Don't Fence Me In: Area of a Parallelogram: Version I

Learning Activities Teacher's Questions and Expected Students' Reactions	Teacher's Support	Points of Evaluation
1. Introduction to the Problem 1. Explain that rancher Jack has 4 pieces of fencing measuring 5, 5, 8 and 8 feet each. Five foot pieces can only be attached to eight foot pieces and vice versa. Jack makes a rectangular pen with his fence material. a) What would the area of Jack's pen be? b) Compare your answer to part a. with your group members. (?? Do we need to review how to construct a parallelogram?)	If students are not clear on how to construct a parallelogram, teacher will go around and offer guiding questions to help with the construction.	Do students understand the situation?
2. Problem Solving 1. Work in your own space; group answer to present to class goes in center at the end. Don't worry about making mistakes, only the final answer in the center will be presented to the class. c) Present Scenario: Jodi, Jack's daughter is very environmentally conscious, and tells her father that she believes she can make a pen with a different area than his. In fact, she claims to have made a pen, using the same 4 pieces as her father (5, 5, 8, 8) to make a pen with an area of 38 square feet. Draw a pen, using the same fence lengths (5, 5, 8, 8), that has an area other than 40 square feet. Can you make Jodi's pen? d) Allow students time to work with table on problems. Each group member should work within their placemat space but should discuss and work with other group members. e) When all groups have several different answers ask them to compare their answers in their group and discuss any similarities in the way each group member found their area. f) Each group should choose one of their parallelograms to put in the center of the placemat to be presented to the class.	Offer supports to the students who are not able to start, but realizing that they really have to only come up with one. Encourage the students who finish quickly trying to find other parallelograms of various lengths. Student may keep the length of the base and stretch the length of the side and thus maintain the area the same. We aware and show the student that they are not keeping the side lengths fixed. Consider the variety of ways that students can find the area of the parallelogram, such as dissection (into two triangles, rectangle and two triangles, etc), translation (cutting a triangle and sliding to the opposite side to make a rectangle), subtraction (construct a rectangle around the polygon and subtract the missing triangles), and counting the squares on graph paper.	If you do not think that you can, why not? How did they find the area? (side times side?) What is the shape of the pen that you have created and how do you know?
3. Class Discussion 1. Call on each group to share their figure and to explain how they found the area of their figure. What shape is your pen? Ask the presenter questions that define their numbers, e.g. what does 8 represent? Where did you	Anticipate all of the possible student methods, including the student who feels that the area of the polygon will not change. The interaction should be	Look at the variety of methods that the students have presented. The teacher may want

get 4? What did you do to the numbers? What unit is your answer? Why? 2. Discuss as a class asking questions: • If the side measures of your parallelograms are the same as everyone else, then why are your areas different? • What are the components that are important in finding the area of the parallelogram? • Why didn't anyone find a pen with a greater area than Jack's? • Why? This is the time to formalize the formula for the area of a parallelogram: $A = bh$	student to student.	to start with answers that will form the rectangle first, so that they can still see the base and height. Did anyone get an area larger than 40 square units?
4. Summing Up 1. Give the students parallelograms with various dimensions and ask them to find the area. Ask the questions below: • What did you notice about the areas you found? (they are all the same) • Why? (Even though the dimensions are different, the base and height are the same, therefore the area is the same) 2. Draw a pen with the same area as Jodi's (using the 5 and 8 foot pieces); explain how you know the area of your pen is 38 square feet. 3. Reflecting on today's lesson, can you explain why the formula for the area of a triangle is $A = \frac{1}{2} bh$?		