## Warm Up

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


## 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 gees 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?



## EXAMPLE 1

What is the relationship between the hours after sunrise, $x$, and the temperature, $y$, shown in the scatter plot?
as hovers goes op, so

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

> as hours goes up, te mp goes down.


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

Doesn't look like rain depends on hours


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 increase as $x$-values increase, the two data sets have a negative association.

$$
\text { As } x \uparrow, y \downarrow
$$

When there is no general relationship between the $x$-values and the $y$-values, the two data sets have a no association.

Describe the type of association each scatter plot shows.
a. t association
b. No association



## EXAMPLE 2

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

$$
\begin{aligned}
& \text { Looks like a line, } \\
& \text { Linear }
\end{aligned}
$$



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.

Linear with negative correlation


## Example 3

What trend line models the data in the scatter plot?

$$
\begin{aligned}
& (6,200)(M, 450) \quad \text { w/2 points we } \\
& \frac{450-200}{14-6}=\frac{250}{8}=\frac{125}{4} \quad \begin{array}{l}
\text { Can then calculate } \\
31.25 \quad \text { the function. }
\end{array} \\
& f(x)-200=31.25(x-6) \\
& f(x)-200=\frac{31.25 x-187.5}{\mid f(x)=31.25 x+12.5}
\end{aligned}
$$

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

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?

$$
\begin{aligned}
& \frac{66-62}{4-7}=-\frac{4}{3} \\
& f(x)-66=-\frac{4}{3}(x-4) \\
& f(x)-66=-\frac{4}{3} x+\frac{16}{3} \\
& \hline f(x)=-\frac{4}{3} x+\frac{214}{3} \\
& \text { Trend line is meant to approximate } \\
& \text { th data so it may, or may not go } \\
& \text { through a point. }
\end{aligned}
$$

## 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?


## 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.

$$
\frac{6-4}{40-55}=\frac{2}{-15} x-0.13
$$

$$
f(x)-6=-0.13(x-40)
$$

$$
\begin{array}{ll}
\overline{40-55}=\frac{\square}{15} x-0.13 \\
f(x)-6=-0.13(x-40) & \\
f(x)-6=-0.13+5.2 \\
f(x)=-0.13+11.2 \\
g(x)=-0.1146 x+10.485 \quad \text { fairly close }
\end{array}
$$

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

$$
\varnothing=-.13 x+11.2
$$

$$
-11.2=-.13 x
$$

$$
86.15=x
$$

internet speed for
cosec. download.
makes no sense

$$
b / c \text { it always take }
$$

some time to download.

Scatter Plots and Trend Lines

## TABLE Positive Association

| $x$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $y$ | 2 | 3 | 3 | 4 | 6 | 7 | 7 |

Negative Association

| $x$ | 1 | 2 | 2 | 4 | 5 | 6 | 6 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $y$ | 7 | 7 | 5 | 4 | 3 | 3 | 1 |

## GRAPHS

Positive Correlation


Negative Correlation


## Homework

Pg. 124
9, 11, 15-22, 26, 27

