Using GeoGebra to Support Student Learning During Problem Solving Tasks

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Plan for this Workshop

- Explore a basic “conjecturing” GeoGebra Task
- Create the worksheet for the GeoGebra task.
- Explore a more complex GeoGebra Task
- Create the more complex worksheet for the GeoGebra task.
- Explore a more open ended task – you will create a GeoGebra worksheet to use to check your solution

Supporting Students w/ GeoGebra

- Keys for Supporting Student Learning During Problem Solving Tasks with GeoGebra
  1. Start with a good problem solving task
  2. Promote student exploration of key mathematical ideas tied to the goal of the lesson
  3. Utilize dynamically linked, multiple representations
  4. Encourage student conjecturing
  5. Have students reflect on what varies and what stays the same as they explore a dynamic worksheet

Triangle Exploration

Go to **http://tinyurl.com/nctm17geogebra**

- Take 2 minutes and explore the Triangle Exploration task according to the instructions at the top of the page.
- Then, consider the question:
  - What mathematical goals could this applet be used to achieve?
- Share your ideas with a partner.

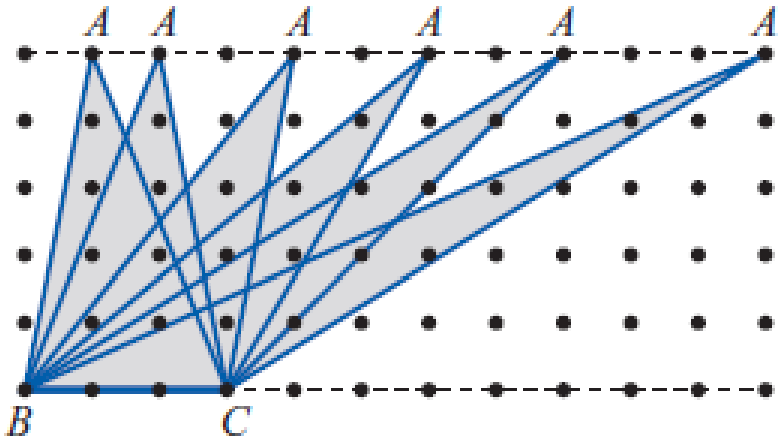
Creating the Sheet

(Handouts available at the end of session.)

Go to **www.geogebra.org**

- Geometry page
- Create segment
- Construct parallel line
- Create a point on the line
- Create triangle
- Measure triangle
- … go to GeoGebra!

For the different choices of point A, which, if any, of the different triangles ABC below has the greatest area? The line that the A's are on and the line that B and C are on are parallel. Explain. (*Hint*: Do *not* count squares.)



- *Reconceptualizing Mathematics for Elementary School Teachers* (Sowder, Sowder, & Nickerson, 2014)

Parallelogram Exploration

Go to **http://tinyurl.com/nctm17geogebra3**

- Take 2 minutes and explore the Parallelogram Exploration task according to the instructions at the top of the page.
- Then, consider the question:
  - What mathematical goals could this applet be used to achieve?
- Share your ideas with a partner.

Creating the Parallelogram Sheet

Go to **www.geogebra.org**

- Geometry page, create segment
- Construct parallel line
- Connect endpoint of 1st segment to point on || line
- Construct parallel line through other endpoint
- Mark point of intersection
- Create diagonal line segment
- Create point on diagonal
- Create parallel lines through point on diagonal
- Mark intersection points, create and color the parallelograms, hide lines, etc.
- Insert spreadsheet and record areas in spreadsheet

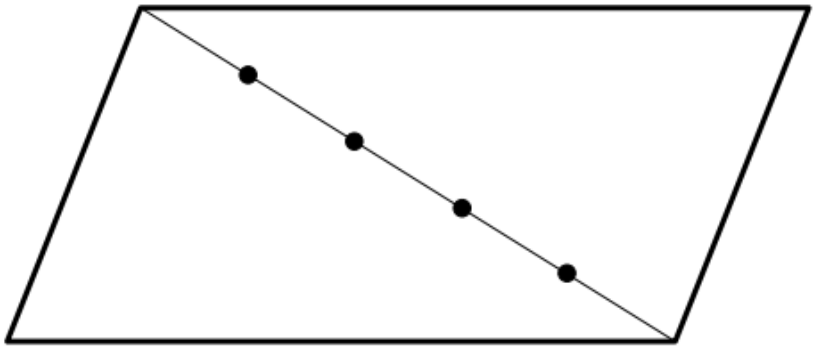
- NCTM Illuminations
- Developing Essential Understanding of Geometry Grades 9-12

Perplexing Parallelograms

NAME _____

For this investigation, complete the following steps:

- Choose one of the points along the diagonal of the parallelogram below, and label it point *P*.
- Through *P*, draw two line segments, one parallel to each pair of sides. As necessary, use a ruler, compass, or protractor.
- These two segments will divide the parallelogram into four smaller parallelograms. For reference, label the four smaller parallelograms *A*, *B*, *C*, and *D*.



1. Measure the base and height of parallelograms *A*, *B*, *C*, and *D* to the nearest centimeter. Then, calculate the area of each parallelogram and record the results in the table below.

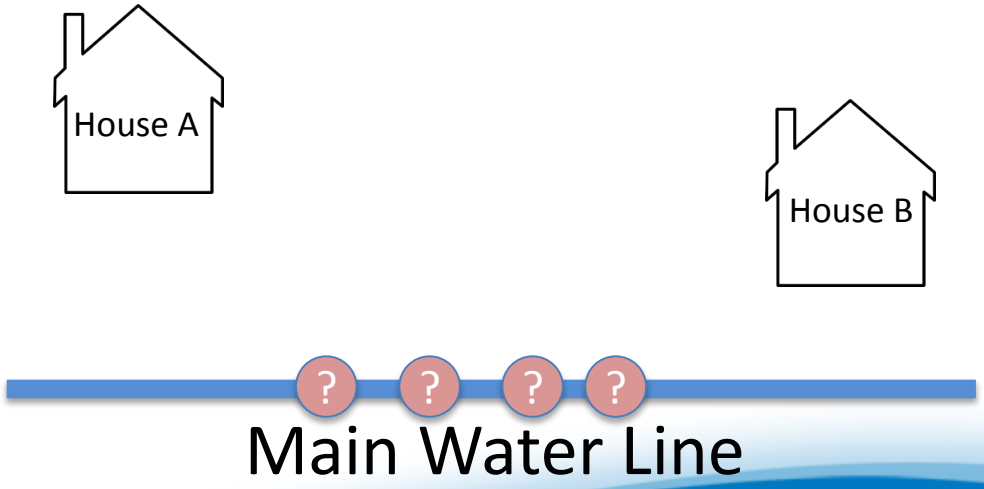
PARALLELOGRAM	AREA
A	
B	
C	
D	

2. What observations can you make regarding the areas of the four smaller parallelograms? What, if any, patterns emerge?

Water Pump Exploration

Where should an engineer place a water pump on the main water line to pump water to two different houses (A and B) but use the least amount of pipe to the two houses as possible? Houses A and B are different distances from the main water line.

Determine a potential solution to this problem and use GeoGebra to test whether your solution is correct.



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Closing Slide

- **Keys for Supporting Student Learning During Problem Solving Tasks with GeoGebra**
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- **Thank you!**
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