Unit 6 Formulas/Info you can use on the test

<u>1-Sample</u>	**2-Sample (independent groups)** **<u>"Difference of Means"</u>**	**2-Sample (matched pairs)** **<u>"Mean of Differences"</u>**
$df = n-1$	$df = (\textit{big formula} - \textit{use calculator})$	$df = n-1$ (*working only with differences*)
$H_0: \mu = \mu_0$ $H_A: \mu(<,>,\neq)\mu_0$	$H_0: \mu_1 = \mu_2$ $H_A: \mu_1(<,>,\neq)\mu_2$	$H_0: \mu_D = 0$ $H_A: \mu_D(<,>,\neq)0$ (*define* μ_D *with direction*)
Conditions: 1) SRS 2) indep w/in sample 3) n<10% pop 4) sample nearly normal	Conditions: 1) SRSs 2) groups indep 3) both n<10%pops 4) both samples nearly normal	Conditions: 1) SRS 2) matched pairs (matched by ?) 3) n<10%pop 4) differences nearly normal

Nearly Normal? $n \geq 40$ (assume by sample size)
$15 \leq n < 40$ Check with histogram
$n < 15$ Check with histogram plus normal probability plot (NPP) if skewed
If there are gaps in histogram, use boxplot to verify no outliers

TTest TInterval	2-SampTTest 2-SampTInt	TTest (on differences) TInterval (on differences)
Test statistic: $t = \dfrac{\bar{x} - \mu_0}{SE_{\bar{X}}}$	Test statistic: $t_{\bar{X}_1 - \bar{X}_2} = \dfrac{(\bar{X}_1 - \bar{X}_2) - 0}{SE_{\bar{X}_1 - \bar{X}_2}}$	Test statistic: $t_D = \dfrac{\bar{x}_D - 0}{SE_D}$

Confidence Interval Formulas:

$$\bar{x} \pm t^*\left(\frac{s}{\sqrt{n}}\right) \qquad (\bar{x}_1 - \bar{x}_2) \pm t^*\left(\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}\right) \qquad \bar{x}_D \pm t^*\left(\frac{s_D}{\sqrt{n}}\right)$$

<u>Wording formats</u>

<u>Explaining hypothesis test conclusion</u>:
With significance of .05, p-value=0.02 is low so we reject Ho.
We <u>do</u> have sufficient statistical evidence to conclude (Ha).

<u>Explaining p-value</u>: If the difference between drug and placebo was actually zero, our p-value of .09 means there is a 9% probability of this sample's result (drug 3.4 mm higher <u>mean</u> tumor reduction) or higher occurring just due to chance.

<u>Explaining confidence interval in context</u>:
We are 90% confident that the true <u>average</u> improvement in SAT scores is between 25 and 36 points.

<u>Explaining confidence level</u>: 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 <u>mean</u> improvement in SAT score.

<u>Common z* values</u>: 90%: z*=1.64, 95%: z*=1.96, 99%: z*=2.576

Sampling distributions for proportions:

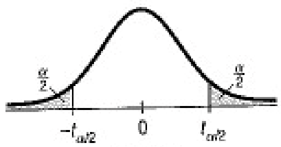
Random Variable	**Parameters of Sampling Distribution**		**Standard Error* of Sample Statistic**
For one population:			
$\hat{p}$	$\mu_{\hat{p}} = p$	$\sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}}$	$s_{\hat{p}} = \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$
For two populations:			
$\hat{p}_1 - \hat{p}_2$	$\mu_{\hat{p}_1-\hat{p}_2}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

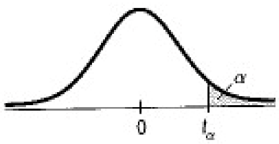
Random Variable	**Parameters of Sampling Distribution**		**Standard Error* of Sample Statistic**
For one population:			
$\overline{X}$	$\mu_{\overline{X}} = \mu$	$\sigma_{\overline{X}} = \frac{\sigma}{\sqrt{n}}$	$s_{\overline{X}} = \frac{s}{\sqrt{n}}$
For two populations:			
$\overline{X}_1 - \overline{X}_2$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

Table T

Values of t_α



Two tails



One tail

Two tail probability	0.20	0.10	0.05	0.02	0.01	
One tail probability	0.10	0.05	0.025	0.01	0.005	
df						df
1	3.078	6.314	12.706	31.821	63.657	1
2	1.886	2.920	4.303	6.965	9.925	2
3	1.638	2.353	3.182	4.541	5.841	3
4	1.533	2.132	2.776	3.747	4.604	4
5	1.476	2.015	2.571	3.365	4.032	5
6	1.440	1.943	2.447	3.143	3.707	6
7	1.415	1.895	2.365	2.998	3.499	7
8	1.397	1.860	2.306	2.896	3.355	8
9	1.383	1.833	2.262	2.821	3.250	9
10	1.372	1.812	2.228	2.764	3.169	10
11	1.363	1.796	2.201	2.718	3.106	11
12	1.356	1.782	2.179	2.681	3.055	12
13	1.350	1.771	2.160	2.650	3.012	13
14	1.345	1.761	2.145	2.624	2.977	14
15	1.341	1.753	2.131	2.602	2.947	15
16	1.337	1.746	2.120	2.583	2.921	16
17	1.333	1.740	2.110	2.567	2.898	17
18	1.330	1.734	2.101	2.552	2.878	18
19	1.328	1.729	2.093	2.539	2.861	19
20	1.325	1.725	2.086	2.528	2.845	20
21	1.323	1.721	2.080	2.518	2.831	21
22	1.321	1.717	2.074	2.508	2.819	22
23	1.319	1.714	2.069	2.500	2.807	23
24	1.318	1.711	2.064	2.492	2.797	24
25	1.316	1.708	2.060	2.485	2.787	25
26	1.315	1.706	2.056	2.479	2.779	26
27	1.314	1.703	2.052	2.473	2.771	27
28	1.313	1.701	2.048	2.467	2.763	28
29	1.311	1.699	2.045	2.462	2.756	29
30	1.310	1.697	2.042	2.457	2.750	30
32	1.309	1.694	2.037	2.449	2.738	32
35	1.306	1.690	2.030	2.438	2.725	35
40	1.303	1.684	2.021	2.423	2.704	40
45	1.301	1.679	2.014	2.412	2.690	45
50	1.299	1.676	2.009	2.403	2.678	50
60	1.296	1.671	2.000	2.390	2.660	60
75	1.293	1.665	1.992	2.377	2.643	75
100	1.290	1.660	1.984	2.364	2.626	100
120	1.289	1.658	1.980	2.358	2.617	120
140	1.288	1.656	1.977	2.353	2.611	140
180	1.286	1.653	1.973	2.347	2.603	180
250	1.285	1.651	1.969	2.341	2.596	250
400	1.284	1.649	1.966	2.336	2.588	400
1000	1.282	1.646	1.962	2.330	2.581	1000
∞	1.282	1.645	1.960	2.326	2.576	∞
Confidence levels	80%	90%	95%	98%	99%	