6. Make a conjecture about the coordinates of a shape reflected in the y-axis and a different conjecture about the coordinates of a shape reflected in the x-axis.

7. Draw lines from the vertices of Figure 1 to the corresponding vertices of Figure 2. What can you say about these lines? How is the y-axis related to each of these lines?

LOCATION ACTIVITIES: Coordinate Dilations

1. Begin with a four-sided shape in the first quadrant on coordinate grid paper. Make a list of the coordinates, and then make a new set of coordinates by multiplying each of the original coordinates by 2. Plot the resulting shape. What is the result?

_____

_____

_____

2. Multiply each of the original coordinates by 1/2 and plot that shape. What is the result?

_____

_____

_____

3. Draw a line from the origin to a vertex of the largest shape on your paper. Repeat for one or two additional vertices. What do you notice?

_____

_____

_____

Adapted from *Teaching Student-Centered Mathematics: Grades 3-5* (pp. 241-242)

VISUALIZATION ACTIVITIES: Pentominoes

A pentomino is a shape formed by joining five squares as if cut from a square grid. Each square must have at least one side in common with another.

The teacher will provide you with five square tiles and a sheet of square grid paper for recording. See how many different pentomino shapes you can find. Shapes that are flips or turns of other shapes are not considered different.

Extension 1: Once students have decided upon the total number of pentominoes, the pieces can be used in a variety of activities. Paste the grids with your pentominoes onto tagboard and cut out the shapes.

- Try to fit all 12 pieces into a 6 x 10 or 5 x 12 rectangle.
- Examine each of the pentominoes and decide which will fold up to make an open box. For those that are "box makers." which square is at the bottom? Once a "box maker" has been identified, write the letters M-A-T-H on the four sides so that the box will spell "MATH" around the sides.

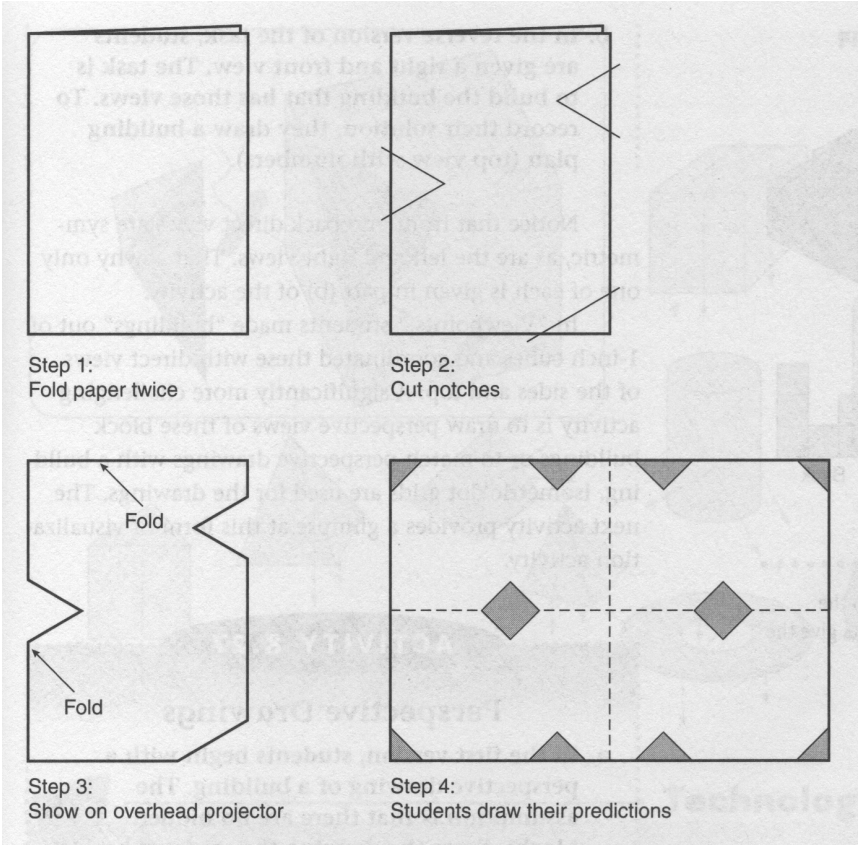
Extension 2: Explore the number of shapes that can be made from six equilateral triangles or from four 45-degree right triangles (halves of squares). With the right triangles, sides that touch must be the same length.

VISUALIZATION ACTIVITIES: Notches and Holes

The teacher will fold a piece of paper in half and then half again, making the second fold in the opposite direction from the first. Students make a sketch of the paper when it is opened, showing a line for each fold.

With the paper folded, the teacher will cut notches in one or two sides and/or cut off one or two corners. The teacher may also use a paper punch to make a hole or two. While still folded, the paper will be presented to the students. The folded edges should be to the left and at the bottom (see below). The task is for students to draw the notches and holes that they think will appear when the paper is opened.

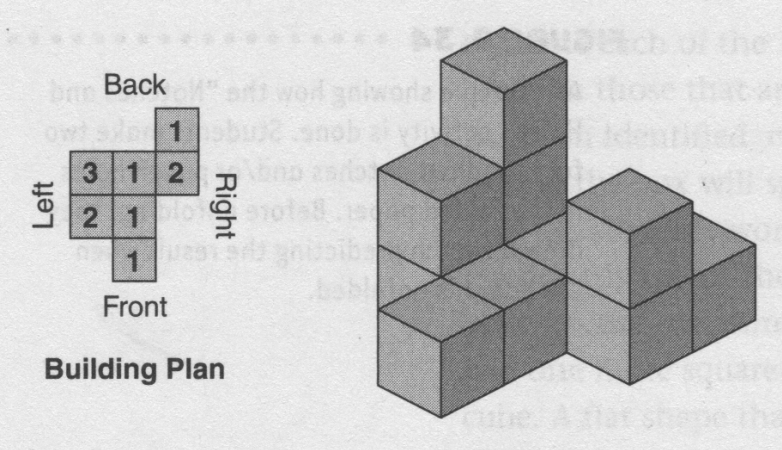
Extension: Begin with only one fold and only two cuts, and then eventually move on to a more difficult challenge.



