Section 2.4 PART I

Summarizing Data — using — Measures of Variation

Amounts of Juice in 8 bottles (marked 16oz)

$\bar{x} = \frac{\Sigma x}{n} = \frac{123.9}{8} = 15.4875$

	x (oz.)	$x - \bar{x}$	$\lvert x - \bar{x} \rvert$	$(x - \bar{x})^2$
	15.1	−0.3875	0.3875	0.15015625
	15.3	−0.1875	0.1875	0.03515625
	15.8	0.3125	0.3125	0.09765625
	15.7	0.2125	0.2125	0.04515625
	15.6	0.1125	0.1125	0.01265625
	15.5	0.0125	0.0125	0.00015625
	15.2	−0.2875	0.2875	0.08265625
	15.7	→ 0.2125	0.2125	0.04515625
Total:	123.9	0.0000	1.7250	0.46875

(not free or random)

WHY? Max. error in a statistic is proportional to variability.

→ Range = max − min = 15.8 − 15.1 = 0.7 oz ← {Range uses the most extreme values. That's not good!

→ For a single value, x, the deviation of x from the sample mean ($\bar{x}$) is $x - \bar{x}$. The deviation from the population mean is $x - \mu$. Note the sum of deviations is always zero. This means that the last deviation is not "free" or random. With n deviations from the mean ($\bar{x}$), $n-1$ are free/random, so $n-1$ = "degrees of freedom."

→ Mean Absolute Deviation (mean distance from $\bar{x}$)

$$MAD = \frac{\Sigma |x - \bar{x}|}{n} = \frac{1.7250}{8} = 0.2156$$

→ Population Standard Deviation: $\sqrt{\frac{\Sigma (x-\mu)^2}{N}} = \sigma$ (sigma)

→ Sample Standard Deviation: $s = \sqrt{\frac{\Sigma (x-\bar{x})^2}{n-1}} = \sqrt{\frac{0.46875}{8-1}}$

$= \sqrt{0.06696} \approx 0.2588$