

# PUZZLES

MEASUREMENT • NUMBER • GEOMETRY

- Counting
- Estimation
- Area
- Comparing

## Getting Ready

### What You'll Need

Snap Cubes, 30 per pair

*Puzzle Shapes*, pages 96-100

Construction paper, 14 sheets

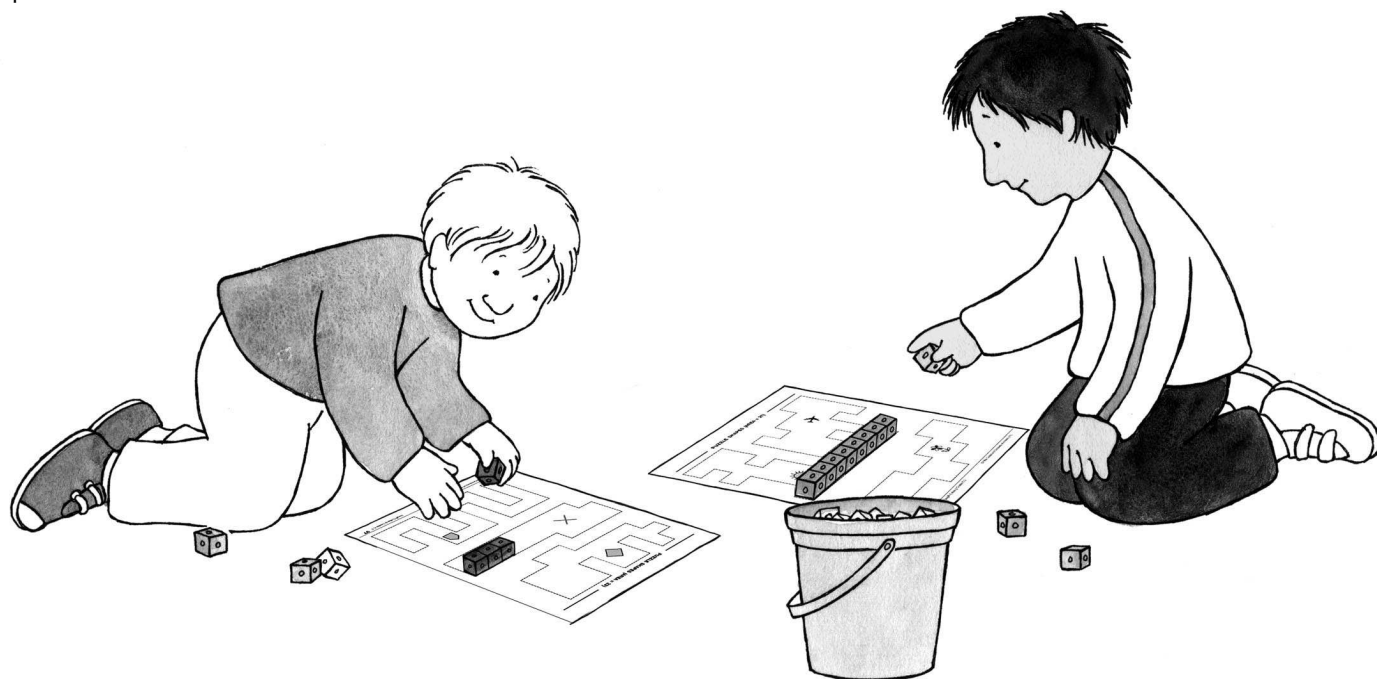
Snap Cube grid paper, page 93

Overhead Snap Cubes and/or  
Snap Cube grid paper transparency  
(optional)

## Overview

Children estimate, then find the number of Snap Cubes required to cover the areas of figures. In this activity, children have the opportunity to:

- ◆ find the area of a variety of shapes
- ◆ discover that different shapes may have the same area
- ◆ develop estimation skills
- ◆ develop and use systems for counting groups of numbers



## The Activity

After copying the five *Puzzle Shapes* pages, cut the 14 puzzle shapes out and mount each one on construction paper for children to use in *On Their Own*.

You may need to point out that, as children cover the puzzle shapes, they should ignore the connectors on the ends of the Snap Cubes that lie beyond the outlines of the shapes.

