Algebraic Thinking in Primary Grades

1. How are the following examples of Algebraic Thinking?

Table K-3. Types of Addition and Subtraction Problems (Kindergarten)

Type of Problem	Result Unknown	Change Unknown	Start Unknown
Add to	Two bunnies sat on the grass. Three more bunnies hopped there. How many bunnies are on the grass now? $2 + 3 = \square$	Two bunnies were sitting on the grass. Some more bunnies hopped there. Then there were 5 bunnies. How many bunnies hopped over to the first two? $2 + \square = 5$	Some bunnies were sitting on the grass. Three more bunnies hopped there. Then there were 5 bunnies. How many bunnies were on the grass before? $\square + 3 = 5$
Take from	Five apples were on the table. I ate 2 apples. How many apples are on the table now? $5 - 2 = \square$	Five apples were on the table. I ate some apples. Then there were 3 apples. How many apples did I eat? $5 - \square = 3$	Some apples were on the table. I ate 2 apples. Then there were 3 apples. How many apples were on the table before? $\square - 2 = 3$

(excerpt from California Mathematics Framework)

2. Abel has 9 balls. Susan has 3 balls. How many more balls does Abel have than Susan. Support your answer with drawings, bar models or number bond diagrams.

The Unknown Truth

(problems adopted from Smarter Balance Assessment Consortium)

1. Brandon learned that, beginning at age 2, children grow about 6 centimeters per year. Brandon's brother is 2 years old today and 80 centimeters tall. Brandon wants to estimate what his brother's height would be at age 7. Use pictures, math, or words to explain the work needed to find his brother's height.

2. For each number sentence below, what unknown number makes the equation true?

   a) $8 \times 6 = 6 \times n$

   b) $8 \times 6 = 8 \times n \times 2$

   c) $5 \times 9 = 5 \times 10 - n$

   d) $5 \times 8 = 10 \times 8 \div n$

   e) $6 \times 6 = 6 \times 5 + n$

   f) $8 \times 7 = 5 \times 7 + n \times 7$

The Unknown Truth

(problems adopted from Smarter Balance Assessment Consortium)

1. Give a positive value for n that makes this statement true:

   1 x n is less than 1 but greater than 0.

2. Which equation below is equivalent to: 405 ÷ 15 = n

   a) 405 x n = 15

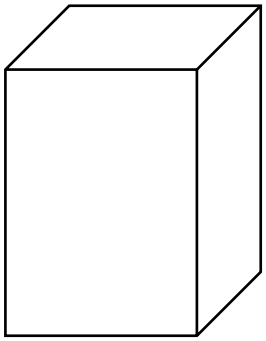
   b) n ÷ 405 = 15

   c) 15 x n = 405

   d) n ÷ 15 = 405

Race to the Top

1. The rectangular prism below has a volume of 42 cubic units. If its length is 3 units and width is 2 units, what is the height of the prism?



2. What would be the height of the prism given the following length, width and volume?

   a) ___ in. x ___ in. x ___ in., volume = ___ in^3

   b) ___ in. x ___ in. x ___ in., volume = ___ in^3

   c) ___ in. x ___ in. x ___ in., volume = ___ in^3

3. The formula for finding the volume of a prism is, $V = l\,x\,w\,x\,h$. According to the pattern above, you rewrote the formula for height as:

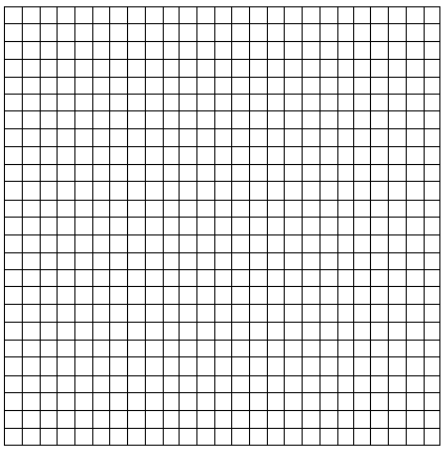
   h= _____

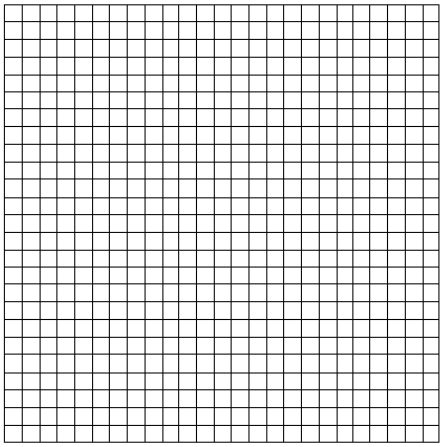
The Goat Pen

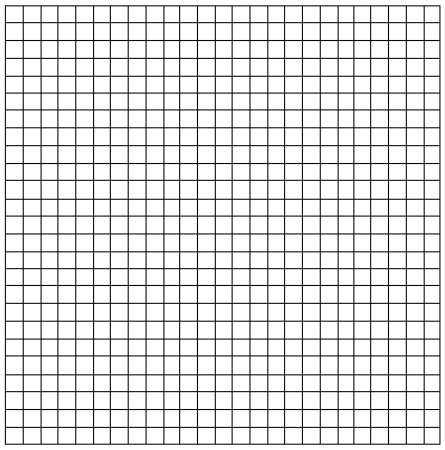
Farmer John has a goat for which he needs to build a rectangular pen. He has enough fencing material for 24 feet of fence.

1. Draw 3 different rectangles that can each represent Farmer John's Goat pen. Be sure to use all 24 feet of fence material for each pen. Using the grids below, draw each rectangle. Then complete the chart for the dimensions of your rectangle.

Pen	Length (in)	Width (in)	Area (in^2)
#1			
#2			
#3			







2. Farmer John wants his goat to have more than 60 square feet of ground area inside the pen. He finds that if he uses the side of his house as one of the sides of the goat pen, he can make the goat pen larger.

   Draw another rectangular goat pen, that …
   - Uses all 24 feet of fencing for 3 sides of the pen.
   - Uses one side of the house for the other side of the pen.
   - That has a ground area inside the pen which is greater than 60 square feet.

   Using the grid below, draw a rectangle to represent the pen. Record your dimensions in the space provided.

   Length: _____

   Width: _____

   Area: _____