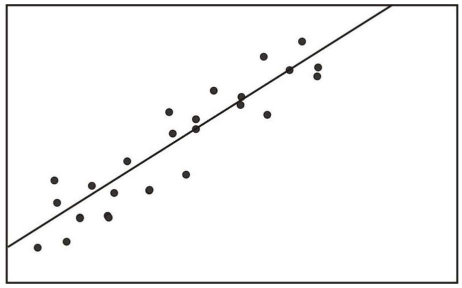
Testing Linear Correlation Coefficient & TI



Testing linear correlation coefficient r:

$H_0 : \rho = 0 \Rightarrow$ **Linear Correlation is not significant**

$H_1 : \rho \neq 0 \Rightarrow$ **Linear Correlation is significant**

Where ρ is the greek letter and it is pronounced rho.

Using P-Value Method:

1. **Find CTS & P-value using TI:**

   STAT $\rightarrow$ **TESTS** $\downarrow$ **LinRegTTest** | **Xlist:** L_1 | **Ylist:** L_2 | **Freq:** 1 | $\rho : \neq 0$ | **RegEQ: blank**

2. **Find CTS & P-value using formula & TI:**

Formula for C.T.S.	TI Command for P-value
$t = r \cdot \sqrt{\dfrac{n-2}{1-r^2}}$	tcdf with $df = n - 2$

3. **Conclusion Process:**
   - Use the testing chart to determine the validity of H_0 and H_1.
   - Draw the final conclusion whether linear correlation is significant or not.

Predicting y value for a given x value:

- **Use $y = a + bx$ when linear correlation is significant.**

  Plug in the given x value to find the prediction value y.

- **Use $\overline{y}$ when linear correlation is not significant.**

Guided Examples:

Example 1: Given $n = 8$, and $r = 0.725$, test the claim that the linear correlation is significant using $\alpha = 0.1$.

First we find the computed test statistics

$$\boxed{t = r \cdot \sqrt{\frac{n-2}{1-r^2}} = 0.725 \cdot \sqrt{\frac{8-2}{1-0.725^2}} = 2.578}$$

Now using TI command tcdf for Two-Tail Test with $df = n - 2$ and $\alpha = 0.1$, we find the P-value.

$$\boxed{\textbf{P-value } p = 2 \cdot \textbf{tcdf}(2.578, E99, 6) = 0.042}$$

Since p-value $\leq \alpha$, the alternative hypothesis is valid which implies that the linear correlation is significant.

Example 2: Given $n = 10$, and $r = -0.575$, test the claim that the linear correlation is significant using $\alpha = 0.05$.

First we find the computed test statistics

$$\boxed{t = r \cdot \sqrt{\frac{n-2}{1-r^2}} = -0.575 \cdot \sqrt{\frac{10-2}{1-(-0.575)^2}} = -1.988}$$

Now using TI command tcdf for Two-Tail Test with $df = n - 2$ and $\alpha = 0.1$, we find the P-value.

$$\boxed{\textbf{P-value } p = 2 \cdot \textbf{tcdf}(-E99, -1.988, 8) = 0.082}$$

Since p-value $> \alpha$, the null hypothesis is valid which implies that the linear correlation is not significant.

Example 3: Given $\hat{y} = 12.5 + 2.8x$, and $\bar{y} = 28$, predict y for $x = 5$.

If we assume that the linear correlation is significant, we use the regression line to make the prediction.

$$\boxed{\hat{y} = 12.5 + 2.8(5) = 12.5 + 14 = 26.5}$$

If we assume that the linear correlation is not significant, we use $\bar{y}$ as the prediction.

$$\boxed{\textbf{Prediction } \bar{y} = 28}$$
