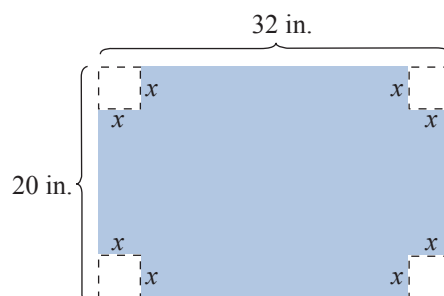


Chapter 10 Project

Math in a Box

An activity to demonstrate the use of polynomials in real life.

Suppose you have a piece of cardboard with length 32 inches and width 20 inches and you want to use it to create a box. You would need to cut a square out of each corner of the cardboard so that you can fold the edges up. But what size square should you cut? Cutting a small square will make a shorter box. Cutting a large square will make a taller box. Look at the diagram below.



- Since we haven't determined the size of the square to cut from each corner, let the side length of the square be represented by the variable x . Write a simplified polynomial expression in x and note the degree of the polynomial for each of the following geometric concepts:
 - The length of the base of the box once the corners are cut out.
 - The width of the base of the box once the corners are cut out.
 - The height of the box.
 - The perimeter of the base of the box.
 - The area of the base of the box.
 - The volume of the box.
- Evaluate the volume expression for the following values of x . (Be sure to include the units of measurement.)
 - $x = 1$ in.
 - $x = 2$ in.
 - $x = 3$ in.
 - $x = 3.5$ in.
 - $x = 6$ in.
 - $x = 7$ in.
- Based on your volume calculations for the different values of x in Problem 2, if you were trying to maximize the volume of the box, between what two values of x do you think the maximum will be?
- Using trial and error, see if you can determine the side length x of the square that maximizes the volume of the box. (**Hint:** It will be a value in the interval from problem 3.)
- Using the value you found for x in Problem 4, determine the dimensions of the box that maximize its volume.
- Calculate the volume of the box in Problem 5.