**Activity 3.5.7Areas of Quadrilaterals**

The purpose of this activity is to derive the formulas for the area of a rectangle, parallelogram, triangle, trapezoid, and kite. Throughout this activity, the *base* may refer to any side of a polygon and the *height* is perpendicular to the base.

**1.** **Rectangle Area Postulate**

Assign each student in your group one of the rectangles at the right.

A: How many rows? \_\_\_\_\_ How many columns? \_\_\_\_\_

 Area? \_\_\_\_\_\_\_\_

B: How many rows? \_\_\_\_\_ How many columns? \_\_\_\_\_

 Area? \_\_\_\_\_\_\_\_

C: How many rows? \_\_\_\_\_ How many columns? \_\_\_\_\_

 Area? \_\_\_\_\_\_\_\_

**Rectangle Area Postulate -**  If *b* is the base and *h* is the height of a rectangle, then

*Area* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Explain by referring to the rectangles above.

**2. Parallelogram Area Formula**

Go to <http://people.wku.edu/tom.richmond/area.html> and click parallelogram. Watch the animation and explain below what kind of transformations you saw. Does the base change? Does the height change? Does the area change? What is the area formula for the area of a parallelogram? Make a sketch of the animation.

**Parallelogram Area Formula -**  If *b* is the base and *h* is the height of a parallelogram, then

*Area* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**3.** **Triangle Area Formula**

Use the same website and click triangle1. Watch the animation and explain below what kind of transformations you saw. Does the base change from the triangle to the parallelogram? Does the height change? Does the area change? What is the formula for the area of a triangle? Make a sketch of the animation.

Use the same website and click triangle2. Watch the animation and explain below what kind of transformations you saw. Does the base change from the triangle to the parallelogram? Does the height change? Does the area change? What is the formula for the area of a triangle? Make a sketch of the animation. Which animation do you like better?

**Triangle Area Formula -**  If *b* is the base and *h* is the height of a triangle, then

*Area* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**4.** **Trapezoid Area Formula**

Use the same website and click trapezoid1. Watch the animation and explain below how the figure was divided. Show the algebraic steps in the animation. What is the formula for the area of a trapezoid? Make a sketch of the animation.

Use the same website and click trapezoid2. Watch the animation and explain below what kind of transformations you saw. Does the base change from the trapezoid to the parallelogram? Does the height change? Does the area change? What is the formula for the area of a trapezoid? Make a sketch of the animation. Which derivation do you like better for the trapezoid?

**Trapezoid Area Formula –** If *b1* and *b2* are the measures of the two bases of a trapezoid and *h* is the height, then *Area* = ­­­­­­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**5.** **Kite Area Formula**
For any kite, a rectangle can constructed around it such that the base and height of the rectangle are parallel to the diagonals of the kite. See picture to the right.

Label the diagonals *d1* and *d2*. Then label the parallel sides of the rectangle *d1* and *d2*. What is the area of the rectangle in terms of *d1* and *d2*? How does the area of the kite compare to the area of the rectangle?

**Kite Area Formula –** If *d1* and *d2* are the diagonals of a kite, then *Area* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**6.** What formula(s) would you use to calculate the area of a rhombus? Explain your options.