Answer on Question #49016 – Math – Statistics and Probability

I surveyed each house on the block to determine how much we are spending on Halloween treats. The distribution below represents the results in dollars.

$ Spent	f
50-59	1
40-49	2
30-39	5
20-29	12
10-19	7
0-9	7

Calculate whether there has been a significant increase over the average 2010 figure of $18 reported in the neighborhood newspaper. State the hypotheses, alpha, df, and critical value.

Solution

Hypotheses are

H_o: There is not a significant increase over the average 2010 figure of $18 reported in the neighborhood newspaper.

H_a: There is a significant increase over the average 2010 figure of $18 reported in the neighborhood newspaper.

Evaluate

$$\overline{x} = \frac{\sum(xf)}{n} = \frac{7 \cdot 4.5 + 7 \cdot 14.5 + 12 \cdot 24.5 + 5 \cdot 34.5 + 2 \cdot 44.5 + 1 \cdot 54.5}{34} = 21.85.$$

$$\sum(x)^2 = \sum(x^2 f) = 7 \cdot 4.5^2 + 7 \cdot 14.5^2 + 12 \cdot 24.5^2 + 5 \cdot 34.5^2 + 2 \cdot 44.5^2 + 1 \cdot 54.5^2 = 21698.46.$$

$$s = \sqrt{\frac{\sum(x)^2 - n\bar{x}^2}{n-1}} = \sqrt{\frac{21698.46 - 34 \cdot (21.85)^2}{34-1}} = 12.87.$$

Hypotheses:

$H_o: \mu \le 18$

$H_a: \mu > 18$

Decision Rule:

$\alpha = 0.05$

Degrees of freedom $n - 1 = 34 - 1 = 33.$

Critical t-score from t-table $t^* = 1.692.$

Reject H_0 if $t > 1.692$.

Test Statistic:

$$t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}} = \frac{21.85 - 18}{\frac{12.87}{\sqrt{34}}} = 1.744.$$

Decision (in terms of the hypotheses):

Since $t = 1.744 > \text{t}^* = 1.692$ we reject H_0.

Conclusion (in terms of the problem):

There is a significant increase at 0.05 significance level over the average 2010 figure of $18 reported in the neighborhood newspaper.