KEY POINTS

chapter 10

Type I error (false positive) occurs when you incorrectly reject a true null hypothesis,

Type II error (false negative) happens when you fail to reject a false null hypothesis.

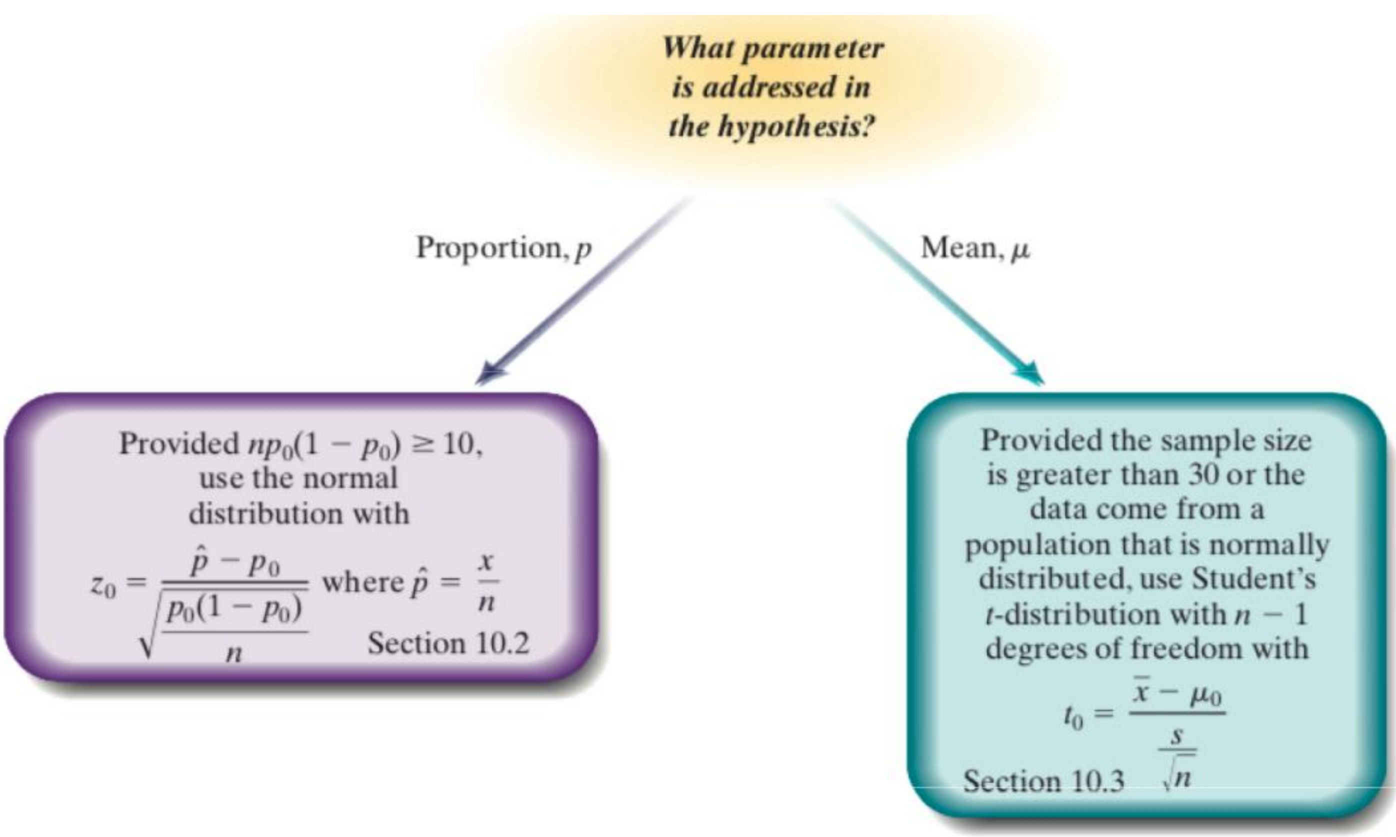
P = population proportion

σ = population standard deviation

μ = mean

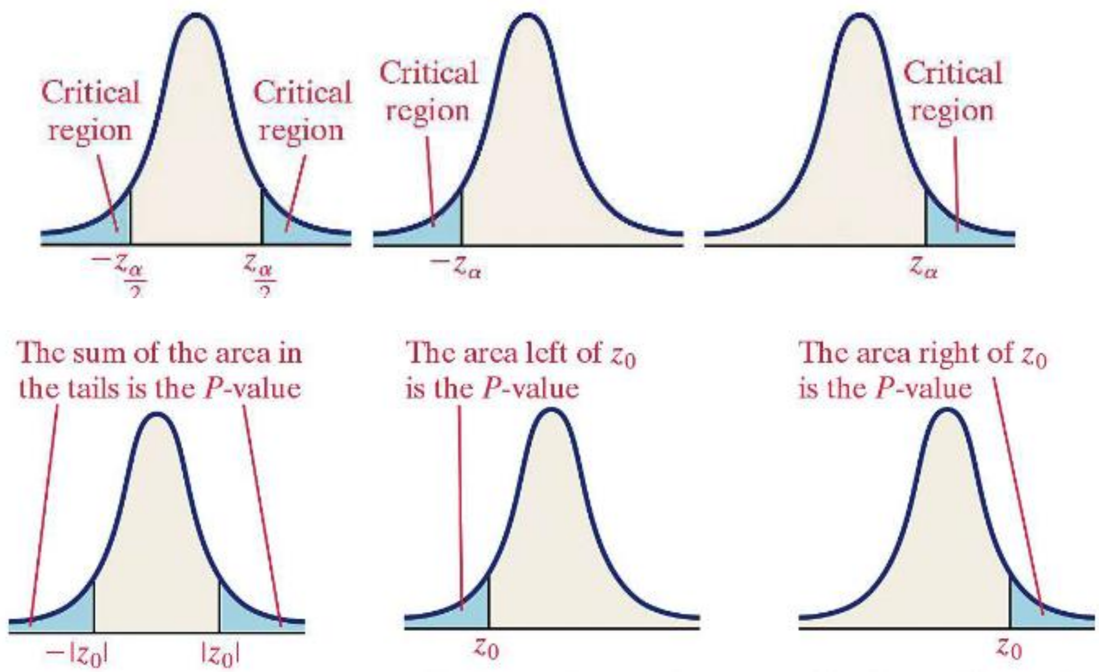
$p < \alpha$ = "is sufficient" = you reject

$p > \alpha$ = "is NOT sufficient" = you DON'T reject



Population Proportion

	Two-Tailed	Left-Tailed	Right-Tailed
