

WARM UP

Given the following tables, find the average difference of your y-values.

x	4	5	6	7	8	9
y	3.31	4.63	5.82	6.74	7.50	8.68

ESSENTIAL QUESTION

How can you use a scatter plot to describe the relationship between two data sets?

NEEDED VOCAB:

- ▶ **Negative Association**
- ▶ **Negative Correlation**
- ▶ **No Association**
- ▶ **Positive Association**
- ▶ **Positive Correlation**
- ▶ **Trend Line**

GOAL: "I CAN. . .

Use a scatter plot to describe the relationship between two data sets."

Nicholas plotted data points to represent the relationship between screen size and cost of television sets. Everything about the televisions is the same, except for screen size.

What, if any, patterns do you see?

as screen size goes up, \$ ↑

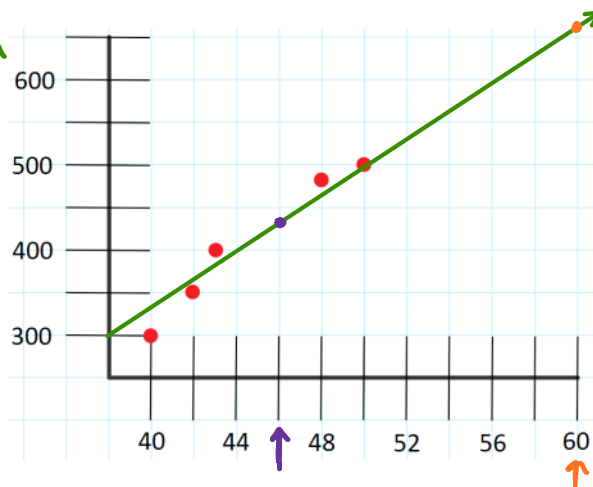
What does this set of points tell you about the relationship of screen size and cost of television?

It almost looks like a line

How much do you think a 46-inch television would cost? A 60-inch?

46 → \$435

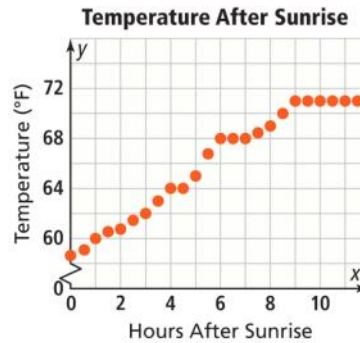
60 → \$675



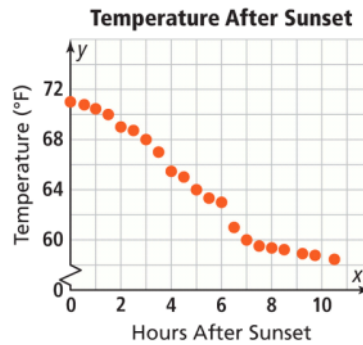
EXAMPLE 1

What is the relationship between the hours after sunrise, x , and the temperature, y , shown in the scatter plot?

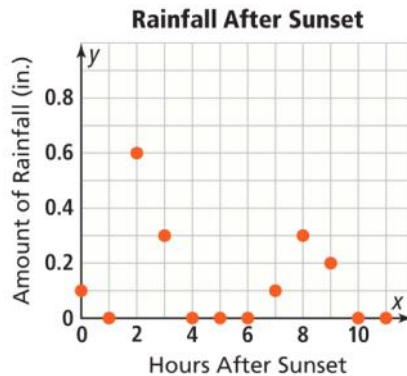
as hours goes up, so
does temp.



What is the relationship between the hours after sunset, x , and the temperature, y , shown in the scatter plot?



What is the relationship between the hours after sunset, x , and the amount of rain, y , shown in the scatter plot?



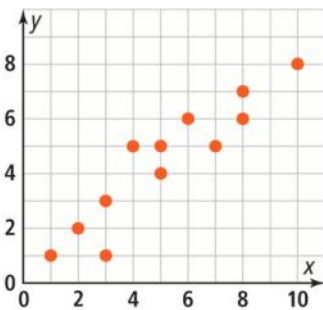
When y-values tend to increase as x-values increase, the two data sets have a **positive association**. *As $x \uparrow$, $y \uparrow$*

When y-values tend to decrease as x-values increase, the two data sets have a **negative association**. *As $x \uparrow$, $y \downarrow$*

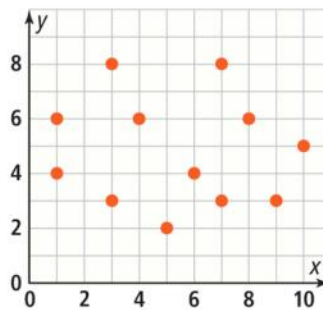
When there is no general relationship between the x-values and the y-values, the two data sets have a **no association**. *Neither depends on the other*

Describe the type of association each scatter plot shows.

a.



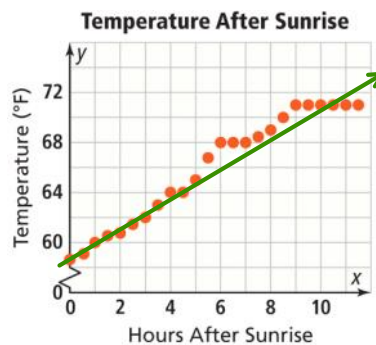
b.



EXAMPLE 2

How can the relationship between the hours after sunrise, x , and the temperature, y , be modeled?

