Assignment 03

23K-0800

Q 1

$\bar{x} = 1.8$, $n = 50$, $\sigma = 1/3$

$1 - \alpha = 0.90$

$\alpha = 0.1$

$\alpha/2 = 0.05$

$Z_{\alpha/2} = -1.645$

Applying formulae.

$$\bar{x} - Z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}} < \mu < \bar{x} + Z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$$

$$\Rightarrow 1.8 - (-1.645) \cdot \frac{1/3}{\sqrt{50}} < \mu < 1.8 + (-1.645) \cdot \frac{1/3}{\sqrt{50}}$$

$$1.72 < \mu < 1.88$$

This is lower than the study's average of 2.1 hours.

Q 2

$\bar{x} = 217.7$; $n = 10$; $s = 17.49$

$1 - \alpha = 0.95$ $\quad v = n - 1 = 9$

$\alpha = 0.05$ $\quad t_{\alpha/2} = 2.262$

$\alpha/2 = 0.025$

$$\bar{x} - t_{\alpha/2} \cdot \frac{s}{\sqrt{n}} < \mu < \bar{x} + t_{\alpha/2} \cdot \frac{s}{\sqrt{n}}$$

$$217.7 - (2.262)\frac{(17.49)}{\sqrt{10}} < \mu < 217.7 + (2.262)\frac{(17.49)}{\sqrt{10}}$$

$$205.19 \le \mu < 230.21$$

Q 3

$\bar{x} = 43,260$; $n = 30$; $\sigma = 5230$

Step 1:
H_0: $\mu \le 42,000$
H_1; $\mu > 42,000$

Step 2:
$\alpha = 0.05$ $\quad z = 1.645$

Step 3:
$$z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} \Rightarrow 1.32$$

Step 4:
$1.32 < 1.645$ Accept H_0.

Q 4

$\bar{x} = 26.64$ B ; $\sigma = 28.7$ B ; $n = 50$

Step 1:
H_0 : $\mu \le 24$ Billion
H_1 : $\mu > 24$ Billion

Step 2:
$$z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} \Rightarrow 0.65$$

Step 3:
$P(z > 0.65) = 0.2573$

Step 4:
0.257 Billion > 0.05

H_0 Accepted.

Q 5

$n = 20$; $\bar{x} = 3.85$; $s = 2.52$; $\alpha = 0.05$

Step 1:
H_0: $\mu = 5.8$
H_1: $\mu \ne 5.8$

Step 2
$$z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} \Rightarrow z = -3.46$$

Step 3:
$v = n - 1 = 20 - 1 = 19$
$t_{\alpha/2} = \pm 2.093$

Step 4
$-3.46 < -2.093$
H_1 accepted

Q 6

Material A: $n_1 = 12$; $\bar{x} = 85$; $\sigma = 4$
Material B: $n = 10$; $\bar{x} = 81$; $\sigma = 5$

$\alpha = 0.05$

Step 1
H_0 : $\mu_1 - \mu_2 \le 2$
H_1 $\mu_1 - \mu_2 > 2$

Step 2
$$S_p = \sqrt{\frac{(11)(16) + (9)(25)}{20}}$$
$S_p = 4.55$

Step 3:
$$t_0 = \frac{(\bar{x}_1 - \bar{x}_2) - \bar{d}}{S_p\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

Step 4:
$v = n_1 + n_2 - 2 = 20$

$$t_0 = \frac{(85 - 81) - 2}{4.55\sqrt{\frac{1}{12} + \frac{1}{10}}}$$

$t = 1.01$

Step 5:
Critical value of $t = 1.725$

Step 6
$1.01 < 1.725$

Accept H_0.