

# Math TODAY™

## Teacher Edition

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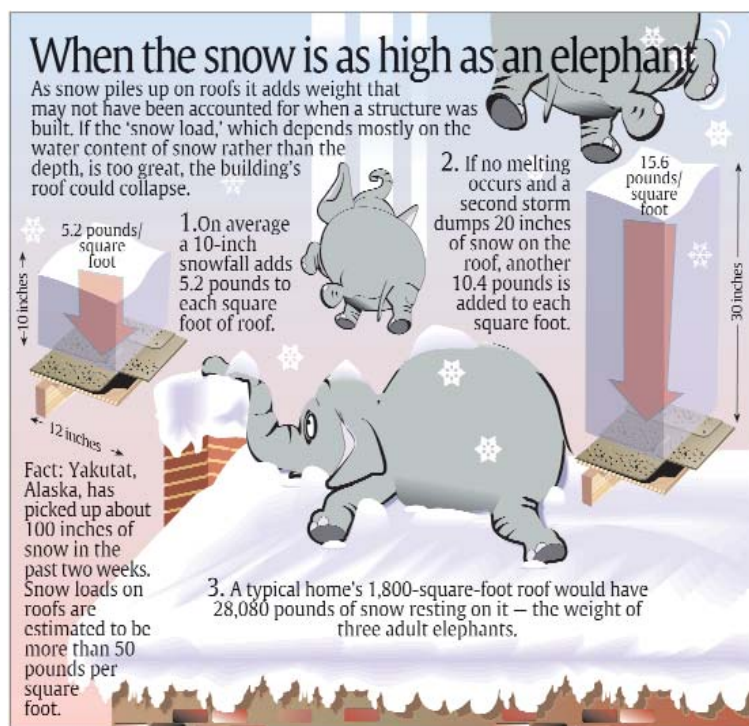
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## When the snow is as high as an elephant

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Source: The Snow Booklet by Nolan J. Doesken and Arthur Judson

By Dave Merrill, USA TODAY

### Activity at a Glance:

- Grade level: 6-10
- Subject: Geometry
- Estimated time required: 100 minutes

### Materials:

- TI-73 family, TI-83 Plus family or TI-84 Plus family
- Overhead view screen calculator for instruction/demonstration
- Student handout
- Transparency
- Ruler or yardstick
- Bucket or box lined with a plastic trash bag
- Scoop or shovel
- Scale

### Prerequisites:

Students should be able to:

- find area of various shapes.
- calculate volume.
- convert units.
- use the List Editor on the handheld.

### Activity Overview:

Snow is nothing more than frozen, crystallized water, but its white beauty has the ability to transform a rather bleak and drab landscape into a sparkling wonderland. It also creates an entirely different set of problems for the average homeowner than its fluid parent. The USA TODAY Infograph "When the snow is as high as an elephant" helps us understand snow from a more practical point of view. Students will answer several questions about the different components of the graphic. Then, they will have the opportunity to do some fieldwork by measuring the depth of snowfall and finding its weight. They will combine their individual data with their classmates' data to make estimates more accurate. Finally, students will use the combined data to make estimates of various weights that roofs in your area can support.



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## When the snow is as high as an elephant

### Concepts:

- Calculating the volume of a prism
- Converting units from inches to feet
- Calculating the area of a figure
- Collecting data and sharing data

### Objectives:

Students will:

- draw a shape on cardboard and calculate its area.
- measure snow depths and use the area of their base to calculate the volume of the snow.
- calculate the pounds per cubic foot of snow.
- use class data to make estimates and predictions.

### Background:

This is a hands-on activity that will help students better understand the relationship between area, volume and weight. Students will also develop the connection between linear, 2-dimensional and 3-dimensional measurements. By working with the graphic, students will have the opportunity to practice unit conversions with an application.

Students will also practice measuring using a ruler and scale and will use the average of collected data to make predictions. Students must understand how to zero out the scale in order to get an accurate weight measurement.

