## TOPIC: VARIATION AND THE COEFFICIENT OF DETERMINATION

### Variation and the Coefficient of Determination

◆ **Coefficient of Determination** ($R^2$): Measures how much the variation in ____ is *explained* by variation in ____.

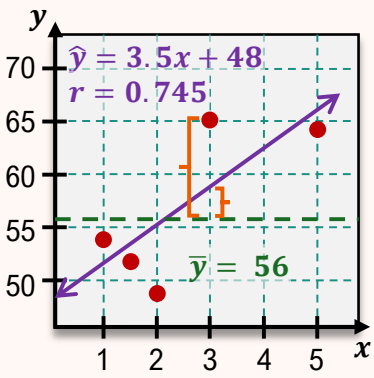
► $R^2$ close to **[ 1 | 0 ]** indicates almost **[ ALL | NONE ]** of the variation is *because* the data is linearly correlated.

**EXAMPLE**

The data below shows test scores ($y$) versus hours studied ($x$). Find the coefficient of determination. What does this tell you about the explained and unexplained variation of the data about the regression line?

**New** **Coefficient of Determination**

| Hours ($x$) | 1 | 1.5 | 2 | 3 | 5 |
|---|---|---|---|---|---|
| Score ($y$) | 54 | 52 | 48 | 65 | 64 |




$$R^2 = \frac{\text{"Explained" Variation}}{\text{Total Variation}}$$

$R^2$ = _____

____% of variation in score is *explained* by relationship of hours vs. score

____% of variation is *unexplained*, due to randomness or other factors

**"Explained" Variation**: sum of squared *distances* from _____ to **mean**

**Total Variation**: sum of squared *distances* from _____ to **mean**

**HOW TO: Find Coefficient of Determination on TI-84**

1) STAT, **1:Edit…**

Enter data in **L1** ($x$) & **L2** ($y$)

2) STAT > to **CALC**

**4:LinReg(ax+b)**

3) **XList: L1**

**YList: L2**

4) **r** = Correlation Coefficient

**r²** = Coefficient of Determination

**PRACTICE**

In a given dataset, you determine the value of the correlation coefficient to be $r = -0.957$. Find the coefficient of determination. What does this tell you about the explained variation of the data about the regression line? What about the unexplained variation?

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### PRACTICE

A retail analyst is studying the relationship between the number of in-store promotional displays ($x$) and weekly sales revenue ($y$) at 12 store locations. Use the data below and a calculator to find the coefficient of determination.

| Displays ($x$) | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Weekly Revenue ($y$) | 1400 | 1500 | 1700 | 1900 | 2100 | 2300 | 2500 | 2600 | 2800 | 3000 | 3100 | 3300 |

**HOW TO: Find Coefficient of Determination on TI-84**

1) STAT, **1:Edit…**
   Enter data in **L1** ($x$) & **L2** ($y$)
2) STAT > to **CALC**
   **4:LinReg(ax+b)**
3) **XList: L1**
   **YList: L2**
4) **r** = Correlation Coefficient
   **r²** = Coefficient of Determination