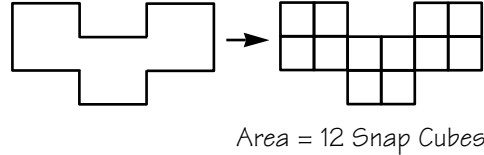
## Introducing

- ◆ Show children one of the *Puzzle Shapes* worksheets. Ask them for estimates of how many Snap Cubes will cover the shape.
- ◆ Place cubes on the shape.
- ◆ With the help of the class, count the number of Snap Cubes needed to cover the shape.
- ◆ Explain that the word “area” is used to describe the number of Snap Cubes needed to cover the shape and that the area of this figure is equal to \_\_\_\_\_ Snap Cubes.

## On Their Own



### *How many puzzle shapes can you find that have the same area?*

- Work with a partner and take 1 of the puzzle shapes from the classroom set.
- Estimate how many Snap Cubes would completely cover the shape.
- Then place Snap Cubes on the shape to find the area. The area of the shape is the number of Snap Cubes that will exactly cover the shape. For example, this shape has an area of 12 Snap Cubes.
- Compare your estimate to the actual area of the puzzle shape.
- Record your results by copying the picture you see on the shape. Write the area of the shape next to the picture.
- Return the puzzle shape to the classroom set. Choose another shape that you think has the same area as your first shape. Find and record the area of this shape.
- Continue to choose shapes and find their areas. Check your results to see if any of the shapes have the same area.
- Keep looking until you find at least 1 pair of shapes with the same area. Look for shortcuts for finding area.



## The Bigger Picture

### *Thinking and Sharing*

Write children's findings on the board. You might use sentences like this: Each of shapes  and shape  have an area of 23 Snap Cubes.

*You may want to post the puzzle shapes for reference.*

Use prompts such as these to promote class discussion:

- ◆ How did you find the area of these shapes?
- ◆ How close were your estimates to the actual areas?
- ◆ (Point to one figure.) How would you estimate the area of this figure?
- ◆ How could you tell which puzzle shape has the greatest area without using cubes?
- ◆ What ideas do you have for counting the cubes?

### *Writing*

Have children use Snap Cubes to create two different shapes that would each cover an area of 15 Snap Cubes. Then have them trace the figures onto Snap Cube grid paper and explain why they know each area is 15.

### Extending the Activity

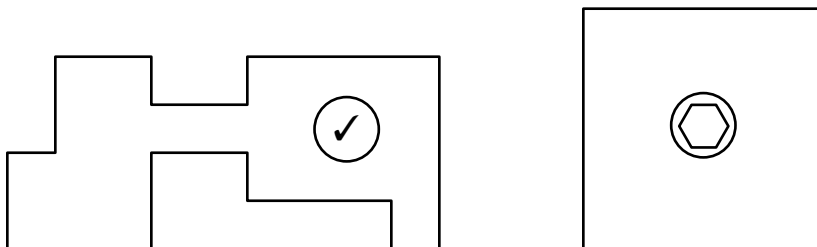
1. Have children add to the class collection by making two new shapes that look different but have the same area. Have them keep track of the areas of the new shapes.
2. Take one shape of each area from the classroom set of puzzles. Have children put them in order of area, from smallest to largest.

## Teacher Talk

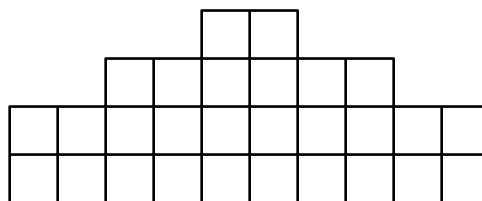
### Where's the Mathematics?

This activity gives children opportunities to see that shapes that look different may have the same area. Children use estimation to predict the area of a shape based on their understanding of the size of the face of a Snap Cube. They use estimation again as they look through the class set of puzzles for shapes with matching areas.

Children's early estimates will probably be just guesses. As they find the areas of more shapes, they begin to develop estimation strategies. As they share their estimation strategies and listen to the strategies of their classmates, they start to see that estimates are more than mere guesses. Some estimation strategies may include comparing a shape to one whose area they have already found or noting that certain longer figures may have areas that are close to those of more compact figures.

