

Descriptive Statistics Exam - Solutions

Your Name

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Question 1: Descriptive Statistics

(a) **Mean, Median, and Mode:**

$$\text{Mean} = \frac{15 + 18 + 20 + 25 + 22 + 19 + 16 + 23 + 21 + 17}{10} = 19.6$$

$$\text{Median} = 20.5$$

(after sorting the data)

Mode = No mode (all values are distinct)

(b) **Range, Variance, and Standard Deviation:**

$$\text{Range} = 25 - 15 = 10$$

$$\text{Variance} \approx 9.04$$

$$\text{Standard Deviation} \approx 3.01$$

Question 2: Normal Distribution

(a) **Probability of less than 25 kg:**

Using a standard normal distribution table, find the z-score for $X = 25$:

$$z = \frac{X - \mu}{\sigma} = \frac{25 - 30}{5} = -1$$

Look up the z-score in the table, $P(Z < -1) \approx 0.1587$.

So, the probability is approximately 0.1587.

(b) **Top 20% of households:**

Find the z-score corresponding to the top 20% (z-score of 0.84 approximately).

Convert back to the quantity using $X = \mu + z \times \sigma$:

$$X = 30 + 0.84 \times 5 = 34.2 \text{ kg}$$

Question 3: Waste Composition Analysis

Mean and Standard Deviation:

$$\text{Mean} = 0.25 \times \text{Plastics} + 0.20 \times \text{Paper} + 0.15 \times \text{Glass} + 0.30 \times \text{Organic Matter} + 0.10 \times \text{Others}$$

$$\text{Standard Deviation} = \sqrt{0.25 \times (\text{Plastics} - \text{Mean})^2 + \dots + 0.10 \times (\text{Others} - \text{Mean})^2}$$

Question 4: Visualization

Histogram:

