

# Math TODAY™

## Teacher Edition

# USA TODAY

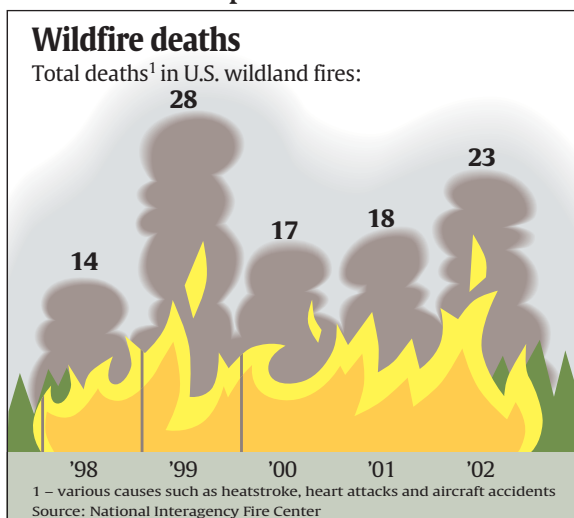
NO. 1 IN THE USA



## Wildfire deaths

By: Brenda Perkins

### USA TODAY Snapshots®



By Sam Ward, USA TODAY

### Activity Overview:

Wildfires devastate millions of acres a year and cost millions of dollars in lost lumber, housing, and suppression costs. The most alarming figure is the number of fatalities associated with wildfires. The USA TODAY Snapshot "Wildfire deaths" displays the number of fatalities for the five years spanning 1998 through 2002. Students will be asked to use this data to determine a linear model. They will examine the affect an outlier has on the model and compare methods to determine the best model.

### Concepts:

- Linear regression with  $r$  and  $r^2$  values
- Median-median lines
- Slope and  $y$ -intercept
- Scatter plots
- Outliers

### Activity at a Glance:

- Grade level: 9-12
- Subject: Algebra
- Estimated time required: 50 minutes

### Materials:

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

### Prerequisites:

Students should be able to:

- enter data into the List Editor.
- set-up a scatter plot on the calculator.
- calculate a linear regression and median-median fit equation using the calculator.



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This activity was created for use with Texas Instruments handheld technology.

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## Wildfire deaths

### Objectives:

Students will:

- create a scatter plot.
- determine a linear equation using linear regression both with and without the outlier on the calculator.
- determine a linear equation using median-median both with and without the outlier on the calculator.
- compare the two sets of lines and determine which method is better when there is an outlier in the data set.

### Background:

In this activity, students are asked to compute different mathematical algorithms, to compare different algorithms on the same data, and to make decisions on which yields the better result. The data provided has an outlier, which significantly affects the prediction equation. Students should compare the linear equation developed through a linear regression. Then, using the same data the equation developed, use the median-median method. They should calculate the equation with the outlier in the data set, and then without it. Finally, students are asked to evaluate the equations and determine the better method for this particular situation.

This data, over an extended period of time, is not linear. Therefore, this activity does not instruct students to use their equations for prediction. The National Interagency Fire Center provides data on deaths caused by wildfires from 1910 to current. The data is very cyclical with a maximum of 78 fatalities in 1910 to several years of only having a single fatality. This activity gives students the opportunity to use data to pre-determine results.

### Preparation:

- Provide one graphing handheld for each student (and TI Keyboard if available).
- Each student should have a copy of the corresponding student activity sheet.
- Provide a straight edge and colored pencils for graphing.

### Data Source:

National Interagency Fire Center

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

#### Algebra Standard

- Represent and analyze mathematical situations and structures using algebraic symbols.
- Use mathematical models to represent and understand quantitative relationships.

#### Data Analysis Standard

- Develop and evaluate inferences and prediction that are based on data.

#### Problem-Solving Standard

- Apply and adapt a variety of appropriate strategies to solve problems.

#### Representation Standard

- Create and use representations to organize, record, and communicate mathematical ideas.
- Use representations to model and interpret physical, social and mathematical phenomena.

\*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.

## Wildfire deaths

### 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.
- Allow students to talk about the "how" and "why" approach they used to find the solutions.
- This activity can be used as a review of concepts or a culminating activity with the class.

### Activity Extension:

- Have students use their chosen equations to make predictions about future and past fatalities caused by wildfires. This should lead the students to determine that the limited data set appears to be linear but the entire set is not.
- Have the students write a persuasive article using their chosen linear equation for prediction.
- Ask students to look through USA TODAY to identify other environmental disasters that have an impact on society. In what ways have people worked to avert these disasters? If they could not be averted, what have people done to prepare for these situations?

### Curriculum Connections:

- Earth Science/Biology
- Geography
- Health
- Statistics

### Additional Resources:

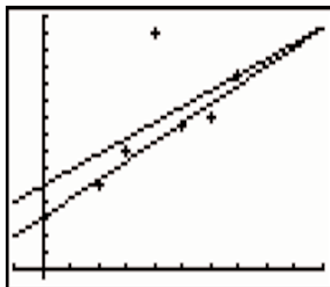
- Student handout
- Transparency
- TI Technology Guide, for information on the following: TI-83 Plus family, TI-84 Plus family, List Editor, Science Tools, Finance and Cabri® Jr.
- TI-Navigator™ Basic Skills Guide for information on using the TI-Navigator Classroom Learning System

### Teacher Notes:

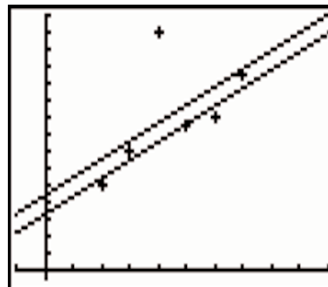
## Wildfire deaths

### Assessment and Evaluation:

Linear Regression



Median-Median



Window for both graphs

```

WINDOW
Xmin=-1
Xmax=10
Xscl=1
Ymin=-1
Ymax=30
Yscl=2
Xres=1
    
```

$$Y1 = 1.886x + 9.848 \quad r = 0.551 \quad r^2 = 0.303$$

$$Y3 = 2.125x + 8.770$$

$$Y2 = 2.256x + 6.023 \quad r = 0.969 \quad r^2 = 0.939$$

$$Y4 = 2.125x + 6.583$$

**Q. Using the equations from the linear regression, which equation best fits the model? List at least two reasons and be specific.**

A. The second equation fits best. 1) It has better  $r^2$ . 2) It better approximates the middle of the data points.

**Q. What is the difference in the slope of the two linear regressions? The y-intercept?**

A. The slopes differ by 0.37 and the y-intercepts by 3.825.

**Q. What is the difference in the slope of the two median-median equations? The y-intercept?**

A. There is no difference in the two slopes. The y-intercepts differ by 2.187.

**Q. Which linear regression equation is closer to the median-median equation?**

A. The second equation is closer. The slopes are nearly the same and the y-intercept is closer.

**Q. What is the method least affected by the outlier?**

A. The method which is least affected by an outlier is the median-median.



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.