

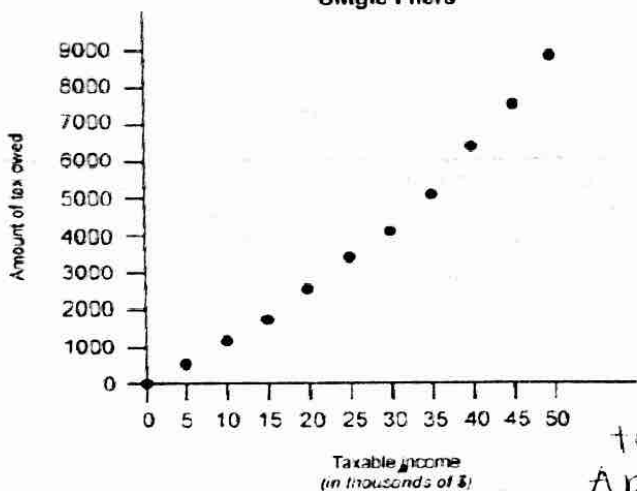
Name: KEU Date: _____ Period: _____

Using Recursion in Models and Decision Making: Relationships in Data

IV.A Student Activity Sheet 1: Using Scatterplots in Reports

1. Consider the following graph. Who are the subjects in the study? What are the variables of interest? Thoroughly describe the information illustrated by the graph, choosing at least two data points to help with your explanation.

**2007 Tax Tables
Single Filers**



Subjects in the Study: single tax filers in 2007

Variables of Interest:

- 1) taxable income
- 2) amt. of tax owed

Choose at least 2 data points:

(10, 1000) and (50, 9000)

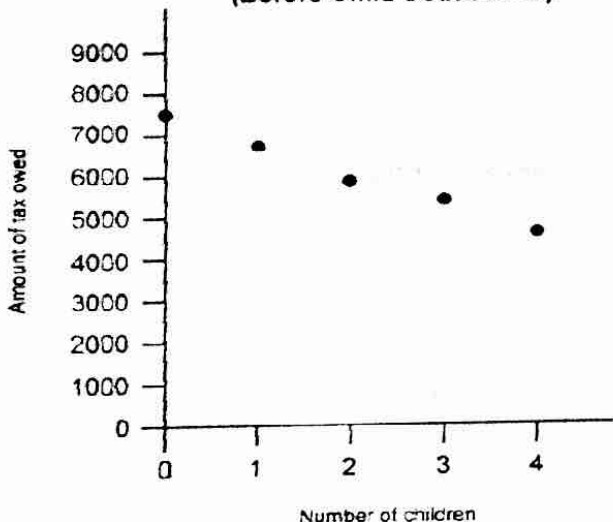
Explain what the data points mean in words:

A single person with \$10,000 in taxable income pays \$1,000 in taxes.
A person with \$50,000 in taxable income pays \$9,000 in taxes.

(Data compiled from 2007 tax tables for Form 1040 on www.irs.gov.)

2. Look at this new graph and discuss with your partner the information illustrated. Then compare and contrast this display with the graph in Question 1.

**Head of Household
\$50,000 Taxable Income
(Before Child Deductions)**



a) How does the shape of this graph differ from the graph in number 1?
as the # of children increases, the tax owed decreases. * slants down versus up in #1.

b) What is the y-intercept?
(0, 7500)

c) Explain in words what the y-intercept represents.
A head of household filer with \$50,000 taxable income & no children pays around \$7500 in taxes.

d) How much does a head-of-household filer with \$50,000 taxable income and no children pay in taxes?
around \$7500

