



# Concept Cartoon Formative Assessment: Triangle Similarity, Ratios, and Proportions in High School Geometry Classrooms

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## Abstract

Triangle similarity, ratios, and proportions are important and reoccurring concepts in high school geometry. The students in two high school geometry classes were given a concept cartoon formative assessment after a unit on triangle similarity and proportions. The assessment presented the students with questions on triangle similarity and proportions and three options for the answer. The goal was to find any underlying misconceptions and to gauge how well the students understood the concepts. The results showed that students were comfortable with the concept of proportions and ratios, as well as with the three ways in which one can identify similar triangles. However, there was some confusion on solving proportions that included a quadratic and on when Pythagorean's Theorem is appropriate to use.

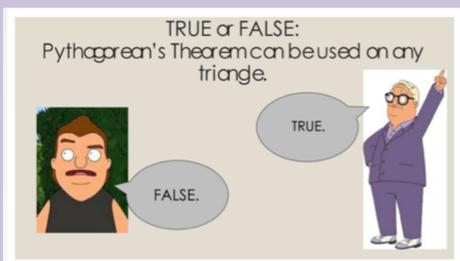
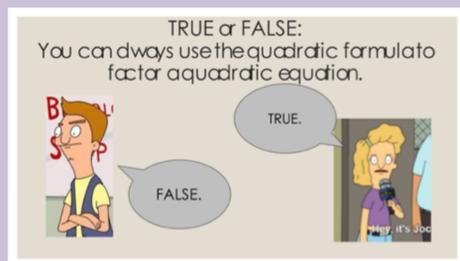
## Methods

I used a concept cartoon, in which I presented the students with 6 of questions and they chose one of the 3 answers given by various cartoon characters. I warned the students that they would need to explain why they chose their answer or would need to describe why an answer was wrong. The activity was done with the whole class, and this made for a lively and involved activity.

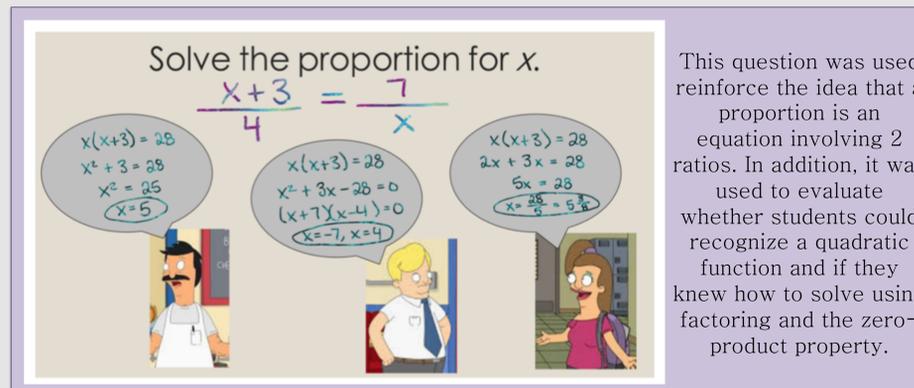
## Results

- All of the students in both classes displayed a firm understanding of the ways in which triangles can be called similar.
- In both classes, students were familiar with the fact that a ratio and a proportion are different things, but were not able to give a precise definition of each, and were unable to articulate the way in which they are related.
- There were 3 students in each class that held the misconception that Pythagorean's theorem could be used for all triangles. When these students were reminded by their peers that the theorem worked only for right triangles, all of these students expressed that they knew that and had only forgotten. The students were very engaged in the discussions about each question and the validity of each character's response.
- Similarly, a few students in each class were unconvinced that the quadratic formula could be used to solve any quadratic function. I reminded them that because the formula used the coefficients of a quadratic, it was applicable to any quadratic.
- Those students who chose an incorrect answer for any of the questions were convinced, after discussion with the large group, of their error in thinking and agreed that the correct answer was in fact the right answer.

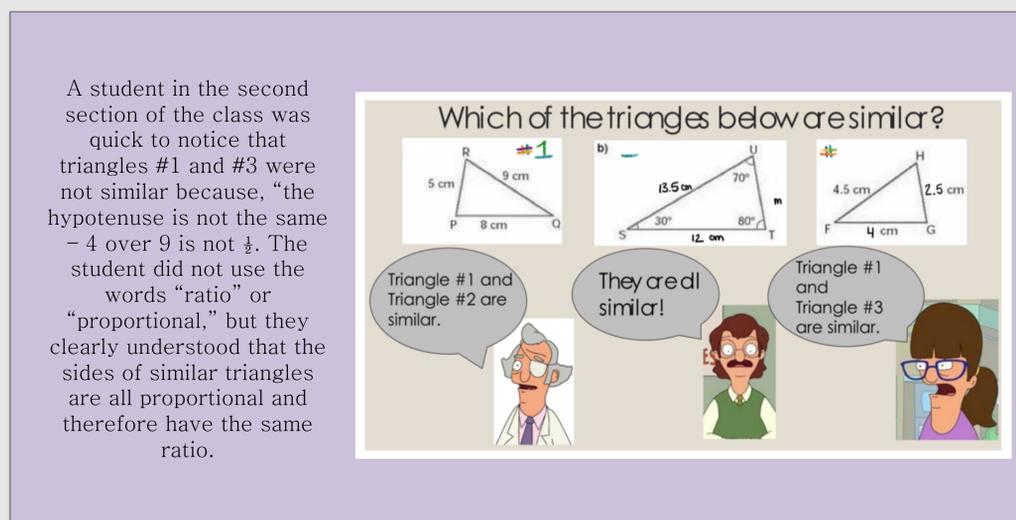
## Slide Examples



The true/false questions in the assessment served as a misconception probe for the applications of Pythagorean's theorem and the quadratic formula.



This question was used to reinforce the idea that a proportion is an equation involving 2 ratios. In addition, it was used to evaluate whether students could recognize a quadratic function and if they knew how to solve using factoring and the zero-product property.



A student in the second section of the class was quick to notice that triangles #1 and #3 were not similar because, "the hypotenuse is not the same - 4 over 9 is not 1/2. The student did not use the words "ratio" or "proportional," but they clearly understood that the sides of similar triangles are all proportional and therefore have the same ratio.

## Conclusion

The concept cartoon formative assessment was one that kept both classes actively engaged in the activity, but those students that are more quiet were not able to express their ideas as well as they might have on a paper assessment. In the future I would incorporate a system in which students write down their responses before voting and discussing with the large group. Else wise, it was useful way to reinforce the differences and relationship between a ratio and a proportion and to probe for and then clarify misconceptions about various concepts.

## Acknowledgements

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