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

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. The pieces can't be cut or attached in the middle of a side. 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.	If students are not clear on how to construct a parallelogram, teacher will go around and offer guiding questions to help with the construction. Write constraints on board for students to refer to. Ask if rectangle can be oriented differently? Does this change the area? What measures did you use to find area? What can be said about the relationship between these sides of the rectangle	Do students understand the situation?
2. Problem Solving 1. Present Scenario: Jodi, Jack's daughter tells her father that she believes she can make a pen with a different area than his using the same fence lengths (5, 5, 8, 8). Using the same lengths that Jodi's father used (5, 5, 8, 8) work on your own, but discuss and compare with your group to make a pen that has an area other than 40 square feet. Be sure to show/discuss how you found your area. In a bit, your group will put one of your answers on large chart paper. Don't worry about making mistakes, only the one problem that the group agrees to use will be presented to the class. a) Allow students time to work with table on problems. Each group member should work on their own example(s), but should discuss and compare answers with other group members. b) When all groups have several different answers ask them to compare their work within their group and discuss any similarities in the way group members found their area. c) Each group should choose one of their parallelograms to put on chart paper to be presented to the class.(Give an amount of time to complete this.. e.g. 5 minutes)	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. Be sure to ask,	Anticipate all of the possible student methods, including the student who feels that the area of	Look at the variety of methods that the students have

repeatedly: What shape is your pen? How do you know? Ask the presenter questions that define their numbers, e.g. what does 8 represent? Where did you get 4? What did you do to the numbers? What unit is your answer? Why? What is the relationship between those parts of the figure? Why did we use side lengths when finding the area of a parallelogram, but are using different measures here? What is the same about each group's method? How does that compare to what we did with the rectangle? 2. Discuss as a class asking questions: a) If the side measures of your parallelograms are the same as everyone else's, then why are your areas different? b) What are the components that are important in finding the area of the parallelogram? c) Why didn't anyone find a pen with a greater area than Jack's? This is the time to formalize the formula for the area of a parallelogram: $A = bh$; How does this compare to finding the area of a rectangle? Why does this formula work? What will be true about the base and the height that we use?	the polygon will not change. The interaction should be student to student.	presented. The teacher may want 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 worksheet containing parallelograms with various dimensions and ask them to find the area of each. Ask the questions below: a) What did you notice about the areas you found? (they are all the same) b) Why? (Even though the dimensions are different, the base and height are the same, therefore the area is the same) 2. Jodi's pen had an area of 38 square feet (using the 5 and 8 foot pieces); work with your group to find a pen with the same area as Jodi's. Can you find another pen, with an area of 38 square feet? Another? Why not? 3. Reflecting on today's lesson, can you explain why the formula for the area of a triangle is $A = \frac{1}{2} bh$?		