

# Math TODAY™

## Teacher Edition

# USA TODAY

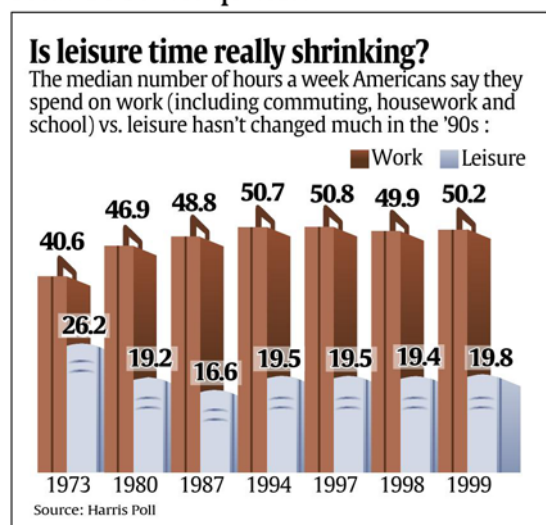
NO. 1 IN THE USA



## Is leisure time really shrinking?

By: Bob Tower

### USA TODAY Snapshots



USA TODAY

### Activity Overview:

Students will have the opportunity to organize data from the USA TODAY Snapshot “Is leisure time really shrinking?” into two scatter plots and determine the quadratic model for each scatter plot. Students will need to explore the graphs and determine if these graphs intersect. Students will learn the concept of extrapolation by expanding the viewing window to find the intersection. Also, by comparing the predicted value with the listed value through percent error, students will gain practice with calculating percent increase or decrease.

### Concepts:

- Reading and interpreting graphs
- Modeling data with quadratic functions
- Solving non-linear systems of equations
- Determining percent error

### Activity at a Glance:

- Grade level: 9-12
- Subject: Algebra
- Estimated time required: 10-20 minutes

### Materials:

- TI-83 Plus family or TI-84 Plus family
- Overhead view screen calculator for instruction/demonstration
- Student handout
- Transparency

### Prerequisites:

Students should:

- be familiar with solving systems of equations.
- be familiar with the regression capabilities of the calculator.
- have prior knowledge about quadratics and what the vertex represents graphically.



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### Objectives:

Students will:

- create two scatter plots from the data.
- explore quadratic regression models for the scatter plots.
- find the intersection for the system of quadratic equations.
- find the vertex of a quadratic model.
- calculate the percent error between two values for one of the data sets.

### Background:

This activity will give students the opportunity to work with a system of quadratic equations. Students will explore solutions to problems by solving a system of equations. Students are also asked to explain the trend in the data by using a scatter plot of the data from the USA TODAY Snapshot “Is leisure time really shrinking?”. When the quadratic regression model is determined, the vertex of the model will be used to answer questions. Finally, students will be asked to compare a value from the model to the actual value listed in the USA TODAY Snapshot and determine the percent error between the two values.

### Preparation:

- Provide one graphing handheld for each student.
- Each student should have a copy of the corresponding student activity sheet.

### 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.
- Students can work individually or in small groups on this activity. Working in groups is especially helpful as they learn the various features of the handheld.
- This activity provides students with the opportunity to learn about numerically, graphically, and symbolically analyzing data. Give students the option of discussing the trends with each other and then have them write their own response to the question about trends.

### Data Source:

Harris Poll

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

#### Algebra Standard

- Write equivalent forms of equations, inequalities, and systems of equations and solve them with fluency-mentally or with paper and pencil in simple cases and using technology in all cases.

#### Problem Solving Standard

- Solve problems that arise in mathematics and in other contexts.

\*Standards are listed with the permission of the National Council of Teachers of Mathematics (NCTM), [www.nctm.org](http://www.nctm.org). NCTM does not endorse the content or validity of these alignments.

### Additional Resources:

- Student handout
- Transparency
- TI Technology Guide, for information on the following: TI-83 Plus family, TI-84 Plus family and List Editor
- TI-Navigator™ Basic Skills Guide for information on using the TI-Navigator Classroom Learning System

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### Activity Extension:

- Have students explore the Life section of USA TODAY to find activities, books, and movies that may interest them. Have them make a list of two or three new activities, books or movies that they would be interested in pursuing to expand and make the best of their leisure time.
- Facilitate a class discussion of what constitutes "leisure time" and the value and challenges in achieving a balanced quality of life. Then have students read and research in USA TODAY different ways people approach leisure time - some may volunteer, some may play sports, some may invest in the stock market, some may travel, etc.
- Have students conduct a poll in your community to determine the current number of hours per week adults spend on work and leisure. Have them create a USA TODAY-type Snapshot based on their data (using the type of work as a category rather than year). Have students note the number of people who completed the poll.

### Curriculum Connections:

- Health and Physical Education
- Business Education

### Teacher Notes:

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### Assessment and Evaluation:

- Q. Describe the trend in the difference between work and leisure time for the time period shown in the USA TODAY Snapshot “Is leisure time really shrinking?”.**
- A. The difference between hours spent at work and hours spent on leisure time increased from 1973 through 1987. There is a decrease in the difference between hours at work and at leisure from 1987 to 1994 with a slight increase between 1994 and 1997. Then the general trend is that the difference gets smaller from 1997 through 1999.
- Q. Will there be a time when Americans spend equal amounts of time on leisure and work? If so, predict when this will happen.**
- A. The scatter plots appear to be quadratic during this time period. The intersection of the two quadratic models would place the year at 2015 when equal amounts of time will be spent on leisure and work.
- Q. Using the mathematical model, predict the year when the most time was spent on work and determine the percent error in the prediction compared to the value listed in the USA TODAY Snapshot for that year.**
- A. The greatest number of hours spent on work according to the regression model was during 1994. The number of hours spent on work each week was predicted to be 50.6 for that year. The value listed in the Snapshot is 50.7, which creates a percent error of 0.2%. This means that the predicted value is under estimated by 0.2%.



If you are using the TI-Navigator Classroom Learning System, send the provided LearningCheck assessment to your class to gauge student understanding of the concepts presented in the activity. See the TI-Navigator Basic Skills Guide for additional information on how this classroom learning system may be integrated into the activity.