3. REFLECTION: Use the previous graphs to complete the following sentences.

A person with higher taxable income pays higher taxes

A person with lower taxable income pays lower taxes

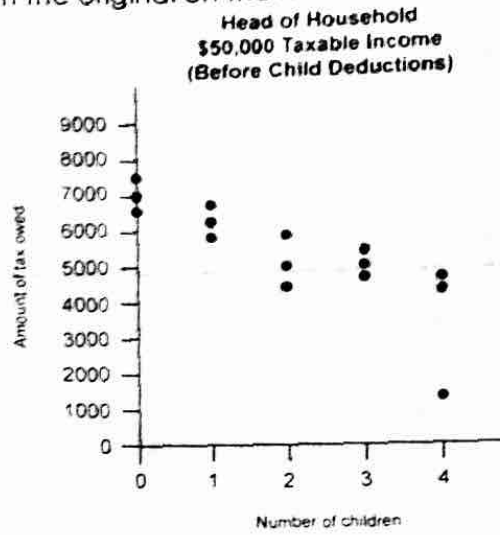
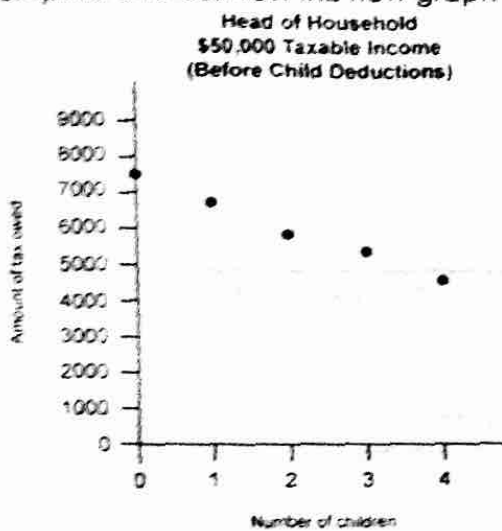
This is an example of a positive association.

A person with fewer children pays higher taxes

A person with more children pays lower taxes

This is an example of a negative association.

4. In actuality, head-of-household filers with \$50,000 in taxable income and the same number of children could pay different amounts of income tax, as shown by the graph on the right. These differences result from tax credits for expenses such as child care that can reduce the amount of tax owed. Compare and contrast this new graph with the original on the left.



(Data compiled from 2007 tax tables for Form 1040 on www.irs.gov.)

a) Do the graphs show a positive correlation, negative correlation, or no correlation?

Both show a negative correlation.

b) What is the shape of the graphs?

The 1st graph is linear. The 2nd appears to be linear but data values do not fall tightly along a line.

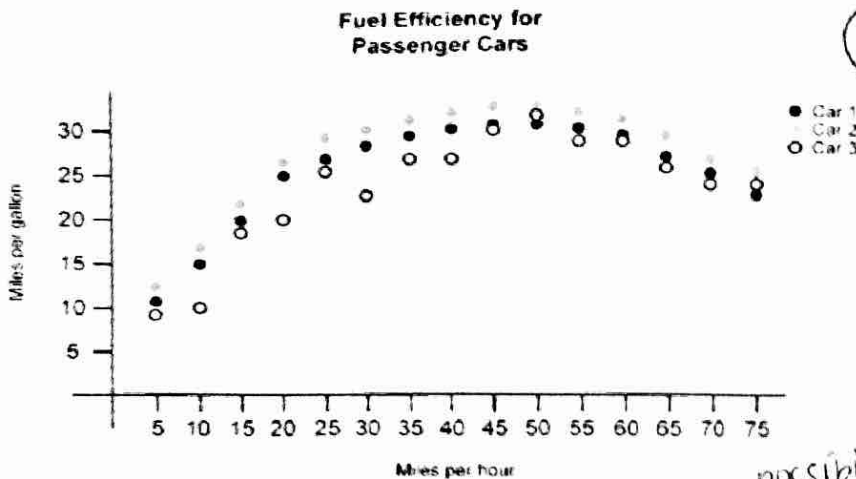
c) Which graph is more variable? Explain how you know.

The 2nd graph since the data is more spread out.

d) Are the graphs continuous or discrete?

Both are discrete.

5. Now consider the following graph. What information is displayed? Compare and contrast this graph with the others you have analyzed.



As cars go at a relatively fast pace, fuel efficiency improves.

