# Math TODAY™ Challenge
## Teacher Edition

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# Wildfires nearly snuffed

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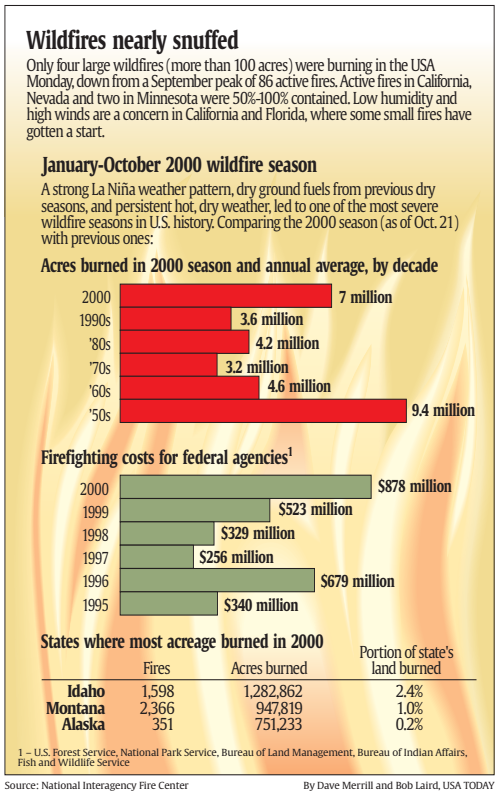


## Activity Overview:

Every summer, wildfires spread when areas of the United States become hot and dry. We often hear reports about the number of acres that are burning and see footage from the regions. How large is the area that is burning? What are some possible perimeters for the fires? Students will use the data from the USA TODAY Infograph to explore the relationship between area and perimeter for rectangles and circles and they will make generalizations about the shape of the rectangle that will produce the smallest perimeter. Students will also consider numerical summary statistics of mean and median with the cost to fight wildfires.

## Concepts:

- Unit conversion
- Area and perimeter of rectangles
- Area, circumference, and radius of circles
- Measures of central tendency (mean and median)

## Activity at a Glance:

- Grade level: 8-12
- Subject: Geometry
- Estimated time required: 50-60 minutes

## Materials:

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

## Prerequisites:

Students should:

- know the basic functionality of the CellSheet™ Application.
- know how to use the ScienceTools application for unit conversion.
- have prior experience with area and perimeter of a rectangle.
- have prior experience with area, radius and circumference of a circle.

This activity works with TI navigator A Classroom Learning System

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## Objectives:

Students will:
- convert measurements within the customary system.
- investigate relationships between area and perimeter of rectangles.
- find the radius and circumference of a circle with a given area.
- determine the type of rectangle with a given area that will produce the smallest perimeter.
- explore the measures of central tendency.

## Background:

Students will have the opportunity to explore the relationship between the dimensions of a rectangle with fixed area and the perimeter. The students will graphically analyze data to decide if there is a certain type of rectangle that would generate the smallest perimeter. Students will compare the perimeters of rectangles and circles and decide if one shape will generate the optimum perimeter. Data provided in the USA TODAY Infograph will give the students a look at the finances involved in firefighting.

## 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.
- If this is the first time students will be working with the CellSheet™ App, you may want to direct the entire class on how to open and name the spreadsheet.
- This is a great time to have the students work on the handheld with CellSheet™ and then, using CellSheet™ Converter, move the data from the handheld to the computer. The students can work with the spreadsheet on the computer and then transfer the spreadsheet to their handheld.
- You may want to review area, perimeter, radius, and circumference before starting this activity.
- This activity can be completed using the list editor on the handheld to create the possible widths, lengths, and perimeters.
- Students can make the conversion with the handheld by knowing that there are 640 acres per one square mile.

## Data Source:

National Interagency Fire Center

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

**Geometry Standard**
- Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.
- Use visualization, spatial reasoning, and geometric modeling to solve problems.

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

*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.