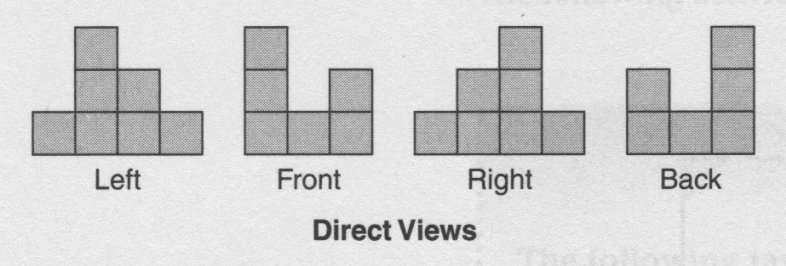
Adapted from *Teaching Student-Centered Mathematics: Grades 3-5* (p. 244)

VISUALIZATION ACTIVITIES: Viewpoints

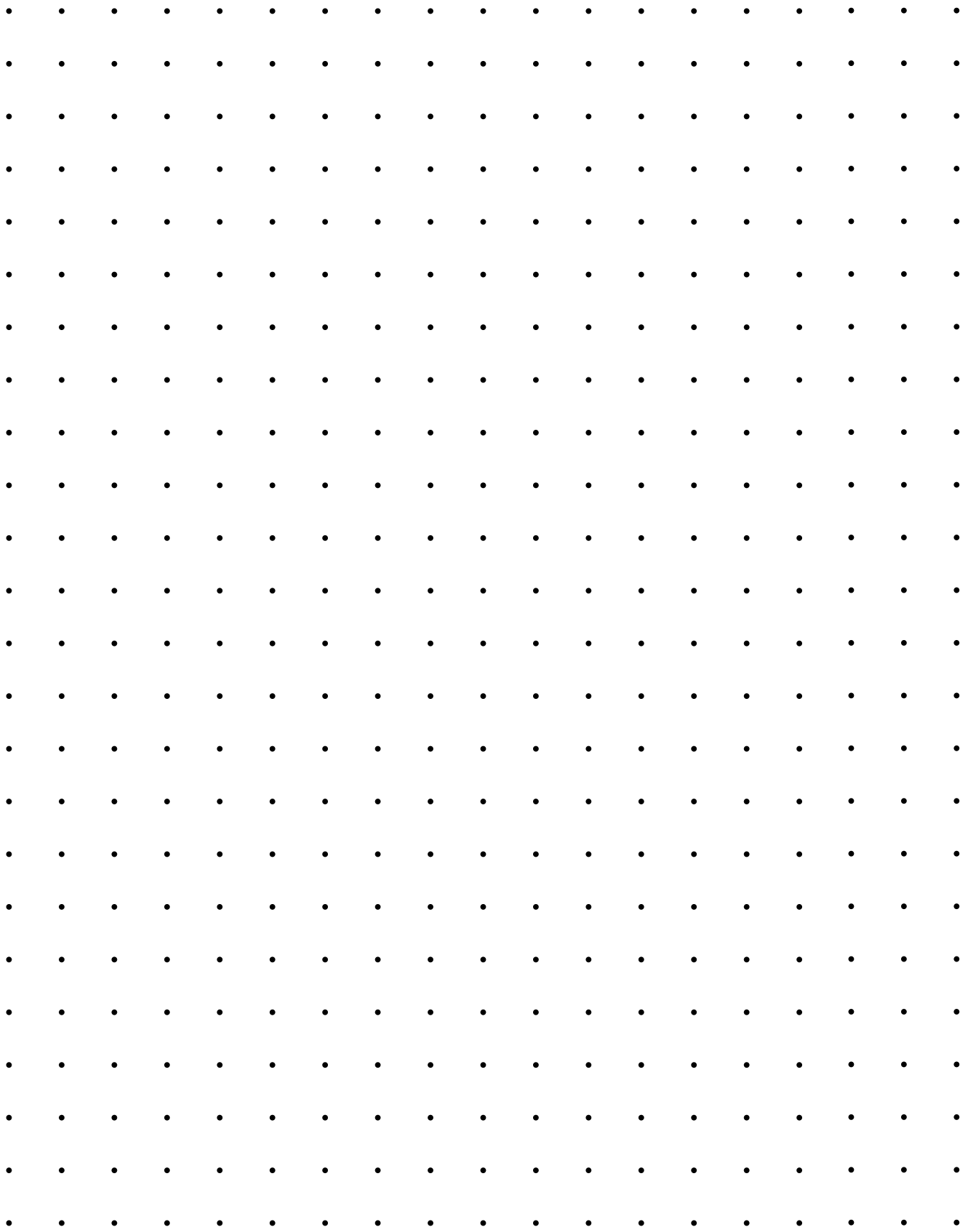
1. Students begin with a building and draw the left, right, front, and back direct views. Below, the building plan shows a top view of the building and the number of blocks in each position. After you build a building from a plan like this, your task is to draw the front, right, left and back direct views as shown in the figure.



