The management at New Century Bank claims that the mean waiting time for all customers at its branches is less than that at the Public Bank, which is its main competitor. A business consulting firm took a sample of 200 customers from the New Century Bank and found that they waited an average of 4.5 minutes before being served. Another sample of 300 customers taken from the Public Bank showed that these customers waited an average of 4.75 minutes before being served. Assume that the two populations are normally distributed with population standard deviations of 1.2 minutes (New Century Bank) and 1.5 minutes (Public Bank).

σ_1 and σ_2 unknown and equal

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- **Independent Samples**
- **Unknown σ_1 and σ_2 but assumed to be unequal**
- **At LEAST ONE of the following is true**
  - **Both samples are "large"**
  - **If either sample is small, both populations are normally distributed.**

Pooled Sample Standard Deviation

- **By assuming σ_1 and σ_2 equal, we can use σ for both σ_1 and σ_2. Because σ is unknown, we replace it by its point estimator, s_p, or the *pooled sample standard deviation*.**
- **s_p is an estimator of σ.**

$$s_p = \sqrt{\frac{(n_1 - 1)s_1^{\,2} + (n_2 - 1)s_2^{\,2}}{n_1 + n_2 - 2}}$$

$$s_{\bar{x}_1 - \bar{x}_2} = s_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$$

FORMULAS YOU WILL USE

- **Confidence Interval:** $(\bar{x}_1 - \bar{x}_2) \pm t s_{\bar{x}_1 - \bar{x}_2}$
- **Test statistic for an hypothesis test:**

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{s_{\bar{x}_1 - \bar{x}_2}} = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{s_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

p. 447, #17

The following information is obtained from two independent samples selected from 2 populations with equal but unknown standard deviations.

$n_1 = 25$ $\bar{x}_1 = 12.5$ $s_1 = 3.75$

$n_2 = 20$ $\bar{x}_2 = 14.6$ $s_2 = 3.1$

a) What is the point estimate of $\mu_1 - \mu_2$?

b) Construct a 95% confidence interval for $\mu_1 - \mu_2$.

p. 449, #19

Test at the 5% significance level if the two population means are different.

n_1 = 25 $\bar{x}_1$= 12.5 s_1 = 3.75

n_2 = 20 $\bar{x}_2$= 14.6 s_2 = 3.1

- **P. 450 #25**

n_1 = $\bar{x}_1$ = s_1 =

n_2 = $\bar{x}_2$ = s_2 =

a) Construct a 99% confidence interval for the difference between the mean amounts spent by all male and female customers at this store.

b) Using the 2.5% significance level, can you conclude that the mean amount spent by all male customers is less than that spent by female customers?