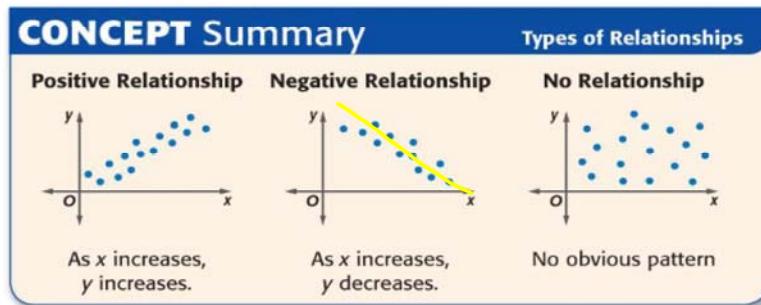


Name \_\_\_\_\_  
Date \_\_\_\_\_

Period \_\_\_\_  
Scatter Plots & Correlation

What you will learn....how to describe the relationship between two variables by constructing and interpreting scatter plots. You will also learn what is meant by a correlation coefficient.

a graph that shows the relationship  
A scatter plot is between two sets of data. In a scatter plot, two sets of data are graphed as ordered pairs on a coordinate system. We say there is a *correlation* between two variables if their values are linked, as shown below.



**Example 1: Construct a scatter plot.**

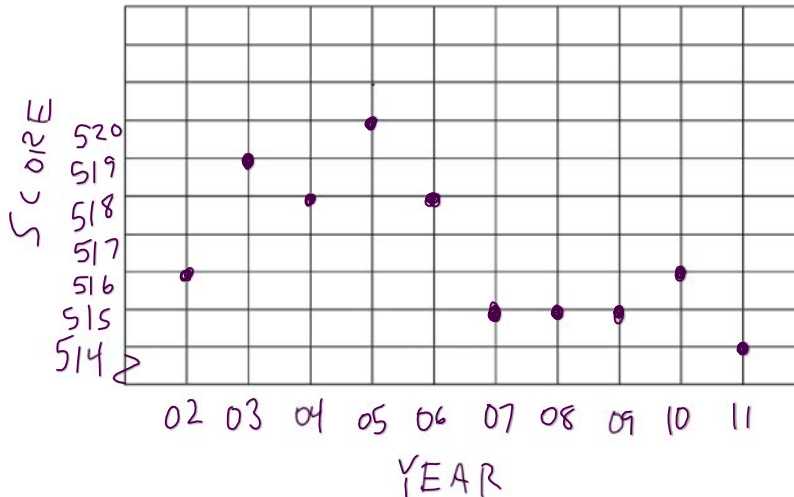
The table shows the average SAT Math scores from 2002 - 2011.

514 → 520

Make a scatter plot of the data.

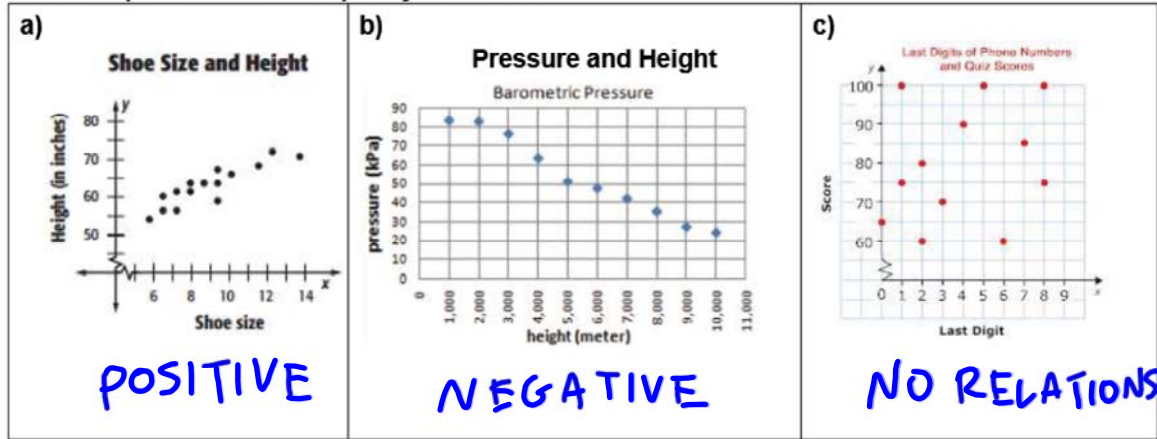
x	year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
y	score	516	519	518	520	518	515	515	515	516	514

Let the horizontal axis, or x axis, represent the year. Let the vertical axis, or the y-axis represent the score. Then graph the ordered pairs (year, score). Be sure to label the axes and title the scatter plot.