	$H_0: p = p_0$	$H_0: p = p_0$	$H_0: p = p_0$
	$H_1: p \neq p_0$	$H_1: p < p_0$	$H_1: p > p_0$
Critical value	$-z_{\frac{\alpha}{2}}$ and $z_{\frac{\alpha}{2}}$	$-z_{\alpha}$	z_{α}



P-value $= 2P(z > |z_0|)$ | P-value $= P(z < z_0)$ | P-value $= P(z > z_0)$

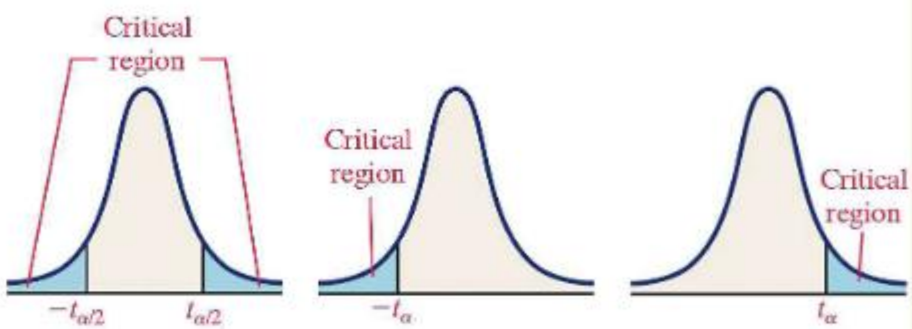
- the sample is obtained by simple random sampling or the data result from a randomized experiment.
- $np_0(1 - p_0) \geq 10$.
- the sampled values are independent of each other. That is, the sample size is less than 5% of the population size.

