Statistics Formula Sheet:

Mean:	**Sample Mean:** $\bar{X} = \frac{\sum X}{n}$	**Population Mean:** $u = \frac{\sum X}{N}$
Median: (Q2)	**If n is odd:** $M = \left(\frac{n+1}{2}\right)^{th} Term$	**If n is even:** $M = \frac{\left(\frac{n}{2}\right)^{th} Term + \left(\frac{n}{2}+1\right)^{th} Term}{2}$
Mode:	The number with the highest frequency.	
Range: H → Highest Value L→ Lowest Value	$Range = H - L$	$MidRange = \frac{H+L}{2}$
Standard Deviation:	**Sample:** $s = \sqrt{\frac{\sum(X-\bar{X})^2}{n-1}}$	**Population:** $\sigma = \sqrt{\frac{\sum(X-u)^2}{N}}$
Variance:	**Sample Variance:** $s^2 = \frac{\sum(X-\bar{X})^2}{n-1}$	**Population Variance:** $\sigma^2 = \frac{\sum(X-u)^2}{N}$
Coefficient of Variation:	**Sample CV:** $CV = {}^{s}/_{\bar{X}} \times 100\%$	**Population CV:** $CV = {}^{\sigma}/_{u} \times 100\%$
Mean Absolute Deviation:	**Sample MD (Mean):** $MD = \frac{\sum\lvert X-\bar{X}\rvert}{n}$	**Population MD (Mean):** $MD = \frac{\sum\lvert X-u\rvert}{N}$
Average Deviation:	**Sample AD:** $AD = \frac{\sum(X-\bar{X})}{n}$	**Population AD:** $AD = \frac{\sum(X-u)}{N}$

Quartile:	$$\boldsymbol{Q_k} = k\left(\frac{n+1}{4}\right)^{th} Term$$ $$\boldsymbol{Q_1} = 1\left(\frac{n+1}{4}\right)^{th} Term \qquad \boldsymbol{Q_3} = 3\left(\frac{n+1}{4}\right)^{th} Term$$
Percentile:	$$\boldsymbol{P_k} = k\left(\frac{n+1}{100}\right)^{th} Term$$ $$\boldsymbol{P_{30}} = 30\left(\frac{n+1}{100}\right)^{th} Term \qquad \boldsymbol{P_{70}} = 70\left(\frac{n+1}{100}\right)^{th} Term$$
Decile:	$$\boldsymbol{D_k} = k\left(\frac{n+1}{10}\right)^{th} Term$$
Octile:	$$\boldsymbol{O_k} = k\left(\frac{n+1}{8}\right)^{th} Term$$
Interquartile Range:	$$\boldsymbol{IQR} = Q_3 - Q_1$$
Quartile Deviation:	$$\boldsymbol{QD} = \frac{Q_3 - Q_1}{2} = \frac{1}{2}(IQR)$$
Coefficient of Quartile Deviation:	$$\boldsymbol{CQD} = \frac{Q_3 - Q_1}{Q_3 + Q_1}$$
Range of Outliers:	$$[Q_1 - 1.5\,IQR,\ \ Q_3 + 1.5IQR]$$ **Note:** Any data point that exists outside of the range shown above is considered an outlier.
Coefficient of Range:	$$\boldsymbol{CR} = \frac{H - L}{H + L}$$

	General Formula:	Expanded Form:	2 Numbers:
Arithmetic Mean:	$\bar{X} = \frac{\sum X}{n}$	$\bar{X} = \frac{X_1 + X_2 + X_3 + \cdots X_n}{n}$	$AM = \frac{a+b}{2}$
Geometric Mean:	$\bar{X}_G = \left(\prod_{i=1}^{n} X_i\right)^{\frac{1}{n}}$	$\bar{X}_G = (X_1 * X_2 * X_3 \ldots X_n)^{1/n}$	$GM = \sqrt{ab}$
	$\bar{X}_G = 10^{\left(\frac{\sum \log(X)}{n}\right)}$	$\bar{X}_G = 10^{\left(\frac{\log(X_1)+\log(X_2)+\ldots+\log(X_n)}{n}\right)}$	$GM = 10^{\frac{\log(a)+\log(b)}{2}}$
Weighted Mean:	$\bar{X}_W = \frac{\sum WX}{W}$	$\bar{X}_W = \frac{W_1X_1 + W_2X_2 + \ldots + W_nX_n}{W_1 + W_2 + \ldots + W_n}$	$WM = \frac{W_1a + W_2b}{W_1 + W_2}$
Harmonic Mean:	$\bar{X}_H = \frac{n}{\sum\left(\frac{1}{\bar{X}}\right)}$	$\bar{X}_H = \frac{n}{\frac{1}{X_1} + \frac{1}{X_2} + \frac{1}{X_3} + \ldots + \frac{1}{X_n}}$	$HM = \frac{2}{\frac{1}{a} + \frac{1}{b}} = \frac{2ab}{a+b}$
Root Mean Square:	$X_{rms} = \sqrt{\frac{\sum(X^2)}{n}}$	$X_{rms} = \sqrt{\frac{X_1^{\,2} + X_2^{\,2} + X_3^{\,2} + \ldots + X_n^{\,2}}{n}}$	$X_{rms} = \sqrt{\frac{a^2 + b^2}{2}}$
Mean Relationship:	$GM = \sqrt{(AM)(HM)}$ *For 2 Numbers*		
	$\sqrt{ab} = \sqrt{\left(\frac{\cancel{a+b}}{2}\right)\left(\frac{2ab}{\cancel{a+b}}\right)}$		

Statistics Formulas for Grouped Data:

Mean:	$$\bar{X} = \frac{\sum f X_m}{\sum f} = \frac{\sum f X_m}{n}$$
Midpoint of Range:	$$X_m = \frac{X_1 + X_2}{2}$$
Standard Deviation:	$$s = \sqrt{\frac{\sum f(X_m - \bar{X})^2}{n-1}} = \sqrt{\frac{\sum f {X_m}^2 - \frac{(\sum f X_m)^2}{n}}{n-1}}$$
Variance:	$$s^2 = \frac{\sum f(X_m - \bar{X})^2}{n-1} = \frac{\sum f {X_m}^2 - \frac{(\sum f X_m)^2}{n}}{n-1}$$
1st Quartile:	$$Q_1 = L_1 + \frac{w_1}{f_1}\left(\frac{n}{4} - C_1\right)$$ $L \rightarrow Lower\ Class\ Boundary$ $\quad$ $w \rightarrow Width\ of\ Class\ Interval$
Median – 2nd Quartile:	$$Median = Q_2 = L_2 + \frac{w_2}{f_2}\left(\frac{n}{2} - C_2\right)$$ $f \rightarrow frequency\ of\ quartile\ class$ $\quad$ $n \rightarrow total\ frequency$
3rd Quartile:	$$Q_3 = L_3 + \frac{w_3}{f_3}\left(\frac{3n}{4} - C_3\right)$$ $C \rightarrow Cumulative\ frequency\ of\ preceding\ quartile\ class.$
Mode:	$$Mode = L + h\left(\frac{f_m - f_1}{2f_m - f_1 - f_2}\right)$$ $L \rightarrow Lower\ boundary\ of\ modal\ class$ $h \rightarrow Size\ of\ class\ interval$ $f_m \rightarrow frequency\ of\ modal\ class$ $f_1 \rightarrow frequency\ of\ preceding\ class$ $f_2 \rightarrow frequency\ of\ succeeding\ class$