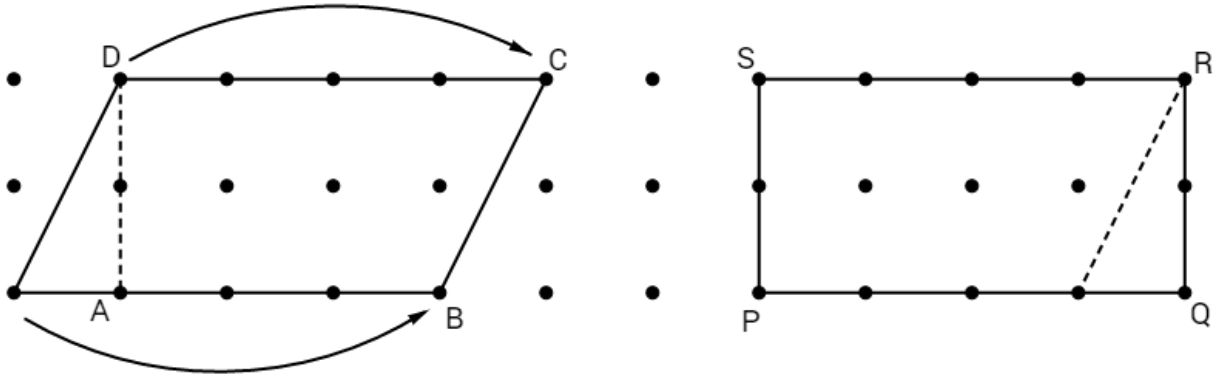


**Activity 1: Area—From Rectangles to Parallelograms**

For this activity, you will need dot paper and a centimeter ruler.

1. Construct a parallelogram on your dot paper. Construct the altitude from one vertex of the upper base as shown. Sketch the parallelogram again, moving the triangle to the other end of the figure (by sketching, as the arrows show below) and match the vertices as shown.

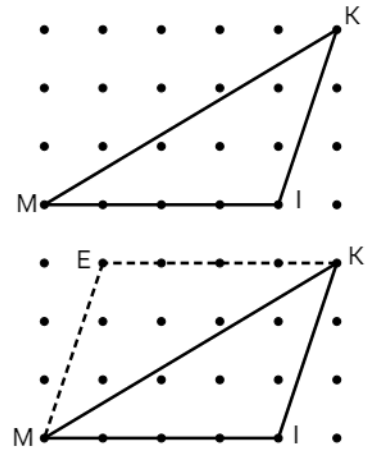


2. What kind of polygon is the new figure? Justify your answer with properties of the new polygon.
3. What is the relationship between the base and altitude of the original parallelogram and those of the new polygon?
4. What is the area of the new polygon?
5. What is the relationship between the area of the original parallelogram and the area of the new polygon?
6. What is the area of the original parallelogram?
7. What is the rule for determining the area of a parallelogram with base  $b$  and height  $h$ ?

**Activity 2: Area—From Parallelograms to Triangles**

For this activity you will need dot paper and a centimeter ruler.

1. Construct  $\triangle KIM$  on your dot paper. Construct a segment  $\overline{KE}$  that is parallel to  $\overline{MI}$  and has length equal to the length of  $\overline{MI}$  as shown. Draw the segment  $\overline{EM}$ .
2. What type of quadrilateral is  $MIKE$ ? Justify your answer with properties of  $MIKE$ .

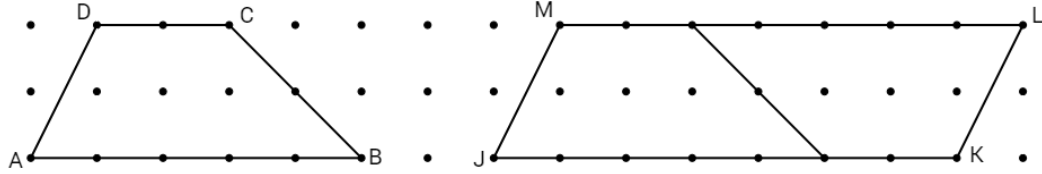


3. What is the area of quadrilateral  $MIKE$ ?
4. What is the relationship between the base and the height of the quadrilateral  $MIKE$  and the base and the height of  $\triangle KIM$ ?
5. Given the area of quadrilateral  $MIKE$ , how can you find the area of  $\triangle KIM$ ? What is that area?
6. What is the rule for determining the area of a triangle with base  $b$  and height  $h$ ?

**Activity 3: Area—From Parallelograms to Trapezoids**

For this activity you will need dot paper and a centimeter ruler.

- Construct a trapezoid  $ABCD$  on your dot paper as shown. Construct a rotated copy of trapezoid  $ABCD$ , and match the vertices with the original trapezoid as shown.



- Polygon  $JKLM$  is what type of quadrilateral? Justify your answer with properties of  $JKLM$ .
- What is the area of quadrilateral  $JKLM$ ?
- How can you use the area of  $JKLM$  to find the area of  $ABCD$ ?
- If the length of the bases of  $ABCD$  are  $AB = b_1$  and  $CD = b_2$ , what is the length of each base of  $JKLM$ ?
- What is the relationship between the height of  $ABCD$  and the height of  $JKLM$ ?
- What is the rule for determining the area of a trapezoid with bases  $b_1$ ,  $b_2$  and height  $h$ ?

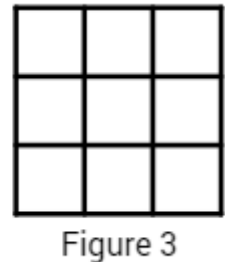
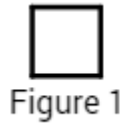
### Activity 4: Pattern Block Similarity

For this activity, you will need a set of pattern blocks.






1. First, follow this example to get the idea of this activity.

Using squares, we can construct larger squares that are **similar** to the original one.

The original square, Figure 1, uses one pattern block. The next larger similar square, Figure 2, uses 4 pattern blocks. The next larger similar square, Figure 3, uses 9 pattern blocks.



2. Use pattern blocks to construct Figure 4, the next larger similar square after Figure 3. How many blocks are needed to construct it?
3. Complete the table below for each of the following pattern block shapes. If you don't have enough pattern blocks to make Figure 5, or 6, or 7 (etc) make a conjecture based upon the pattern that you see in Figures 1-4.

Shape	Number of Blocks in...								
	Figure 1	Figure 2	Figure 3	Figure 4	Figure 5	Figure 6	Figure 7	...	Figure n
	1	4	9					...	
								...	
								...	
								...	
								...	

4. How does this activity demonstrate the Theorem from Section 10.4 about Perimeters and Areas of Similar Figures?

**Activity 5: Diameters to Circumferences**

You will need a piece of paper, a compass, and scissors for this activity.

1. On a blank piece of paper, use your compass to draw a circle with a radius between 1 and  $1\frac{3}{4}$  inches.
2. Cut a strip of paper from the long edge of your sheet. We will use this as a flexible ruler.
3. Use your strip of paper to measure the circumference of your circle (that is, around your circle). Cut the strip of paper to this length.
4. Use the strip of paper to measure the diameter of the circle. (You may want to use an actual ruler as a straight edge to draw the diameter of the circle before measuring it.)
5. Fold your strip of paper into parts that are as long as the diameter.

This activity shows that a circle's circumference is about \_\_\_\_\_ times as long as its diameter. (Round any fractional part to a reasonable approximation)

How does this relate to the value of  $\pi$ ?