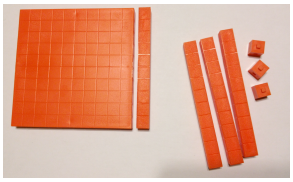
Activity/Lesson: Day 3: Division (no remainders) - Use base 10 blocks to build an area (product), given the area (product/dividend) and one dimension (length/factor/divisor), to find an unknown dimension (width/factor/quotient).

Example 1 – The area is 143 square units and the length is 11 units. Find the width (the unknown factor) of this rectangle.

Use the blocks to make the length 11 units. Count with students along the edge 11 units. Use the remaining blocks to make a rectangle and find the width. Model the trial and error process for students.



What is the width in units of my area? [13 units] Count the edge of the width to verify that one rod equals 10 units plus 3 more units equals 13 units.

What is the relationship between multiplication and division? [they are inverse operations] How would we write this model as a multiplication and a division sentence?

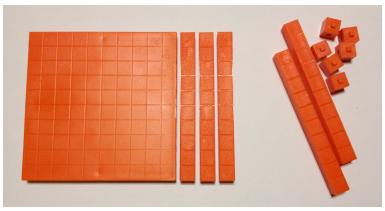
$$factor \times factor = product$$
$$11 \times 13 = 143$$

$$length \times width = area$$
$$11\ units \times 13\ units = 143\ square\ units$$

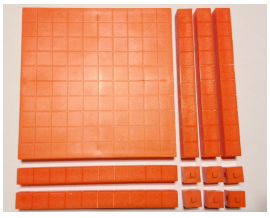
$$dividend \div divisor = quotient$$
$$product \div factor = factor$$
$$143 \div 11 = 13$$

Example 2 – The area is 156 square units and the length is 13 units. Find the width of this rectangle. Show with equations how multiplication and division have an inverse relationship.

156 ÷ 13



$$156 \div 13 = 12$$
$$or$$
$$12 \times 13 = 156$$
$$12\ units \times 13\ units = 156\ square\ units$$



You Tries (work with a partner)

1. The area is 169 square units and the length is 13 units. Find the width of this rectangle.[13 units] Show with equations how multiplication and division have an inverse relationship. $[169 \div 13 = 13\ or\ 13 \times 13 = 169 - a\ perfect\ square]$
2. The area is 165 square units and the length is 15 units. Find the width of this rectangle. [11 units] Show with equations how multiplication and division have an inverse relationship. $[165 \div 15 = 11\ or\ 11 \times 15 = 165]$

Provide students with as much practice as possible.

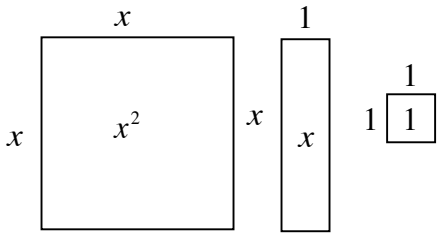
Assessment: Assess students each day with a check off list on building area models given factors only, area only, and area with one dimension. Also assess if students can write equations showing an inverse relationship between multiplication and division.

Example assessment checklist for building area models to show relationship between multiplication and division.

Student Name	Given factors only	Given area only	Given area and one factor	Show inverse relationship

Algebra Connection

Hand out and explain Algebra Tiles.



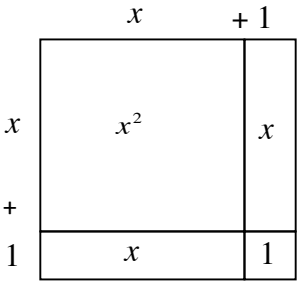
Students will use skills similar to these when factoring in Algebra 1. Algebra tiles, which are named by the area of each tile, are used to help students visualize factoring. They are given the "area" of a figure, which is the product of two binomials, and are asked to find the factors, which would be the "dimensions" of a shape.

The area of a figure is given as the trinomial $x^2 + bx + c$. The area of a figure is found by finding two numbers whose product is equal to *c* and whose sum is equal to *b*. Those numbers are then placed in two binomials and are listed as the factors of the trinomial.

