Math TODAY™
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Cropland Value Grows

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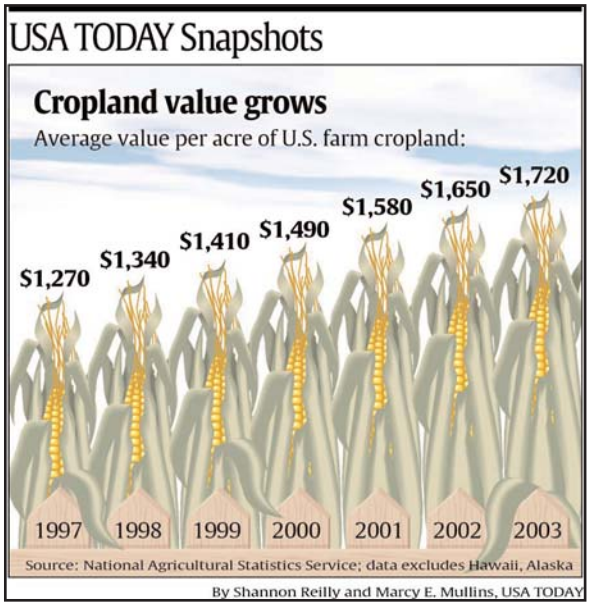

Activity Overview:

Students will create a scatter plot of the data in the USA TODAY Snapshot® "Cropland value grows" and identify the independent and dependent variables for the data. The students will find the rate of change for the data and be asked to label this value with the appropriate units. Students will determine the linear model to fit the data and then use this model to make predictions based on this model.

Concepts:

- Rate of change (slope)
- Reading and interpretation of graphs
- Identification of the independent and dependent variables
- Slope-Intercept form of linear equations
- Modeling data with linear functions
- Evaluating, synthesizing and analyzing real-world data

Objectives:

Students will:

- find the rate of change (slope) for a given set of data.
- determine a linear regression model from data.
- use the regression model to predict an answer.
- use the appropriate labels with numerical values for the rate of change.
- create a scatter plot of the data.

Activity at a Glance:

- Grade level: 8-12
- Subject: Algebra I
- Estimated time required: 15-20 minutes

Materials:

- TI-83 Plus or TI-83 Plus Silver Edition
- Overhead view screen handheld for instruction/demonstration
- Student handout
- Transparency

Prerequisites:

Students should be able to:

- enter data into the List Editor.
- create a linear regression model.
- make a prediction using the linear regression model.
- find rate of change and include appropriate labels.
- use the Science Tools APP.

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Background:

In this activity students will determine the rate of growth of the U.S. cropland and find a linear model from the data to predict the value of an acre of cropland in the future should these trends continue. Students will have the opportunity to demonstrate their understanding of rate of growth (slope), linear equations and independent/dependent variables using real data.

Since this is a real-world problem, students will have the opportunity to correlate the algebra concepts to topics with meaning. This context illustrates the need for using appropriate labels for the variables and on the rate of change values that will be found.

This is an excellent opportunity to use the Science Tools APP for the graphing and analysis of this data. Students can benefit from using different methods to solve a problem.

Preparation:

- Provide one graphing handheld for each student.
- Each student should have a copy of the corresponding student activity sheet.
- When using Science Tools make sure that each handheld has this APP.

Classroom Management Tips:

- Students will have a better understanding of how to read the graphic and retrieve data if you use the transparency for a class discussion before the students start working.
- Remind students to carefully read all parts of the graphic before they start collecting data.
- Students can work individually or in small groups on this activity.
- Students can work individually or in groups to assist each other as they learn the various features of the handheld.
- Allow students to talk about the "how" and "why" approach they used to find the solution.
- This activity can be used as a review of concepts or a culminating activity with the class.
- Talk to the class about the different ways they can determine the answers to the questions. One method would be to use the [TRACE] key and enter the independent value so that the handheld will determine the dependent value. The students could use the [TABLE] key and find the answer in an input/output format.

Data Source:

National Agricultural Statistics Service

National Council of Teachers of Mathematics (NCTM) Standards*:

Number and Operations Standard
- Compute fluently and make reasonable estimates.

Algebra Standard
- Use mathematical models to represent and understand quantitative relationships.
- Analyze change in various contexts.

Measurement Standard
- Understand measurable attributes of objects and the units, systems, and processes of measurement

Problem-Solving Standard
- Solve problems that arise in mathematics and in other contexts.

Connections Standard
- Recognize and apply mathematics in contexts outside of mathematics.

*Standards are listed with the permission of the National Council of Teachers of mathematics (NCTM), www.nctm.org. NCTM does not endorse the content or validity of these alignments.

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Activity Extension:

- Have students review the National Agricultural Statistics Service Web site (www.usda.gov/nass/).

Curriculum Connections:

- Agriculture/FFA
- Economics/Business

Additional Resources:

Student Handout

Transparency

TI Technology Guide, for information on the following:

- TI-83 Plus
- List Editor
- ScienceTools
- TI-Navigator™ Classroom Learning System

Teacher Notes:

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Assessment and Evaluation:

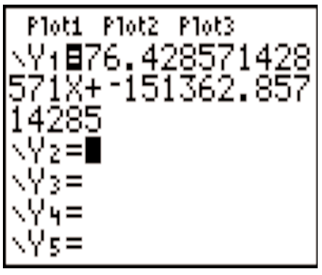
Q. According to the USA TODAY Snapshot "Cropland value grows," explain what would represent the independent and the dependent variables?

A. Independent variable: The years when the data was collected.

Dependent variable: The average value per acre of U.S. farm cropland in dollars.

Q. Determine the "rate of change" in average cropland value per year and interpret the meaning of this value.

A. Mathematical model:



Q. Using the model above, what value represents the "rate of change"?

A. 76.428571428571 using the value from the handheld or to three significant digits 76.40

Q. What is the meaning of the "rate of change"?

A. The rate of change means that there is an average increase of $76.43 per acre per year ($76.40 per acre per year using significant digits).

Q. Estimate the average value per acre of U.S. cropland in 2004 and 1996.

A. Average value per acre of U.S. cropland in 2004: $1,802.86 ($1,800 using significant digits).

Average value per acre of U.S. cropland in 1996: $1,191.42 ($1,190 using significant digits).