Students' Meanings of Division with Fractions and Unknowns
From the IDR²eAM Project: **I**nvestigating **D**ifferentiated Instruction and **R**elationships between **R**ational Number Knowl**e**dge and **A**lgebraic Reasoning in **M**iddle School

Fern Sunflower Heights Problem. The height of a sunflower measured in inches is one-fourth the height of a fern measured in inches. We don't know either height, so they are both unknowns.
a)   Draw a picture of the situation and describe what your picture represents.
b)   Write an equation for this situation that relates the two heights. Explain your equation in terms of your picture.
c)   Can you write another, different equation that relates the two heights? Explain this equation in terms of your picture.
d)   If you wrote an equation using division, can you write it with multiplication? Explain your new equation in terms of your picture.
e)   Let's say that the fern's height is 56 inches. How tall is the sunflower? Use this example to check all of your equations. If an equation does not work, see if you can change it so that it does. Explain any changes that you make.

Corn Stalk Tomato Plant Heights Problem. A tomato plant and corn stalk are growing in the garden, each of unknown height. The height of the corn stalk measured in centimeters is 5 times the height of the tomato plant measured in centimeters.
a)   Draw a picture of this situation and describe what your picture represents.
b)   Write an equation for this situation that relates the two heights. Explain what your equation means in terms of your picture.
c)   Can you write another, different equation that relates the two heights? Explain what your equation means in terms of your picture.
d)   If you wrote an equation using division, can you write it with multiplication? Explain what your new equation means in terms of your picture.
e)   Let's say that the stalk of corn's height is 150 cm. How tall is the tomato plant?
Use this example to check all of your equations.
If an equation does not work, see if you can change it so that it does.
Explain any changes that you make.

Tree Heights Problem. Steven and Lia each are growing a pine tree. The height of each of their trees is unknown. The height of Lia's tree measured in feet is 3/7 the height of Steven's tree measured in feet.
a)   Draw a picture of the situation and describe what your picture represents.
b)   Write an equation for this situation that relates the two heights. Explain your equation in terms of your picture.
c)   Can you write another, different equation that relates the two heights? Explain this equation in terms of your picture.
d)   If you wrote an equation using division, can you write it with multiplication? Explain what your new equation means in terms of your picture.
e)   Let's say that the Lia's tree height is 21 feet. How tall is Steven's tree?
Use this example to check all of your equations.
If an equation does not work, see if you can change it so that it does.
Explain any changes that you make.