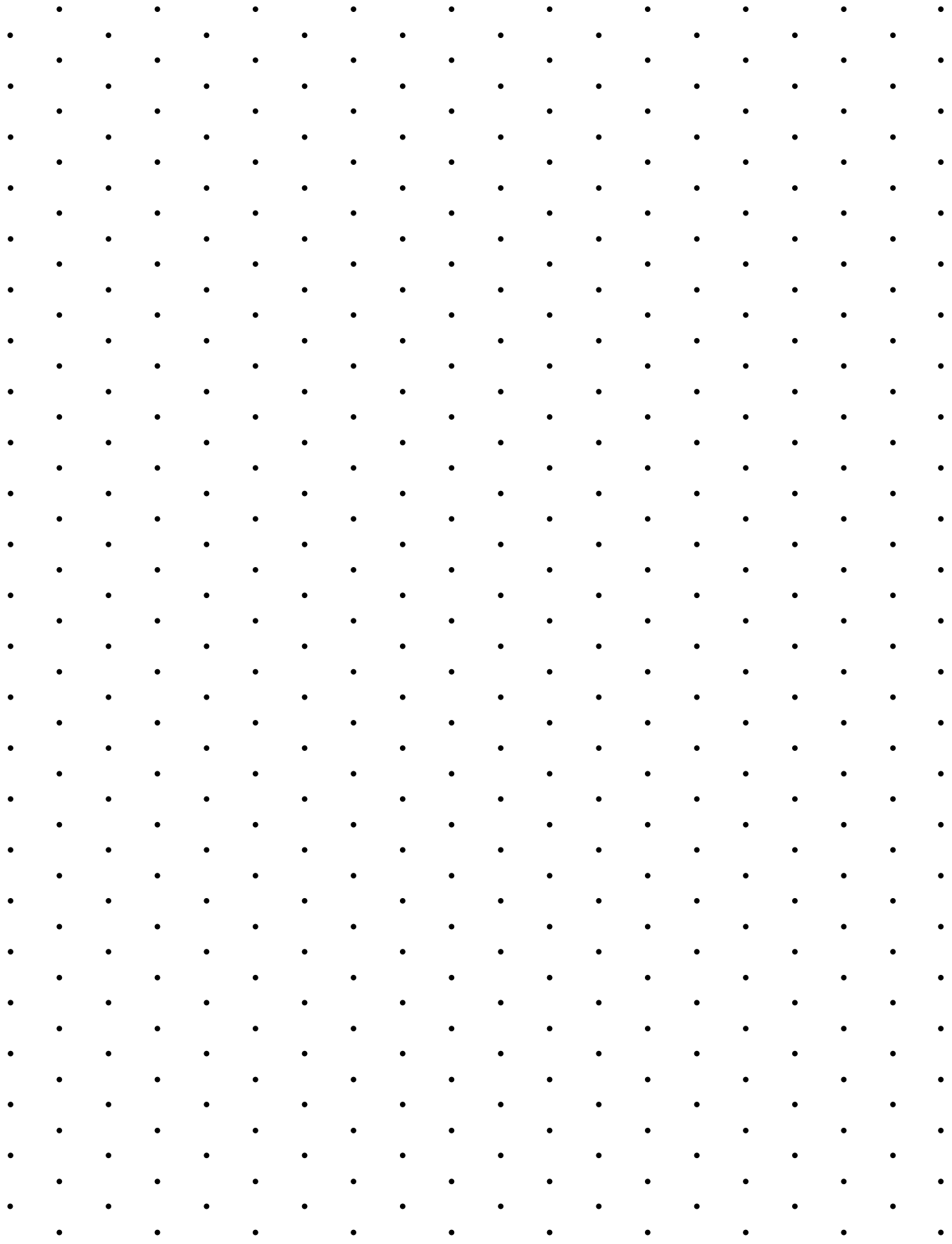
2. In the reverse version of the task, students are given a right and front view. The task is to build the building that has those views. To record your solution, draw a building plan (top view with numbers).



Adapted from *Teaching Student-Centered Mathematics: Grades 3-5* (pp. 245-246)



