

# *Manipulative Mathematics*

Using Manipulatives to Promote Understanding of Math Concepts

## **Area and Perimeter**

Visualizing Area and Perimeter

Measuring Area and Perimeter

### **Manipulatives used:**

Square 'color' tiles

## *Manipulative Mathematics* Visualizing Area and Perimeter

## Instructor Page

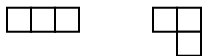
### Resources Needed:

Each student needs 7 color tiles and a sheet of grid paper.

### Background Information:

Linear and square measurements have little meaning for many students. This activity is designed to have students work with perimeter and area concretely and better understand the concepts of linear and square measurement. Students will also differentiate between perimeter and area.

### Directions:

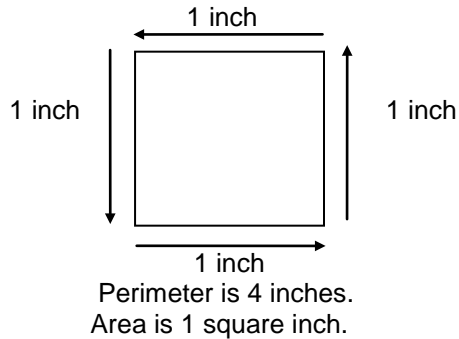
- Give each student a set of 7 color tiles and a sheet of grid paper.
- Use one tile to explain the concepts of linear measurement and perimeter, and square measurement and area. Show students:
  - The perimeter of the tile is 4 inches.
  - The area is one square inch.
  - This is the only shape possible with just 1 tile.
- Project 3 tiles and ask your students:
  - How many different shapes can be made with 3 tiles? Explain that to create a shape with more than one tile, all the tiles must be used and that each tile must touch another tile completely along one side. (So there are just 2 shapes made with 3 tiles.)  

  - What is the perimeter of each shape?
  - What is the area of each shape?
- Have students do Exercises 1, 2, and 3 on the worksheet. Working in groups seems to work best.
- When most groups are finished with Exercise 3, making shapes from 4 tiles, you may want to discuss their results. Ask each group to show one of their shapes on the board, and to write the perimeter and area. (Perimeters of 8 and 10 are possible - any others?) Some groups may show the same shape, but with a different orientation, giving you an opportunity to talk about rotations and flips, etc. When all possible shapes of 4 tiles have been shown, have your students record them shapes on their grid paper.
- Then ask your students, still working in groups, to finish the worksheet where they will find various shapes using 5 tiles. Students may also investigate making shapes with 6 and/or 7 tiles if time permits.
- Bring the class together for a quick debriefing of their responses to Exercises 6 and 7.
- You may want to use the square blocks at the interactive website [http://nlvm.usu.edu/en/nav/frames\\_asid\\_169\\_g\\_1\\_t\\_3.html?open=activities&from=topic\\_t\\_3.html](http://nlvm.usu.edu/en/nav/frames_asid_169_g_1_t_3.html?open=activities&from=topic_t_3.html) to show the different shapes you can make using 3 tiles.

*Manipulative Mathematics*  
**Visualizing Area and Perimeter**

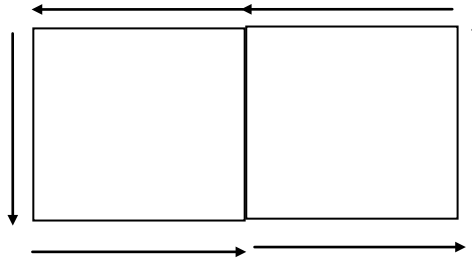
Name \_\_\_\_\_

Team \_\_\_\_\_  
Members \_\_\_\_\_

A color tile is a square that is 1 inch on a side. If an ant walked around the edge of the tile, it would have walked 4 inches. This distance around the tile is called the **perimeter** of the tile. The **area** of the tile is measured by determining how many square inches (or other unit) cover the tile. Since a color tile is a square that is 1 inch on each side, its area is one square inch.



- 1) Use 2 tiles to make a shape like the one shown below. Notice that each tile must touch the other along one complete side.



