Unit 5 Formulas/Info you can use on the test

Hypothesis Tests:

- State Hypotheses (in symbols and in words)
- Check conditions (SRS, independence, n<10%pop, np,nq >= 10)
- Compute p-value (state what test in calculator, show what was entered, report Z and p-value)
- Conclusion (example): With significance of .05, p-value=0.02 is low so we reject Ho.
  We do have sufficient statistical evidence to conclude (Ha).

Explaining p-value: If 78% of DV seniors were actually still staying in state for college, our p-value of .09 means there is a 9% probability of this sample's result (85% staying in state) or higher occurring just due to chance.

Confidence Intervals:

- Check conditions (SRS, independence, n<10%pop, np,nq >= 10)
- Compute the confidence interval (state which function in calculator, show what was entered, report the resulting interval).
- Conclusion (example): We are 90% confident that the true difference in percentage of students staying in state for college (this year – last year) is between 2.4% and 3.8%.

Explaining confidence level: If we were to take many samples of size 40 and compute confidence intervals for each, 90% of the confidence intervals would contain the true percentage of all DV seniors who are staying in state this year.

Errors:

Decision:	Null Hypothesis is: True	Null Hypothesis is: False
Reject	Type I Error α	OK (power) $1-\beta$
Not Reject	OK	Type II Error β

$P(I)=\alpha$

$P(II)=\beta$

$Power\ of\ the\ Test = 1-\beta$

Things that increase Power:

- (for fixed n): Increasing α: $\alpha \nearrow,\ \beta \searrow,\ Power \nearrow$
- Increasing n: $n \nearrow,\ \alpha \searrow,\ \beta \searrow,\ Power \nearrow$
- Larger Effect Size

Sample Size Calculations:

$$CI = \hat{p} \pm \underbrace{\boxed{z^* \sqrt{\frac{\hat{p}\hat{q}}{n}}}}_{margin\ of\ error} \qquad so... \qquad z^* \sqrt{\frac{\hat{p}\hat{q}}{n}} = required\ margin\ of\ error$$

($use\ \hat{p} = 0.5\ \ and\ round\ n\ up$ to guarantee the margin of error)

Common z* values: 90%: z*=1.64, 95%: z*=1.96, 99%: z*=2.576

Sampling distributions for proportions:

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

Sampling distributions for means:

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