BLM 10—1-cm square dot grid

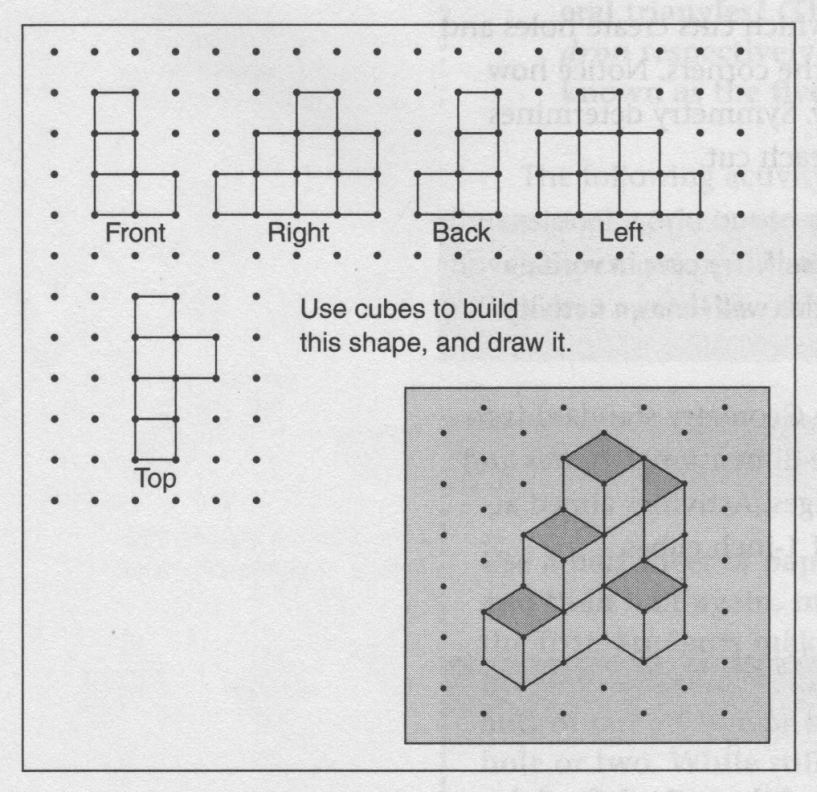


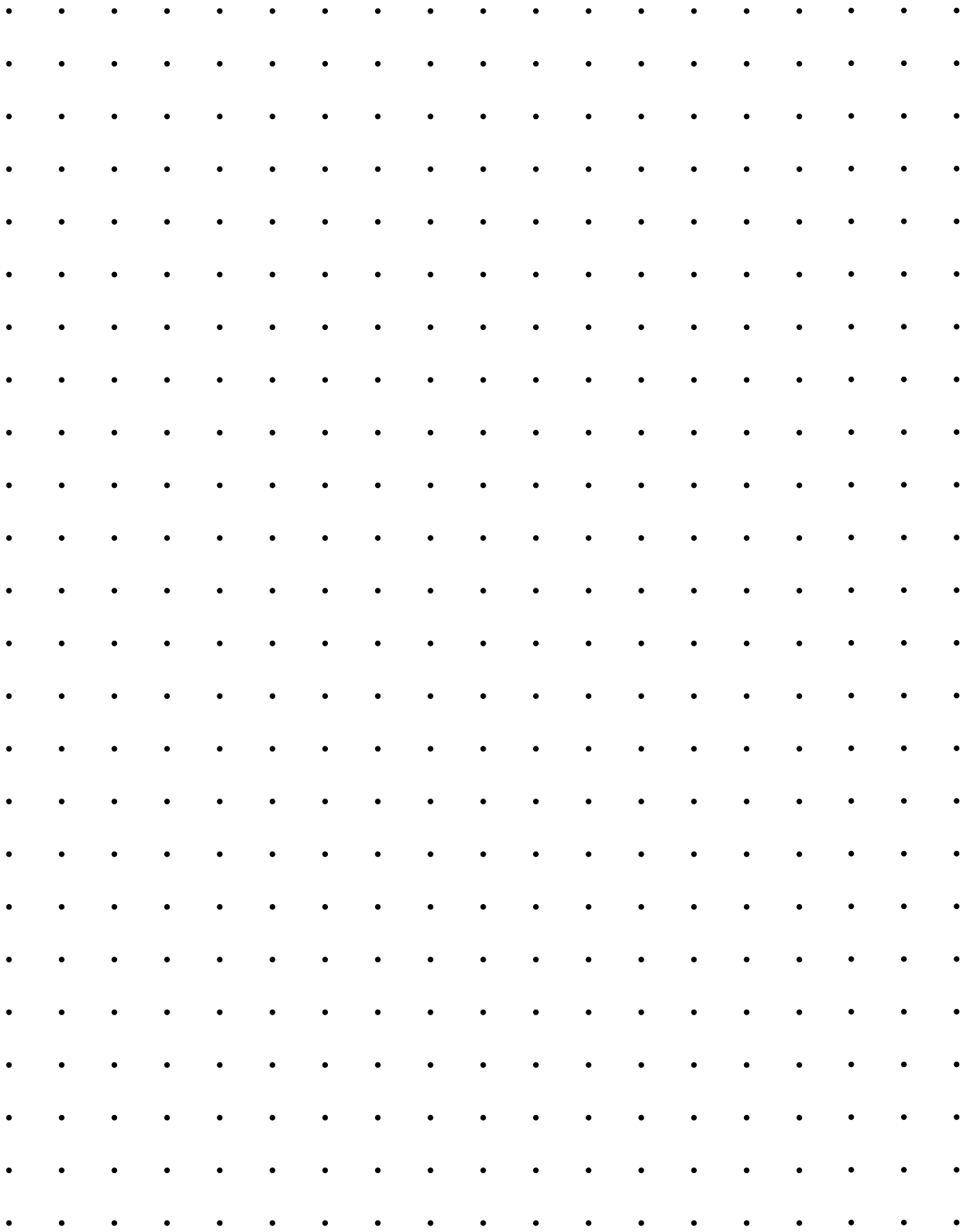
BLM 12—1-cm isometric dot grid

VISUALIZATION ACTIVITIES: Perspective Drawings

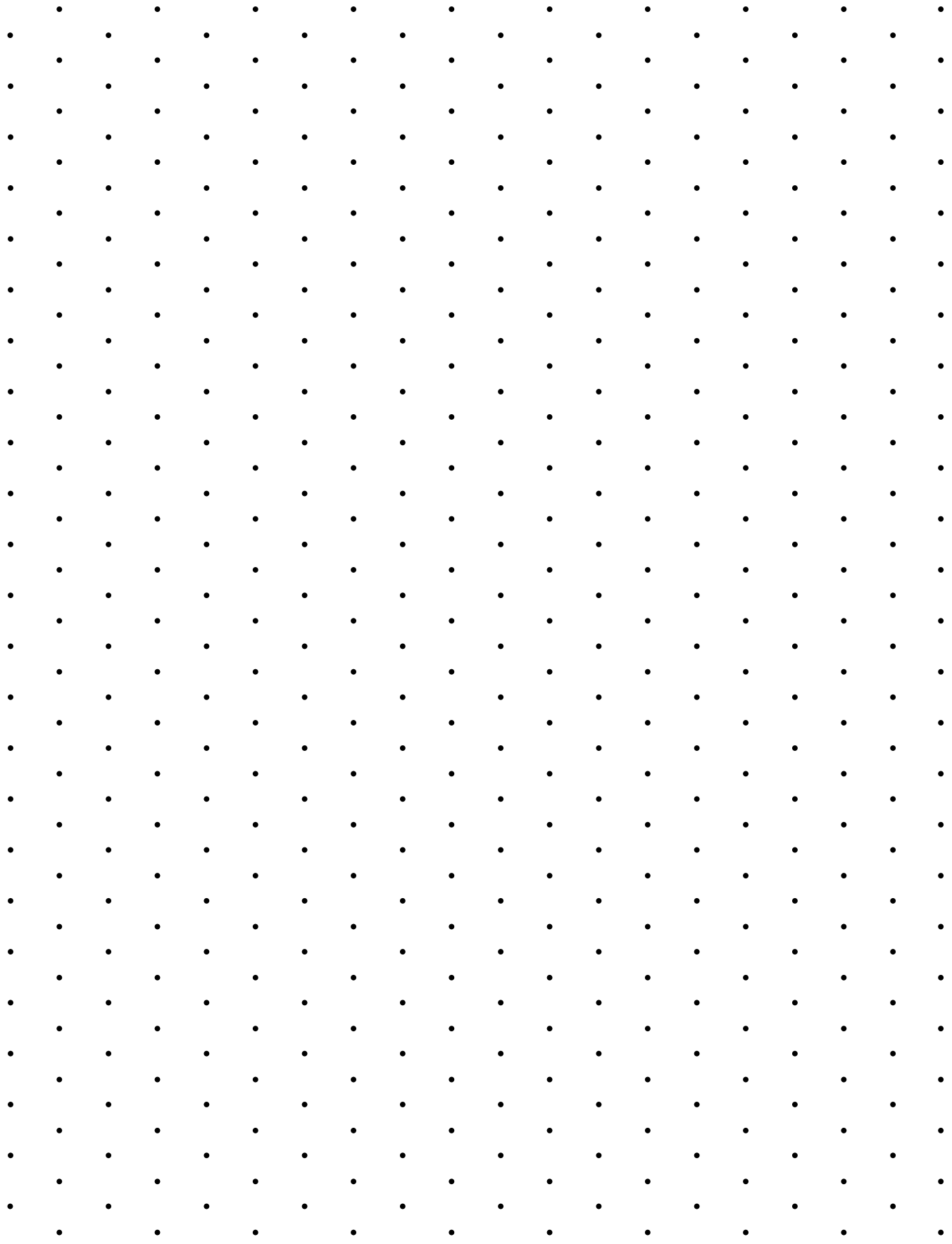
1. Students begin with a perspective drawing of a building. The assumption is that there are no hidden blocks. From the drawing, build the actual building with your blocks. To record the result, draw a building plan indicating the number of blocks in each position.