- (a) What is the perimeter of this shape? Perimeter = \_\_\_\_\_  
(b) What is the area? Area = \_\_\_\_\_  
(c) Can you make any other shape using two tiles? \_\_\_\_\_  
(d) Can you find any other perimeter using two tiles? \_\_\_\_\_  
(e) Record your results in the chart in #5.
- 2) Make all possible shapes with 3 tiles. Keep in mind that rotations and flips are really the same shape! Sketch your shapes on your grid paper, and color or shade in the squares.
- (a) How many shapes did you make? \_\_\_\_\_  
(b) For each shape, find its perimeter. Write the perimeter next to each shape.  
(c) What is the area of each shape that you made? Write the area inside each shape.  
(d) Record your results in the chart in #5.

- 3) Now use 4 tiles. Sketch all the possible shapes on your grid paper.
- How many shapes did you make? \_\_\_\_\_
  - For each shape, find its perimeter. Write the perimeter next to each shape.
  - What is the area of each shape that you made? Write the area inside each shape.
  - Record your results in the chart in #5.
- 4) Take 5 tiles. Sketch all the possible shapes on your grid paper.
- How many shapes did you make? \_\_\_\_\_
  - For each shape, find its perimeter. Write the perimeter next to each shape.
  - List all the perimeters of the shapes with 5 tiles.
  - Was more than one shape possible for any perimeter? \_\_\_\_\_
  - What is the smallest perimeter possible using 5 tiles? \_\_\_\_\_ Why?
  - What is the largest perimeter possible using 5 tiles? \_\_\_\_\_ Why?
  - What is the area of each shape that you made? Write the area inside each shape.
  - List all the areas of the shapes with 5 tiles.
  - Record your results in the chart in #5.
- 5) Fill in the chart below to show your results from #1-4.

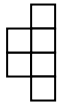
Number of tiles	Perimeters Found	Areas Found
1	4 inches	1 square inch
2		
3		
4		
5		

- 6) Name one fact you learned about perimeter from this activity.
- 7) Name one fact you learned about area from this activity.

**Visualizing Area and Perimeter – Extra Practice**

Find the area and perimeter of each shape.

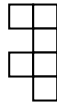
1)



area= \_\_\_\_\_

perimeter= \_\_\_\_\_

2)



area= \_\_\_\_\_

perimeter= \_\_\_\_\_

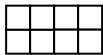
3)



area= \_\_\_\_\_

perimeter= \_\_\_\_\_

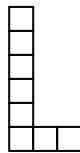
4)



area= \_\_\_\_\_

perimeter= \_\_\_\_\_

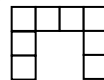
5)



area= \_\_\_\_\_

perimeter= \_\_\_\_\_

6)



area= \_\_\_\_\_

perimeter= \_\_\_\_\_

7)



area= \_\_\_\_\_

perimeter= \_\_\_\_\_

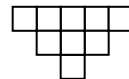
8)



area= \_\_\_\_\_

perimeter= \_\_\_\_\_

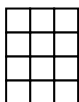
9)



area= \_\_\_\_\_

perimeter= \_\_\_\_\_

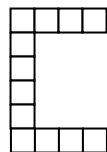
10)



area= \_\_\_\_\_

perimeter= \_\_\_\_\_

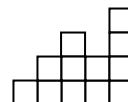
11)



area= \_\_\_\_\_

perimeter= \_\_\_\_\_

12)



area= \_\_\_\_\_

perimeter= \_\_\_\_\_

For more practice, use color tiles to make your own shapes and then find the area and perimeter. You may want to use the square blocks at the interactive website

[http://nlvm.usu.edu/en/nav/frames\\_asid\\_169\\_g\\_1\\_t\\_3.html?open=activities&from=topic\\_t\\_3.html](http://nlvm.usu.edu/en/nav/frames_asid_169_g_1_t_3.html?open=activities&from=topic_t_3.html)

*Manipulative Mathematics*  
**Measuring Area and Perimeter**

**Instructor Page**

**Resources Needed:**

Each student needs a set of 20 color tiles and the worksheets, including Shapes I through VI. It may be helpful if you can project Shape I through use of an overhead projector or document camera.

**Background Information:**

Linear and square measurements have little meaning for many students. This activity is designed to have students work with area and perimeter concretely and better understand the concept of linear and square measurement.