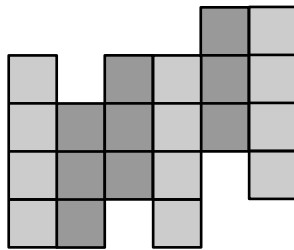


Many children simply count the Snap Cubes to find area. However, some may discover that counting in groups can save time. For example, in this figure, children who focus on columns will see four 2s, four 3s, and two 4s. Those who focus on rows will see one 2, one 6, and two 10s.



3. Show the children a puzzle shape that they have not seen before. Have them compare the shape to other puzzle shapes whose areas they have already figured out. Ask questions about the new shape such as, "Is it larger? smaller?" and "How is it the same? different?" Ask children to use the answers to these questions to estimate the area. Then have them use Snap Cubes to find the actual area.

Some children may develop visual means of recognizing groups of numbers. For example, they may organize their Snap Cubes in rows (or columns) of different colors to facilitate finding area. The child who covered the shape shown below arranged the cubes into trains of four of one color and three of another color. This allows for skip-counting by 4s (4, 8, **12**), then by 3s (3, 6, **9**), then adding to find the area ( $12 + 9 = 21$ ).

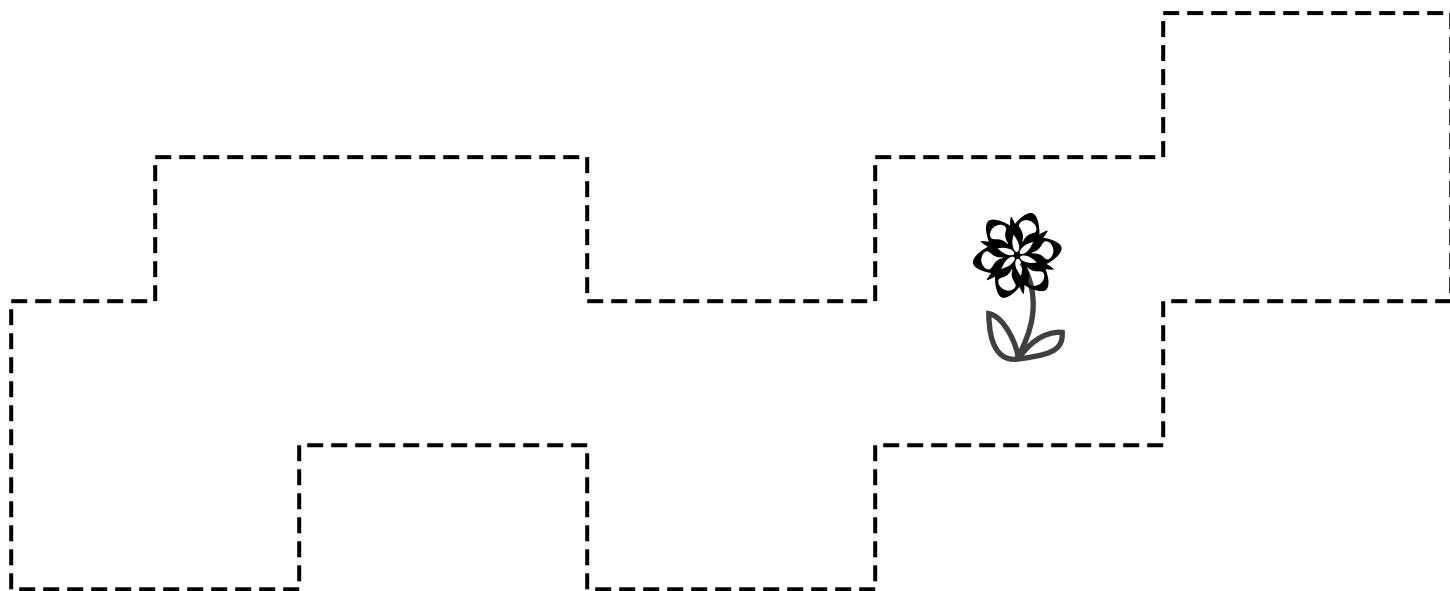
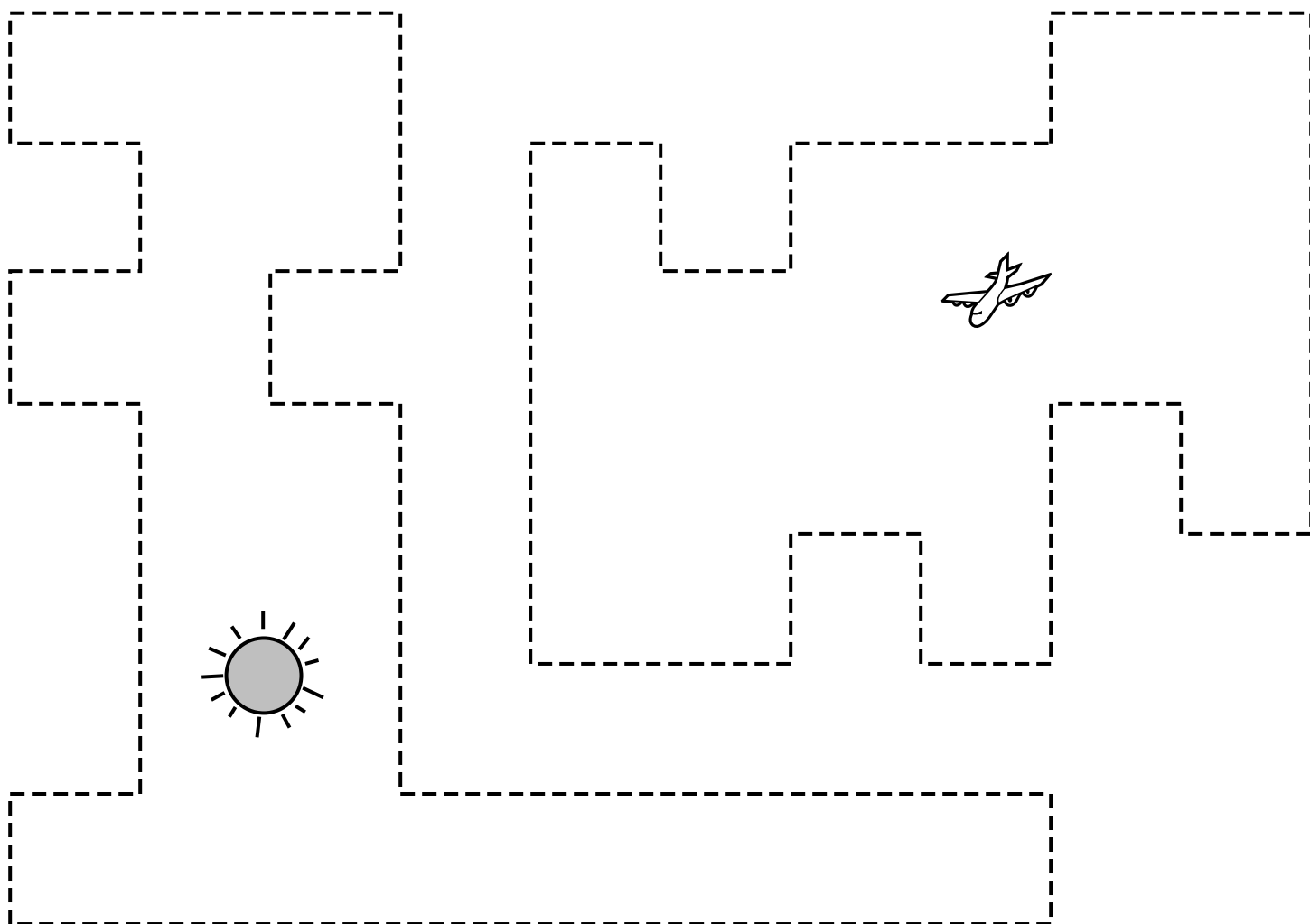


Other children may use a marker cube in a different color to keep track of each tenth cube they have counted.

|   |   |   |   |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|--|--|--|--|--|--|--|--|--|
| 1 | 2 | 3 | 4 |   |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |
| 5 | 6 | 7 | 8 | 9 |   | 1 | 2 | 3 | 4 |   |  |  |  |  |  |  |  |  |  |
|   |   | 5 | 6 | 7 | 8 | 9 |   | 1 | 2 | 3 |  |  |  |  |  |  |  |  |  |

Not all children are comfortable with the place-value concepts that can help them with their counting. These children will need many experiences with grouping sets of ten cubes before they are convinced that, for example, two groups of ten and one group of twenty represent the same number.