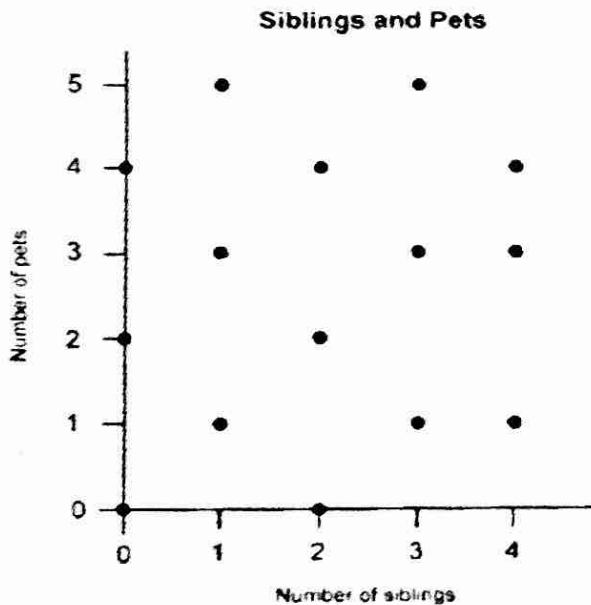
a) What does the graph illustrate? cars get poor gas mileage when driven slowly. (or too fast).

b) Describe the shape of this graph. What type of function does it represent?
the data is very curved. changes from a positive to a negative relationship.

c) As cars go faster, does the fuel efficiency seem to improve?
slightly - depends on how fast.

possibly quadratic

6. A survey of students asked, "How many siblings live in your house with you?" and "How many pets does your family have?" The results are displayed below. Comment on the graph, comparing and contrasting it with the previous graphs.



a) What type of pattern does this graph show?
none

b) What type of correlation does it represent?
no correlation

c) Can you infer that students with more siblings have more pets? Why or why not?
you cannot since the graph is completely scattered.

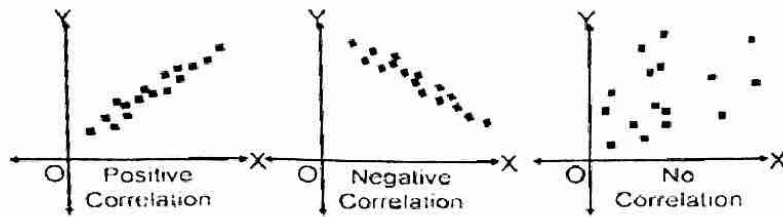
Name: KEY
 SAS 1: Using Scatterplots in Reports

Date: _____ Period: _____

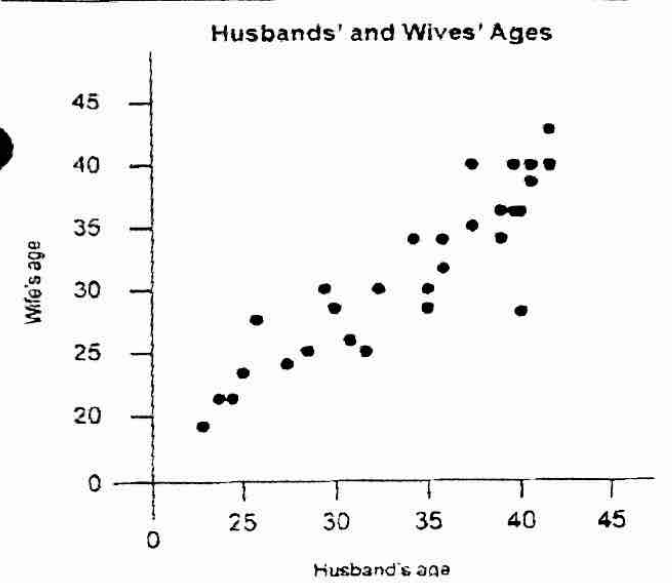
7. When analyzing a display of bivariate statistics, you need to consider the following:

- **Form**—Does the graph exhibit a linear or nonlinear pattern?
- **Direction**—Does the graph exhibit a positive relationship, a negative relationship, or neither?
- **Relative strength**—Are the data points tightly clustered along the line or curve (strongly associated) or are they more scattered (weakly associated)?