2. Students are given either a block plan or the five direct views. Build the building accordingly and draw two or more of the perspective views. There are four possible perspectives from above the table: the front left and right, and the back left and right. It is useful to build the building on a sheet of paper with the words "front", "back", "left", and "right" written on the edges to keep from getting different viewpoints confused.





BLM 10—1-cm square dot grid



BLM 12—1-cm isometric dot grid

USING UNITS OF LENGTH: Changing Units

Directions: Complete the following problems, in order.

1a. Measure the length of _____ (object) in _____ (unit).

Measurement of object: _____

1b. Predict the length of _____ (same object) in _____ (different unit).

Prediction of measurement: _____

Explain how your prediction was made: _____

_____

_____

1c. Actual measurement of object: _____

2a. Measure the length of _____ (object) in _____ (unit).

Measurement of object: _____

2b. Predict the length of _____ (same object) in _____ (different unit).

Prediction of measurement: _____

Explain how your prediction was made: _____

_____

_____

2c. Actual measurement of object: _____

3a. Measure the length of _____ (object) in _____ (unit).

Measurement of object: _____

3b. Predict the length of _____ (same object) in _____ (different unit).

Prediction of measurement: _____

Explain how your prediction was made: _____

_____

_____

3c. Actual measurement of object: _____

4. As you completed each problem, did your predictions of measurement become more or less accurate? Why or why not?

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5. For each problem, is there a relationship between the two actual measurements? If so, what are they?

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Adapted from *Teaching Student-Centered Mathematics: Grades 3-5* (pp. 258-259)

COMPARISON ACTIVITIES: Rectangular Comparison – No Units

Directions: Cut out the rectangles. For each pair, decide which is larger or if they are the same area. You may cut or fold the rectangles to help with your decision.

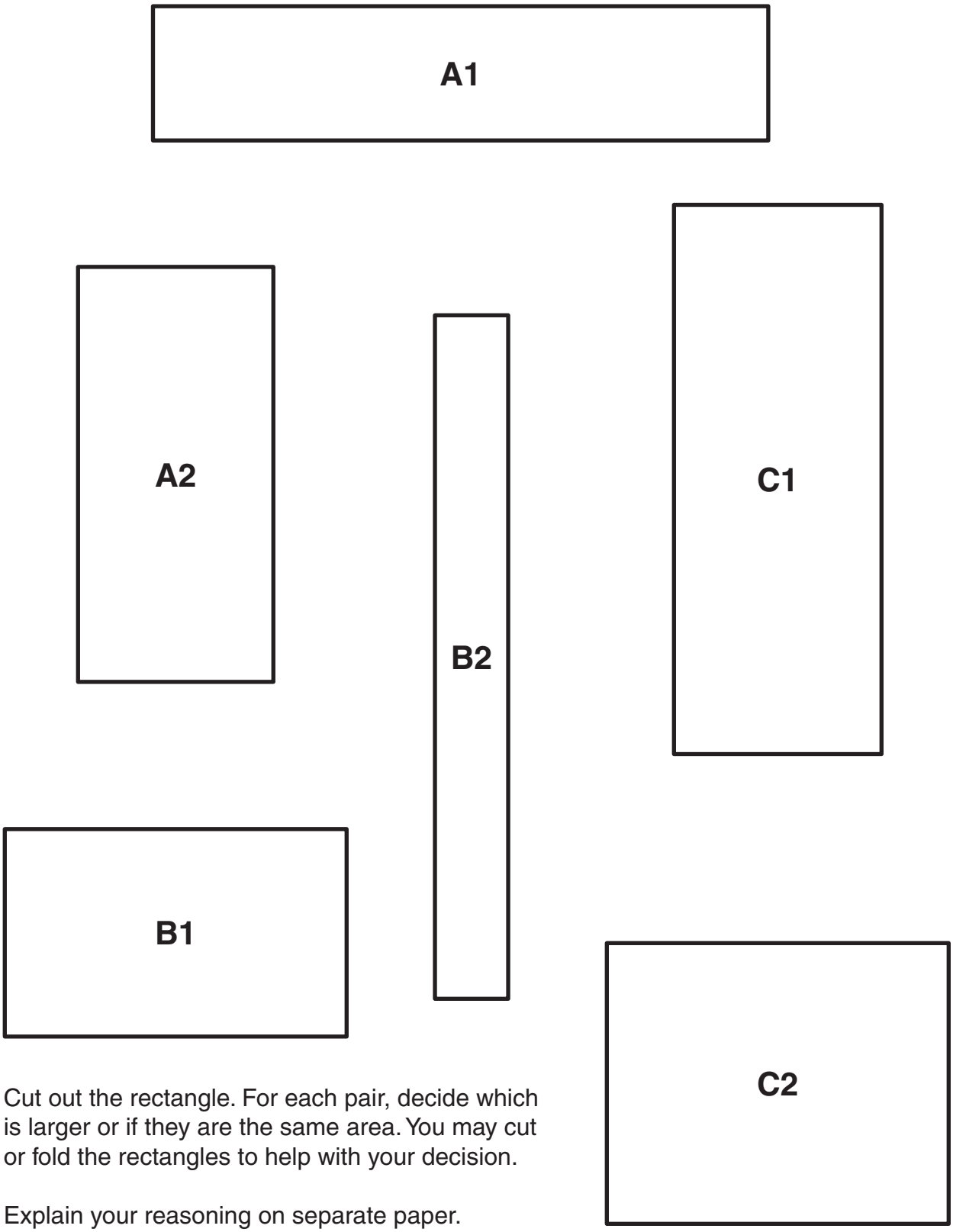
After, answer the questions below.

