8.

Let $\Sigma x'$ be the corrected sum

$\Sigma x' = 200$ + (Correct Value) - (Wrong Value)

= 200 + 12 - 8 = 204

Corrected mean will be $\bar{x'} = \frac{\Sigma x'}{N} = \frac{204}{20} = 10.2$

To find SD:

$$SD^2 = \left(\frac{\Sigma x^2}{N}\right) - \left(\frac{\Sigma x}{N}\right)^2$$

$$4 = \frac{\Sigma x^2}{20} - 100$$

$$\Rightarrow \Sigma x^2 = 2080$$

This value is wrong since item 12 was wrongly entered as 8.

Let $\Sigma x'^2$ be the corrected sum of squares.

$\Sigma x'^2 = 2080$ + (Correct Value)^2 - (Wrong Value)^2

$= 2080 + 12^2 - 8^2$

$= 2160$

Corrected SD:

$$SD^2 = \left(\frac{\Sigma x'^2}{N}\right) - \left(\frac{\Sigma x'}{N}\right)^2$$

$$SD^2 = \frac{2160}{20} - (10.2)^2$$

$$\Rightarrow SD = 1.99$$

The corrected mean is 10.2, corrected SD is 1.99

15. Question

If $n = 10, \bar{x} = 12$ and $\sum x^2 = 1530$, then calculate the coefficient of variation.

Answer

$SD^2 = \left(\frac{\sum x^2}{N}\right) - \left(\frac{\sum x}{N}\right)^2$

$SD^2 = \left(\frac{1530}{10}\right) - (12)^2$

$\Rightarrow SD = 3$

Coefficient of Variation

$CV = \frac{SD}{\bar{x}} \times 100$

$= \frac{3}{12} \times 100 = 25$

16. Question

Calculate the coefficient of variation of the following data: 20, 18, 32, 24, 26.

Answer

To find $\bar{x}$

Formula for $\bar{x} = \frac{\sum x_i}{N}$

$= \frac{20 + 18 + 32 + 24 + 26}{5} = \frac{120}{5} = 24$

x_i	$x_i - \bar{x}$	$(x_i - \bar{x})^2$
20	- 4	16
18	- 6	36
32	8	64
24	0	0
26	2	4
N = 5		$\sum(x_i - \bar{x})^2 = 120$

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

$= \sqrt{\frac{120}{5}} = 4.89$

$CV = \frac{SD}{\bar{x}} \times 100$

$= \frac{4.89}{24} \times 100 = 20.41$

17. Question

If the coefficient of variation of a collection of data is 57 and its S.D is 6.84, then find the mean.

Answer

Given SD = 6.84 and CV = 57, to find $\bar{x}$

$CV = \frac{SD}{\bar{x}} \times 100$

$= \frac{6.84}{\bar{x}} \times 100 = 57$

$\Rightarrow \bar{x} = 12$

18. Question

A group of 100 candidates have their average height 163.8 cm with coefficient of variation 3.2. What is the standard deviation of their heights?

Answer

Given N = 100, CV = 3.2, $\bar{x}$ = 163.8 cm

$CV = \dfrac{SD}{\bar{x}} \times 100$

$= \dfrac{SD}{163.8} \times 100 = 3.2$

$\Rightarrow SD = 5.24$

19. Question

Given $\sum x = 99, n = 9$ and $\sum (x - 10)^2 = 79$. Find $\sum x^2$ and $\sum \left(x - \bar{x}\right)^2$.

