Assignment_9.11476

Solution 1:

$$H_0: \mu = Rs.52 \quad vs \quad H_1: \mu > Rs.52$$

$$n = 100, \quad \bar{x} = Rs.52.80, \quad \sigma = Rs.4.50, \quad \alpha = 0.05$$

Calculate the Z score as follows

$$Z^* = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$$

$$= \frac{52.8 - 52}{\frac{4.50}{\sqrt{100}}} = \frac{0.8}{0.45} = \mathbf{1.778}$$

Now we need to compute the appropriate ***p-value*** based on our alternative hypothesis.

$$P(Z > Z^*) = P(Z > 1.778)$$

$$= 1 - P(Z < 1.778)$$

$$= 1 - 0.9623 = \mathbf{0.0377} < 0.05$$

Since the calculated *p-value* (**0.0377**) is less than the level of significance (**0.05**), we reject the null hypothesis and conclude that the average cost of the bookstore textbook is higher than Rs. 52

Solution 2:

$$H_0: \mu = 34 \quad vs \quad H_1: \mu < 32.5$$

$$n = 50, \quad \bar{x} = 32.5, \quad \sigma = 8, \quad \alpha = 0.01$$

Calculate the Z score as follows

$$Z^* = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$$

$$= \frac{32.5 - 34}{\frac{8}{\sqrt{50}}} = \frac{-1.5}{1.13} = \mathbf{-1.33}$$

Now we need to compute the appropriate ***p-value*** based on our alternative hypothesis.

$$P(Z < Z^*) = P(Z < -1.33)$$

$$= 1 - P(Z < 1.33)$$

$$= 1 - 0.9082 = \mathbf{0.0918} > 0.01$$

From the above calculations the test statistic lies in the Acceptance Region for H_0 Therefore we fail to reject H_0

Solution 3:

$$H_0: \mu = 1135 \quad vs \quad H_1: \mu \neq 1031.31$$

$$n = 22, \quad \bar{x} = 1031.31, \quad \sigma = 240.37, \quad \alpha = 0.05/2$$

Calculate the Z score as follows

$$Z^* = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$$

$$= \frac{1031.31 - 1135}{\frac{240.37}{\sqrt{22}}} = \frac{103.69}{51.25} = -\mathbf{2.023}$$

Now we need to compute the appropriate ***p-value*** based on our alternative hypothesis.

$$P(Z > Z^*) = P(-2.02 < Z > 2.02)$$

$$= 1 - P(Z < 2.02)$$

$$= 1 - 0.9783 = \mathbf{0.0217} < \ 0.025$$

From the above calculations the test statistic lies in the rejection Region for H o
Therefore we reject H0

Solution 4:

$$H_0: \mu = 48{,}432 \quad vs \quad H_1: \mu \neq 48{,}574$$

$$n = 400, \quad \bar{x} = 48{,}574, \quad \sigma = 2000, \quad \alpha = 0.05$$

Calculate the Z score as follows

$$Z^* = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$$

$$= \frac{48{,}432 - 48{,}574}{\frac{2000}{\sqrt{400}}} = \frac{-142}{100} = -\mathbf{1.42}$$

Now we need to compute the appropriate ***p-value*** based on our alternative hypothesis.

$$P(Z > Z^*) = P(-2.02 < Z > 2.02)$$

$$= 1 - P(Z < 2.02)$$

$$= 1 - 0.9222 = \mathbf{0.0217} < \ 0.025$$

From the above calculations the test statistic lies in the Acceptance Region for H_0
Therefore we fail to reject H_0

Solution 5:

$$H_0: \mu = 32.28 \quad vs \quad H_1: \mu \neq 31.67$$

$$n = 19, \qquad \bar{x} = 31.67, \qquad \sigma = 1.29, \qquad \alpha = 0.05/2$$

Calculate the Z score as follows

$$Z^* = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$$

$$= \frac{31.67 - 32.28}{\frac{1.29}{\sqrt{19}}} = \frac{-0.61}{0.3} = -\mathbf{2.03}$$