SCATTER PLOT EXAMPLES

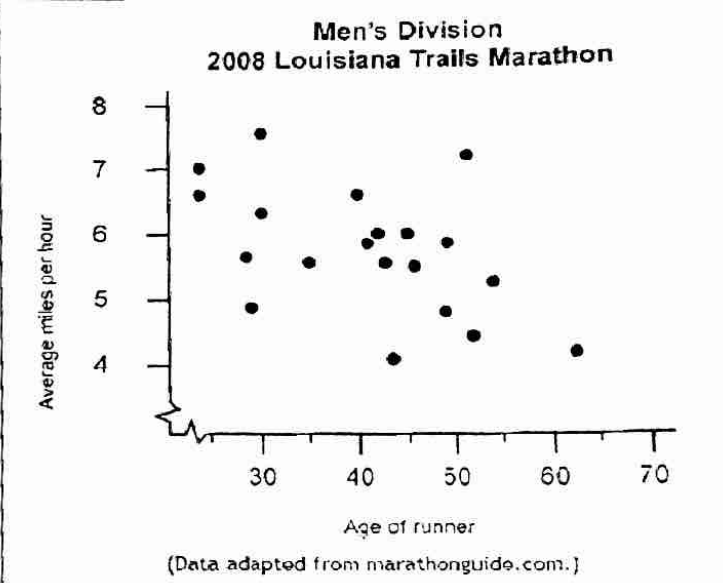


Using the guidelines from number 7, analyze the following graphical displays. Conduct your analysis in the context of the situation.



Form: fairly linear
 Direction: positive
 Strength: fairly strong

Can you make any inferences based on the graphical display?
 in general, older men have wives who are older & younger men have wives who are younger. (however this is not causation)

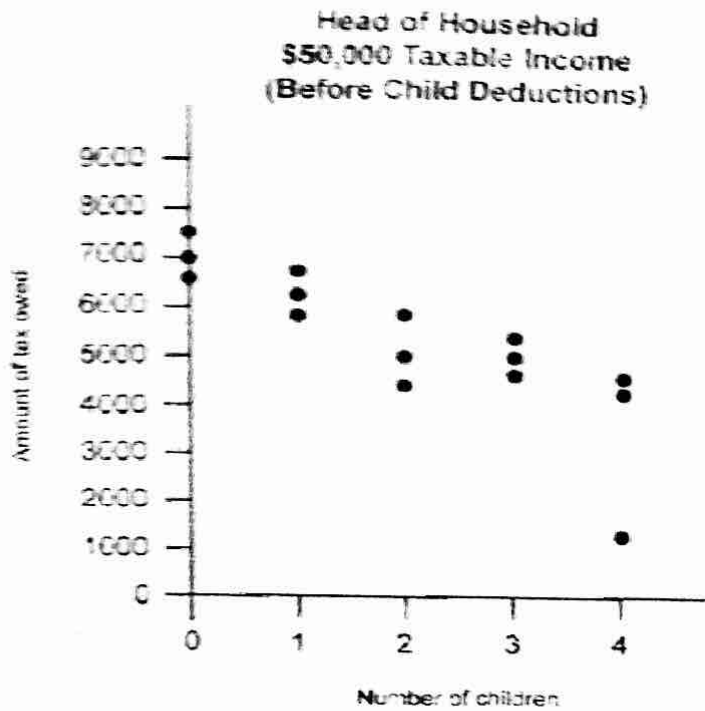


(Data adapted from marathonguide.com.)

