Formula Sheet Chapters 7 & 8 Test

P-value Decision Rule

1. If $P \leq \alpha$, then reject H_0.

2. If $P \geq \alpha$, then fail to reject H_0.

Interpretation table

	Claim is H_0	Claim is H_a
Reject H_0	There is enough evidence to reject the claim.	There is enough evidence to support the claim.
Fail to reject H_0	There is not enough evidence to reject the claim.	There is not enough evidence to support the claim.

Finding the P-value

a. For a left-tailed test, P = (Area in left tail).

b. For a right-tailed test, P = (Area in right tail).

c. For a two-tailed test, P = 2(Area in tail of test statistic).

z-Test for a mean μ

Used when the population is normal and σ known, or when $n \geq 30$. When $n \geq 30$, you may use s instead of σ.

$$z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}}$$

t-Test for a mean μ

Used when the population is normal, σ unknown, and $n < 30$.

$$t = \frac{\bar{x} - \mu}{\left(\frac{s}{\sqrt{n}}\right)}, \quad \text{d.f.} = n - 1$$

z-Test for a proportion *p*

Used when $np \geq 5$ and $nq \geq 5$.

$$z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}}$$

χ^2-Test for a Variance σ^2 or Standard Deviation σ

Used when the population is normal.

$$X^2 = \frac{(n-1)s^2}{\sigma^2}, \quad \text{d.f.} = n - 1$$

Two-Sample z-Test for the Difference Between Means

Used when samples are randomly selected and independent. The populations must be normally distributed and population standard deviations known, or both have sample size at least 30. When both have sample size at least 30, you may use s_1 and s_2 instead of σ_1 and σ_2.

$$z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

Two-Sample t-Test for the Difference Between Means

Used when samples are randomly selected and independent. The populations must be normally distributed.

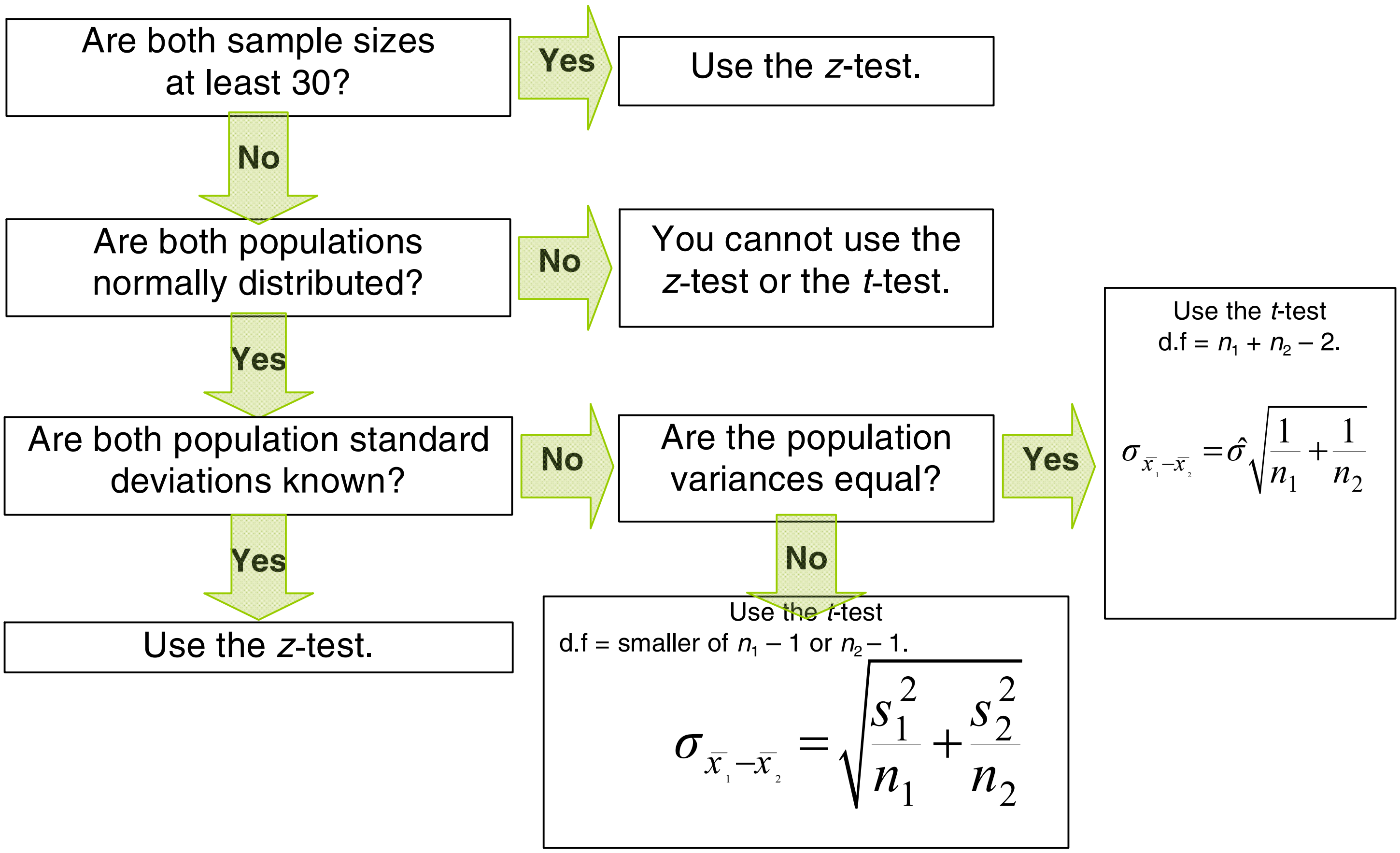
$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sigma_{\bar{x}_1 - \bar{x}_2}}$$

If the population variances are equal, then $\sigma_{\bar{x}_1 - \bar{x}_2} = \hat{\sigma}\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$ where $\hat{\sigma} = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}}$

and d.f. $= n_1 + n_2 - 2$.

If the population variances are not equal, then $\sigma_{\bar{x}_1 - \bar{x}_2} = \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$ where d.f. = smaller of $n_1 - 1$ or $n_2 - 1$.

Normal or *t*-Distribution?



t-Test for the Difference Between Means

Used when a sample is randomly selected from each population, each population is normal, and the samples are dependent.

$$t = \frac{\bar{d} - \mu_d}{s_d / \sqrt{n}}, \quad s_d = \sqrt{\frac{n\left(\sum d^2\right) - \left(\sum d\right)^2}{n(n-1)}}, \quad \text{d.f.} = n - 1$$

Two-Sample z-Test for the Difference Between Proportions

Used when a sample is randomly selected from each population.

$$z = \frac{(\hat{p}_1 - \hat{p}_2) - (p_1 - p_2)}{\sqrt{\bar{p}\bar{q}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$ where $\bar{p} = \frac{x_1 + x_2}{n_1 + n_2}$ and $\bar{q} = 1 - \bar{p}$. $n_1\bar{p},\ n_1\bar{q},\ n_2\bar{p},\ n_2\bar{q}$ must be at least 5.