
Homework 2

2.11. The breaking strength of a fiber is required to be at least 150 psi. Past experience has indicated that the standard deviation of breaking strength is $\sigma = 3$ psi. A random sample of four specimens is tested. The results are $y_1=145$, $y_2=153$, $y_3=150$ and $y_4=147$.

- (a) State the hypotheses that you think should be tested in this experiment.
- (b) Test these hypotheses using $\alpha = 0.05$. What are your conclusions?
- (c) Find the P -value for the test in part (b).
- (d) Construct a 95 percent confidence interval on the mean breaking strength.

2.15. The shelf life of a carbonated beverage is of interest. Ten bottles are randomly selected and tested, and the following results are obtained:

Days	
108	138
124	163
124	159
106	134
115	139

- (a) We would like to demonstrate that the mean shelf life exceeds 120 days. Set up appropriate hypotheses for investigating this claim.
- (b) Test these hypotheses using $\alpha = 0.01$. What are your conclusions?
- (c) Find the P -value for the test in part (b).
- (d) Construct a 99 percent confidence interval on the mean shelf life.

2.19. Two machines are used for filling plastic bottles with a net volume of 16.0 ounces. The filling processes can be assumed to be normal, with standard deviation of $\sigma_1 = 0.015$ and $\sigma_2 = 0.018$. The quality engineering department suspects that both machines fill to the same net volume, whether or not this volume is 16.0 ounces. An experiment is performed by taking a random sample from the output of each machine.

Machine 1		Machine 2	
16.03	16.01	16.02	16.03
16.04	15.96	15.97	16.04
16.05	15.98	15.96	16.02
16.05	16.02	16.01	16.01
16.02	15.99	15.99	16.00

- (a) State the hypotheses that should be tested in this experiment
- (b) Test these hypotheses using $\alpha=0.05$. What are your conclusions?
- (c) What is the P -value for the test?
- (d) Find a 95 percent confidence interval on the difference in the mean fill volume for the two machines.

2.21. The following are the burning times (in minutes) of chemical flares of two different formulations. The design engineers are interested in both the means and variance of the burning times.

Type 1		Type 2	
65	82	64	56
81	67	71	69
57	59	83	74
66	75	59	82
82	70	65	79

- (a) Test the hypotheses that the two variances are equal. Use $\alpha = 0.05$.
- (b) Using the results of (a), test the hypotheses that the mean burning times are equal. Use $\alpha = 0.05$. What is the P -value for this test?

2.23. A new filtering device is installed in a chemical unit. Before its installation, a random sample yielded the following information about the percentage of impurity: $\bar{y}_1 = 12.5$, $S_1^2 = 101.17$, and $n_1 = 8$. After installation, a random sample yielded $\bar{y}_2 = 10.2$, $S_2^2 = 94.73$, $n_2 = 9$.

- (a) Can you conclude that the two variances are equal? Use $\alpha = 0.05$.
- (b) Has the filtering device reduced the percentage of impurity significantly? Use $\alpha = 0.05$.