STA2023: Test 1 Formulas

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Mean	$\frac{\sum x}{n}$
Mean of a frequency distribution:	$\bar{X} = \frac{\sum f \cdot X_i}{\sum f}$
Weighted mean:	$\bar{X} = \frac{\sum w \cdot X}{\sum w}$
Population Variance	$\sigma^2 = \frac{\sum(x_i - \mu)^2}{n}$ Equivalent to $\sigma^2 = \frac{n\sum x^2 - (\sum x)^2}{n^2}$
Sample Variance	$s^2 = \frac{\sum(x_i - \bar{x})^2}{n-1}$ Equivalent to $s^2 = \frac{n\sum x^2 - (\sum x)^2}{n(n-1)}$
Population standard deviation	$\sigma = \sqrt{\frac{\sum(x_i - \mu)^2}{n}}$ Equivalent to $\sigma = \sqrt{\frac{n\sum x^2 - (\sum x)^2}{n^2}}$
Sample standard deviation	$s = \sqrt{\frac{\sum(x_i - \bar{x})^2}{n-1}}$ Equivalent to $s = \sqrt{\frac{n\sum x^2 - (\sum x)^2}{n(n-1)}}$
Range = $max - min$	Midrange = $\frac{max + min}{2}$
Standard Deviation rule of thumb: $s \approx \frac{range}{4}$	Coefficient of Variation, $CV = \frac{s}{\bar{x}} \cdot 100$
Z score = $\frac{x - \mu}{\sigma}$ Therefore, $x = z \cdot \sigma + \mu$	Interquartile range, IQR : IQR = $Q_3 - Q_1$

Rule to determine outliers: a data value is an outlier if it is greater than $Q_3 + 1.5 \cdot$ IQR or less than $Q_1 - 1.5 \cdot$ IQR

Chebyshev's Theorem: at least $1 - \frac{1}{k^2}$ of the data lie within k standard deviations of the mean, that is, in the interval with endpoints $\bar{x} \pm ks$ (samples) and with endpoints $\mu \pm k\sigma$ (populations), where $k > 1$.

The Empirical Rule: The empirical rule, or the 68-95-99.7 rule, tells you where most of the values lie in a normal distribution: Around 68% of values are within 1 standard deviation of the mean $(\mu \pm \sigma)$. Around 95% of values are within 2 standard deviations of the mean $(\mu \pm 2\sigma)$. Around 99.7% of values are within 3 standard deviations of the mean $(\mu \pm 3\sigma)$.

Note: Calculators output does not include the population variance or sample variance, they just yield the population standard deviation and the sample standard deviation. Therefore, if you need the population variance, square the population standard deviation, sigma x; for the sample variance, square the sample standard deviation, Sx.