

# Math TODAY®

## Teacher Edition

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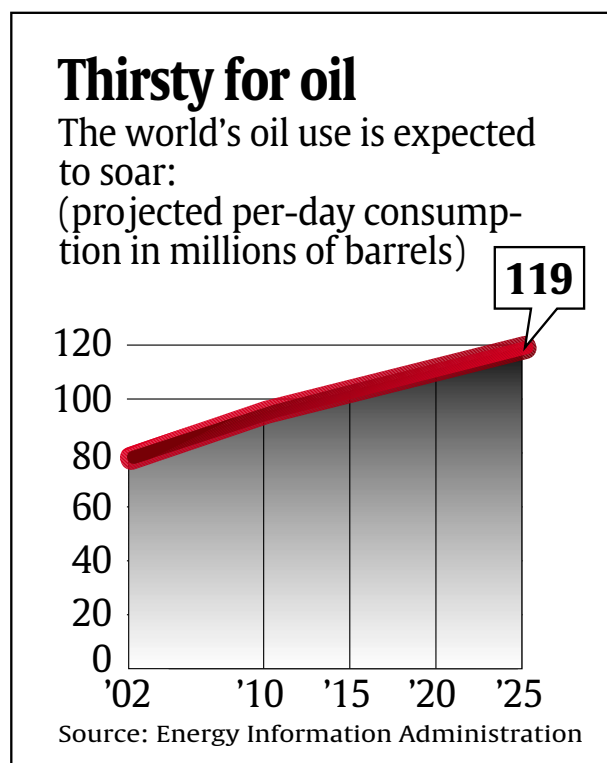
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## Thirsty for oil

by: Bob Tower



By Keith Simmons, USA TODAY

### Activity Overview:

In this activity, students will use the USA TODAY Infograph “Thirsty for oil” to explore the area of a trapezoid and determine how to find area. Students will find the area of a parallelogram and use this to determine a formula for the area of a trapezoid. Applying the relationship to a real-world problem will help students understand how geometry is used to solve problems.

### Activity at a Glance:

- Grade level: 8-10
- Subject: Geometry
- Estimated time required: 30 minutes

### Materials:

- TI-83 Plus family or TI-84 Plus family
- Cabri® Jr. Application
- TI-ViewScreen™ calculator for instruction/demonstration
- Student Handout
- Transparency
- USA TODAY newspapers (recommended)

### Prerequisites:

Students should:

- know how to use Cabri Jr.
- have prior knowledge about area of parallelogram
- have prior knowledge about the definition of a trapezoid



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## Thirsty for oil

### Concepts:

- Area of trapezoid
- Area of parallelogram
- Unit analysis

### Objectives:

Students will:

- find the area of a parallelogram.
- explore and find the area of a trapezoid.
- use appropriate units for area.

### Background:

The purpose of this lesson is to help students to develop a better understanding of area of a trapezoid. In this activity, students will use concepts from their study of the area of a parallelogram to derive a formula for the area of a trapezoid. Applying the area formula to a real-world problem will help students understand where formulas can be applied. When finding the area, students will need to think about the unit's values given and what the unit value would be for the area found.

### Preparation:

- Provide one graphing calculator for each student.
- Each student should have a copy of the corresponding student activity sheet.
- Provide each student with the following calculator file (*AppVar*) *TRAP*.

### Classroom Management Tips:

- Have students link their calculators and share the AppVars as part of the class period on the previous day or during the beginning of the class period when you are going to use this activity. Insure that Cabri Jr. and the calculator operating system have been updated to latest versions.
- Review opening an AppVars using Cabri Jr. with your class before starting the activity.
- Students can work individually or in groups to assist each other during the activity.
- Have students discuss their discoveries while they work to better understand the relationships.
- Before starting the AppVars, remind students to carefully read the opening screen and the activity pages.

### Data Source:

Energy Information Administration

### National Council of Teachers of Mathematics (NCTM)

#### Standards:

#### Geometry Standard

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

#### Problem Solving Standard

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

#### Connections Standard

- Recognize and apply mathematics in contexts outside of mathematics.

### Document Links:

*TI Technology Guide*, for information on the following:

- TI-83 Plus family or TI-84 Plus family
- Cabri Jr.