Form: somewhat linear
 Direction: negative
 Strength: weak

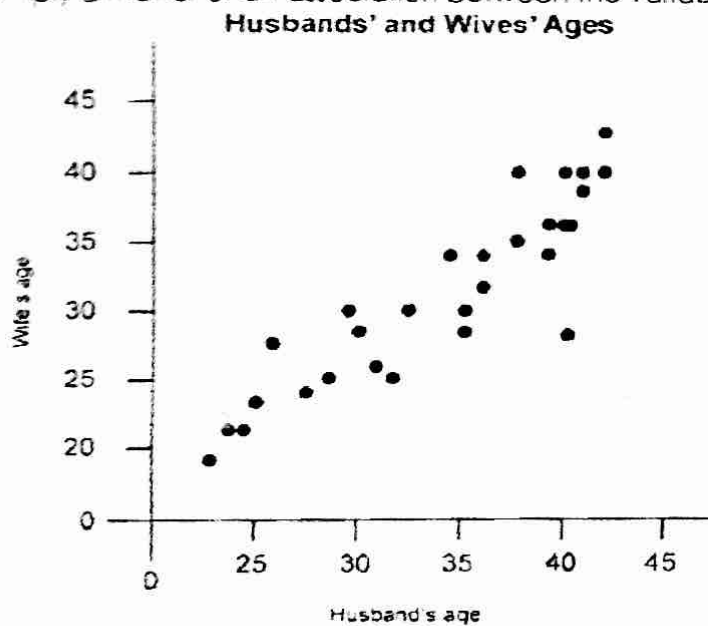
Can you make any inferences based on the graphical display?
 even though there's a weak relationship, we could say that in this marathon younger men ran faster & older men ran slower.
 *men in their 40s ran at varying speeds

8. The following graph illustrates the fact that for a designated filing status and taxable income level, the amount of tax owed depends on the number of children. Does this sound like a cause-and-effect relationship or simply a matter of an association between the variables?



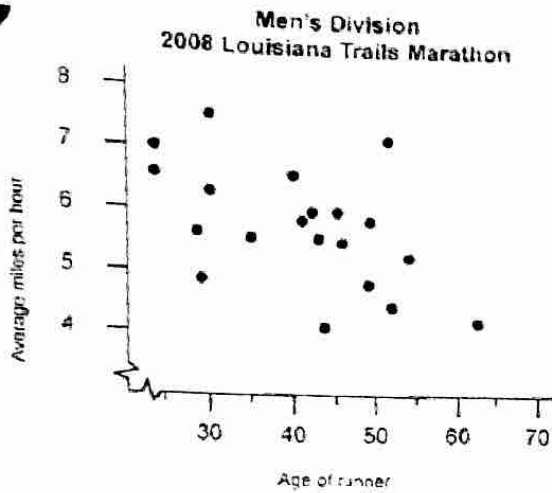
The tax tables are actually designed so that each additional child reduces the amount of tax owed, so it is cause & effect. (However, not perfect since other things can also reduce amt. of tax owed.)

9. The graph shown below illustrates that in general older men have wives about their age and younger men have wives about their age. Does this sound like a cause-and-effect relationship or simply a matter of an association between the variables?



Just an association. The husband's age does not cause the wife's age & vice versa.

10. A news report noted, "As men age, they begin to run slower." Does this report imply cause and effect or association? What is your opinion of this implication?



(Data adapted from marathonguide.com)

The report implies cause & effect, but this is only an association. Growing older doesn't cause men to run slower. They can actually run faster if they train better. There could be other things associated with aging & speed - ex. overall physical fitness.

11. A special report on the evening news exposed a startling fact: When more doctors are on duty at a hospital, more deaths occur. Does this mean that doctors are killing patients? What are some other explanations?



Perhaps the common thread is the size of the hospital. Small hospitals have fewer doctors on duty & fewer sick people - thus fewer deaths. With more patients (& doctors) at larger hospitals, there is more potential for dying.

12. In the last 40 years, spending on education has increased, while SAT scores have gone down.

(need to google)
a) Sketch a scatterplot that represents these trends.

b) Does increased spending cause a drop in SAT scores? Explain your reasoning.

increased spending does not cause a drop in SAT scores. The common variable is the passage of time. As time passed, spending ↑ due to outside influences (politics/inflation).

SAT scores ↓ since more students are taking the SAT. In the past, only higher achieving students took the test.