When using algebra tiles, students must select the proper tiles and then arrange them to form a "perfect" rectangle. That is, it must have no gaps and all of the pieces must fit together perfectly. Once this rectangle is formed, students may examine the length of the edges to determine the dimensions of the rectangle. These dimensions also correspond to the factors of the trinomial.

Example: Find the area of the figure shown.
Find the product: $(x+1)(x+1)$

Multiply the length and the width of each piece of the figure. Then, find the total area by combining like terms. The final answer will be a trinomial of the form $x^2 + bx + c$.



$$(x+1)(x+1)$$
$$= x \bullet x + x \bullet 1 + 1 \bullet x + 1 \bullet 1$$
$$= x^2 + x + x + 1$$
$$= x^2 + 2x + 1$$

Once we have multiplied, we may see that the factors of 1, the "*c*" term, also add to 2, the "*b*" term. We may work backwards to find the factors of a trinomial using this area model.

Example: Suppose that the area of a figure is $x^2 + 5x + 6$. Suppose that one of the dimensions is $(x+3)$. Find the other dimension using Algebra Tiles. Illustrate your answer below.

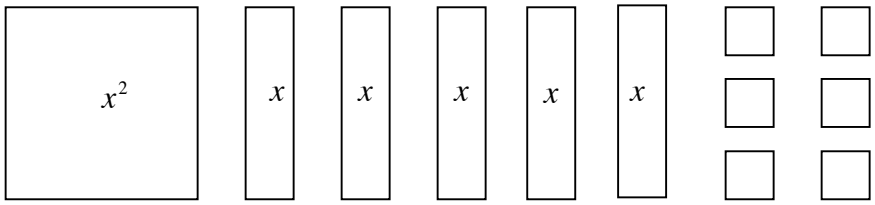
Gather all of the necessary tiles.

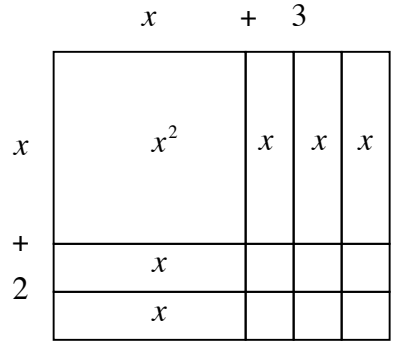
Arrange tiles so that one side has length $(x+3)$.

Make the other tiles "fit perfectly."

Determine the dimension of the other side.

Check.





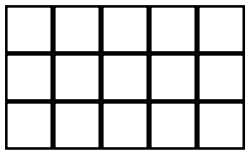
$$(x+3)(x+2)$$
$$= x \bullet x + x \bullet 3 + 2 \bullet x + 2 \bullet 3$$
$$= x^2 + 3x + 2x + 6$$
$$= x^2 + 5x + 6$$

Multiplication & Division Warm-Up

CST Grade 3

The figure below is a model for the multiplication sentence.

5×3=15



Which division sentence is modeled by the same figure?

A $3 \times 5 = 15$

B $10 \div 5 = 2$

C $15 \div 5 = 3$

D $15 \div 3 = 3$

Review: Grade 4

Draw a rectangle with a length of 7 units and a width of 4 units.

Label all four sides in units.

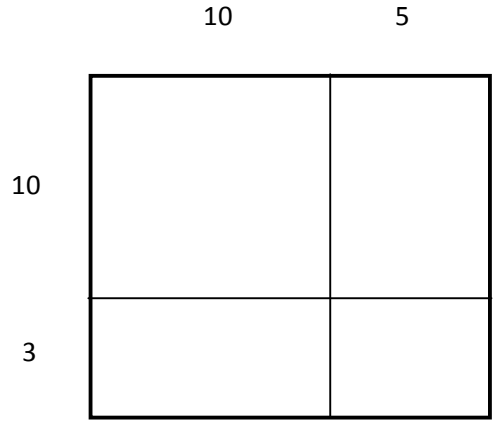
What is the area?

What is the perimeter?

x

Current Grade 4

Find the area **two** ways.



Other: Grade 8

What are the length and width of this area model?