Measures of Central Tendency

71. The mean of a group X is 70 and the mean of group Y is 85. If the number of observations in group Y is five times that of group X, then the combined mean of both the groups is :

(a) 75   (b) 80   (c) 77.5   (d) 82.5

$$\text{(X)} \quad \bar{x}_1 = 70 \qquad \text{(Y)} \quad \bar{x}_2 = 85$$

$$n_1 \qquad\qquad n_2 = 5n_1$$

$$\bar{x}_c = \frac{70n_1 + (85)(5n_1)}{n_1 + 5n_1}$$

$$= \frac{495 \, n_1}{6 \, n_1}$$

79. The quartile deviation of the distribution of the following data is :

x	2	3	4	5	6
f(x)	2	4	8	4	1

(a) 0   (b) 1   (c) 1/4   (d) 1/2

$$c.f \quad 2 \quad 6 \quad 14 \quad 18 \quad 19$$

$\uparrow Q_1$ $\uparrow Q_3$

$$Q_1 = 1\left(\frac{20}{4}\right)^{th} obs^n$$
$$= 5^{th}$$
$$Q_1 = 3$$

$$Q_3 = 3(5)^{th}$$
$$= 15^{th}$$
$$= 5$$

$$Q.D. = \frac{Q_3 - Q_1}{2}$$
$$= \frac{5-3}{2}$$
$$= 1$$

73. The mean of a set of 20 observations in 18.3. The mean is reduced by 0.6 when a new observation is added to the set. The new observation is

(a) 17.6   (b) 18.9   (c) 5.7   (d) 24.6

$$n = 20$$
$$\bar{x} = 18.3$$
$$\Sigma x = 366$$

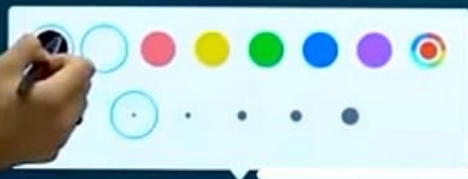$$n = 21$$
$$\bar{x} = 17.7$$
$$\frac{366 + a}{21} = 17.7$$

$$\boxed{a = 5.7 \checkmark}$$

Measures of Dispersion

74. The coefficient of the range of the data: 7, 8, 4, 1, 9, 12, 18, 16, ⑨④, 3, 5, ⑤⑥ is

 (a) 133.6   (b) 163.3   (c) 166.3   (d) 113.6

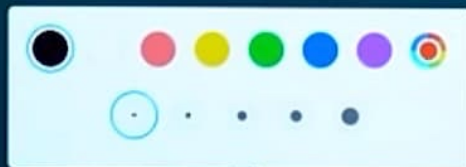$$= \frac{94-(-6)}{94+(-6)} \times 100 = \frac{100}{88} \times 100$$

75. For the first 20 natural numbers, the standard deviation is

 (a) 5.77   (b) 7.75   (c) 5.64   (d) 6.54

78. In a data set, 25 percent of values are smaller than 30 and one-fourth of values are larger than 70, then the coefficient of quartile deviation is _____ %
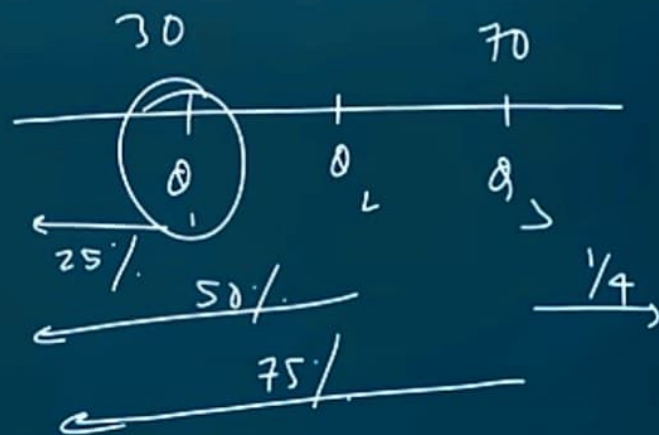
(a) 40   (b) 50   (c) 60   (d) 70

$$= \frac{Q_1 - Q_3}{Q_1 + Q_3} \times 100$$

$$= \frac{40}{100} \times 100$$

$$= 40$$

30   70

Q_1 Q_2 Q_3

25%   50%   ¼

75%

79. Consider the data sets: $X = \{-6, 2, -2, 6\}$, $Y = \{4, 8, 2, 6\}$, $Z = \{103, 100, 102, 101\}$. Let S_x, S_y and S_z be the standard deviations of the sets X, Y and Z respectively. We have the relations,

