Formulae for Reliability Studies

1. Spearman-Brown

$r^1 = \frac{Lr}{1+(L-1)r}$	This is used to estimate the reliability of a test if it were of a <u>different length</u> (L). *L of the original test is 1*
$r^1 = \frac{2r}{1+(2-1)r}$	To estimate the reliability of a full-length test from a <u>split-half reliability</u> r, L should have a value of two (or twice as long). Split-half tests show reliability of a test half as long as the original.

2. Flanagan's Formula

$r = 2(1 - \frac{S_a^2 + S_b^2}{S^2})$	Flanagan's formula yields a more accurate <u>split-half reliability</u> by taking the variances of the two parts into account. S_a^2 is the variance of part a S_b^2 is the variance of part b S^2 is the variance of total scores

3. Kuder-Richardson

$\boldsymbol{r_{KR20} = \frac{k}{k-1}\left(1 - \frac{\sum pq}{S^2}\right)}$ $\boldsymbol{r_{KR21} = \frac{k}{k-1}\left(1 - \frac{k\overline{pq}}{S^2}\right)}$	Use Kuder-Richardson formula to compute for <u>internal consistency</u> of test items. p is the proportion passing a given item q is the proportion not passing a given item q = 1 - p S^2 is the variance of the total scores k is the number of test items Formula KR21 is easier to use but is less accurate, here $\bar{p} = \bar{X}/k$, assuming the test items are of equal difficulty

4. Cronbach Alpha

$\boldsymbol{r_{\propto} = \frac{I}{I-1}\left(1 - \frac{\sum S_i^2}{S^2}\right)}$	Use this for <u>tests having several parts</u> I is the number of parts $\boldsymbol{S_i^2}$ is the variance of scores of part i

5. Standard Error of Measurement

$\boldsymbol{SE_m = 43\sqrt{k}}$	Use this to <u>estimate SE_m</u> in terms of raw scores
$\boldsymbol{SE_m = \frac{43}{\sqrt{k}}}$	Use this to estimate SE_m in terms of percent scores (as in a poll $\bar{o} \pm$ 3%)