**Directions:**

- This activity is best done individually. Give each student a set of 20 color tiles and worksheets.
- Explain the concepts of linear measurement and perimeter, and square measurement and area.
- Show the class Shape I.
- Have the students estimate how many tiles will cover the shape. Record this on the board and label it 'Estimated Area'. Be sure the estimate is in square inches. Then have the students estimate the perimeter of the shape, and label it 'Estimated Perimeter'. The units will be inches.
- Then cover the shape completely with tiles and count the number of tiles needed. Write that on the board labeled 'Measured Area', again using square inches. Now count the number of tiles along the perimeter of the shape, and label that 'Measured Perimeter'. Have your students briefly discuss how good they are at estimating area and perimeter.
- Direct your students to use their color tiles to complete the worksheet, estimating and measuring Shapes II through VI.
- When most students have finished, discuss their answers to Exercises 3 and 4 with the class.

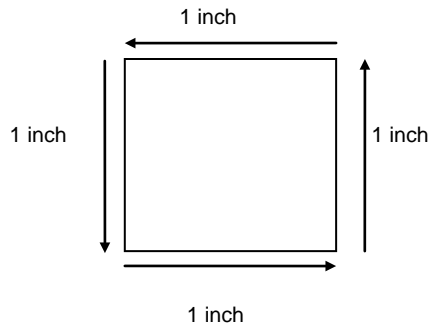
As an alternative to the using the shape pages, you might want to create your own shapes online using the geoboard activity at [http://nlvm.usu.edu/en/nav/frames\\_asid\\_282\\_g\\_3\\_t\\_3.html?open=activities&from=topic\\_t\\_3.html](http://nlvm.usu.edu/en/nav/frames_asid_282_g_3_t_3.html?open=activities&from=topic_t_3.html). You can create a shape by stretching a rubber band around the pegs, and then click on 'Measures' to see the area and perimeter. To be consistent with the shapes on the worksheets, be sure to use only right angles.

*Manipulative Mathematics*  
**Measuring Area and Perimeter**

Name \_\_\_\_\_

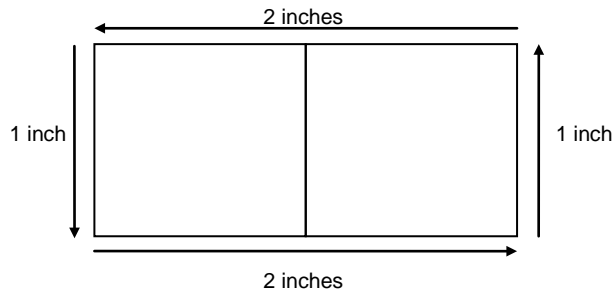
The **area** of a shape is measured by determining how many square inches (or other unit) cover the shape. The **perimeter** is the distance around the shape.

A color tile is a square that is 1 inch long on each side.  
Its area is one square inch. Its perimeter is 4 inches.



Perimeter is 4 inches.  
Area is 1 square inch.

If we put two tiles side by side we have a shape with area two square inches. The perimeter is 6 inches, because the distance along a side of each square is 1 inch.



Perimeter is 6 inches.  
Area is 2 square inches.

1) Take your set of tiles and Shape I.

- First, estimate how many tiles will be needed to completely cover Shape I. Record this in the 'Estimated Area' column on the chart below.
- Next, estimate how many tiles will form the perimeter of Shape I. Record this in the 'Estimated Perimeter' column on the chart below.
- Now cover Shape I completely with tiles. Count the number of tiles you used and record this in the 'Measured Area' column in the chart on the next page. Count the number of tiles along the perimeter and record this in the 'Measured Perimeter' column.

2) Repeat this process with the rest of your shapes.

Shape	Estimated Area	Estimated Perimeter	Measured Area	Measured Perimeter
I				
II				
III				
IV				
V				
VI				

3) Think about area.

(a) When might you need to use area in your everyday life?

(b) Give an example of when estimating an area is useful.

(c) Give an example of when measuring an area is necessary.

4) Think about perimeter.