(a) $S_x < S_y < S_z$ (b) $S_z < S_y < S_x$ (c) $S_z < S_x < S_y$ (d) $S_x < S_z < S_y$

$$X = \{-6, -2, 2, 6\}$$

$$Y = \{2, 4, 6, 8\}$$

$$Z = \{100, 101, 102, 103\}$$

$$S_x > S_y > S_z$$

71. If mean of 5 observations $x + 1$, $x + 3$, $x + 5$, $x + 7$ and $x + 9$ is given 15, then the value of x will be:

(a) 10   (b) 12   (c) 8   (d) 11

$$\frac{5x + 25}{5} = 15$$

$$5x + 25 = 75$$

$$5x = 50$$

$$\boxed{x = 10}$$

Measures of Central Tendency

66. A professor has given an assignment to students in a Statistics class. A student computes the arithmetic mean and standard deviation for a set of 100 observations as 50 and 5 respectively. Later on, she points out that she has made a mistake in taking one observation as 100 instead of 50. What would be the correct mean if the wrong observation is corrected?

(a) 50.5   (b) 49.9   (c) 49.5   (d) 50.1

Century Solved Examples wali Q. 69

$$n = 100$$
$$\bar{x} = 50 \Big)$$
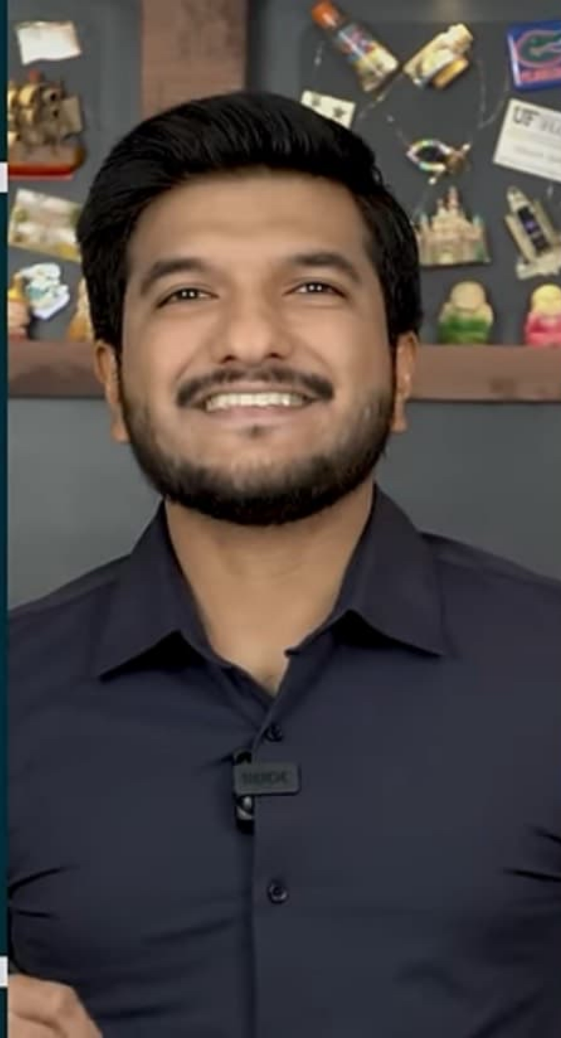$$\sigma = 5$$