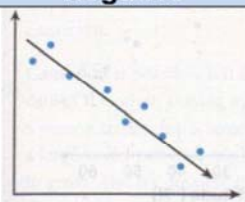
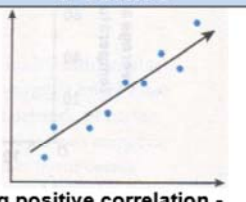
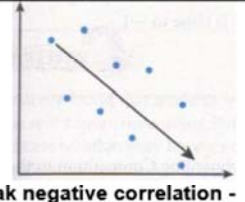
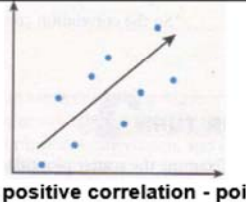
**Example 2: Interpret Scatter plots.**

Determine whether a scatter plot of the data for the following might show a positive, negative, or no relationship or correlation. Explain your answer.



One measure of strength and direction of a correlation is the correlation coefficient, denoted by  $r$ . The value of  $r$  ranges from -1 to 1. Although  $r$  can be precisely calculated, in the lesson we examine qualitatively how its value describes a correlation. See the chart below.



	Negative	Positive	<p>If there is <u>no</u> correlation between the two variables in a data set, the points in a scatter plot do not lie along a line, and <math>r</math> is close to zero.</p>
<b>Strong</b>	 <p>Strong negative correlation - points lie close to a line with a negative slope. <math>r</math> is close to -1.</p>	 <p>Strong positive correlation - points lie close to a line with a positive slope. <math>r</math> is close to 1.</p>	
<b>Weak</b>	 <p>Weak negative correlation - points loosely follow a line with a negative slope. <math>r</math> is between 0 and -1.</p>	 <p>Weak positive correlation - points loosely follow a line with a positive slope. <math>r</math> is between 0 and 1.</p>	

Practice Questions:

1. Ella recorded data and used her graphing calculator to find the equation for the line of best fit. She then used the correlation coefficient to determine the strength of the linear fit. Which correlation coefficient represents the strongest linear relationship?

- 1) 0.9
- 2) 0.5
- 3) -0.3
- 4) -0.8

2. Analysis of data from a statistical study shows a linear relationship in the data with a correlation coefficient of  $-0.524$ . Which statement best summarizes this result?

- 1) There is a strong positive correlation between the variables.
- 2) There is a strong negative correlation between the variables.
- 3) There is a moderate positive correlation between the variables.
- 4) There is a moderate negative correlation between the variables.

3.

A nutritionist collected information about different brands of beef hot dogs. She made a table showing the number of Calories and the amount of sodium in each hot dog.

*L1*                      *L2*

Calories per Beef Hot Dog	Milligrams of Sodium per Beef Hot Dog
186	495
181	477
176	425
149	322
184	482
190	587
158	370
139	322

NORMAL FLOAT AUTO REAL RADIAN HP

**LinReg**

$y = ax + b$   
 $a = 4.587538544$   
 $b = -346.6018795$   
 $r^2 = .8878031316$   
 $r = .9422330559$

- a) Write the correlation coefficient for the line of best fit. Round your answer to the *nearest hundredth*.
- b) Explain what the correlation coefficient suggests in the context of this problem.

4.

The table below shows 6 students' overall averages and their averages in their math class.

<b>Overall Student Average</b>	92	98	84	80	75	82
<b>Math Class Average</b>	91	95	85	85	75	78

If a linear model is applied to these data, which statement best describes the correlation coefficient?

- 1) It is close to  $-1$ .
- 2) It is close to  $1$ .
- 3) It is close to  $0$ .
- 4) It is close to  $0.5$ .