Population Mean

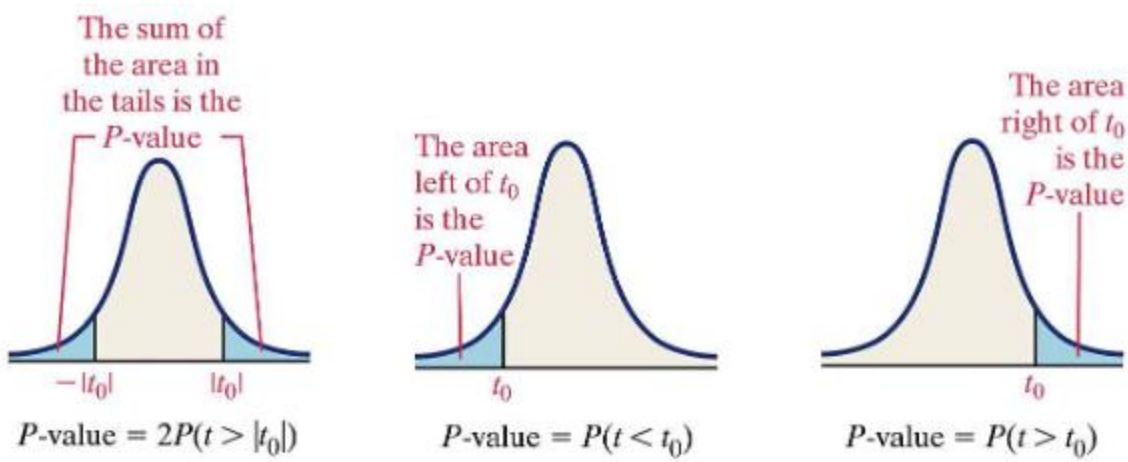
p < α = “is sufficient” = you reject

p > α = “is NOT sufficient” = you DON’T reject

	Two-Tailed	Left-Tailed	Right-Tailed
	H_0: $\mu = \mu_0$	H_0: $\mu = \mu_0$	H_0: $\mu = \mu_0$
	H_1: $\mu \neq \mu_0$	H_1: $\mu < \mu_0$	H_1: $\mu > \mu_0$
Critical value(s)	$-t_{\frac{\alpha}{2}}$ and $t_{\frac{\alpha}{2}}$	$-t_{\alpha}$	t_{α}



If **t-value** falls in <u>between</u> the critical values on a number line, **REJECT & IS SUFFICIENT**



- the sample is obtained using simple random sampling or from a randomized experiment.
- the sample has no outliers and the population from which the sample is drawn is normally distributed, or the sample size, n, is large ($n \geq 30$).
- the sampled values are independent of each other. That is, the sample size is less than 5% of the population size.

P-value is the likelihood or probability that a sample will result in a statistic such as the one obtained if the statement in the null hypothesis is true.

BOTTOM LINE IS the lower the P-value, the stronger the evidence against the statement in the null hypothesis.

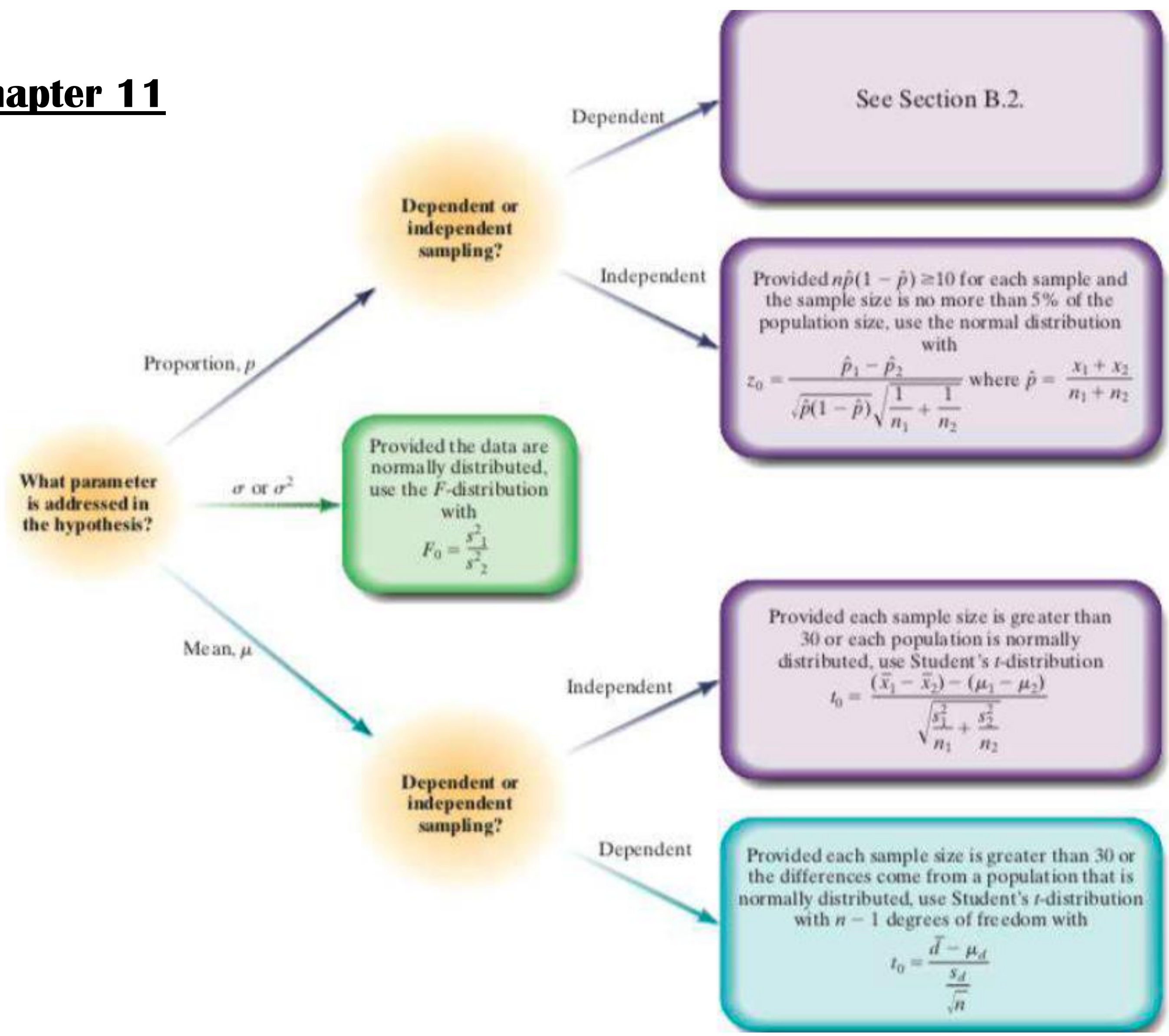
Confidence Interval Critical Values, $z_{\alpha/2}$