Answer

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

Or $SD^2 = \dfrac{\sum(x_i - \bar{x})^2}{n}$

To find $\bar{x}$

$\bar{x} = \dfrac{\sum x_i}{n} = \dfrac{99}{9} = 11$

$\Rightarrow SD^2 = \dfrac{\sum(x_i - 11)^2}{n} = \dfrac{\sum(x_i - 10 - 1)^2}{n} = \dfrac{\sum[(x_i - 10) - 1]^2}{n}$

Expanding the numerator in the form of $(a - b)^2 = a^2 + b^2 - 2ab$,

$SD^2 = \dfrac{\sum[(x_i - 10)^2 + 1 - 2(x_i - 10)]}{n} = \dfrac{\sum(x_i - 10)^2}{n} + \dfrac{\sum 1}{n} - \dfrac{2\sum x_i}{n} + \dfrac{20\sum 1}{n}$

Substituting all the known terms in the above equation,

$SD^2 = \dfrac{79}{9} + \dfrac{9}{9} - \dfrac{2 \times 99}{9} + \dfrac{20 \times 9}{9} = 7.77$

We know that, $SD^2 = \left(\dfrac{\sum x^2}{n}\right) - \left(\dfrac{\sum x}{n}\right)^2$

$7.77 = \left(\dfrac{\sum x^2}{9}\right) - \left(\dfrac{99}{9}\right)^2$

$\Rightarrow \sum x^2 = 1159$

$SD^2 = \dfrac{\sum(x_i - \bar{x})^2}{n} = 7.77$

$\Rightarrow \sum(x_i - \bar{x})^2 = 70$

20. Question

The marks scored by two students A, B in a class are given below.

A	58	51	60	65	66
B	56	87	88	46	43

Who is more consistent?

Answer

<u>SD of A</u>

$$\bar{x} = \frac{\sum x_i}{n} = \frac{58 + 51 + 60 + 65 + 66}{5} = 60$$

x_i	$x_i - \bar{x}$	$(x_i - \bar{x})^2$
58	- 2	4
51	- 9	81
60	0	0
65	5	25
66	6	36
N = 5		$\sum(x_i - \bar{x})^2 = 146$

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

$SD_A = 5.4$

<u>SD of B</u>

$$\bar{x} = \frac{\sum x_i}{n} = \frac{56 + 87 + 88 + 46 + 43}{5} = 64$$

x_i	$x_i - \bar{x}$	$(x_i - \bar{x})^2$
58	- 6	36
51	- 13	169
60	- 4	16
65	1	1
66	2	4
N = 5		$\sum(x_i - \bar{x})^2 = 146$

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

$SD_B = 6.7$

5.4<6.7

SD of A is less than SD of B.

$\Rightarrow$ A is more consistent than B

Exercise 11.2

1. Question

The range of the first 10 prime numbers 2, 3, 5, 7, 11, 13, 17, 19, 23, 29 is

A. 28

B. 26

C. 29

D. 27

Answer

Range R = x_{max} - x_{min}

R = 29 - 2 = 27

So the correct option is D.

2. Question

The least value in a collection of data is 14.1. If the range of the collection is 28.4, then the greatest value of the collection is

A. 42.5

B. 43.5

C. 42.4

D. 42.1

Answer

Given x_{min} = 14.1, R = 28.4

Range R = x_{max} - x_{min}

28.4 = x_{max} - 14.1

$\Rightarrow x_{max}$ = 42.5

So the correct option is A.

3. Question

The greatest value of a collection of data is 72 and the least value is 28. Then the coefficient of range is

A. 44

B. 0.72

C. 0.44

D. 0.28

Answer

Given x_{max} = 72, x_{min} = 28

Coefficient of range s = $\dfrac{x_{max} - x_{min}}{x_{max} + x_{min}}$

= $\dfrac{72 - 28}{72 + 28}$ = 0.44

So the correct option is C.

4. Question

For a collection of 11 items, $\sum x = 132$, then the arithmetic mean is

A. 11

B. 12

C. 14

D. 13

Answer

N = 11

AM $\bar{x} = \dfrac{\sum x}{N} = \dfrac{132}{11} = 12$

So the correct option is B.

5. Question

For any collection of n items, $\sum \left(x - \bar{x} \right) =$

A. $\sum x$

B. $\bar{x}$

C. $n\bar{x}$

D. 0

Answer

$\sum(x-\bar{x})$ can be rewritten as $\sum x - \sum \bar{x}$

We know that $\bar{x} = \frac{\sum x}{n}$ so $\sum x = n\bar{x}$

Also, $\sum \bar{x} = n\bar{x}$ because $\bar{x}$ is just a constant term.

