

Question #9

a) $\bar{x} = 40$, $\sigma^2 = 16^2$, $\sigma = 16$, $n = 125$

$$H_0: \mu = 42$$

$$H_1: \mu \neq 42$$

$$\alpha = 0.05$$

This is two-tailed Z-test.

Type I error: Reject the claim that the true mean amount of time that it takes the workers to complete the assignment is 42 seconds when the true mean is actually 42 seconds.

$$Z = \frac{(40 - 42)}{\frac{16}{\sqrt{125}}} = -1.3915$$

$$Z_{\text{crit}} = \pm 1.96$$

$$P\text{-value} = 0.1623$$

Since $0.1623 > 0.05$, Fail to reject null hypothesis.

b) $\bar{x} = 40$, $S = 15$, $n = 125$

$$H_0: \mu = 42$$

$$H_1: \mu \neq 42$$

$$\alpha = 0.05$$

This is two-tailed t-test.

$$t = \frac{(40 - 42)}{\frac{15}{\sqrt{125}}} = -1.4907$$

$$t_{\text{crit}} = \pm 1.979 \text{ with } df = 125 - 1 = 124.$$

$$P\text{-value} = 0.1386$$

Since $0.1386 > 0.05$, Fail to reject null hypothesis.

Question #9

$$\textcircled{c} H_0: \sigma^2 = 17^2$$

$$H_a: \sigma^2 > 17^2$$

$$\alpha = 0.01$$

this right-tailed chi-square test.

$$\chi^2 = \frac{(n-1)s^2}{\sigma^2} = \frac{(125-1)15^2}{17^2} = 96.5398.$$

$$\chi^2_{\text{crit}} = 163.5465 \text{ with } df = 125-1 = 124.$$

$$P\text{-value} = 0.9678.$$

Since $0.9678 > 0.01$, do not reject null hypothesis.

Therefore, fail to reject null hypothesis and conclude that there is Not significant evidence of the Variance is greater 17^2 seconds at the 1% significance level.

d) Hypothesis test play a critical role in separating the signal from the noise. This protective function helps prevent you from mistaking random error for a real effect. If the appropriate hypothesis test is not statistically significant, your sample provides insufficient evidence for concluding that the pattern on your graph represents a real effect at the population level.