**Supplementary Activities**

**Unit 3 Investigation 5**

**Properties of Parallelograms**

**Open one of these files:**

Option A: <http://tube.geogebra.org/material/simple/id/1464593> has measurements built into the file..

Option B: <http://tube.geogebra.org/material/simple/id/1381069> has you use Geogebra’s measurement tools.

Which option did you choose (check one): A\_\_\_\_\_\_or B \_\_\_\_\_\_\_\_

Move points *A, B,* and *D* to form different parallelograms. Use the tools GeoGebra within this applet to investigate the answers to the following questions:

1. Are opposite sides of a parallelogram always congruent?
2. Are opposite angles of a parallelogram always congruent?
3. Do the diagonals of a parallelogram always bisect each other?
4. Does a diagonal of a parallelogram always bisect a pair of opposite angles? If so, how many do?
5. Are the diagonals of a parallelogram always perpendicular?
6. Are the diagonals of a parallelogram always congruent?
7. Does either diagonal of a parallelogram serve as a line of symmetry? If so, how many?

**Properties of Rectangles**

**Open one of these files:**

Option A: <http://tube.geogebra.org/material/simple/id/1456225> has measurements built into the file..

Option B: <http://tube.geogebra.org/material/simple/id/1382817> has you use Geogebra’s measurement tools.

Which option did you choose (check one): A\_\_\_\_\_\_\_ or B \_\_\_\_\_\_\_\_

Move points *A, B,* and *D* to form different parallelograms. Use the tools GeoGebra within this applet to investigate the answers to the following questions:

1. Is a rectangle always a parallelogram?
2. Are opposite sides of a rectangle always congruent?
3. Are opposite angles of a rectangle always congruent?
4. Do the diagonals of a rectangle bisect always each other?
5. Does a diagonal of a rectangle always bisect a pair of opposite angles?
6. Are the diagonals of a rectangle always perpendicular?
7. Are the diagonals of a rectangle always congruent?
8. Does either diagonal of a rectangle always serve as a line of symmetry? If so, how many?

**Area of a Triangle**

**Open the file:** <http://tube.geogebra.org/material/simple/id/2971017>

Slide the slider in the applet. Then change the locations of the triangle's vertices *before* sliding the slider again.  Repeat the experiment several times, paying close attention to the phenomena you're observing.

1. What transformation(s) took place in the applet?

1. How does the area of the **yellow triangle** compare with the area of the **pink triangle**?

1. What figure was formed each time the slider reached its end?

1. Justify why your answer to (3) is correct.

1. The **original triangle** makes up what fractional part of bigger figure formed**?**

1. Write a formula for the area of the original triangle based on your answer to (5).

**Area of a trapezoid**

**Open the file:** <http://tube.geogebra.org/material/simple/id/1451559>

Slide the slider in the applet. Then change the locations of the trapezoid's vertices *before* sliding the slider again.  Repeat the experiment several times, paying close attention to the phenomena you're observing.

1. What transformation(s) took place in the applet?

1. How does the area of the **big triangle** compare with the area of the **original trapezoid**?

1. How would you write the formula for the area of a trapezoid in terms of “height,” “base1,” and “base2”?

1. Suppose base1 = base2. Does the formula still work? What special trapezoid do you have?

**Area of a regular polygon**

**Open the file:** <http://tube.geogebra.org/material/simple/id/2925955>

Slide the slider in the applet.

1. Define apothem.
2. What transformation(s) took place in the applet?
3. Write a formula for the area of a regular pentagon in terms of its apothem and perimeter.
4. Will your formula work for a regular polygon with any number of sides?    Explain.
5. Now open the file: <http://tube.geogebra.org/material/simple/id/2998287> to confirm your answer to question (4).