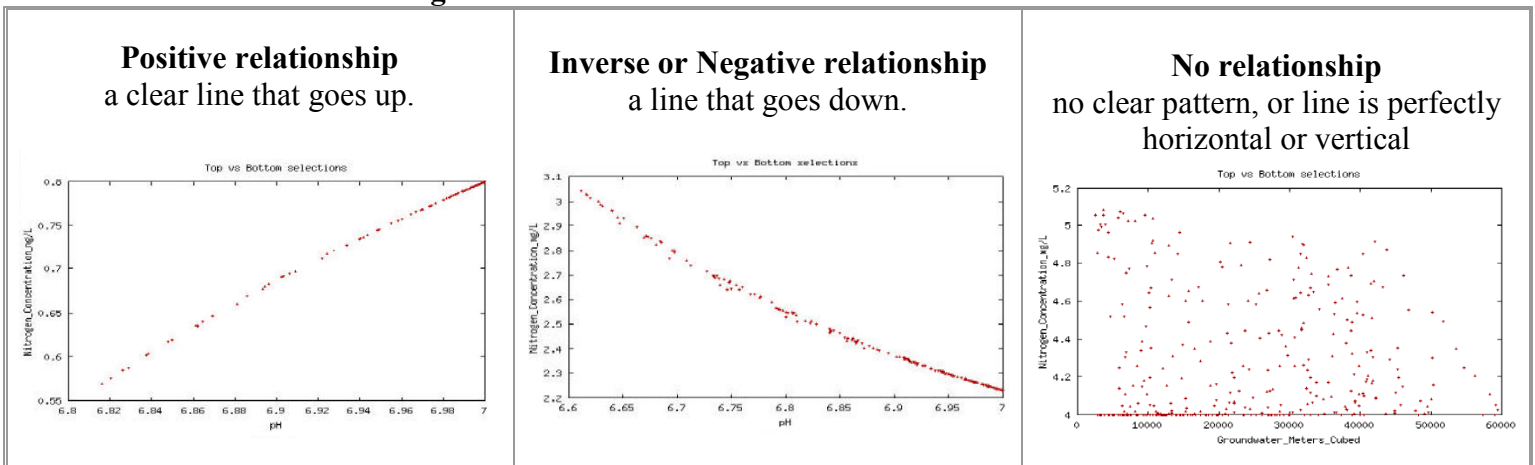


# RELATIONSHIPS ON A SCATTER PLOT

**Goals:**  
 Students will analyze scatter plots to determine:  
 -Are variables X and Y related?  
 -Are variables X and Y linearly related? If so How?  
 -Does the variation in Y change depending on X?

A scatter plot reveals relationships between two variables. Such relationships manifest themselves by any non-random structure in the plot. Various common types of relationships are demonstrated in the examples.

## Part I – Positive and Negative



*The following are descriptions of slope of a line or pattern on a scatter plot. Identify the relationship that best fits each description.*

- |                         |                   |
|-------------------------|-------------------|
| 1) Positive slope _____ | 4) 0.0036 _____   |
| 2) Negative slope _____ | 5) 23.6 _____     |
| 3) -36.5 _____          | 6) $\infty$ _____ |

7) In a positive relationship, if the X variable increases what happens to the Y variable?

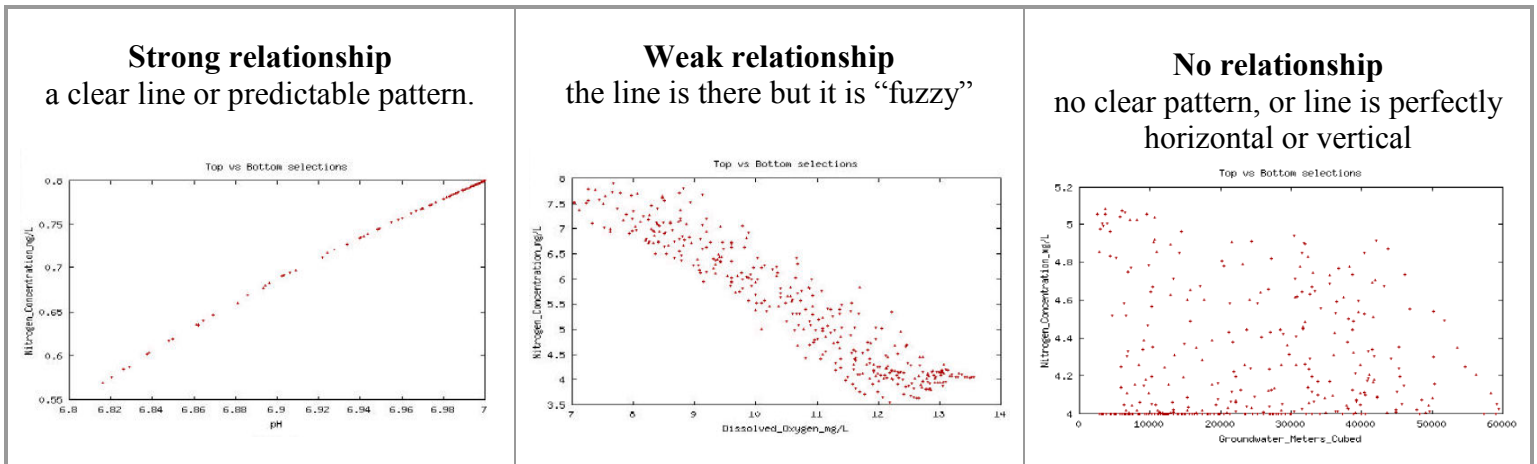
8) In a negative relationship, if the X variable increases what happens to the Y variable?

