Summary: Inferences Involving One Population

Q: Are conditions met for me to use z or t-table? → Am I dealing with p or μ ? → Do I know σ? → Use z-table

↓ NO → Cannot Proceed

↓ p → Use z-table

↓ NO → Use t-table

What you want to Infer About	Sample	Standard Deviation Given in Problem	Table Used	Justification of Use of Table	Test Statistic for Hypothesis Test	Confidence Interval
μ (Actual Population Mean)	n = sample size $\overline{x}$ = sample mean	σ (Actual Population Standard Deviation)	z - table	$n \geq 30$ or Population from which the sample is taken is normal	$z = \frac{\overline{x} - \mu_o}{\sigma/\sqrt{n}}$ μ_o = hypothesized mean	$\overline{x} - E < \mu < \overline{x} + E$ $E = z_{\alpha/2} \cdot \sigma/\sqrt{n}$ $1 - \alpha$ = confidence level $z_{\alpha/2}$ is the z value that bounds a TAIL area of $\alpha/2$
μ (Actual Population Mean)	n = sample size $\overline{x}$ = sample mean	s (Sample standard deviation)	t-table Degrees of Freedom $n - 1$	$n \geq 30$ or Population from which the sample is taken is normal	$t = \frac{\overline{x} - \mu_o}{s/\sqrt{n}}$ μ_o = hypothesized mean	$\overline{x} - E < \mu < \overline{x} + E$ $E = t_{\alpha/2} \cdot s/\sqrt{n}$ $1 - \alpha$ = confidence level $t_{\alpha/2}$ is the t value that bounds a TAIL area of $\alpha/2$
p (Actual Population Proportion with desired characteristic)	n = sample size $p' = x/n$ = sample proportion x = # of people in sample with desired characteristic	No standard deviation given but you can find it with either p_o or p'	z - table	For Hypothesis Testing: $n\,p_o \geq 5$ $n(1 - p_o) \geq 5$ p_o = hypothesized proportion For Confidence Interval: $np' \geq 5$ $n(1 - p') \geq 5$	$z = \frac{p' - p_o}{\sigma_o}$ $\sigma_o = \sqrt{\frac{p_o(1 - p_o)}{n}}$ p_o = hypothesized proportion	$p' - E < p < p' + E$ $E = z_{\alpha/2} \cdot s$ $1 - \alpha$ = confidence level $z_{\alpha/2}$ is the z value that bounds a TAIL area of $\alpha/2$ $s = \frac{p'(1 - p')}{n}$

What to include in a Hypothesis Test:

1- State H_o and H_a
2- Justify the use of the z or t table
3- Determine the rejection region (illustrate)
4- Calculate the test statistic
5- Determine whether or not to reject H_o
6- Write a brief conclusion interpreting your decision

* Note that you might have to use classical approach or p-value approach depending on what the question asks

Summary: Inferences Involving TWO Populations

Q: Are conditions met for me to use z or t-table? → Do I know σ_1 & σ_2? → Use z-table

↓ NO (Are conditions met?) → Cannot Proceed

↓ NO (Do I know σ_1 & σ_2?) → Use t-table

What you want to Infer About	Sample	Standard Deviation Given in Problem	Table Used	Justification of Use of Table	Test Statistic for Hypothesis Test	Confidence Interval
$\mu_1 - \mu_2$ (Difference of Actual Population Means)	n_1 = sample size of first population n_2 = sample size of second population $\overline{x}_1$ = sample mean of first population $\overline{x}_2$ = sample mean of second population	σ_1 & σ_2 (Actual Population Standard Deviations)	z - table	**For BOTH populations** $n \geq 30$ or Population from which the sample is taken is normal	$z = \dfrac{\overline{x}_1 - \overline{x}_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$	$(\overline{x}_1 - \overline{x}_2) - E < \mu < (\overline{x}_1 - \overline{x}_2) + E$ $E = z_{\alpha/2}\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$ $1 - \alpha$ = confidence level $z_{\alpha/2}$ is the z value that bounds a TAIL area of $\alpha/2$
$\mu_1 - \mu_2$ (Difference of Actual Population Means)	n_1 = sample size of first population n_2 = sample size of second population $\overline{x}_1$ = sample mean of first population $\overline{x}_2$ = sample mean of second population	s_1 & s_2 (Sample standard deviations)	t-table Degrees of Freedom $\dfrac{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^2}{\frac{s_1^4}{(n_1)^2(n_1-1)} + \frac{s_2^4}{(n_2)^2(n_2-1)}}$	**For BOTH populations** $n \geq 30$ or Population from which the sample is taken is normal	$t = \dfrac{x_1 - x_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$	$(\overline{x}_1 - \overline{x}_2) - E < \mu < (\overline{x}_1 - \overline{x}_2) + E$ $E = t_{\alpha/2}\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$ $1 - \alpha$ = confidence level $t_{\alpha/2}$ is the t value that bounds a TAIL area of $\alpha/2$

What to include in a Hypothesis Test:

1- State H_0 and H_a
2- Justify the use of the z or t table
3- Determine the rejection region (illustrate)
4- Calculate the test statistic
5- Determine whether or not to reject H_0
6- Write a brief conclusion interpreting your decision

* Note that you might have to use classical approach or p-value approach depending on what the question asks