Fewest Squares
Grades 3-12

Introduction:

This is a really worthwhile mathematical investigation that students may explore together. Teachers and students love this problem and it creates a lot of interesting problem solving dialogue.

Agenda:

Activity	Time	Description/Prompt	Materials
Introduce the problem	5 min	1. Ask students to draw an 11 x 13 rectangle. 2. Pose the question, 'What is the fewest number of squares you can draw inside of your 11x13 rectangle?' 3. Respond to clarifying questions as they come up. Introduce the task as stated since we want students to ask questions.	• White board • Graph/grid paper • Pen/pencil • Colored pencils/ markers
Explore	15 min	Students work on graph paper to consider the problem. Students can work with their groups to ask questions and share thinking.	• Graph/grid paper • Pen/pencil • Colored pencils/ markers
Class debrief	5 min	Invite students to share their thinking on the white board.	• White board

Activity:

To get students started ask them to draw an 11x13 rectangle on their paper, and then pose the question, What is the fewest number of squares you can draw inside of your 11x13 rectangle? Pose the problem only as stated and let students get started. Encourage them to ask questions. We almost always answer any question by posing a question in return. For example, a student might ask, "can the squares overlap?" Response, "If you were tiling a 11x13 floor would it be ok if the square tiles overlapped?" A student might ask, "do all of the square tiles have to be the same size?" Response, "read the problem again, what do you think?" We carried this type of questioning throughout camp. Our goal is to never answer a question that students can answer themselves! Encourage students to use their group to ask questions and wonder together about how to draw the fewest number of squares in an 11x13 rectangle. Provide plenty of graph/grid paper so students feel like they can try the activity more than once. We like to have student journals that are full of graph paper.

Don't ever tell students what the answer is, ever. Keep asking them, "How do you know?" "Can you

prove that to me?" This task should never be complete. Students can keep working on it and think-ing about it over a long period of time. One of our favorite mathematicians, Steve Strogatz, told us that his most exciting problem given to him in high school required months of work for him to solve. This is the type of excitement we want to provide our students. During camp we found that many students went back to this problem over and over again because they wanted to keep working on it. Several asked if they could take it home so they could continue working on it and share their work with their parents. Now that's an exciting task!

Extensions:
- Determine the fewest number of squares in a 12x15 rectangle.
- What is the size of the rectangle you can find using 9 squares? Can you find more than one rectangle?
- How do you know you have found the fewest squares? Can you prove your answer?