### Preparation:

- Provide one graphing handheld for each student.
- Each student should have a copy of the corresponding student activity sheet.
- Assemble all of the necessary materials to measure the snowfall.

### Classroom Management Tips:

- Students will have a better understanding of how to read the graphic 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. 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.

### Data Source:

The Snow Booklet by Nolan J. Doesken and Arthur Judson

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

#### Number and Operations Standard

- Compute fluently and make reasonable estimates.
- Understand numbers, ways of representing numbers, relationships among numbers, and number systems.

#### 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.

#### Data Analysis and Probability Standard

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

#### Problem Solving Standard

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

#### Communications Standard

- Organize and consolidate mathematical thinking through communications.
- Communicate mathematical thinking coherently and clearly to peers, teacher and others.

\*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.

## When the snow is as high as an elephant

### Activity Extension:

- Have students compare the volume of the snow to the amount of water produced when the snow melts.
- Have students build structures and test for the amount of weight different shapes will hold.
- Have students research different types of roofs. Ask them to determine which climates each roof type is prevalent in and describe why.
- Have students look in USA TODAY and find a weather related article. Ask them to create a cartoon related to the article.

### Curriculum Connections:

- Earth Science
- Industrial Arts/Building Trades

### 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, Science Tools, Finance and Cabri® Jr.
- TI-Navigator™ Basic Skills Guide for information on using the TI-Navigator Classroom Learning System

### Teacher Notes:

## When the snow is as high as an elephant

### Assessment and Evaluation:

#### Reading and Analyzing the USA TODAY Infograph

Round all of your answers to two decimal places.

**Q. Look at #1 on the USA TODAY infograph "When the snow is as high as an elephant." Calculate the volume of the snow prism drawn. Use cubic feet as your units. Then calculate the weight of the snow per cubic ft.**

A. Volume =  $1440 \text{ inches}^3 = .83 \text{ feet}^3$       Weight =  $6.27 \text{ lb/ft}^3$

**Q. Look at #2 on the USA TODAY infograph. Calculate the volume of snow prism drawn. Use cubic feet as your units. Then calculate the weight of the snow per cubic foot.**

A. Volume =  $4320 \text{ inches}^3 = 2.5 \text{ feet}^3$       Weight =  $6.24 \text{ lb/ft}^3$

**Q. Explain how #3 arrived at a total weight of 28,080.**

A. The authors multiplied 2800 square feet times 15.6-lb/square foot.

**Q. Read the "Fact" in the lower left hand corner of the USA TODAY Infograph. What is the exact number of inches needed to make the snow load 50 pounds per square foot? Show your work.**

A.  $50 \text{ lbs/ft}^2 \div 5.2 \text{ lbs/ft}^2 \text{ for } 10 \text{ inches} = 9.615 \times 10 = 96.15 \text{ inches}$

**Q. According to the graphic, how much does the average adult elephant weigh?**

A. Weight = 9360 lbs

#### Working the Experiment

Round all of your answers to two decimal places. Student's answers will vary.

**Q. What was the area of your base? The average depth of the snow? The weight of the snow?**

A.  $A_B = \underline{\hspace{2cm}}$       Avg. Depth =  $\underline{\hspace{2cm}}$       Weight =  $\underline{\hspace{2cm}}$

**Q. What is the volume of your block of snow?**      A. Volume =  $\underline{\hspace{2cm}}$   $\text{ft}^3$

**Q. How much does the snow weigh per cubic foot?**      A. Weight =  $\underline{\hspace{2cm}}$  per cubic foot

**Q. What are the mean and median weights per square foot?**

A. Mean =  $\underline{\hspace{2cm}}$       Median =  $\underline{\hspace{2cm}}$

**Q. Using either the mean or median calculate the weight currently on a typical roof of 1800ft<sup>2</sup>. Show your work.**

A. Mean =  $\underline{\hspace{2cm}}$       Median =  $\underline{\hspace{2cm}}$



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.