

Supertall Skyscrapers

ID: 8684

 Time required
 30 minutes

Activity Overview

In this activity, students use their graphing calculators to measure scale drawings of famous “supertall” skyscrapers. They first check that the Sears Tower is drawn to scale by verifying that two expressions form a proportion. They then use their measurements to calculate the scale of the drawing. Next they write and solve more proportions to find the heights of other skyscrapers drawn with the same scale. The activity closes with the students creating an accurate scale model of themselves within one of the scale drawings.

Topic: Linear Equations

- *Use cross-multiplication to solve for any variable in a proportion.*

Teacher Preparation and Notes

- *This activity is designed for use in an Algebra 1 or Pre-Algebra classroom. Prior to beginning the activity, students should download the **SKYSCRAP** program to their handhelds. They should also have some experience verifying and solving proportions, and have plotted points on the Cartesian plane. Before the activity you may choose to share the following information to generate interest:*
 - *The Sears Tower, located in Chicago, is the tallest building in the United States. The high definition television antennae, placed there by helicopter in 2000, make it the world’s tallest building by ‘tip height.’ Its elevators move at 1,600 feet per minute. It has 108 floors. Over 1.5 million people visit the observation deck every year.*
 - *The Taipei 101, located in Taiwan, currently holds the title for the World’s Tallest Building. The building has 101 floors and construction was completed in 2004. In this activity, students will discover the height of the Taipei 101.*
 - *For more information on these and other skyscrapers, go to **www.tallestbuildingintheworld.com**.*
- ***To download the student worksheet and calculator program, go to education.ti.com/exchange and enter “8684” in the keyword search box.***

Associated Materials

- *Skyscrapers_Student.doc*
- *SKYSCRAP.8xp*

A scale drawing is an enlarged or reduced drawing that is similar to an actual object or place. Blueprints and maps are examples of scale drawings. The ratio of a distance in the drawing to the actual distance is the scale of the drawing.

To start, students will need an empty graph window. Clear out any functions from the $\boxed{Y=}$ screen and turn off all Stat Plots. Use this document as a reference and to record your answers.

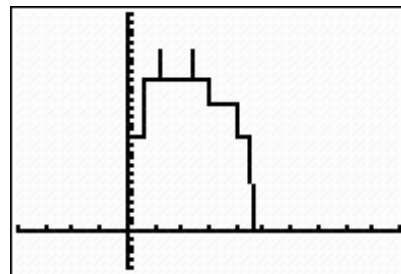
Problem 1 – Verifying that a drawing is to scale

In this problem, students will view and measure a scale drawing on their calculator.

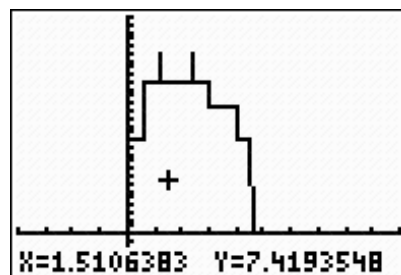
They will choose the **SKYSCRAP** program and select **1:Sears Tower**.



The program displays a scale drawing of the Sears Tower, the tallest building in the United States. Students will use to graph's axes to measure the height of the building in the scale drawing.



Students measure the figure using coordinates and the $\boxed{\text{TRACE}}$ feature. Because the antennae are not a structural part of the Sears Tower building, they are not included in its official height measurement. The official height is the roof height, without the antennae.

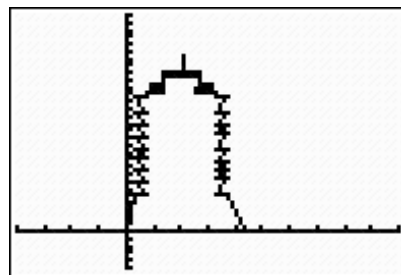


All answers will vary. Sample answers:

- $x = 0.0425; y = 0.161$
- tip height = 25 units
- roof height = 20.967 units
- $\frac{527}{25} = \frac{442}{20.967}$
- Yes. When you cross-multiply, you get $11,049.609 \approx 11,050$. The two sides of the expression are approximately equal.
- Yes. The drawing is to scale because the two heights formed a proportion.
- 1 unit = 21.08 meters

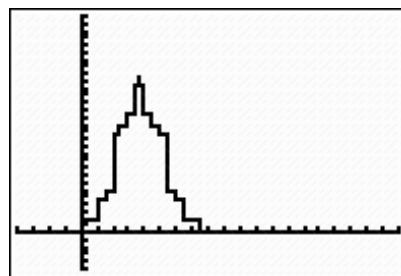
Problem 2 – Finding the height of other skyscrapers

Run the **SKYSCRAP** program again. This time select **2: Taipei 101**. The program displays a scale drawing of the Taipei 101, currently the tallest building in the world. Students adjust the window settings if necessary to see the entire drawing.



The spire at the top of the Taipei 101 is considered part of the structure, so it is included in its official height measurement. Students calculate the actual height of the Taipei 101.

Run the **SKYSCRAP** program again and choose **3: Empire State**. This drawing uses the same scale as the Sears Tower and Taipei 101 drawings. Students find the actual height of the Empire State Building.

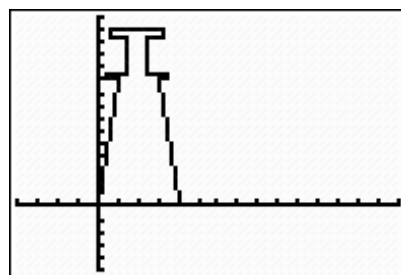


All answers will vary. Sample answers:

- official model height = 24.09867 units
- $\frac{527}{25} = \frac{x}{24.09867}$
- actual height of Taipei 101 = 508 meters
- actual height of Empire State Building = 449 meters

Problem 3 – Are you to scale?

Run the **SKYSCRAP** program again and choose **4: Lighthouse**. This program displays a drawing of a lighthouse. This drawing does **not** have the same scale as the skyscraper drawings. The actual height of the lighthouse is 10 meters. Students will explore what it would look like if they stood next to this lighthouse. They will add a scale drawing of themselves to this figure.



All answers will vary. Sample answers:

- Check students' answers.
- lighthouse height = 14 units
- 1 unit = 0.7143 meters
- Check students' answers.