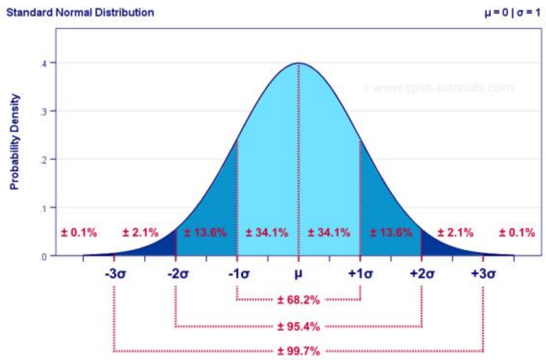
AP Statistics: Normal Distribution

From Simple Studies, https://simplestudies.edublogs.org & @simplestudiesinc on Instagram

Z-Scores

- $Z = {}^{x - \mu}/_{\sigma}$
  - x = A number
  - μ = Mean
  - σ = Standard Deviation
- The distribution must be normal or approximately normal in order to use Z-scores ($n \geq 30$ or both $np \geq 10$ and $nq \geq 10$)



From HYPERLINK "https://www.spss-tutorials.com/normal-

Probability

- To find the probability of a number or more extreme occurring, convert to a Z-score.

Formula Sheets

- Use the AP Statistics formula sheets (pages 3 and 4 of the 2020 version) to find the probability of a Z-score or less occurring.
  - $P(Z < Z_0)$
- To find the probability of a Z-score or greater occurring, subtract the probability of that Z-score or less occurring from one
  - $P(Z > Z_0) = 1 - P(Z < Z_0)$
- To find the probability of in between two Z-scores, subtract the probability of the smaller Z-score or less occurring from the probability of the larger Z-score or less occurring
  - $P(Z_0 < Z < Z_1) = P(Z < Z_1) - P(Z < Z_0)$

Sampling distributions for proportions:

Random Variable	Parameters of Sampling Distribution		Standard Error* of Sample Statistic
For one population: $\hat{p}$	$\mu_{\hat{p}} = p$	$\sigma_{\hat{p}} = \sqrt{\dfrac{p(1-p)}{n}}$	$s_{\hat{p}} = \sqrt{\dfrac{\hat{p}(1-\hat{p})}{n}}$
For two populations: $\hat{p}_1 - \hat{p}_2$	$\mu_{\hat{p}_1-\hat{p}_2} = p_1 - p_2$	$\sigma_{\hat{p}_1-\hat{p}_2} = \sqrt{\dfrac{p_1(1-p_1)}{n_1} + \dfrac{p_2(1-p_2)}{n_2}}$	$s_{\hat{p}_1-\hat{p}_2} = \sqrt{\dfrac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \dfrac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$ When $p_1 = p_2$ is assumed: $s_{\hat{p}_1-\hat{p}_2} = \sqrt{\hat{p}_c(1-\hat{p}_c)\left(\dfrac{1}{n_1} + \dfrac{1}{n_2}\right)}$ where $\hat{p}_c = \dfrac{X_1 + X_2}{n_1 + n_2}$

Sampling distributions for means:

Random Variable	Parameters of Sampling Distribution		Standard Error* of Sample Statistic
For one population: $\bar{X}$	$\mu_{\bar{X}} = \mu$	$\sigma_{\bar{X}} = \dfrac{\sigma}{\sqrt{n}}$	$s_{\bar{X}} = \dfrac{s}{\sqrt{n}}$
For two populations: $\bar{X}_1 - \bar{X}_2$	$\mu_{\bar{X}_1-\bar{X}_2} = \mu_1 - \mu_2$	$\sigma_{\bar{X}_1-\bar{X}_2} = \sqrt{\dfrac{\sigma_1^2}{n_1} + \dfrac{\sigma_2^2}{n_2}}$	$s_{\bar{X}_1-\bar{X}_2} = \sqrt{\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}}$

From HYPERLINK "https://apcoronavirusupdates.collegeboard.org/media/pdf/formula-sheet-and-tables-

Z-Score Formulas

- "Standard deviation is a measurement of variability from the theoretical population. Standard error is the estimate of the standard deviation. If the standard deviation of the statistic is assumed to be known, then the standard deviation should be used instead of the standard error" (College Board, p. 2)