

BULKELEY HIGH SCHOOL GYM H.O.T. LESSON

Grade Level and Course: 9th grade Algebra 1

Time Frame: 45 minutes

Content Objectives:

- Students will be able to model square units, specifically a square foot and a square yard, using manipulatives and drawings.
- Students will be able to recognize that square units are measurements for area.
- Students will be able to explain the mathematical relationship between areas measured in these two units.

Language Objectives:

- Vocabulary: many times longer than, many times bigger than, times more people than, area, lengths, sides, widths, square feet, square yards, and equivalent terms feet squared, yards squared
- Students will be able to express comparisons of quantities (specifically areas) using the above vocabulary.

Higher Order Thinking:

- Students will be able to reason about and discuss the relationship between the dimensions of a gym and the area of a gym, particularly how changing the dimensions affect the area.

Materials:

- Rulers
- Yardsticks
- Linking Cubes
- Task cards (1 per student)
- Calculator (optional)
- Exit Slip

Launch Task/Language Objectives:

- Have students in groups of 4's prior to the start of the lesson.
- Write on the board and ask students "How many people can we fit in one square foot?"
 - Have a discussion on the meaning of the term "one square foot." Ask if someone can explain one square foot in their own words. Use a ruler to draw out a square foot on the board.
 - Ask students why we call it one square foot? Why not just one foot? Why squared and not rectangle? Go over the **notation** for writing out one square foot. (Keep this notation on the board and later have a student add it to the vocabulary wall so that students can refer to it throughout the week.) Also, go over that one square foot is really **the area enclosed by** a one foot by one foot square. Ask students if they can come up with some things that we might measure using square feet (such as area in a house, an office, other building spaces, carpets, etc).

- Use the kitchen tile as an example of one square foot. Get student volunteers to stand on the tile to determine how many people can fit (probably no more than 2!)
- Now, ask students “How many people can we fit in one square yard?”
 - Discuss with students what the difference between one square foot and one square yard is. Ask a student to draw out one square yard on the board. Go over the notation for writing out one square yard. Also, go over that one square yard is really **the area enclosed by** a one yard by one yard square. Using masking tape, make one square yard on the ground and see how many people we can fit in the one square yard. Ask: How many times more people were we able to fit in one square yard than in one square foot? (note this should be close to 9 times, but may not be exact)
- Help students relate square feet to square yards. Give students some think time at this point! Ask students how many square feet are in one square yard. How do you know? Have a discussion with students on why this is the case. If there are three feet in one yard, then why aren’t there three square feet in one square yard? Be sure to keep the drawings on the board to give students a visual. Also, model this relationship using the linking cubes to show that one square yard is equal to nine square feet.
- Now, give students the approximate measure for the classroom: 12 yards by 9 yards. As a class, determine the area of the classroom in both square yards and square feet. Given what they determined for the number of people that could fit per square foot and per square yard, ask students to predict how many people we could pack into the classroom (in violation of the fire codes of course!).
- Give students a hypothetical situation. Suppose we moved to a different room that is twice as long and twice as wide. Write this on the board and ask students to come up with their own explanations of what twice as long and twice as wide mean. What about three times as long or wide? What does three times mean?
- Let students know that the activity they are doing today will help them answer questions on how the area of a quadrilateral changes when you double or triple certain dimensions, specifically for the Bulkeley High School gym.

Group Work:

- Have a student read the prompt out loud to the rest of the class. Discuss any questions that students may have.
- Review group norms, group roles, group-questions, and check-points. Make sure students understand what they are responsible for individually and as a group. Also, emphasize that the goal is not to just get the answer, but to be able to explain your thinking.
- As students are working in groups, positively reinforce group norms. Be sure that questions asked are group questions only. This will encourage students to communicate with each other instead of immediately calling a teacher over.
- Check Point 1:
 - How many times more square feet than square yards is the Bulkeley High School gym?
 - Check to see that students have “9” as the answer. As a follow-up question, ask students why this makes sense. If there are three feet in a yard, why are there nine square feet in one square yard? Allow students to draw diagrams as justification.
- Check Point 2:

- How many times bigger is the new gym than the old? If the gym is twice as wide and twice as long, show by drawing a diagram or explain in words why the new gym is *not* twice as big.
- Check to see that students have four. Also, get students to explain why this makes sense. If we double the length and width, why don't we just double to get the new area? Why is it that it is four times bigger? Allow students to draw a diagram in order to justify.

Discussion:

- Presentation: Any groups willing to share their work or thoughts on the activity can do so during this time. This could be a good time to publicly value and share particular students' thinking, work, good group behavior, etc...from the lesson.
- Follow-up questions:
 - How would the area of our gym change if we doubled the length and tripled the width?
 - How would the area of the gym change if we tripled the length and tripled the width?

Closing

- Exit Slip: As an individual assessment, students will complete a question on their own.