$$\Sigma x = 100 \times 50$$

$$\Sigma x = 5000 - 100 + 50$$

$$= \frac{4950}{100}$$

$$= 49.5$$

67. Find the mean of the following data

Measures of Dispersion

74. If x and y are related as $4x + 3y + 11 = 0$ and mean deviation of y is 7.2 then the mean deviation of x is
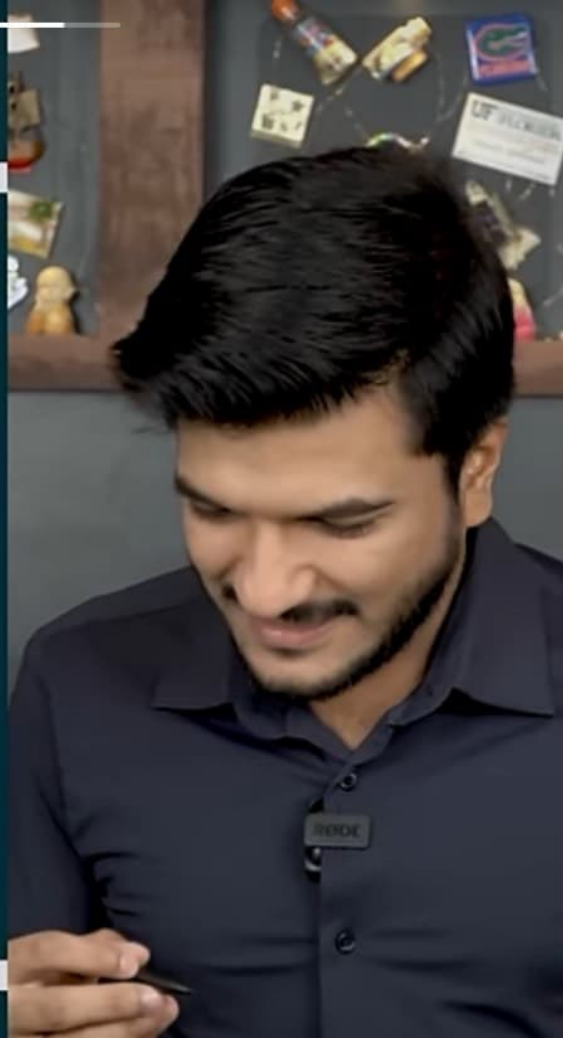
(a) 2.70   (b) 7.20   (c) 4.50   (d) 5.40   **Century Solved Examples wali Q. 66**

$$4x = -3y - 11$$
$$x = -\frac{3}{4}y - \frac{11}{4}$$

$$M.D._x = \frac{3}{4} \times 7.2$$
$$= 5.4$$

Century June 2023

75. What is the mean deviation about mean for the data 12, 16, 24, 30, 35, 39, 40

(a) 9.14   (b) 9.41   (c) 8.91   (d) 9.81

76. If the first quartile is 42.75 and the third quartile is 74.25, then the coefficient of quartile

$$\bar{x}_1 = 10$$

$$d_1 = 2$$

$$d_2 = -3$$

$$900 = 480 + 40 \sigma_2 + 380$$

$$60 = 40 \sigma_2^2$$

$$\sigma_2^2 = \boxed{1.5}$$

$$\sigma_2 = \boxed{1.22}$$

79. For a given set of normally distributed data, the following statistical parameters are known: Mean = 6; Standard deviation = 2.6; Median = 5 and Quartile deviation = 1.5, then the coefficient of quartile deviation equals to
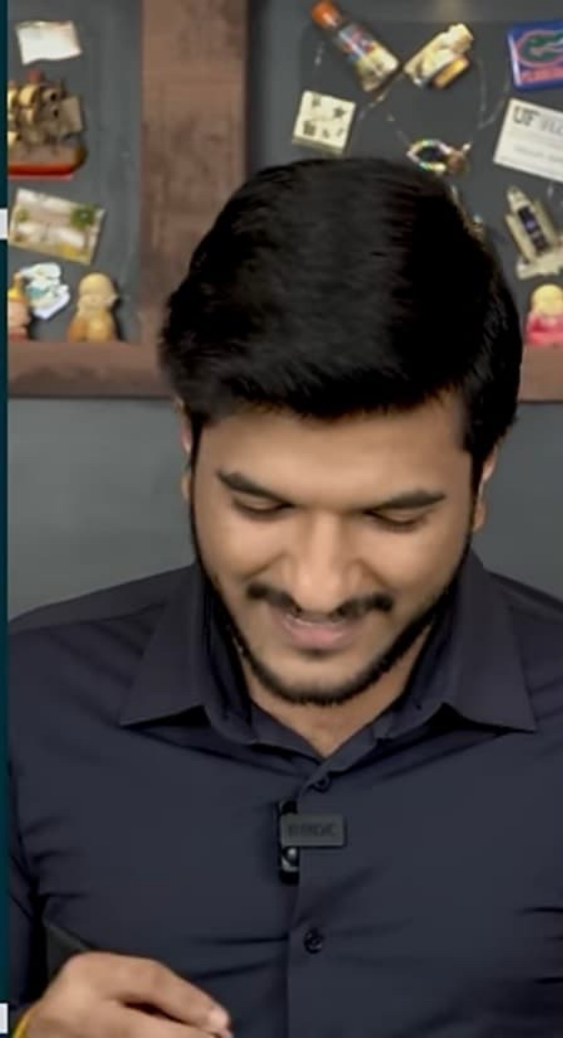
(a) 30 (b) 32 (c) 25 (d) 39

