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Chapter 2

Simple Comparative Experiments

Solutions

2-1 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.

$$H_0: \mu = 150 \quad H_1: \mu > 150$$

- (b) Test these hypotheses using $\alpha = 0.05$. What are your conclusions?

$$n = 4, \quad \sigma = 3, \quad \bar{y} = 1/4 (145 + 153 + 150 + 147) = 148.75$$

$$z_\alpha = \frac{\bar{y} - \mu_0}{\frac{\sigma}{\sqrt{n}}} = \frac{148.75 - 150}{\frac{3}{\sqrt{4}}} = \frac{-1.25}{\frac{3}{2}} = -0.8333$$

Since $z_{0.05} = 1.645$, do not reject.

- (c) Find the P -value for the test in part (b).

$$\text{From the } z\text{-table: } P \cong 1 - [0.7967 + (2/3)(0.7995 - 0.7967)] = 0.2014$$

- (d) Construct a 95 percent confidence interval on the mean breaking strength.

The 95% confidence interval is

$$\begin{aligned} \bar{y} - z_{\alpha/2} \frac{\sigma}{\sqrt{n}} &\leq \mu \leq \bar{y} + z_{\alpha/2} \frac{\sigma}{\sqrt{n}} \\ 148.75 - (1.96)(3/2) &\leq \mu \leq 148.75 + (1.96)(3/2) \\ 145.81 &\leq \mu \leq 151.69 \end{aligned}$$

2-2 The viscosity of a liquid detergent is supposed to average 800 centistokes at 25°C. A random sample of 16 batches of detergent is collected, and the average viscosity is 812. Suppose we know that the standard deviation of viscosity is $\sigma = 25$ centistokes.

- (a) State the hypotheses that should be tested.

$$H_0: \mu = 800 \quad H_1: \mu \neq 800$$

- (b) Test these hypotheses using $\alpha = 0.05$. What are your conclusions?



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