A. Which is larger or are they both the same? Explain your reasoning and any strategies you used.

B. Which is larger or are they both the same? Explain your reasoning and any strategies you used.

C. Which is larger or are they both the same? Explain your reasoning and any strategies you used.

Adapted from *Teaching Student-Centered Mathematics: Grades 3-5* (pp. 261-262)



Cut out the rectangle. For each pair, decide which is larger or if they are the same area. You may cut or fold the rectangles to help with your decision.

Explain your reasoning on separate paper.

COMPARISON ACTIVITIES: Tangram Areas

Directions: Use tangrams to decide which of the three shapes are the same size, which are larger, and which are smaller.

After, answer the questions below.

1. What can you conclude about Shape #1? Explain how you reached these conclusions.

_____

_____

_____

_____

_____

_____

2. What can you conclude about Shape #2? Explain how you reached these conclusions.

_____

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3. What can you conclude about Shape #3? Explain how you reached these conclusions.

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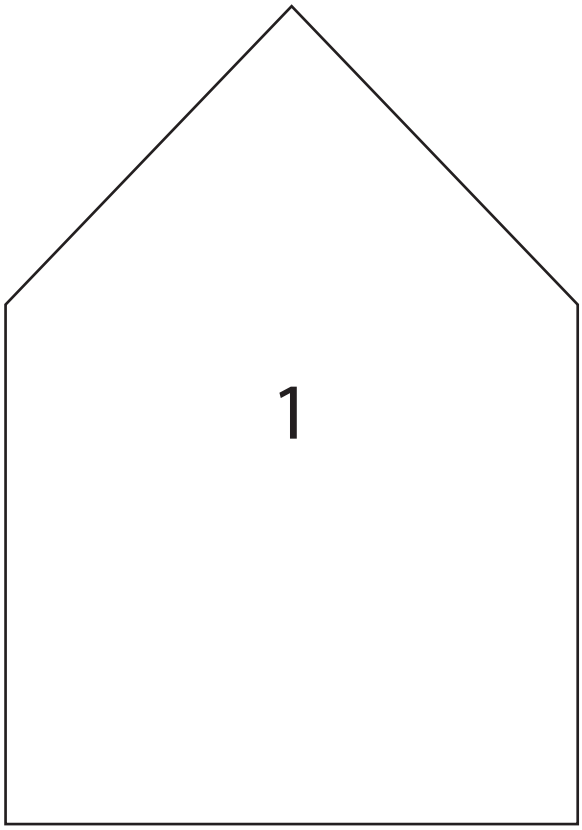
Adapted from *Teaching Student-Centered Mathematics: Grades 3-5* (p. 262)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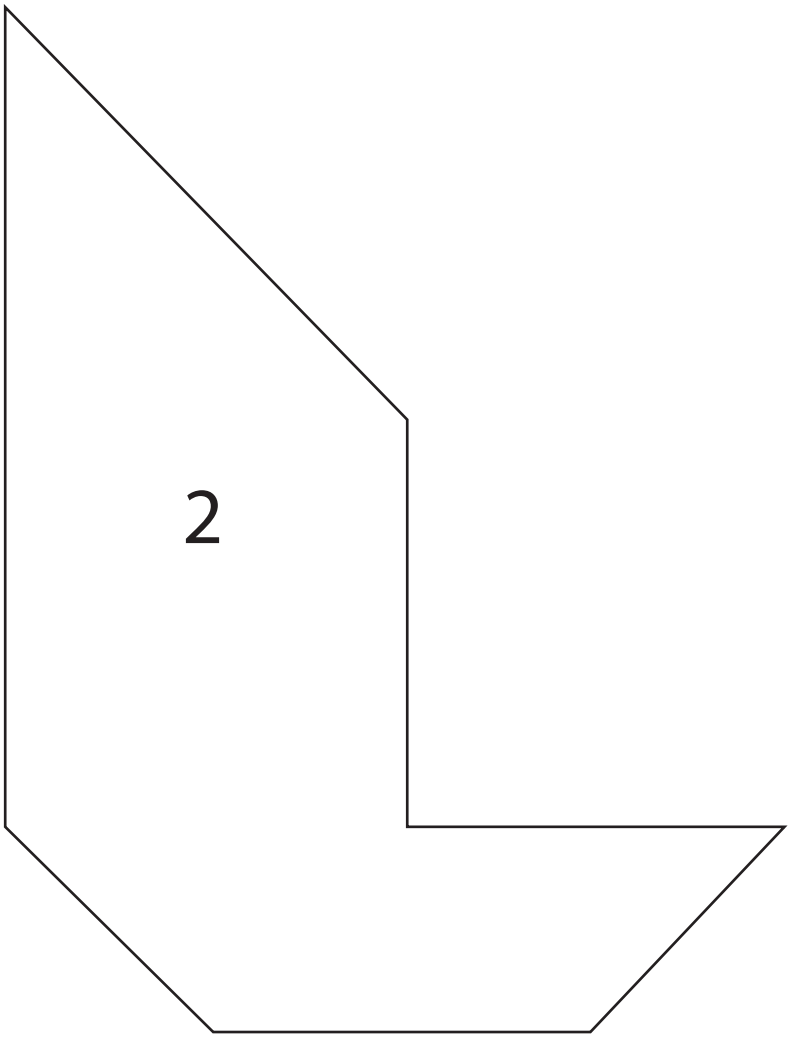
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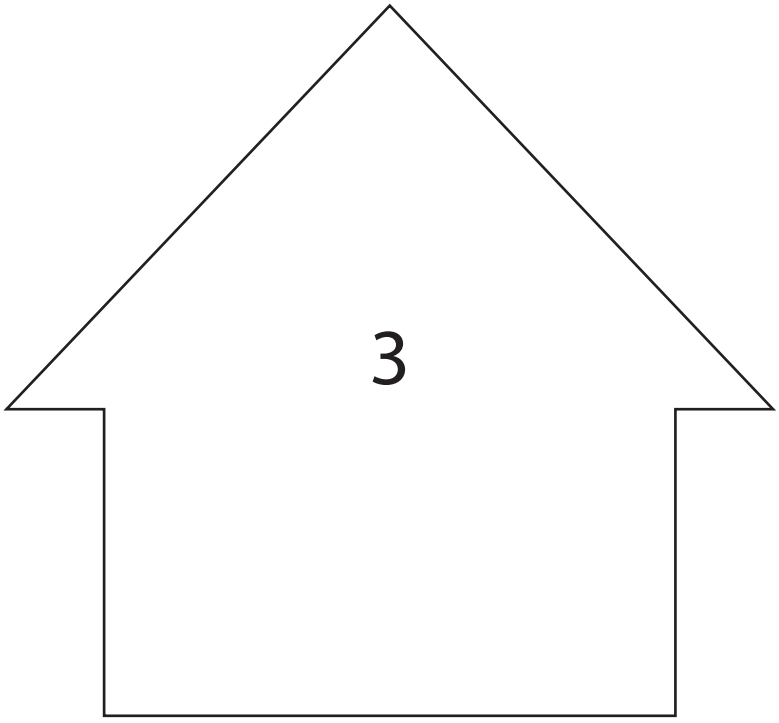
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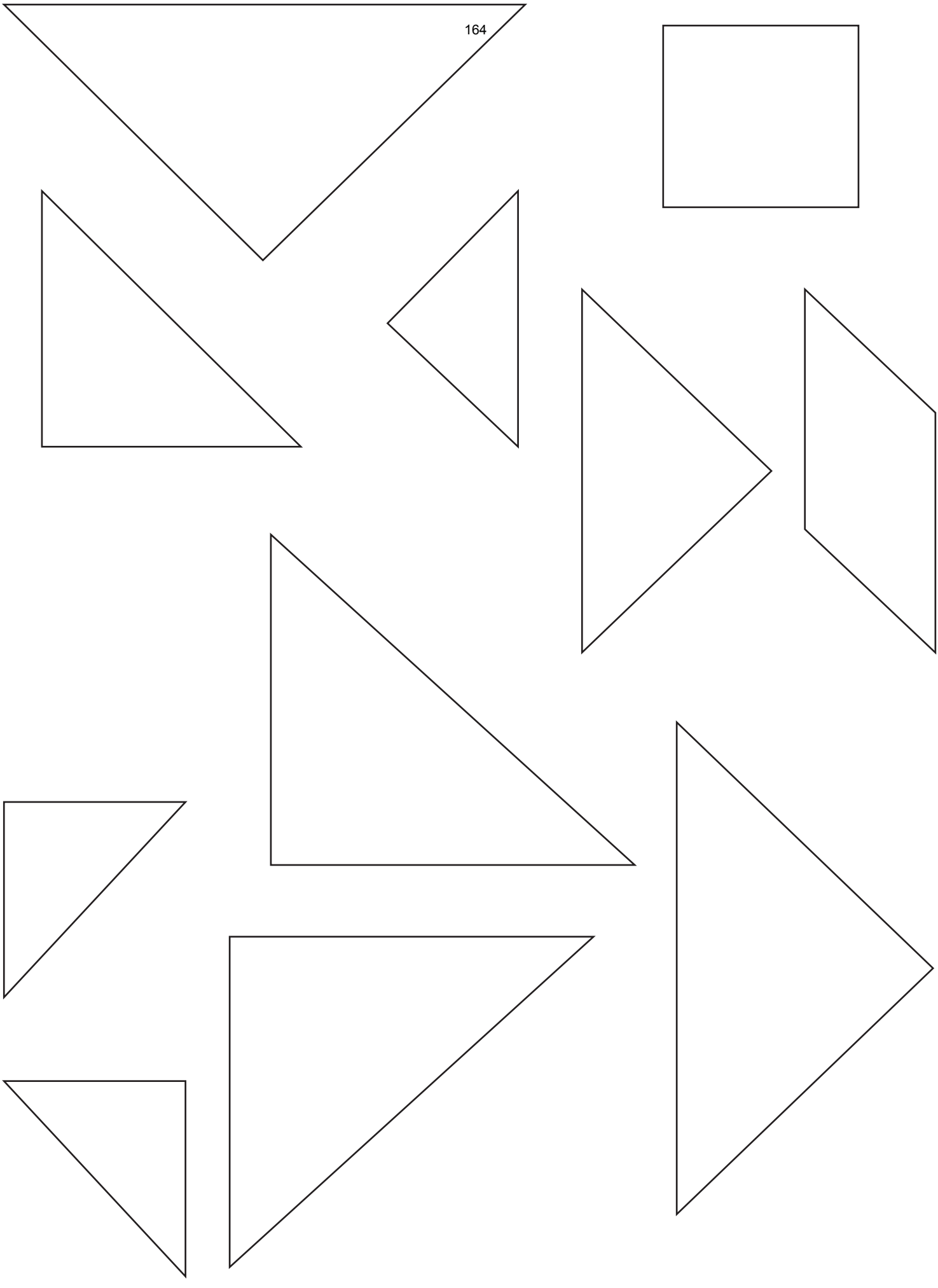

