Answer on Question #48984 – Math – Statistics and Probability

The table below gives two samples selected from 10 supermarkets of the weekly sales of a popular soft drink. The first sample gives the details for a normal shelf display of the product, while the second sample gives the details for an end-aisle shelf display. Assuming equal variances, establish, at the 5% level of significance, whether there is a statistically significant difference in the mean weekly sales for the two display locations.

Normal display :22,34,52,62,30,40,64,84,56,59

END AISLE DISPLAY: 52,71,76,54,67,83,66,90,77,84

Solution

$$H_0: \mu_1 = \mu_2; H_1: \mu_1 \neq \mu_2.$$

x_i	y_i	x_i^2	y_i^2
22	52	484	2704
34	71	1156	5041
52	76	2704	5776
62	54	3844	2916
30	67	900	4489
40	83	1600	6889
64	66	4096	4356
84	90	7056	8100
56	77	3136	5929
59	84	3481	7056
$\sum x_i = 503$	$\sum y_i = 720$	$\sum x_i^2 = 28457$	$\sum y_i^2 = 53256$

$\bar{x} = \frac{\sum x_i}{n} = \frac{503}{10} = 50.3.$ $\bar{y} = \frac{\sum y_i}{n} = \frac{720}{10} = 72.$

$s_x^2 = \frac{\sum x_i^2 - n\bar{x}^2}{n-1} = \frac{28457 - 10 \cdot 50.3^2}{9} = 350.7.$

$s_y^2 = \frac{\sum y_i^2 - n\bar{y}^2}{n-1} = \frac{53256 - 10 \cdot 72^2}{9} = 157.3.$

Assuming equal variances, the t Statistic:

$$t = \frac{\bar{y} - \bar{x}}{\sqrt{\frac{(n-1)s_x^2 + (n-1)s_y^2}{(n-1)+(n-1)}}} = \frac{\bar{y} - \bar{x}}{\sqrt{\frac{s_x^2 + s_y^2}{2}}} = \frac{72 - 50.3}{\sqrt{\frac{350.7 + 157.3}{2}}} = 1.36.$$

Critical value for $n - 1 = 10 - 1 = 9$ degrees of freedom and 5% level of significance is $t^* = 2.262$.

Critical region: $t > 2.262$.

We don't reject H_0 because test statistic $t = 1.36 < 2.262$. There is no statistically significant difference in the mean weekly sales for the two display locations.