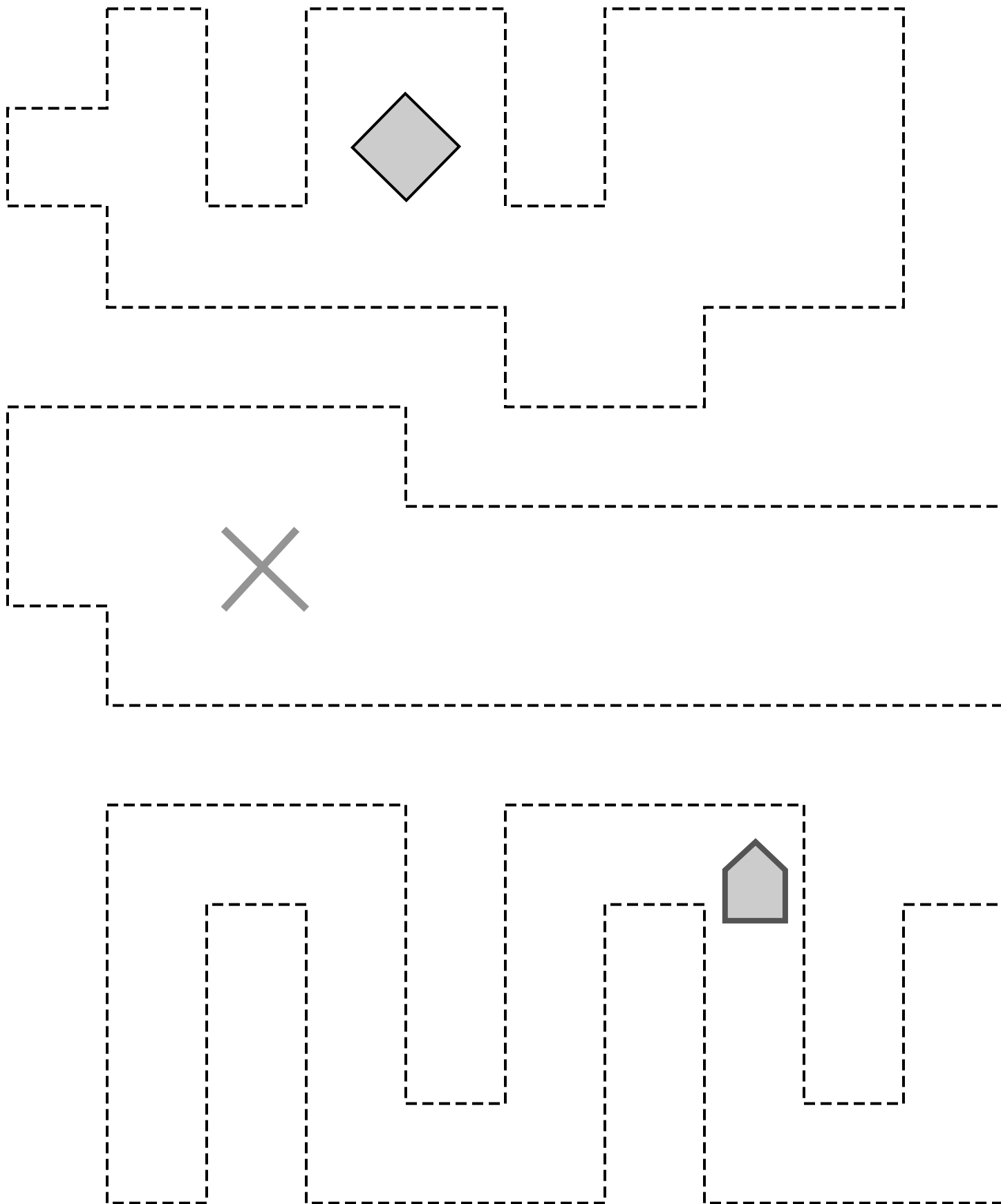
# PUZZLE SHAPES (AREA = 21)