$$= \frac{Q.D.}{median} \times 100$$

$$= \frac{1.5}{5} \times 100$$

$$= 30$$

66. The median of the observations 42, 72, 35, 92, 67, 85, 72, 81, 51, 56 is

(a) 69.5　(b) 72　　(c) 64　　(d) 61.5

$$35, 42, 51, 56, \boxed{67, 72}, 72, 81, 85, 92$$

$n = 10$

$$\frac{67 + 72}{2} = \boxed{69.5}$$

67. The mean of 50 observations is 36. If two observations 30 and 42 are to be excluded, then the mean of the remaining observations will be:

(a) 36　　(b) 38　　(c) 48　　(d) 50

Century

$$\bar{x} = \frac{\Sigma x}{n}$$

$$\Sigma x = \bar{x} \times n$$

$$= 36 \times 50$$

$$= 1800$$

$$\Sigma x_{new} = 1800 - 30 - 42$$

$$\frac{1728}{48} = \boxed{36}$$

70. The average age of 15 students in a class is 9 years. Out of them, the average age of 5 students is 13 years and that of 8 students is 5 years. What is the average age of the remaining 2 students?

(a) 5 years   (b) 9 years   (c) 10 years   (d) 15 years

Combined mean → Century

$$9 = \frac{5 \times 13 + 8 \times 5 + 2\bar{x}_3}{15}$$

$$\bar{x}_c = \frac{n_1\bar{x}_1 + n_2\bar{x}_2 + n_3\bar{x}_3}{n_1 + n_2 + n_3}$$

$$9 \times 15 - 5 \times 13 - 8 \times 5 = 2\bar{x}_3$$

$$\boxed{\bar{x}_3 = 15}$$

57 / 76

Measures of Dispersion

71. If the coefficient of variation and standard deviation are 30 and 12 respectively, then the arithmetic mean of the distribution is

    (a) 40   (b) 36   (c) 25   (d) 19

$$C.V. = \frac{S.D}{mean} \times 100$$

$$Mean = \frac{12}{30} \times 100$$

$$30 = \frac{12}{mean} \times 100$$

72. _____ is based on all the observations and _____ is based on the central fifty percent the observations

    (a) Mean deviation, Range   (b) Mean deviation, Quartile deviation

    (c) Range, Standard deviation   (d) Quartile deviation, Standard deviation

73. Which of the following is not a method of measures of dispersion?

    (a) Standard deviation   (b) Mean deviation

    (c) Range   (d) Concurrent deviation method

74. Mean deviation is minimum when deviations are taken from:

    (a) Mean   (b) Median   (c) Mode   (d) Range

⊢ M.D. about median is minimum (since $\sum |z_i - Me|$ is minimum)

58 / 76

75. If the sum of square of the values equals to 3390, Number of observations are 30 and Standard deviation is 7, what is the mean value of the above observations?
(a) 14   (b) 11   (c) 8   (d) 5

Dïtto

$$\sum x_i^2 = 3390,$$
$$n = 30$$
$$\sigma = 7$$

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

$$7 = \sqrt{\frac{3390}{30} - (\bar{x})^2}$$

$$49 = 113 - (\bar{x})^2$$
$$(\bar{x})^2 = 64$$
$$\boxed{\bar{x} = 8}$$

76. If the variance of a random variable 'x' is 17, then what is variance of $y = 2x + 5$?
(a) 34   (b) 39   (c) 68   (d) 78