## Thirsty for oil

### Activity Extension:

- Challenge students to find and bring in other examples of this type of graph from USA TODAY. Use these as additional problems for students to continue working on this topic or use as a review for an exam.
- Challenge the students to find the daily Markets in the Money Section and find the current price per barrel for crude oil under Commodities. Use this value in the activity or have students work an additional problem using the current price.
- Additional information about oil consumption can be found at [http://www.eia.doe.gov/oiaf/aeo/pdf/aeotab\\_12.pdf](http://www.eia.doe.gov/oiaf/aeo/pdf/aeotab_12.pdf). Encourage students to find additional information and write a one-page summary.
- For a timely activity, ask students to present uses of oil and ways to reduce oil consumption by noting information from USA TODAY.

### Curriculum Connection:

- Geography—world locations
- Algebra—equations of lines

### Assessment and Evaluation:

**Activity 1: You will explore the area of a trapezoid. Complete Activity 1 before answering the questions.**

#### Step 2.

**Q. What is the length of the base of the parallelogram? What is the measure of the height of the parallelogram? What is the area of the parallelogram?**

- Length of the parallelogram
- Height of the parallelogram
- Area of the parallelogram

A. Length of the parallelogram =  $FH + HA = 5.4$   
 Height of the parallelogram =  $AC = 2.5$   
 Area of the parallelogram = 13.5

#### Step 3.

**Q. How does this value compare with your calculation from Step 2?**

A. The areas are the same.

### Teacher Notes:

## Thirsty for oil

### Assessment and Evaluation:

#### Step 4.

**Q.** Use  $b_1$  for FH and DC,  $b_2$  for ED and HA and  $h$  for AC and EG in each trapezoid.

- Write an expression for the length of the base of the parallelogram using  $b_1$  and  $b_2$ .
- Write an expression for the area of the parallelogram using  $b_1$ ,  $b_2$ , and  $h$ .

A. Length of base =  $b_1 + b_2$   
 Area =  $(b_1 + b_2)h$

#### Step 5.

**Q.** How does the area of each trapezoid compare to the area of the parallelogram?

A. Each trapezoid is the area of the parallelogram.

#### Step 6.

**Q.** Use your answers from Steps 4 and 5 to write a formula for the area of each trapezoid.

A. Trapezoid area =  $(b_1 + b_2)h$

#### Step 7.

**Q.** Making sure to exit the current tool, move the pointer (clear arrow) to H and press  $\square$ . Use the hand cursor to grab, move H and press  $\square$ . Move the pointer to D, press  $\square$  and use the hand cursor to grab and move D so that ED is equal to HA. Explain what happened to the area of the parallelogram as the values for FH, HA, ED, and DB change.

A. The area of the parallelogram remains the same.

#### Step 8.

**Q.** Will your formula from Step 6 for the area of each trapezoid still be true?

A. Yes!

**Activity 2: How many total barrels of oil are expected to be consumed from 2002 through 2010**

#### Step 1.

**Q.** How many days are there from 2002 through 2010?

A. 3,285 days

### Teacher Notes:

## Thirsty for oil

### Assessment and Evaluation:

#### Step 2.

**Q.** The region of the Infograph from 2002 through 2010 is in the shape of a trapezoid. Use your formula to approximate the area of this region. What are the units for the vertical axis? What are the units for the horizontal axis?

- A. Vertical axis: millions of barrels per day  
Horizontal axis: years that are converted to days

#### Step 3.

**Q.** The approximate number of barrels of oil for 2010 is 93 million per day. What is the total number of barrels of oil estimated to be consumed in 2010?

- A. 284,152.5 millions of barrels.

**Activity 3:** For the time period shown in the USA TODAY Infograph “Thirsty for oil,” find the expected number of barrels of oil that will be consumed.

#### Step 1.

**Q.** For the time period shown in the USA TODAY Infograph “Thirsty for oil,” find the expected number of barrels of oil that will be consumed.

- A. There are 8,760 days during this period. The expected number of barrels:  
 $(8760)(80 + 119) = 871,620$  million barrels.

**Activity 4:** If the price per barrel of oil is \$63, what is the cost for 2002? For 2002 through 2010?

**Step 1.** Look at the USA TODAY Infograph to determine the number of barrels of oil consumed for 2002.

- A. Barrels for 2002 = 29,200

#### Step 2.

**Q.** Using the price of \$63/barrel, what is the cost for 2002?

- A. For 2002 = \$1,839,600 millions.  
For 2002 through 2010 = \$17,901,607.5 million. WOW!!!

### Teacher Notes:



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.