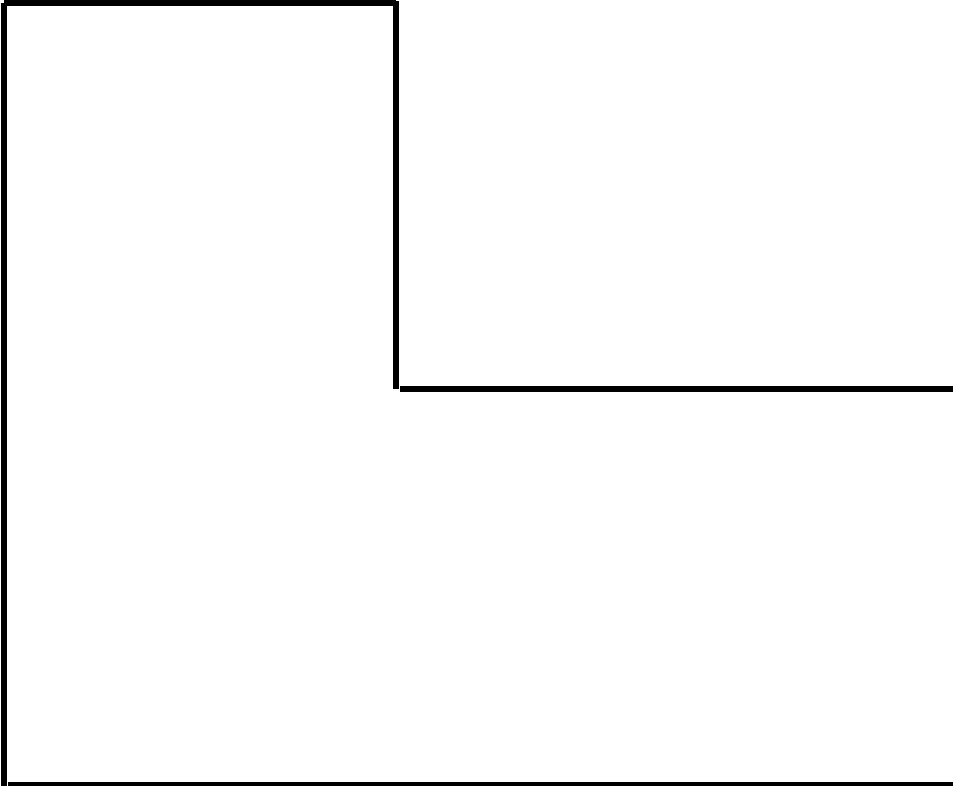
(a) When might you need to use perimeter in your everyday life?

(b) Give an example of when estimating a perimeter is useful.

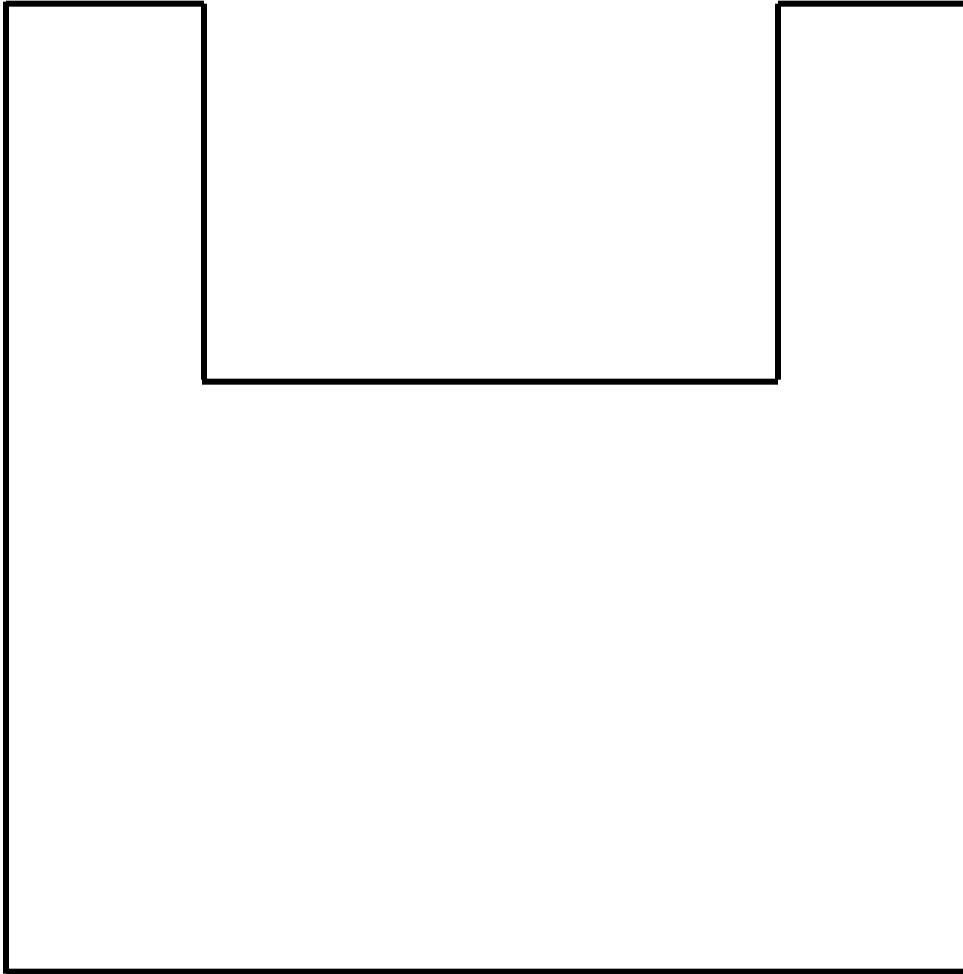
(c) Give an example of when measuring a perimeter is necessary.