9) State a general rule for using slope to determine the relationship on a scatter plot.

## Part II

A scatter plot is a plot of the values of Y versus the corresponding values of X:

- Vertical axis: variable Y--usually the dependent variable
- Horizontal axis: variable X--usually the independent variable



10) Since graphs are scientific models and we use models to make predictions, then explain how strong and weak relationships affect the ability to make predictions.

11) If there is a strong positive relationship explain how the dependent variable changes with a change in the independent variable?

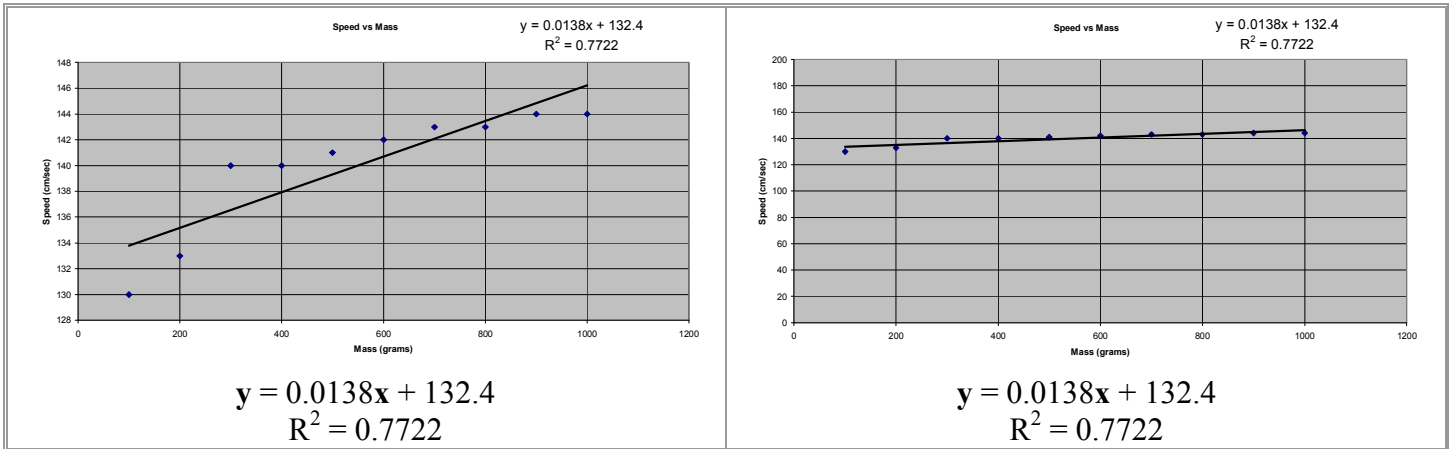
12) If there is no relationship explain how the dependent variable changes with a change in the independent variable?

13) In terms of the dependent and independent variable what does a shallow slope mean?

14) In terms of the dependent and independent variable what does a steep slope mean?

### Part III – Deciding Cause and Effect

The scatter plot uncovers relationships in data. "Relationships" means that there is some pattern between X and Y. Note: a scatter plot can never "prove" cause and effect; it is ultimately only the researcher, relying on the underlying science, who can conclude if a cause and effect relationship actually exists.



15) What is the relationship in the first graph? Why?

16) What is the relationship in the second graph? Why?

17) Both of the above graphs are of the same data. Why do they look different?

18) Which is the better representation of the data? Do you think there is likely a cause and effect relationship?

19) What are the indications that they are the same? Which indication is the easiest to identify?

20) Write a set of procedures for what you should do when you first see a graph to determine the relationship type.

### Exercises

1. Classify the relationship of the dependent and independent variable in the following graphs by circling the correct terms:

	<p>Positive or Negative</p> <p>Strong or Weak</p> <p>No Relationship</p>
	<p>Positive or Negative</p> <p>Strong or Weak</p> <p>No Relationship</p>
	<p>Positive or Negative</p> <p>Strong or Weak</p> <p>No Relationship</p>
	<p>Positive or Negative</p> <p>Strong or Weak</p> <p>No Relationship</p>

2. Draw sample graphs that could be described as the following:

<p>a) Strongly Related</p>	<p>b) Strong Negatively Related</p>	<p>c) Weak Positively Related</p>
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