# Areas of Rectangles to Parallelograms, Triangles, and Trapezoids

This activity develops the formula for the area of a parallelogram, triangle, and trapezoid by comparing to a rectangle.

I.   Draw a parallelogram on the blank dot paper on the last page, using the same number of units for length and height as the drawing below. Draw the altitude from one vertex of the upper base. Cut out the parallelogram and then cut off the triangle. Move the triangle to the other end of the figure and match the vertices. Tape it together and then tape it in the space to the right of the figure below.
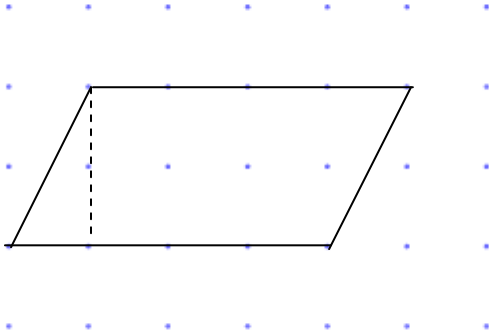

a.   What kind of polygon is the new figure?

b.   What is the relationship between the base and the altitude of the original parallelogram and those of the new polygon?

c.   What is the area of the new polygon?

d.   What is the relationship between the area of the original parallelogram and the area of the new polygon?

e.   Describe two methods for finding the area of a rectangle.

f.   Write a rule to determine the area of a parallelogram. Write an explanation in words of why the rule works, according to what you did.

II. Using the figure below, draw segment $\overline{AD}$ parallel to $\overline{BC}$ with length equal to that of $\overline{BC}$. Draw segment $\overline{DC}$.
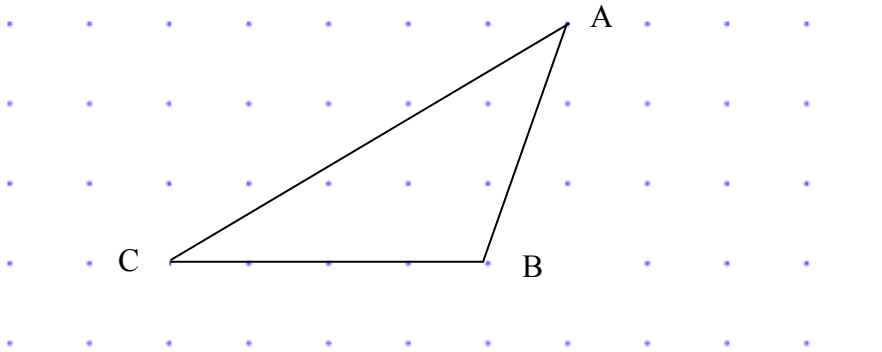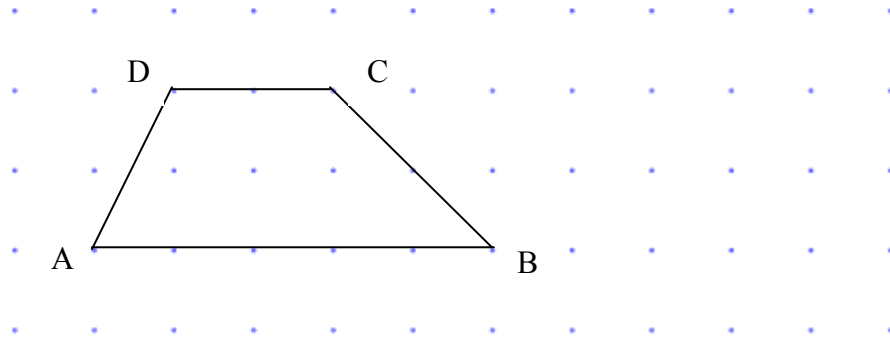
a. Polygon $ABCD$ is what type of quadrilateral?

b. What is the area of quadrilateral $ABCD$?

c. The area of $\triangle ABC$ is what fractional part of the area of quadrilateral $ABCD$?

d. What is the area of $\triangle ABC$?

e. What is the formula for finding the area of a parallelogram?

f. Write a rule to determine the area of a triangle. Write an explanation in words of why the rule works, according to what you did.

III. Draw trapezoid $EFGH \cong ABCD$ using the blank dot paper at the bottom of the page. Cut out trapezoid $EFGH$ and rotate it so that you match vertex B with G and vertex C with F. Tape it in place to form polygon $AHED$.

a. Polygon $AHED$ is what type of quadrilateral?

b. What is the area of quadrilateral $AHED$?

c. What is the relationship between the area of trapezoid $ABCD$ and area of quadrilateral $AHED$?

d. What is the area of trapezoid $ABCD$?

e. What is the relationship between the measure of the base of the parallelogram and the measures of the two bases of the trapezoid?

f. Write a rule for determining the area of a trapezoid. Write an explanation in words of why the rule works, according to what you did.

IV. Extra Credit: Use the same techniques in I-III to write up an activity to develop the formula for a kite. Turn in the solution as well.