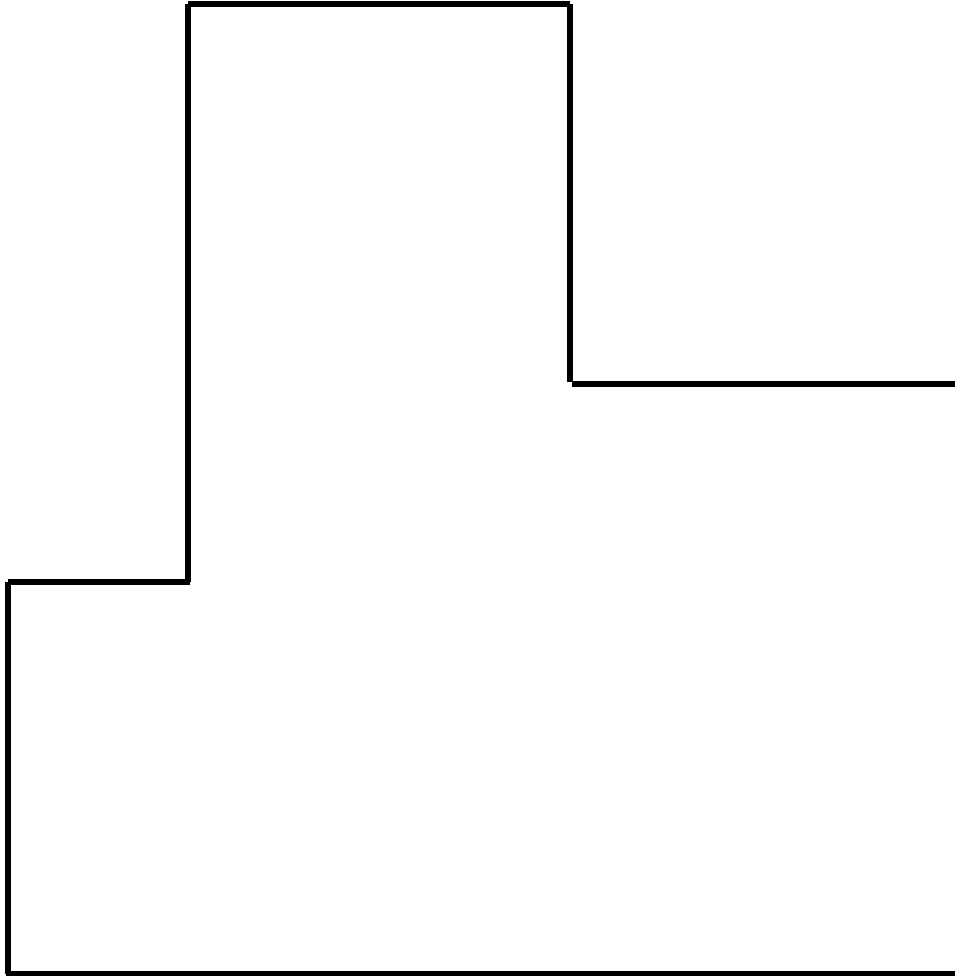
**Shape I**



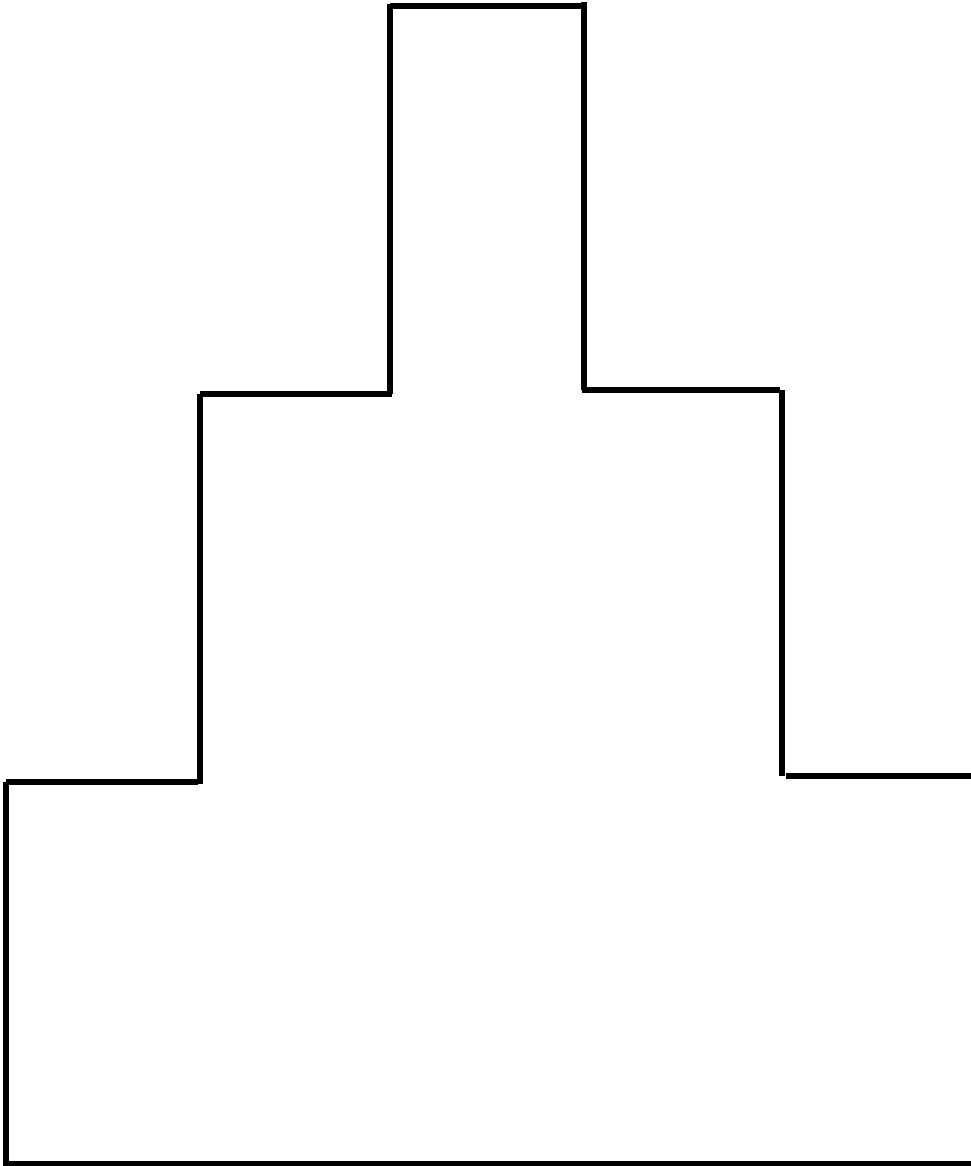
**Shape II**



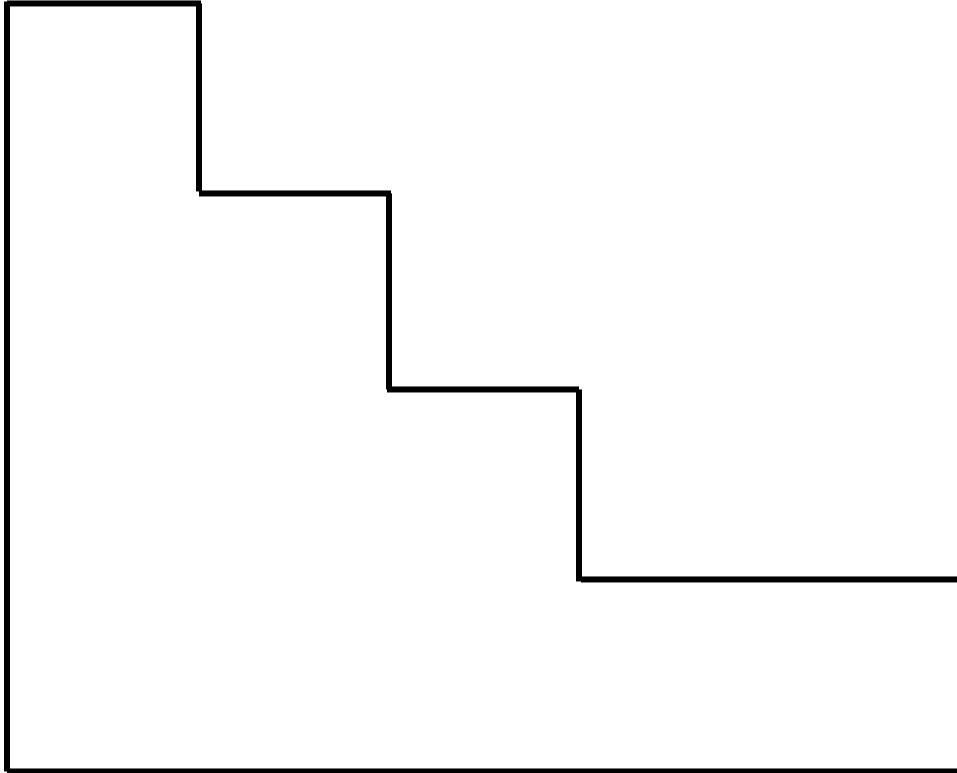
**Shape III**



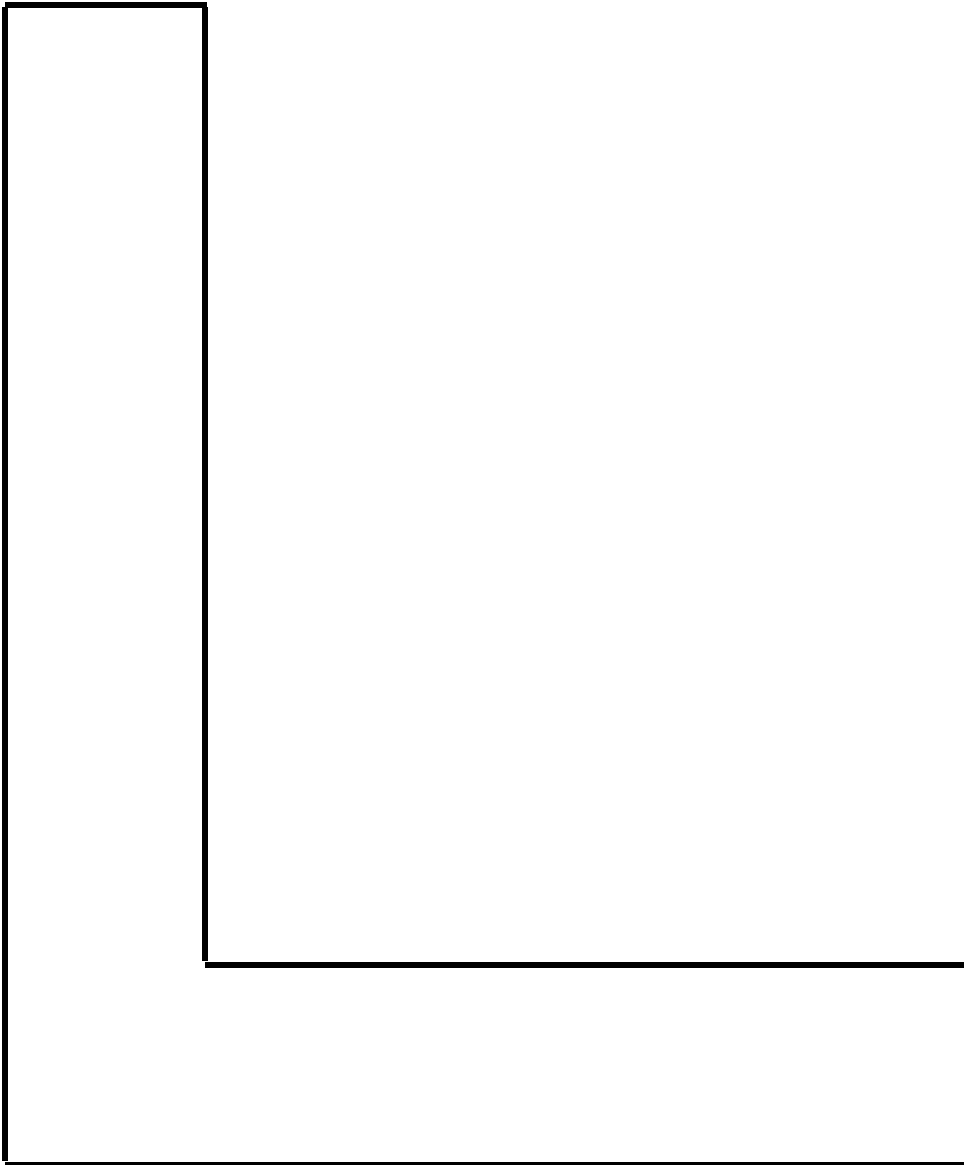
**Shape IV**



**Shape V**




**Shape VI**



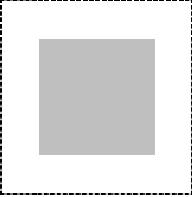
*Manipulative Mathematics*

Name \_\_\_\_\_

