

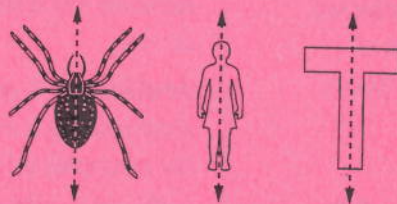
**STUDY LINK**  
**9•10**

## Unit 10: Family Letter

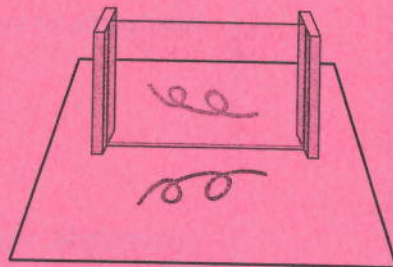


### Reflections and Symmetry

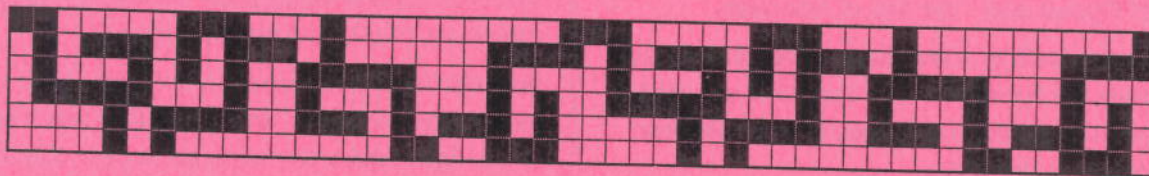
In this unit, your child will take another look at geometry, with an emphasis on symmetry. Many objects in nature are symmetrical: flowers, insects, and the human body, to name just a few. Symmetry is all around—in buildings, furniture, clothing, and paintings.



The class will focus on **reflectional symmetry**, also called **line symmetry** or **mirror symmetry**, in which half of a figure is the mirror image of the other half. Encourage your child to look for symmetrical objects, and if possible, to collect pictures of symmetrical objects from magazines and newspapers. For example, the right half of the printed letter T is the mirror image of the left half. If you have a small hand mirror, have your child check letters, numbers, and other objects to see whether they have line symmetry. The class will use a device called a **transparent mirror**, which is pictured below. Students will use it to see and trace the mirror image of an object.



Geometry is not only the study of figures (such as lines, rectangles, and circles), but also the study of transformations or “motions” of figures. These motions include **reflections** (flips), **rotations** (turns), and **translations** (slides). Your child will use these motions to create pictures like the ones below, called **frieze patterns**.



Students will also work with positive and negative numbers, looking at them as reflections of each other across zero on a number line. They will develop skills of adding positive and negative numbers by thinking in terms of credits and debits for a new company, and they will practice these skills in the *Credits/Debits Game*.

**Please keep this Family Letter for reference as your child works through Unit 10.**



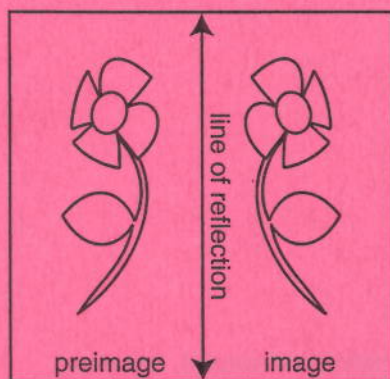
## Vocabulary

Important terms in Unit 10:

**frieze pattern** A geometric design in a long strip in which an element is repeated over and over. The element may be rotated, translated, and reflected. Frieze patterns are often found on the walls of buildings, on the borders of rugs and tiled floors, and on clothing.

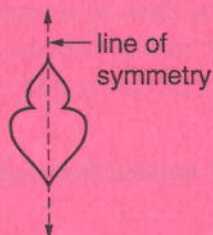


**image** The reflection of an object that you see when you look in the mirror. Also a figure that is produced by a transformation (reflection, translation, or rotation) of another figure. See *preimage*.



**line of reflection** A line halfway between a figure (preimage) and its reflected image. In a reflection, a figure is “flipped over” the line of reflection.

**line of symmetry** A line drawn through a figure that divides the figure into two parts that are mirror images of each other. The two parts look alike, but face in opposite directions.



**negative number** A number that is less than zero; a number to the left of zero on a horizontal

number line or below zero on a vertical number line. The symbol “-” may be used to write a negative number. For example, “negative 5” is usually written as  $-5$ .

**preimage** A geometric figure that is somehow changed (by a *reflection*, a *rotation*, or a *translation*, for example) to produce another figure. See *image*.

**reflection (flip)** The “flipping” of a figure over a line (the *line of reflection*) so that its image is the mirror image of the original (preimage).



reflection

**rotation (turn)** A movement of a figure around a fixed point, or axis; a “turn.”



**symmetric** Having the same size and shape on either side of a line, or looking the same when turned by some amount less than  $360^\circ$ .

**transformation** Something done to a geometric figure that produces a new figure. The most common transformations are translations (slides), reflections (flips), and rotations (turns).