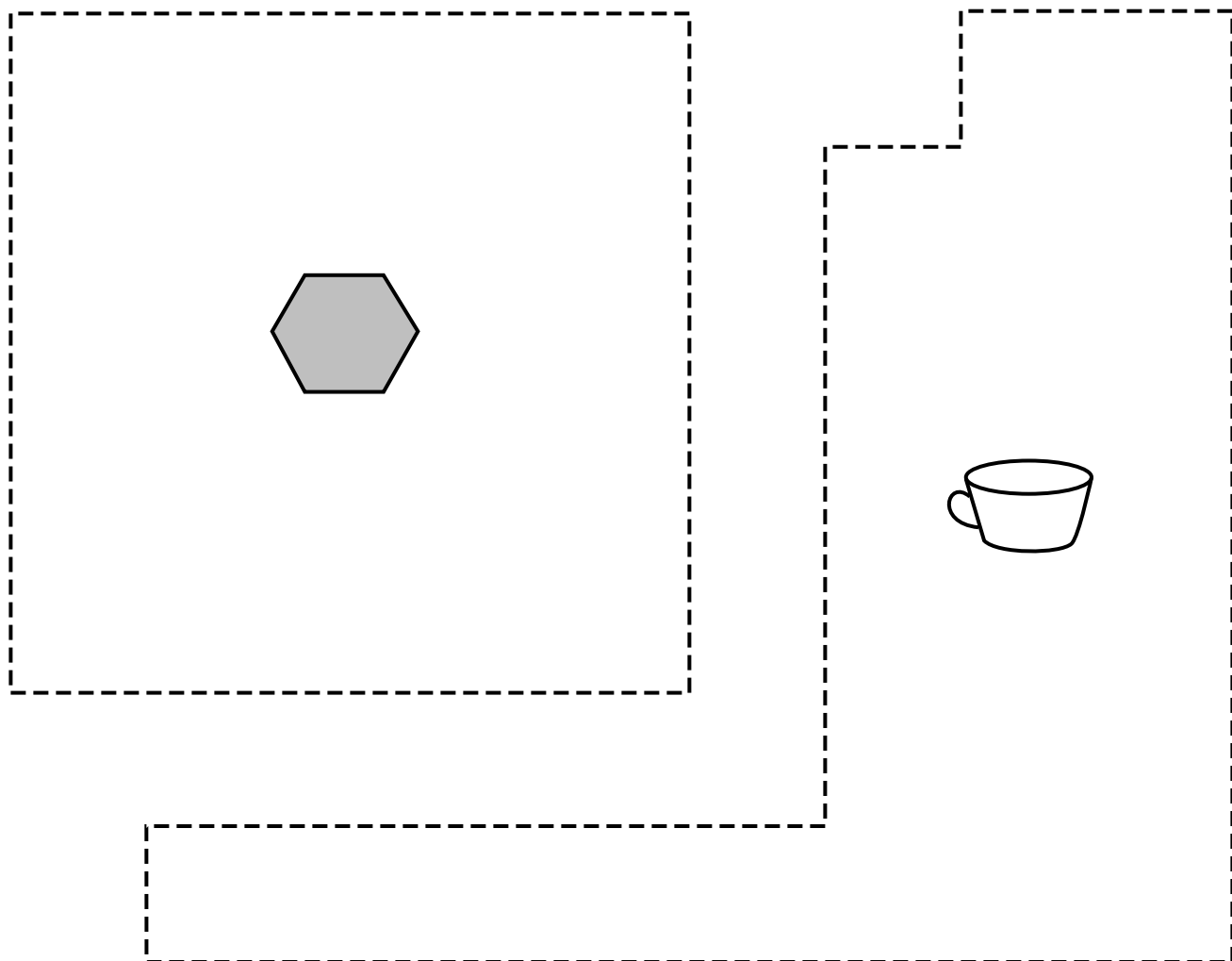
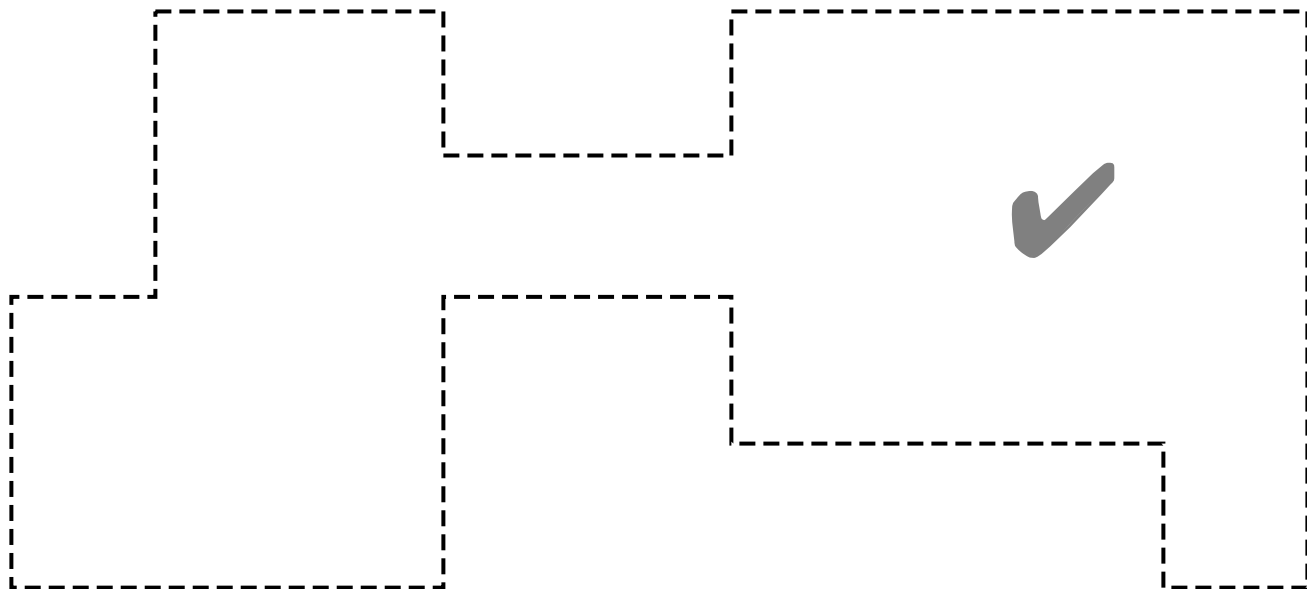
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## PUZZLE SHAPES (AREA = 23)