**Measuring Area and Perimeter – Extra Practice**

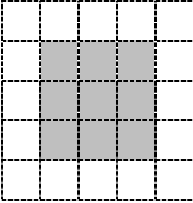
Find the area and perimeter of each shaded region, using this square  as one square unit measure.

1)



Estimated area \_\_\_\_\_

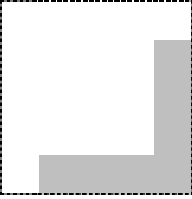
Estimated perimeter \_\_\_\_\_



Measured area \_\_\_\_\_

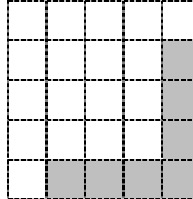
Measured perimeter \_\_\_\_\_

2)



Estimated area \_\_\_\_\_

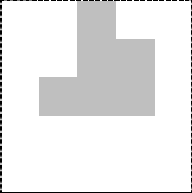
Estimated perimeter \_\_\_\_\_



Measured area \_\_\_\_\_ M

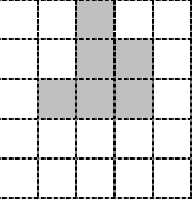
Measured perimeter \_\_\_\_\_

3)



Estimated area \_\_\_\_\_

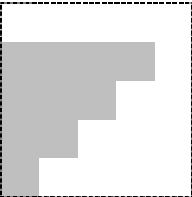
Estimated perimeter \_\_\_\_\_



Measured area \_\_\_\_\_

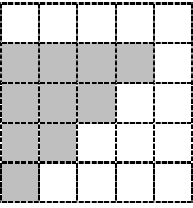
Measured perimeter \_\_\_\_\_

4)



Estimated area \_\_\_\_\_

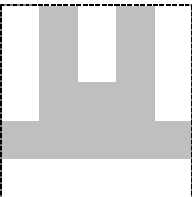
Estimated perimeter \_\_\_\_\_



Measured area \_\_\_\_\_

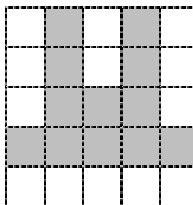
Measured perimeter \_\_\_\_\_

5)



Estimated area \_\_\_\_\_

Estimated perimeter \_\_\_\_\_



Measured area \_\_\_\_\_

Measured perimeter \_\_\_\_\_