**translation** A movement of a figure along a straight line; a “slide.” In a translation, each point of the figure slides the same distance in the same direction.



translation



## Do-Anytime Activities

To work with your child on concepts taught in this unit, try these interesting and rewarding activities:

1. Have your child look for frieze patterns on buildings, rugs, floors, and clothing. If possible, have your child bring pictures to school or make sketches of friezes that he or she sees.
2. Encourage your child to study the mathematical qualities of the patterns of musical notes and rhythms. Composers of even the simplest of tunes use reflections and translations of notes and chords (groups of notes).
3. Encourage your child to incorporate transformation vocabulary—**symmetric**, **reflected**, **rotated**, and **translated**—into his or her everyday vocabulary.

### Building Skills through Games

In this unit, your child will play the following games to develop his or her understanding of addition and subtraction of positive and negative numbers, practice estimating and measuring angles, practice plotting ordered pairs in the first quadrant of a coordinate grid, and identify properties of polygons. For detailed instructions, see the *Student Reference Book*.

**Angle Tangle** See *Student Reference Book*, page 230. Two players need a protractor, straightedge, and several sheets of blank paper to play this game. This game provides practice estimating and measuring angle sizes.

**Credits/Debits Game** See *Student Reference Book*, page 238. Playing the *Credits/Debits Game* offers students practice adding and subtracting positive and negative numbers.

**Over and Up Squares** See *Student Reference Book*, page 257. Two players need a gameboard and record sheet, 2 different-colored pencils, and 2 six-sided dice to play this game. Playing this game provides practice plotting ordered pairs and developing a winning game strategy.

**Polygon Pair-Up** See *Student Reference Book*, page 258. To play this game, two players need a deck of polygon cards, a deck of property cards, and paper and pencils for sketching. Playing this game provides students with practice identifying properties of polygons.

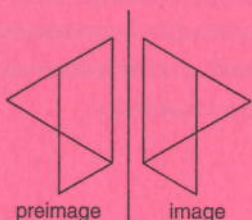


# As You Help Your Child with Homework

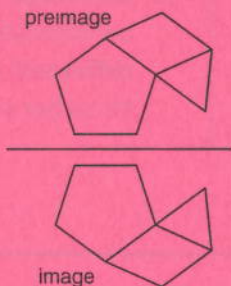
As your child brings assignments home, you may want to go over the instructions together, clarifying them as necessary. The answers listed below will guide you through some of the Study Links in this unit.

## Study Link 10•2

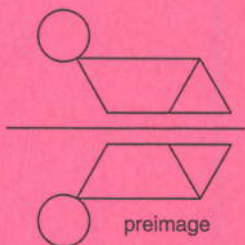
1.



3. preimage

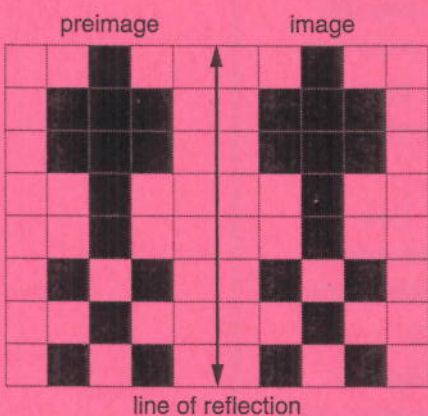


5.

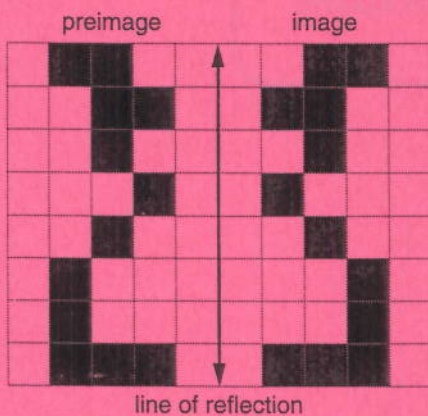


## Study Link 10•3

1.

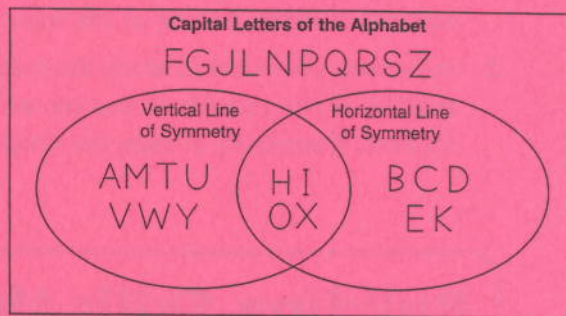


3.



## Study Link 10•4

2.



3. Sample answers:

horizontal	vertical
BOX	TAX
KID	YOU
BOOK	MAT
KICK	HIM

## Study Link 10•5

1. a. reflection    b. translation    c. rotation

## Study Link 10•6

1. <    2. <    3. <    4. >
5. -8, -3.4,  $-\frac{1}{4}$ ,  $\frac{1}{2}$ , 1.7, 5
6. -43, -3, 0,  $\frac{14}{7}$ , 5, 22
7. Sample answers:  $\frac{1}{4}$ ,  $\frac{1}{2}$ ,  $\frac{3}{4}$ , 1
8. Sample answers: -2, -1,  $-\frac{1}{2}$ ,  $-\frac{1}{4}$
9. a. 13    b. -5    c. -13
10. a. 8    b. -2    c. -8
11. a. 15    b. 11    c. -15