

1. [6 pts.] In random samples of 25 from each of two normal populations, we found the following statistics:

$$\bar{X}_1 = 524 \quad s_1 = 129$$

$$\bar{X}_2 = 469 \quad s_2 = 141$$

Do we have a reason to believe that population variances are equal?

2. [12 pts.] For each of the following, determine the number of degrees of freedom assuming equal population variances and unequal population variances.
- $n_1 = 15, n_2 = 15, s_1^2 = 25, s_2^2 = 15$
 - $n_1 = 10, n_2 = 16, s_1^2 = 100, s_2^2 = 15$
 - $n_1 = 50, n_2 = 50, s_1^2 = 8, s_2^2 = 14$
 - $n_1 = 60, n_2 = 45, s_1^2 = 75, s_2^2 = 10$

3. [12 pts.] (Use HW3 P3.xlsx) Every month a clothing store conducts an inventory and calculates losses from theft. The store would like to reduce these losses and is considering two methods. The first is to hire a security guard, and the second is to install cameras. To help decide which method to choose, the manager hired a security guard for 6 months. During the next 6-month period, the store installed cameras. The monthly losses were recorded and are listed here. The manager decided that because the cameras were cheaper than the guard, he would install the cameras unless there was enough evidence to infer that the guard was better. What should the manager do? Assume significance level 5%

Security guard	355	284	401	398	477	254
Cameras	486	303	270	386	411	435

4. [12 pts.] (Use HW3 P4.xlsx) Are Americans more deeply in debt this year compared to last year? To help answer this question, a statistics practitioner randomly sampled Americans this year and last year. The sampling was conducted so that the samples were matched by the age of the head of the household. For each, the ratio of debt payments to household income was recorded. Can we infer that the ratios are higher this year than last? Use 5% significance level.

5. [18 pts.] Random samples from two binomial populations yielded the following statistics:

$$\hat{p}_1 = .45 \quad n_1 = 100 \quad \hat{p}_2 = .40 \quad n_2 = 100$$

- Calculate the *p-value* of a test to determine whether we can infer that the population proportions differ.
- Repeat part (a) increasing the sample sizes to 400.
- Describe what happens to the *p-value* when the sample sizes increase.