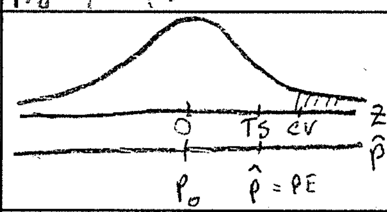
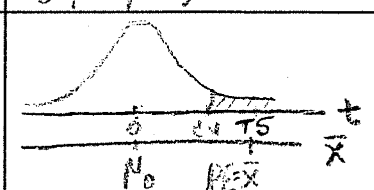
Sample Size — Confidence Intervals — Hypothosis Tests

Formula page Requirements	Statistics	Estimate Population Parameter with Confidence interval		Testing a claim with a Hypothesis Test	
n=Size of population	Find Sample Size	Confidence Intervals One sample	Confidnece Interval Two samples	Test Statistic One Sample	Test Statistic Two sample
Proportion	approx. p known	7.1 **1-PropZInt**	9.1 **2-PropZInt**	8.2 **1-PropZTest**	9.1 **2PropZTest**
requirements np>5, nq>5 Use Normal Distribution $\hat{p}$=x/n $\hat{q}$=1-$\hat{p}$	7.1 $n=\frac{z_{\alpha/2}^2\cdot\hat{p}\cdot\hat{q}}{E^2}$ $\hat{p}$ = given Approx. approx. p Unknown 7.1 $n=\frac{z_{\alpha/2}^2\cdot .25}{E^2}$	PE:p = x/n E= $z_{\alpha/2}\sqrt{\frac{\hat{p}\hat{q}}{n}}$ CV: $z_{\alpha/2}$ = invnorm(1-α/2,0,1) $\hat{p}$ - E < p < $\hat{p}$ + E $(LB, UB)=(\hat{p}-E, \hat{p}+E)$ $E=\frac{UB+LB}{2}$, $\hat{p}=\frac{UB-LB}{2}$	PE: $\hat{p}_1-\hat{p}_2$ E = $z_{\alpha/2}\sqrt{\frac{\hat{p}_1\hat{q}_1}{n_1}+\frac{\hat{p}_2\hat{q}_2}{n_2}}$ $(\hat{p}_1-\hat{p}_2)-E<p_1-p_2<(\hat{p}_1-\hat{p}_2)+E$	Ho: $p=p_0$ PE:$\hat{p}$=x/n TS: $z=\frac{\hat{p}-p_0}{\sqrt{pq/n}}$ CV: z* = invnorm(area) P-value= normalcdf(TS,999) RT normalcdf(-999,TS) LT mult. by 2 for 2tail	Ho: $p_1=p_2$, $p_1-p_2=0$ PE: $\hat{p}_1-\hat{p}_2=\frac{x_1}{n_1}-\frac{x_2}{n_2}$ TS: $z=\frac{\hat{p}_1-\hat{p}_2}{\sqrt{\frac{\bar{p}\bar{q}}{n_1}+\frac{\bar{p}\bar{q}}{n_2}}}$ Use TI CV: z* = invnorm(area) P-value=ncdf(LB,UB) $\bar{p}=(x_1+x_2)/(n_1+n_2)$
Mean = μ **σ Known** σ = Pop. SD n>30 or normal	7.2 $n=\left(\frac{z_{\alpha/2}\cdot\sigma}{E}\right)^2$	Skip **ZInterval** $E=z_{\alpha/2}\cdot\sigma/\sqrt{n}$ $\bar{x}-E<\mu<\bar{x}+E$	Always Assume that the Population Standard deviation is Unknown for two sample means.	**ZTest** Ho: $\mu=\mu_0$ PE: $\bar{x}$ TS: $z=(\bar{x}-\mu_0)/(\sigma/\sqrt{n})$ CV: z^* = InvNorm(area)	Always Assume that the Population Standard deviation is Unknown for two sample means.
Mean = μ **σ Unknown** Use t-distribution σ = Pop. SD unknown n>30 or normal parent population If n < 30 Check normal Histogram QQPlot	7.2 $n=\left(\frac{t_{\alpha/2}\cdot s}{E}\right)^2$ df = n-1 and s from preliminary Sample	7.2 **TInterval** PE: $\bar{x}$ CV: $t_{\alpha/2}$ = invT(1-α/2,df) E = $t_{\alpha/2}\cdot s/\sqrt{n}$ For Data use 1-VarStat(L1) to find $\bar{x}$ and S $\bar{x}-E<\mu<\bar{x}+E$ $\bar{x}=\frac{UB+LB}{2}$ 7.5 Prog. S2Int, inv X2	9.3 **TInterval on L3=L1-L2** **Matched Pairs**, df = n - 1, n = # pairs PE: $\bar{d}=\bar{x}$ 1-VarStat L3 E = $t_{\alpha/2}\cdot\sigma/\sqrt{n}$ $\bar{d}-E<\mu_d<\bar{d}+E$ 9.2 **2-SampTInterval** **Independent** df = smaller(n1-1,n2-1) PE: $\bar{x}_1-\bar{x}_2$ E = $t_{\alpha/2}\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}$ $(\bar{x}_1-\bar{x}_2)-E<\mu_1-\mu_2<(\bar{x}_1-\bar{x}_2)+E$	8.3 **TTest** Ho: $\mu=\mu_0$ PE: $\bar{x}$ TS: $t=\frac{(\bar{x}-\mu_0)}{(s/\sqrt{n})}$ CV:t* = invT(area,df) RT area = 1−α LT area= α 2T area = 1−α/2 df=n−1 P-value= RT tcdf(TS,9999, df) LT tcdf(-9999,TS,df) 2T multiply by 2	9.3 **TTest on L3=L1-L2** **Matched Pairs**, df = n - 1, n = # pairs Ho: $\mu_d=0$ 1-Varstat L3 PE: $\bar{d}$ $\bar{x}=\bar{d}$ $s_x=s_d$ TS: $t=\frac{\bar{d}-\mu_d}{(s_d/\sqrt{n})}$ CV:t* = InvT(Area, df) P-value=tcdf(LB,UB) df 9.2 **2-SampTTest** **Independent** df = smaller(n1-1,n2-1) Ho: $\mu_1=\mu_2$ or $\mu_1-\mu_2=0$ PE: $\bar{x}_1-\bar{x}_2$ TS: $t=(\bar{x}_1-\bar{x}_2)/\sqrt{\frac{s_1^2}{n_1}-\frac{s_2^2}{n_2}}$ CV: t^* = InvT(Area,df) P-value=tcdf(LB,UB) df
Standard Deviation	Table 7.2	7.5 CV: inv X2 PRGM $\sqrt{\frac{(n-1)s^2}{\chi_R^2}}<\sigma<\sqrt{\frac{(n-1)s^2}{\chi_L^2}}$			

