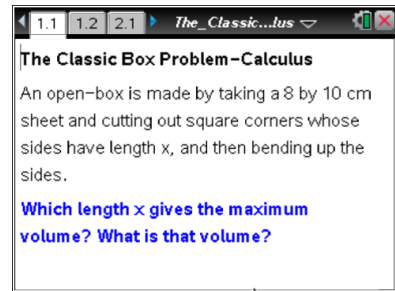## About the Mathematics

The *Box_Problem_Calculus.tns* document takes a classic problem from calculus and uses the dynamic linking capabilities of TI-Nspire to enact the problem in multiple representations: diagramatic, graphic, numeric, geometric, and symbolic. The problem is posed on the title screen shown at the right.

Math Objective

- Students will use differential calculus to solve an optimization problem illustrated through linked graphical, geometric (2D and 3D), and numeric representations.
- Students will make sense of problems and persevere in solving them. (CCSS Mathematical Practice)
- Students will model with mathematics. (CCSS Mathematical Practice)

Using the Document

The document is a self-contained lesson presentation.Page 1.1 poses the problem. Page 1.2 has a dynamic diagram: one can grab and drag a point on the sheet of paper to control the size of squares cut from the corners. Page 2.1 shows the same diagram as well as the numerical results of the corresponding height, base area, and volume of the box. Page 3.1 provides an animated and linked graphical representation of the volume of the box as a function of its height (equal to the side length of the squares cut from the corners).

Page 4.1 provides the dynamic diagram again along with another linked graphical representation, so one can control the box height.

Page 5.1 provides a step-by-step symbolic solution of this optimization problem using differential calculus. Page 6.1 illustrates that the symbolic calculus work indeed provides the solution to the problem.

Possible Applications

This is a great problem for illustrating multiple representations and the power of differential calculus to solve optimization problems. A calculus teacher could use it to effectively introduce applied max-min problems.

TI-Nspire™ Technology Skills:
- Open a document
- Grab and drag a point
- Move between pages

Tech Tips:
- You can hide the function entry line by pressing ctrl G.
- You can download this file to a handheld but it will likely run very slowly. Computer use is recommended.

Lesson Materials:
Box_Problem_Calculus.tns

Visit www.mathnspired.com for lesson updates.