$$Var(y) = b^2 \times Var(x)$$
$$= (2)^2 \times 17$$
$$= 4 \times 17$$
$$= 68$$

Stats Cer

77. If the variance of given data is 12, and their mean value is 40, what is the coefficient of variation (CV)?

(a) 5.66%   (b) 6.66%   (c) 7.50%   (d) 8.65%

$$S.D. = \sqrt{Variance}$$
$$= \sqrt{12}$$

$$C.V. = \frac{\sqrt{12}}{40} \times 100$$
$$= 8.66\%$$

78. In a given set if all the observations are of same value then variance would be:

(a) 0   (b) 1   (c) – 1   (d) 0.5

73. The coefficient of deviation based on 25th percentile and 75th percentile of $6, 9, 3, 8, 4, 5, 8$ and 4 is

(a) 30   (b) 50   (c) 100/3   (d) 25

$P_{25} = Q_1$

$P_{75} = Q_3$

Coefficient of

Deviation $= \dfrac{Q_3 - Q_1}{Q_3 + Q_1} \times 100$

$= \dfrac{8 - 4}{8 + 4} \times 100$

$= \dfrac{4}{12} \times 100$

$= \dfrac{400}{3}$

$3, 4, 4, 5, 6, 8, 8, 9$

$n = 8$

$Q_1 = 1 \left(\dfrac{9}{4}\right)^{th} obs = 2.25^{th}$

$= 2^{nd} + 0.25 (3^{rd} - 2^{nd})$

$= 4 + 0.25 (4 - 4)$

$= 4$

$Q_3 = 3\left(\dfrac{9}{4}\right)^{th} = 6.75$

$= 6^{th} + 0.75(7^{th} - 6^{th})$

$= 8 + 0.75(8 - 8)$

$= 8$

79. The arithmetic mean and coefficient of variation for variable X are 10 and 30 respectively. Find the variance of $(30 - 2x)$

(a) 30   (b) 32   (c) 34   (d) 36

$$\bar{x} = 10$$

$$C.V. = 30$$

$$C.V. = \frac{\sigma_x}{\bar{x}} \times 100$$

$$30 = \frac{\sigma_x}{10} \times 100$$

$$\boxed{\sigma_x = 3}$$

$$y = 30 - 2x$$

$$y = -2x + 30$$

$$S.D._y = |b| \times S.D._x$$

$$= |-2| \times 3$$

$$S.D._y = 6$$

72. For a moderately skewed distribution, the median is twice the mean, then the mode is _____ times the median

(a) 3   (b) 2   (c) 2/3   (d) 3/2

$$\text{Median} = 2 \text{ Mean} \qquad \therefore \text{ Mean} = \frac{1}{2} \text{ Median}$$

$$\text{Mean} - \text{Mode} = 3 \left(\text{Mean} - \text{Median} \right)$$

$$\frac{1}{2} \text{Median} - \text{Mode} = 3 \left(\frac{1}{2} \text{Median} - \text{Median} \right)$$

$$\frac{1}{2} \text{Med.} - \text{Mode} = \left(\frac{-3 \text{ Median}}{2} \right)$$

$$\frac{1}{2} \text{Median} + \frac{3}{2} \text{median} = \text{Mode}$$

$$2 \text{ Median} = \text{Mode}$$

75. The probable value of mean deviation when $Q_3 = 40$ and $Q_1 = 15$ is
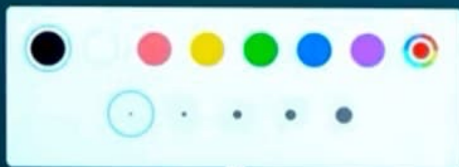
(a) 15   (b) 18.75   (c) 17.50   (d) 0

$$Q.D. = \frac{Q_3 - Q_1}{2}$$

$$\sim \frac{40 - 15}{2}$$

$$\sim \frac{25}{2}$$

$$6\, Q.D. = 5\, M.D.$$

$$\overset{3}{\cancel{6}} \times \frac{\overset{5}{\cancel{25}}}{\underset{1}{\cancel{2}}} \times \frac{1}{\underset{1}{\cancel{8}}} = M.D.$$

$$\boxed{15}$$

74. If there are two groups with n_1 and n_2 observations and H_1 and H_2 are respective harmonic means, then the harmonic mean of combined observation is

(a) $\dfrac{n_1 H_1 + n_2 H_2}{n_1 + n_2}$

(b) $\dfrac{n_1 H_1 + n_2 H_2}{H_1 + H_2}$

(c) $\dfrac{n_1 + n_2}{n_1 H_1 + n_2 H_2}$

(d) $\dfrac{(n_1 + n_2) H_1 H_2}{n_1 H_2 + n_2 H_1}$

$$H.M. = \frac{(n_1 + n_2)}{\dfrac{n_1}{H_1} + \dfrac{n_2}{H_2}} = \frac{(n_1 + n_2) \times H_1 \cdot H_2}{n_1 H_2 + n_2 H_1}$$

$$= \frac{(n_1 + n_2)}{\dfrac{n_1 H_2 + n_2 H_1}{H_1 H_2}}$$