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§2.3 MEASURES OF VARIABILITY

2.13 (c) $\bar{x} = \frac{2+1+1+3+5}{5} = \frac{12}{5} = 2.4$

(b) $s^2 = \frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}$

$= \frac{(2-2.4)^2 + (1-2.4)^2 + (1-2.4)^2 + (3-2.4)^2 + (5-2.4)^2}{4}$

$= \frac{0.16 + 1.96 + 1.96 + 0.36 + 6.76}{4}$

$= 2.8$

(c) $s = \sqrt{s^2} = \sqrt{2.8} \approx 1.673$

(d) $s^2 = \frac{\sum_{i=1}^{n} x_i^2 - \frac{1}{n}\left(\sum_{i=1}^{n} x_i\right)^2}{n-1}$

$= \frac{(2^2 + 1^2 + 1^2 + 3^2 + 5^2) - \frac{1}{5}(2+1+1+3+5)^2}{4}$

$= \frac{40 - \frac{1}{5}(144)}{4} = 2.8$ ✓

2.16 (a) RANGE $= 6 - 1 = 5$

(b) $\bar{x} = \frac{31}{8} = 3.875$

(c) $$s^2 = \frac{\sum_{i=1}^{8} x_i^2 - \frac{1}{8}\left(\sum_{i=1}^{8} x_i\right)^2}{7}$$

$$= \frac{3^2 + 1^2 + 5^2 + 6^2 + 4^2 + 4^2 + 3^2 + 5^2 - \frac{1}{8}(3+1+5+6+4+4+3+5)^2}{7}$$

$$= \frac{137 - \frac{1}{8}(31)^2}{7} = 2.41\ldots \longrightarrow s = \sqrt{2.41\ldots}$$

$$= 1.55\ldots$$

(d) THE RANGE (5) IS APPROXIMATELY 3 - 4 STANDARD DEVIATIONS. $\left(\frac{\text{RANGE}}{s} = \frac{5}{1.55} \approx 3.226\ldots \right)$

2.17 (a) RANGE $= 2.39 - 1.28 = 1.11$

(b) $$s^2 = \frac{\sum x_i^2 - \frac{1}{n}\left(\sum x_i\right)^2}{n-1}$$

$$= \frac{1.28^2 + 2.39^2 + 1.5^2 + 1.88^2 + 1.51^2 - \frac{1}{5}(8.56)^2}{4}$$

$$\boxed{s^2 = 0.19007}, \quad \boxed{s = \sqrt{0.19007} \approx 0.436}$$

(c) RANGE IS APPROXIMATELY 2 - 3 STANDARD DEVIATIONS

$\left(\frac{R}{s} = \frac{1.11}{.436} \approx 2.55 \right)$