Adapted from: Schultz, K.T., & Bismarck, S. M. (2013). Radical thoughts on simplifying square roots. Mathematics teaching in the middle school, 10(4), pp. 222-28.

Mini Warm-up: What does it mean to you to simplify a number under a radical? For instance, what is $\sqrt{16}$ equal to? What does it mean to you?

What is $\sqrt{24}$ equal to? What does it mean to you? How do you determine this symbolically?

Do you ever think about square roots geometrically?

Use the counters in each of the baggies (labeled A, B, and C) to try to make a square array. Take note of the number of counters making a side of the array.

Bag A: Number of Counters per Side: \_\_\_\_\_ Total Number of Counters: \_\_\_\_\_

Bag B: Number of Counters per Side: \_\_\_\_\_ Total Number of Counters: \_\_\_\_\_

Bag C: Number of Counters per Side: \_\_\_\_\_ Total Number of Counters: \_\_\_\_\_

Use nine squares labeled “Area 2” to make a larger square.

Determine the area of the newly-made square: \_\_\_\_\_\_\_\_\_\_\_\_

Determine the side length of this newly-made square: \_\_\_\_\_\_\_\_\_\_\_\_

Use 25 squares labeled “Area 3” to make a larger square.

 Determine the area of the newly-made square: \_\_\_\_\_\_\_\_\_\_\_\_

 Determine the side length of the newly-made square: \_\_\_\_\_\_\_\_\_\_\_\_

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Suppose you wanted to simplify$ \sqrt{12}$. Determine how you would simplify this using any algorithm of which you are familiar. Then find a way to describe this simplification using some of the squares provided.

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How would you represent $\sqrt{48}$ both geometrically and symbolically?

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How would you represent $\sqrt{72}$ geometrically and symbolically?

What have you noticed about the NUMBER of smaller squares used to make the larger square?

Extension: Is it possible to use three of the given squares’ side lengths to make a right triangle? Can you prove that it is a right triangle?

Clearly explain how you can link how you simplify square roots both symbolically and geometrically. Include in your explanation pros and cons of both methods, and be sure to make a clear connection between the two methods.

Are there some numbers that are more easily represented geometrically than others?