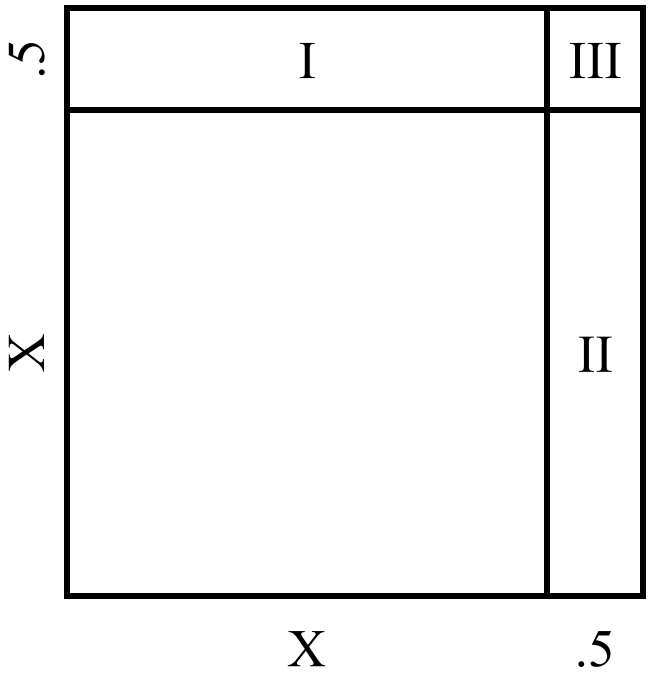
Increasing Area
Explore the Mathematics

Suppose there is a town in the shape of a square with a side of X miles. The town keeps its square shape over the years, but its boundaries grow so that each side of the square increases by a half mile each year. What would the town look like after 1 year of growth? What would be its new area, and what is the increase in its area during this first year?

This activity asks students to find the amount by which the area of a square town increases if the length of the sides of the town increase by 0.5 miles from an initial length of X miles. There are two general methods for finding the increase in the area.

One way is to find the total area and subtract the initial area. This would give the expression $(x + .5)^2 - x^2 = x^2 + 2(.5\text{x}) + .5^2 - x^2 = 2(.5\text{x}) + .5^2$.

A second approach is to divide the increase in the area into sections that can be calculated directly. For example, the area of the increased portion can be split into the three sections shown below. The areas of sections I and II are both $.5x$, and the area of section III is .5^2. Adding these together determines the total increase in area: $.5x + .5x + .5^2 = 2(.5x) + .5^2$.



Connecting to Algebra

In this video, students are making a generalization about the increase in area for a town of any beginning size. This challenges students to move from exploring a situation using a specific case to describing the situation in a general way using variables. Additionally, students are

investigating the distributive property in a visual context. The connection between the visual context and the distributive property have not been made for students, but will come up in a future lesson.

Connecting to the Common Core Standards
A-CED.1. Create equations and inequalities in one variable and use them to solve problems.

S.4. Model with mathematics.