Substituting these in $\sum x - \sum \bar{x}$, we get $n\bar{x} - n\bar{x} = 0$

So the correct option is D.

6. Question

For any collection of n items, $\left(\sum x\right) - \bar{x} =$

A. $n\bar{x}$

B. $(n-2)\bar{x}$

C. $(n-1)\bar{x}$

D. 0

Answer

We know that $\bar{x} = \frac{\sum x}{n}$ so $\sum x = n\bar{x}$

Substituting this in the question, we have

$\left(\sum x\right) - \bar{x} = n\bar{x} - \bar{x} = (n-1)\bar{x}$

So the correct option is C.

7. Question

If t is the standard deviation of x, y. z, then the standard deviation of x + 5, y + 5, z + 5 is

A. $\dfrac{t}{3}$

B. t + 5

C. t

D. x y z

Answer

It is a direct consequence of the theory of standard deviation that, the same constant term added to the terms in a set of data doesn't change the value of standard deviation.

So the correct answer is t and correct option is C.

8. Question

If the standard deviation of a set of data is 1.6, then the variance is

A. 0.4

B. 2.56

C. 1.96

D. 0.04

Answer

Variance = SD^2

So Variance = 1.6^2 = 2.56

Therefore, the correct option is B.

9. Question

If the variance of a data is 12.25, then the S.D is

A. 3.5

B. 3

C. 2.5

D. 3.25

Answer

Variance = SD^2

Or SD = $\sqrt{\text{Variance}}$

SD = $\sqrt{12.25}$ = 3.5

So the correct option is A.

10. Question

Variance of the first 11 natural numbers is

A. $\sqrt{5}$

B. $\sqrt{10}$

C. $5\sqrt{2}$

D. 10

Answer

Variance of first n natural numbers is given by $V = \frac{n^2 - 1}{12}$

$V = \frac{120}{12} = 10$

So the correct option is D.

11. Question

The variance of 10, 10, 10, 10, 10 is

A. 10

B. $\sqrt{10}$

C. 5

D. 0

Answer

Standard deviation of a constant set of data is 0.

We know that Variance = SD^2

$\Rightarrow$Variance = 0

So the correct option is D.

12. Question

If the variance of 14, 18, 22, 26, 30 is 32, then the variance of 28, 36,44,52,60 is

A. 64

B. 128

C. 32√2

D. 32

Answer

Two data sets are given.

Set A : 14, 18, 22, 26, 30 with V = 32

Set B : 28, 36, 44, 52, 60 with V = ?

We notice that each data entry in set B is twice the corresponding data entry in set A.

$\Rightarrow$SD of set B = 2 × SD of set A.

We know that Variance = SD^2

$\Rightarrow$Variance of Set B = 2^2 × Variance of Set A.

= 4 × 32 = 128.

So the correct option is B.

13. Question

Standard deviation of a collection of data is 2√2. If each value is multiplied by 3, then the standard deviation of the new data is

A. $\sqrt{12}$

B. 4√2

C. 6√2

D. 9√2

Answer

SD of set B = n × SD of set A, where n is the data multiplier

Here, n = 3.

So, SD of set B = 3 × SD of set A = 3 × $2\sqrt{2}$ = $6\sqrt{2}$

So, the correct option is C.

14. Question

Given $\sum \left(x - \bar{x} \right) = 48, \bar{x} = 20$ and n = 12. The coefficient of variation is

A. 25

B. 20

C. 30

D. 10

Answer

Insufficient data.

15. Question

Mean and standard deviation of a data are 48 and 12 respectively. The coefficient of variation is

A. 42

B. 25

C. 28

D. 48

Answer

$CV = \frac{SD}{\bar{x}} \times 100$

$CV = \frac{12}{48} \times 100 = 25$

So, the correct option is B.