UB = upper bound of Confidence interval
LB = Lower bound

RT = right Tail
LT = Left Tail

Steps for Hypothesis testing

	Steps	Proportions	Means
1	Check requirements SRS	np>5 and nq>5	n>30 or parent poulation is normal
2	**Ho and H1** Write null and alternate hypothesis: Rules Ho always = If Claim: $<, >, \neq$ Then H_1: Same If Claim: $\leq, \geq, =$ Then H_1: $>, <, \neq$	$H_0: p = p_0$ $H_1: p < p_0, p > p_0,$ OR $p \neq p_0$	$H_0: \mu = \mu_0$ $H_1: \mu < \mu_0, \mu > \mu_0$ or $\mu \neq \mu_0$
3	**PE: Point Estimate** Our best guess of the population parameter based on our sample summary statistics	$\hat{p} = \frac{x}{n}$ $\hat{q} = 1 - \hat{p}$ n = sample size x = # of successes	$\bar{x}, s, n$ Given or 1-VarStat
4	**CV: Critical Values** TS further from zero than CV are statistically significant	CV: $z^* =$ invnorm(Area Left, 0, 1) Area Left $= \begin{cases} \alpha & \text{Left} \\ 1-\alpha & \text{Right} \\ 1-\frac{\alpha}{2} & \text{Two Tails} \end{cases}$	CV: $t^* =$ invT(Area Left, df) $df = n - 1$ area $= \alpha$ (Lt), $1-\alpha$ (Rt), $1-\frac{\alpha}{2}$ (Two)
5	**TS: Test Statistics** The T-score or Z-score of the PE assuming that Ho is true	TS: $z = \dfrac{\hat{p} - p_0}{\sqrt{\frac{p_0 q_0}{n}}}$ $H_0: p = p_0$	TS: $t = \dfrac{\bar{x} - \mu_0}{s/\sqrt{n}}$ $H_0: \mu = \mu_0$,
6	**Draw** Sampling Distribution Include: Ho, CV, TS, PE Shade critical Region	 	
7	**P-Value** Probability of being more extreme than Test Statistic	P-Value = LT = ncdf(-9999, TS, 0, 1) RT = ncdf(TS, 9999, 0, 1) Two = 2 · Smaller of LT & RT	P-Value = LT = Tcdf(-9999, TS, df) RT = Tcdf(TS, 9999, df) Two = 2 · Min(LT, RT)
8	**Initial Conclusion** Reject Ho or Fail to Reject Ho	fail to Reject that $H_0: p = p_0$	Reject that $H_0: \mu = \mu_0$
9	**Final Conclusion**: Use description of population given in the Question.	TINSE to Reject that (pop. prop.) is equal to p_0, and we can't support that $p > p_0$	TISE to Reject that (pop. Mean) equals μ_0, we can support $\mu > \mu_0$.