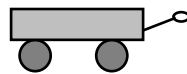
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# PUZZLE SHAPES (AREA = 25)

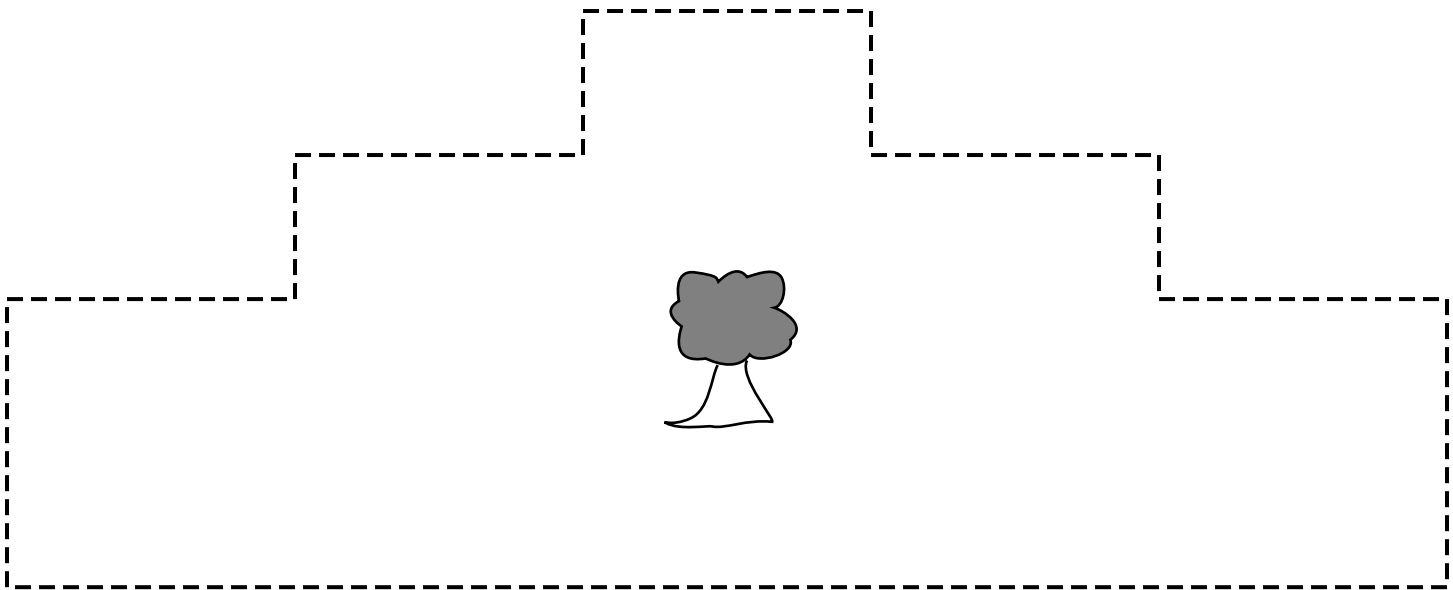
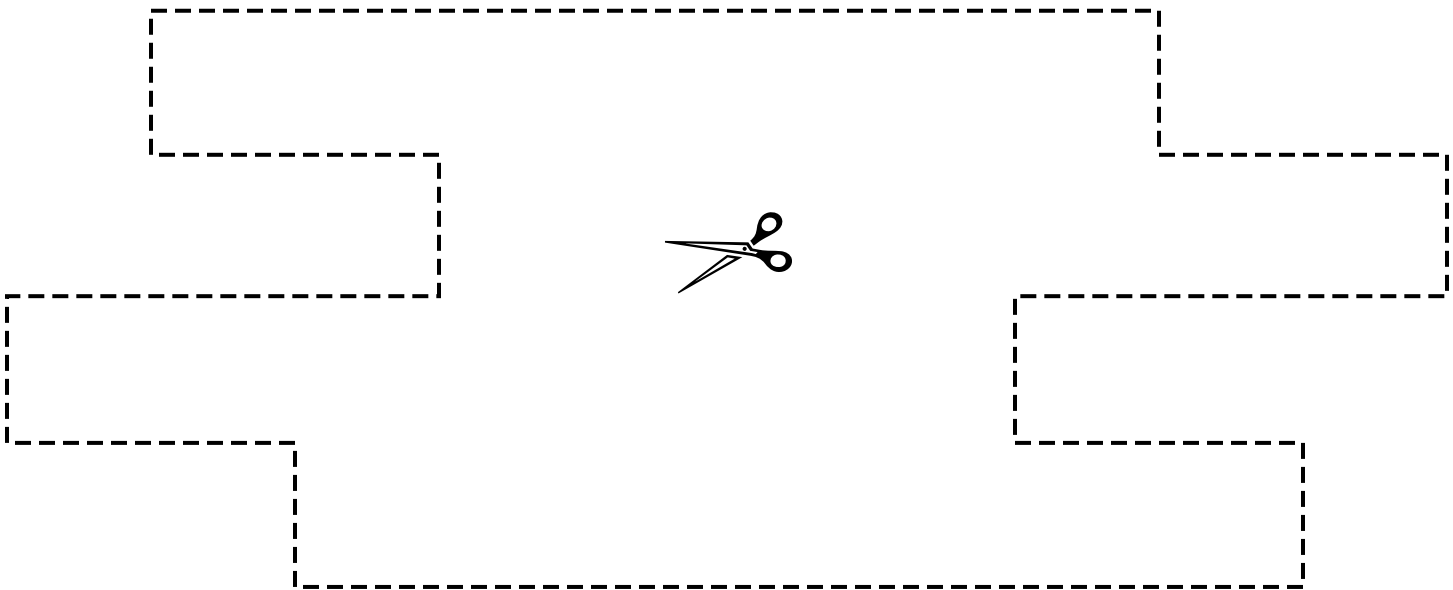


# PUZZLE SHAPES (AREA = 26)





**PUZZLE SHAPES (AREA = 28)**



**SNAP CUBE GRID PAPER**

