THE BOX PROJECT

Essential Question: How can the Surface Area and Volume of a box be expressed using a polynomial?

CCGPS Curriculum Standards:

MCC9-12.A.SSE.1: Interpret expressions that represent a quantity in terms of its context.

MCC9-12.A.SSE.2: Use the structure of an expression to identify ways to rewrite it.

MCC9-12.F.IF.7c: Graph polynomial functions, identifying zeros when suitable factorizations are available.

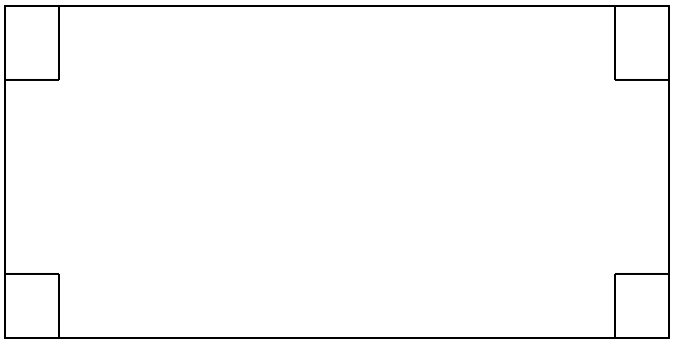
MCC9-12.G.MG.3: Apply geometric methods to solve design problems.

GOALS

- Determine how a flat surface can be turned into a three-dimensional rectangular prism (a perfect box).
- Calculate the Surface Area and Volume of the box provided certain parameters.
- Write Algebraic Polynomial Expressions for Surface Area and Volume with variable parameters.
- Create a model of the prism.

MODELING AND CALCULATING
THE SURFACE AREA AND VOLUME OF
A RECTANGULAR PRISM (A BOX)

You have been hired by a company to design a new box for their product. You have been given the dimensions of a rectangular piece of cardboard that must be used to construct the box. A certain amount must be cut off the corners, in equal squares, so that the tabs are folded upward to create the depth of the box.



Once the congruent squares are removed, you will have a box (with no top).

TASK OUTLINE

1. Create your box cutting off the amount assigned to you. For optimum points, the box must be square and level; tabs must be in alignment.

2. Calculate the Surface Area of your box, showing all work.

3. Write the algebraic model for the Surface Area of the box when "x" units are removed at the corners. Provide the standard form of this polynomial, showing all steps.

4. Substitute your value of "x" (the amount cut off at the corners) into the factored form *and* standard form from #3 above. Ensure the surface area matches your total provided in #2 above.

5. Using a graphing calculator, find the value of "x" that would maximize the surface area of your box. Write a sentence describing what your answer means. Provide a sketch of your graph.

6. Calculate the Volume of your box, showing all work.

7. Write the algebraic model for the Volume of the box when "x" units are removed at the corners. Provide the factored form *and* standard form of this polynomial, showing all steps.

8. Substitute your value of "x" (the amount cut off at the corners) into the factored form *and* standard from #7 above. Ensure the volume matches your total provided in #6 above.

9. Using a graphing calculator, find the value of "x" that would maximize the volume of your box. Write a sentence describing what your answer means. Provide a sketch of your graph.

10. Using your imagination, decorate the box.

THE BOX PROJECT GRADING RUBRIC NAME: _____

DUE DATE: _____My box looks like a _____

Be sure you turn in the following:

1. The Box
2. This Rubric
3. All Calculations in detail with all work shown.

Check your Task Outline to ensure the 10 tasks are accurately completed.

10%	Box is square & level; tabs are in alignment	_____
10%	Calculation of actual Surface Area of your box with all work shown.	_____
10%	Algebraic Model of Surface Area in Standard Form, with all work shown. (Assume the box has a top.)	_____
10%	Specific value of "x" substituted accurately for surface area into both forms, with all work shown.	_____
5%	Value of "x" is accurate for maximum surface area Sentence & sketch are provided & accurate.	_____
10%	Calculation of actual Volume of your box with all work shown.	_____
10%	Algebraic Model of Volume in Factored Form and in Standard Form, with all work shown.	_____
10%	Specific value of "x" substituted accurately for volume into both forms, with all work shown.	_____
5%	Value of "x" is accurate for maximum volume. Sentence & sketch are provided & accurate..	_____
20%	Creativity, Neatness, Interactive Element	_____

Note: 20% off for each day late TOTAL _____