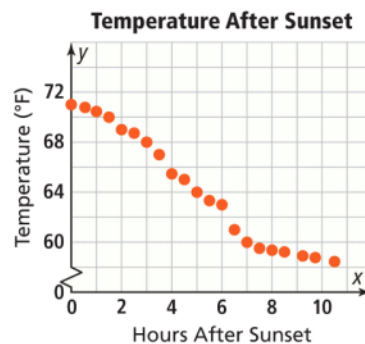
*Looks like a line,
Linear*



The scatter plot suggests a linear relationship. There is a **positive correlation** between the hours after sunrise and the temperature.

When data with a negative association are modeled with a line, there is a **negative correlation**. If the data do not have an association, they cannot be modeled with a linear function.

How can the relationship between the hours after sunset, x , and the temperature, y , be modeled? If the relationship is modeled with a linear function, describe the correlation between the two data sets.



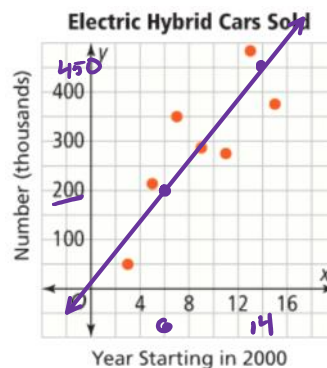
EXAMPLE 3

What trend line models the data in the scatter plot?

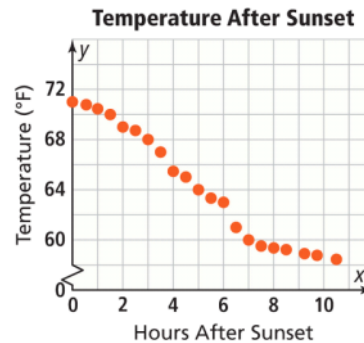
$(6, 200)$ $(14, 450)$
 w/ 2 points we can then calculate the function.
 $\frac{450 - 200}{14 - 6} = \frac{250}{8} = \frac{125}{4}$
 31.25

$f(x) - 200 = 31.25(x - 6)$
 $f(x) - 200 = 31.25x - 187.5$
 $f(x) = 31.25x + 12.5$

A **trend line** models the data in a scatter plot by showing the general direction of the data. A trend line fits the data as closely as possible.



What trend line, in slope-intercept form, models the data of the scatter plot? Explain why there could be no data points on a trend line, yet the line models the data?



EXAMPLE 4

The table shows the amount of time required to download a 100-megabyte file for various internet speeds. Assuming the trend continues, how long would it take to download the 100-megabyte file if the internet speed is 75 kilobytes per second?

Internet Speed (kb/s)	35	40	45	50	55	60
Time to Download 100 Mb (min)	6.65	5.82	5.17	4.65	4.23	3.88

Handwritten calculations for the slope:

$$\frac{6.65 - 3.88}{35 - 60} = \frac{2.77}{-25} = -0.1108$$

$$\frac{5.82 - 3.88}{40 - 60} = \frac{1.94}{-20} = -0.097$$

$$\frac{5.17 - 3.88}{45 - 60} = \frac{1.29}{-15} = -0.086$$

$$\frac{4.65 - 3.88}{50 - 60} = \frac{0.77}{-10} = -0.077$$

$$\frac{4.23 - 3.88}{55 - 60} = \frac{0.35}{-5} = -0.07$$

Average slope: $\text{avg.} = -0.0974$

Avg.

47.5

5.07

Handwritten equations for the trend line:

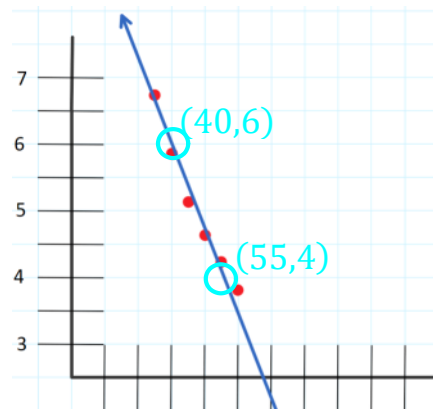
$$g(x) - 5.07 = -0.1148(x - 47.5)$$

$$g(x) - 5.07 = -0.1148x + 5.415$$

$$g(x) = -0.1148x + 10.485$$

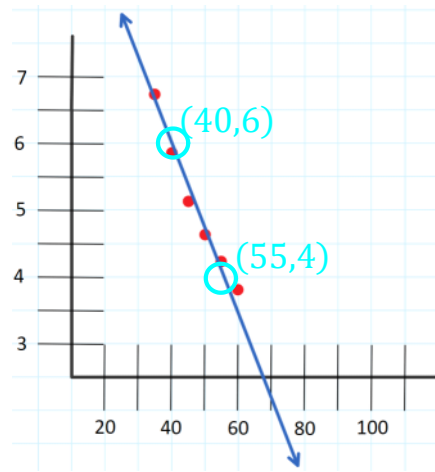
Solving this graphically

If we plot the points from the table and draw in a line that has equal amounts of points on either side of the line, making sure it goes through at least two solid points, we can then use those points to find our linear function.



Solving this graphically

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What is the x-intercept of the trend line we found from before? $y = -.13x + 11.2$? Is that possible in the real-world situation of the problem?

Scatter Plots and Trend Lines

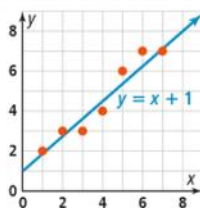
TABLE Positive Association

x	1	2	3	4	5	6	7
y	2	3	3	4	6	7	7

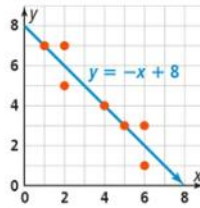
TABLE Negative Association

x	1	2	2	4	5	6	6
y	7	7	5	4	3	3	1

GRAPHS Positive Correlation



GRAPHS Negative Correlation



HOMEWORK

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9, 11, 15-22, 26, 27
