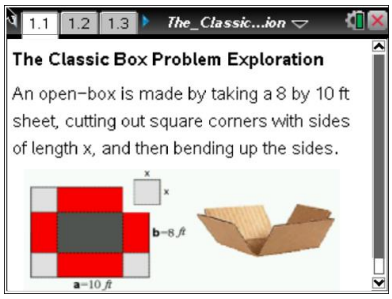
About the Mathematics

The TI-Nspire document *The_Classic_Box_Problem_Exploration.tns* takes a classic optimization problem and uses the dynamic linking capabilities of the TI-Nspire family to enact the problem in multiple representations: diagramatic, geometric, graphic, numeric. The problem scenario is illustrated on the title screen shown at the right.



Math Objective

- Students will use multiple-linked graphical, geometric (2D and 3D), and numeric representations to model a classic optimization problem.
- Students will make sense of problems and persevere in solving them. (CCSS Mathematical Practice)
- Students will model with mathematics. (CCSS Mathematical Practice)

Activity Materials

- Compatible TI Technologies: TI-Nspire™ CX Handhelds, TI-Nspire™ Apps for iPad®, TI-Nspire™ Software

Using the Document

The TI-Nspire document is a self-contained lesson that students can work through entirely on the TI-Nspire handheld or Student Software.

Page 1.1 poses the setting and page 1.2 sets out the goal: determine the size of the squares that result in the largest volume for the box. Page 1.3 poses a pre-assessment question on the graph of the model of the volume of the box as a function of the square side length *x*. Page 2.1 gives directions for page 2.2: a dynamic diagram and 3D representation of the box linked to numeric and graphic representations. Page 2.3 poses a sense-making question on why the graph is *not* monotonically increasing.

Pages 3.1 and 3.2 step students through the modeling process to complete an algebraic expression for the volume of the box as a function of the side length *x* of the square. Page 3.3 gives students the opportunity to graph their models of the volume.

Tech Tips:

- This activity includes screen captures taken from the TI-Nspire CX handheld. It is also appropriate for use with the TI-Nspire family of products including TI-Nspire software and TI-Nspire App. Slight variations to these directions may be required if using other technologies besides the handheld.
- Watch for additional Tech Tips throughout the activity for the specific technology you are using.
- Access free tutorials at http://education.ti.com/calculators/pd/US/Online-Learning/Tutorials

Lesson Files:

The_Classic_Box_Problem_Exploration.tns

Tech Tip: On the graph side of the screen, press ctrl G to display *f*2(*x*) and enter the equation of the model. If the model fits, when you grab and move the point on the net again, the dynamically-linked plot point on the right should trace out the graph!

Tech Tip: On the graph side of the screen, double tap in the open space to display *f*2(*x*) and then enter the equation of the model. If the model fits, when you grab and move the point on the net again, the dynamically-linked plot point on the right should trace out the graph!

Possible Applications

This is a great problem for illustrating multiple representations and algebraic modeling of a geometric scenario to solve a classic optimization problem.