Level of Confidence	Critical Value, $z_{\alpha/2}$
0.90 or 90%	1.645
0.95 or 95%	1.96
0.98 or 98%	2.33
0.99 or 99%	2.575

(c) Hypothesis Testing Critical Values

Level of Significance, α	Left-Tailed	Right-Tailed	Two-Tailed
0.10	−1.28	1.28	±1.645
0.05	−1.645	1.645	±1.96
0.01	−2.33	2.33	±2.575

chapter 11



A sampling method is **independent** when an individual selected for one sample does not dictate which individual is to be in a second sample. A sampling method is **dependent** when an individual selected to be in one sample is used to determine the individual in the second sample. Dependent samples are often referred to as **matched-pairs** samples. It is possible for an individual to be matched against him or herself.

- the samples are independently obtained using simple random sampling or through a completely randomized experiment with two levels of treatment,
- $n_1\hat{p}_1(1-\hat{p}_1) \geq 10$ and $n_2\hat{p}_2(1-\hat{p}_2) \geq 10$, and
- $n_1 \leq 0.05N_1$ and $n_2 \leq 0.05N_2$ (the sample size is no more than 5% of the population size); this requirement ensures the independence necessary for a binomial experiment.

Two-Tailed	Left-Tailed	Right-Tailed
H_0: $p_1 = p_2$	H_0: $p_1 = p_2$	H_0: $p_1 = p_2$
H_1: $p_1 \neq p_2$	H_1: $p_1 < p_2$	H_1: $p_1 > p_2$

Note: p_1 is the population proportion for population 1, and p_2 is the population proportion for population 2.

Two-Tailed	Left-Tailed	Right-Tailed
If $z_0 < -z_{\frac{\alpha}{2}}$ or $z_0 > z_{\frac{\alpha}{2}}$, reject the null hypothesis.	If $z_0 < -z_{\alpha}$, reject the null hypothesis.	If $z_0 > z_{\alpha}$, reject the null hypothesis.

for large sample size

- the sample is obtained using simple random sampling or the data result from a matched-pairs design experiment.
- the sample data are dependent (matched pairs).
- the differences are normally distributed with no outliers or the sample size, n, is large ($n \geq 30$).
- the sampled values are independent (sample size is no more than 5% of population size).

Two-Tailed	Left-Tailed	Right-Tailed
$H_0: \mu_d = 0$	$H_0: \mu_d = 0$	$H_0: \mu_d = 0$
$H_1: \mu_d \neq 0$	$H_1: \mu_d < 0$	$H_1: \mu_d > 0$

Two-Tailed	Left-Tailed	Right-Tailed
If $t_0 < -t_\alpha$ or t_0 ... nu	If $t_0 < -t_\alpha$, reject	If $t_0 > t_\alpha$, reject the

Suppose that a simple random sample of size n_1 is taken from a population with unknown mean μ_1 and unknown standard deviation σ_1. In addition, a simple random sample of size n_2 is taken from a population with unknown mean μ_2 and unknown standard deviation σ_2.

Two-Tailed	Left-Tailed	Right-Tailed
$H_0: \mu_1 = \mu_2$	$H_0: \mu_1 = \mu_2$	$H_0: \mu_1 = \mu_2$
$H_1: \mu_1 \neq \mu_2$	$H_1: \mu_1 < \mu_2$	$H_1: \mu_1 > \mu_2$

Two-Tailed	Left-Tailed	Right-Tailed
If $t_0 < -t_{\frac{\alpha}{2}}$ or $t_0 > t_{\frac{\alpha}{2}}$, reject the null hypothesis.	If $t_0 < -t_\alpha$, reject the null hypothesis.	If $t_0 > t_\alpha$, reject the null hypothesis.