## Additional Resources:

- Student handout
- Transparency
- TI Technology Guide, for information on the following: TI-73 family, TI-83 Plus family, TI-84 Plus family, List Editor, ScienceTools, Finance, and Cabri® Jr.
- TI-Navigator™ Basic Skills Guide for information on using the TI-Navigator Classroom Learning System

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### Activity Extension:

- Have students research the five states that had the greatest amount of land burned by wildfires in 2003 (or another year of your choice). Then, have them create a table showing the percent of land in each state that was burned in that year. Which state had the greatest percent of land affected by wildfires?

- Ask students to use a value that would approximate the total acres burned for 2002 as shown in the USA TODAY article "Fires rage in the West at a mid-August pace". To the nearest mile, what are the dimensions of a rectangle with an area of 1,600,000 acres that has the smallest perimeter? To the nearest mile, what is the perimeter?

- Have students write a proof to show that if a square and a circle have the same area, the circumference of the circle is less than the perimeter of the square.

### Curriculum Connections:

- Physical Education - fitness
- Economics - expenses
- Environmental Science

### Teacher Notes:

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## Assessment and Evaluation:

**Q. Suppose a fire approximately the size of Walker, about 16,000 acres, was burning in the shape of a rectangle. What dimensions (measured in miles) for the rectangle produce the smallest perimeter? What is the smallest perimeter?**

A. Using Science Tools, the 16,000 acres equal 25 square miles.
16,000 acres = 25 square miles
This is the data from the handheld that has converted to a spreadsheet on the computer using TI CellSheet Converter. The rectangle with dimensions of 5 miles X 5 miles will produce the smallest perimeter of 20 miles.

| WIDTH | LENGTH | PERIMETER |
|---|---|---|
| 1 | 25 | 52 |
| 2 | 12.5 | 29 |
| 3 | 8.33333333 | 22.66666667 |
| 4 | 6.25 | 20.5 |
| 5 | 5 | 20 |
| 6 | 4.16666667 | 20.33333333 |
| 7 | 3.57142857 | 21.14285714 |
| 8 | 3.125 | 22.25 |
| 9 | 2.77777778 | 23.55555556 |
| 10 | 2.5 | 25 |
| 11 | 2.27272727 | 26.54545455 |
| 12 | 2.08333333 | 28.16666667 |
| 13 | 1.92307692 | 29.84615385 |
| 14 | 1.78571429 | 31.57142857 |
| 15 | 1.66666667 | 33.33333333 |
| 16 | 1.5625 | 35.125 |
| 17 | 1.47058824 | 36.94117647 |
| 18 | 1.38888889 | 38.77777778 |
| 19 | 1.31578947 | 40.63157895 |
| 20 | 1.25 | 42.5 |
| 21 | 1.19047619 | 44.38095238 |
| 22 | 1.13636364 | 46.27272727 |
| 23 | 1.08695652 | 48.17391304 |
| 24 | 1.04166667 | 50.08333333 |
| 25 | 1 | 52 |

**Q. Suppose the shape of the wildfire was a circle. To the nearest mile, what are the radius and circumference of this wildfire?**

A. A= r2 = 25. The radius is 3 miles and the circumference will be 19 miles.

**Q. Firefighters may control a fire by ensuring that the area just outside the perimeter of the fire is kept from burning. Which geometric shape would be the easiest to control? Why?**

A. The circle, because the circumference is smaller than any perimeter found for rectangles of the same area.

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## Assessment and Evaluation (continued):

**Q. The USA TODAY Infograph "Wildfires nearly snuffed" shows the costs for federal agencies to fight fires from 1995 through 2000. What are the mean and median values for this time period? Look at the USA TODAY Infograph "Wildfires nearly snuffed" and complete the chart below.**

A.

**Firefighting costs for federal agencies**

| Year | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|
| $ in millions | 340 | 679 | 256 | 329 | 523 | 878 |

Mean= 500.8

Median= 431.5

**Q. What was the cost per acre to fight wildfires in the January-October 2000 season?**

A. Cost per acre was $125

**Q. Use this cost per acre and determine the amount spent in Idaho during the January-October 2000 wildfire season.**

A. Idaho's expense to fight the 1,282,862 acres that burned during the January-October 2000 season was $160,357,750.


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.