Now we need to compute the appropriate ***p-value*** based on our alternative hypothesis.

$$P(Z > Z^*) = P(-2.03 < Z > 2.03)$$

$$= 1 - P(Z < 2.03)$$

$$= 1 - 0.9788 = \mathbf{0.0212} < \ 0.025$$

From the above calculations the test statistic lies in the Acceptance Region for H_0. Therefore we fail to reject H_0

Solution 6

B at μ = 52

$$=\frac{48.81-52}{\frac{2.5}{\sqrt{16}}} = \frac{-3.19}{0.625} = -\mathbf{5.104}$$

$$=\frac{51.19-52}{\frac{2.5}{\sqrt{16}}} = \frac{-0.81}{0.625} = -\mathbf{1.30}$$

$$=P(-5.10 \leq Z \leq -1.30)$$

$$=P(Z \leq -1.30) - P(Z \leq 5.10)$$

= (1-0.9032) – 0

=0.0968

B at μ = 50.5

$$=\frac{48.81-50.5}{\frac{2.5}{\sqrt{16}}} = \frac{-1.69}{0.625} = -\mathbf{2.7}$$

$$=\frac{51.19-50.5}{\frac{2.5}{\sqrt{16}}} = \frac{-0.69}{0.625} = -\mathbf{1.1}$$

$$=P(-2.7 \leq Z \leq -1.1)$$

$$=P(Z \leq -2.7) - P(Z \leq 1.1)$$

= (1-0.9965) – (1-0.8643)

=0.1322

☐ at μ = 50

$$=\frac{48.81-50}{\frac{2.5}{\sqrt{16}}} = \frac{-1.19}{0.625} = -1.904$$

$$=\frac{51.19-50}{\frac{2.5}{\sqrt{16}}} = \frac{1.19}{0.625} = 1.904$$

$$=P(Z < -1.904) + P(Z > 1.904)$$

=(1-0.9713)+ (1-0.9713)

=0.0574

☐ at μ = 50

$$=\frac{48.42-50}{\frac{2.5}{\sqrt{16}}} = \frac{-1.58}{0.625} = -2.528$$

$$=\frac{51.58-50}{\frac{2.5}{\sqrt{16}}} = \frac{1.58}{0.625} = 2.528$$

$$=P(Z < -2.528) + P(Z > 2.528)$$

=(1-0.9943)+ (1-.9943)

=0.0114

Acceptance Region	**Sample Size**	**α**	**B at μ = 52**	**B at μ = 50.5**
48.5 < x < 51.5	10	0.0574	0.2643	0.8923
48 < x < 52	10	0.0114	0.5	0.9705
48.81 < x < 51.19	16	0.0574	0.0968	0.1322
48.42 < x < 51.58	16	0.0114	0.2514	0.95815

Solution 7:

$$t^* = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}$$

$$= \frac{12 - 10}{\frac{1.5}{\sqrt{16}}} = \frac{2}{3.75}$$

$$= \mathbf{0.53}$$

Solution 8:

Df = 15

$$t^* = 4.073$$

Solution 9:

$$H_0: \mu = 300 \quad vs \quad H_1: \mu > 320$$

$$n = 16, \qquad \bar{x} = 320, \qquad \sigma = 41.26, \qquad \alpha = 0.05$$

$$t^* = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}$$

$$= \frac{320 - 300}{\frac{41.26}{\sqrt{16}}} = \frac{20}{10.32}$$

$$= \mathbf{1.94}$$

Now we need to compute the appropriate ***p-value*** based on our alternative hypothesis.

$$P(Z > Z^*) = P(Z > 1.94)$$

$$= 1 - P(Z < 1.94)$$

$$= 1 - 0.9738 = \mathbf{0.026} < 0.05$$

From the above calculations the test statistic lies in the rejection Region for H_0
Therefore reject H_0