USING UNITS OF AREA: Fill and Compare

Directions: Complete the following problems, in order.

1. Make a guess about which are the smallest and the largest of the three shapes. Explain how you reached these conclusions.

2. Use a filler of your choice (circular disks, color tiles, lima beans, etc.) to more accurately order the shapes by size. Explain what you found.

3. Were your original guesses accurate or inaccurate? For your accuracies, explain why you think you were correct. For your inaccuracies, explain why you think you were incorrect.

USING UNITS OF AREA: Rectangular Comparison – Square Units

Directions: For each number, use a centimeter ruler and the single square unit (which you may cut out) to determine, in any way that you can, which rectangle is larger or whether they are the same. You are not permitted to cut out the rectangles or even draw on them.

After, answer the questions below.

1. Which rectangle is larger? Explain how you reached this conclusion.

_____

_____

_____

_____

_____

_____

2. Which rectangle is larger? Explain how you reached this conclusion.

_____

_____

_____

_____

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_____

3. Which rectangle is larger? Explain how you reached this conclusion.

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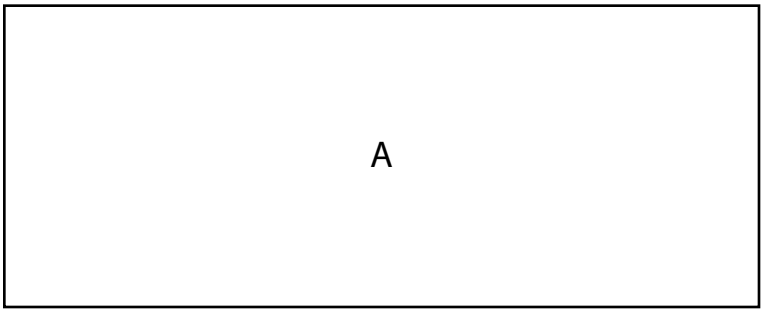
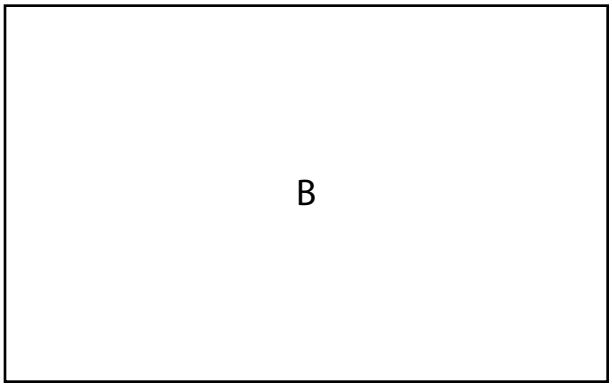
Adapted from *Teaching Student-Centered Mathematics: Grades 3-5* (p. 264)

1.





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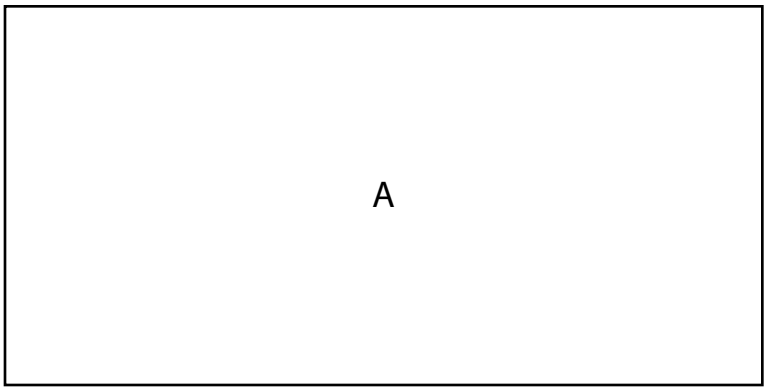

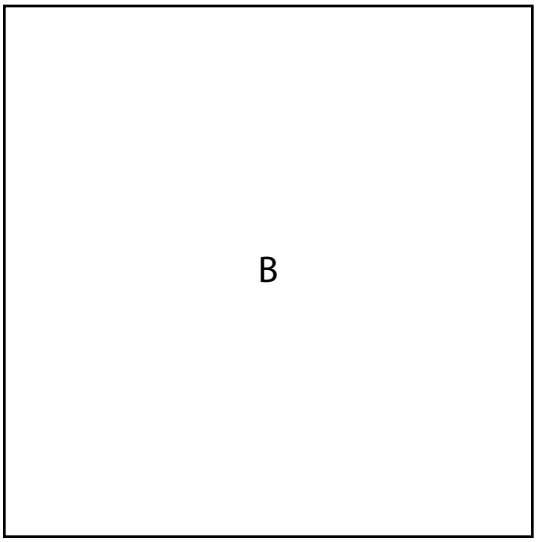

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