Descriptive Statistics 3

Hand Calculations

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Hand Calculations of Measures of Central Tendency and Variability

Part 1: Calculating the Mean and Standard Deviation of the data set {1, 2, 3, 4, 5}

Step 1: Calculate the Mean

The formula for the mean ($\bar{x}$) is:

$$\bar{x} = \frac{\sum X}{N}$$

Where: - X represents each value in the dataset - N is the number of values

Data Set: 1, 2, 3, 4, 5

$$x = \frac{1+2+3+4+5}{5} = \frac{15}{5} = 3$$

Step 2: Calculate the Deviations from the Mean

Subtract the mean from each value: - (1 - 3) = -2 - (2 - 3) = -1 - (3 - 3) = 0 - (4 - 3) = 1 - (5 - 3) = 2

Step 3: Square the Deviations

$$(-2)^2 = 4, \quad (-1)^2 = 1, \quad (0)^2 = 0, \quad 1^2 = 1, \quad 2^2 = 4$$

Step 4: Calculate the Variance

The formula for variance (s^2) is:

$$s^2 = \frac{\sum (X - x)^2}{N}$$

Sum of squared deviations:

$$4 + 1 + 0 + 1 + 4 = 10$$

$$s^2 = \frac{10}{5} = 2$$

Step 5: Calculate the Standard Deviation

The formula for the standard deviation (s) is:

$$s = \sqrt{s^2} = \sqrt{2} \approx 1.41$$

Part 2: Calculating the Mean and Standard Deviation of the data set {5, 4, 3, 4, 5}

Step 1: Calculate the Mean

$$\bar{x} = \frac{5 + 4 + 3 + 4 + 5}{5} = \frac{21}{5} = 4.2$$

Step 2: Calculate the Deviations from the Mean

- (5 - 4.2) = 0.8
- (4 - 4.2) = -0.2
- (3 - 4.2) = -1.2
- (4 - 4.2) = -0.2
- (5 - 4.2) = 0.8

Step 3: Square the Deviations

$$(0.8)^2 = 0.64, \quad (-0.2)^2 = 0.04, \quad (-1.2)^2 = 1.44, \quad (-0.2)^2 = 0.04, \quad (0.8)^2 = 0.64$$

Step 4: Calculate the Variance

$$\sum = 0.64 + 0.04 + 1.44 + 0.04 + 0.64 = 2.8$$

$$s^2 = \frac{2.8}{5} = 0.56$$

Step 5: Calculate the Standard Deviation

$$s = \sqrt{0.56} \approx 0.75$$

Summary:

- **Mean and Standard Deviation for {1, 2, 3, 4, 5}:**
  - Mean = 3, Standard Deviation 1.41
- **Mean and Standard Deviation for {5, 4, 3, 4, 5}:**
  - Mean = 4.2, Standard Deviation 0.75