(4.9) Geometry and spatial reasoning. The student connects transformations to congruence and symmetry.

(4.9.a) Geometry and spatial reasoning. The student connects transformations to congruence and symmetry. The student is expected to demonstrate translations, reflections, and rotations using concrete models.

Clarifying Activity with Assessment Connections

Students use a computer drawing program to create a design exploring translations, reflections, and rotations.

Assessment Connections

Questioning . . .

Open with . . .

- How did you create the design?

Probe further with . . .

- What kinds of transformations did you use to create the design?
- Did you use reflections? Where?
- Did you use translations? Where?
- Did you use rotations? Where?
- What are the differences between a translation, a rotation, and a reflection?
- What would happen if you [turned, flipped, slid] your design?

Listen for . . .

- Does the student use mathematical vocabulary to describe the transformations (such as reflection, translation, rotation, and congruent)?
- Can the student explain the differences between translations, rotations, and reflections?
- Does the student predict and describe the results of translations, rotations, and reflections on two-dimensional shapes when creating the design?
- Can the student describe mental images of a transformation of his or her design?

Look for . . .

- Can the student demonstrate translations, reflections, and rotations using a computer drawing program?
- Does the student visualize and plan the design?
Additional Clarifying Activity

Students create a list of real-world examples of translations (riding on an escalator or in an elevator, pushing a vacuum cleaner back and forth, sliding down a slide), reflections (flipping a pancake or turning over a playing card), and rotations (turning a doorknob, walking in a revolving door, doing cartwheels). Students then go onto the playground to act out some of their examples.

Students create a design using pattern blocks or color tiles and show a translation of that design by creating an identical design to the right, left, above, or below the original.

Students demonstrate reflections by working with a partner and acting out "mirror images" of each other.

Students create shapes on geoboards and record their shapes on dot paper. Students then select a peg on the geoboard to be the center of rotation, place a finger on the peg, and rotate the board one-fourth turn, one-half turn, and three-fourths turn around that peg. Students make a sketch on the dot paper after each rotation and compare it to the shape's original position.

(4.9.b) Geometry and spatial reasoning. The student connects transformations to congruence and symmetry. The student is expected to use translations, reflections, and rotations to verify that two shapes are congruent.

Clarifying Activity with Assessment Connections

Students create two congruent shapes by folding a piece of paper in half and cutting out a shape from the two layers of paper. Working together in pairs, one student lays his or her two shapes on the table, and the other student describes what motions he or she must use (translation, rotation, reflection) to move one shape until it fits exactly on top of the other.

Assessment Connections

Questioning . . .

Open with . . .

- Describe the motions you might use to move one shape until it fits exactly on top of the other.

Probe further with . . .

- How many different transformations did you use?
Did you use any translations? How?
Did you use any rotations? How?
Did you use any reflections? How?
Is there another way to move one shape until it fits exactly on the other?
Can you use the same exact transformations in a different order? Why?
Are there other transformations (motions) that you could use?
Are the shapes congruent? How do you know?

Listen for . . .

- Does the student use mathematical vocabulary to describe the results of transformations?
- Can the student describe what it means for shapes to be congruent?

Look for . . .

- Can the student demonstrate a transformation or a series of transformations that will verify that two shapes are congruent?
- Can the student predict the outcome of translations, reflections, and rotations?
- Can the student use a different order of transformations to verify congruence?

TAKS Connection

20 Which figure is NOT congruent to the other 3 figures?

- F
- G
- H
- J
(4.9.c) Geometry and spatial reasoning. The student connects transformations to congruence and symmetry. The student is expected to use reflections to verify that a shape has symmetry.

Clarifying Activity with Assessment Connections

Students make a design with pattern blocks and investigate the lines of symmetry in the design by placing mirrors in positions where the reflection replicates the design.

Assessment Connections

Questioning . . .

Open with . . .

- Tell me about your design. Is it symmetric? How do you know?

Probe further with . . .

- Where are the lines of symmetry?
- How did you know you found a line of symmetry?
- How did you use the mirror to find a line of symmetry?
- Did you find more than one line of symmetry?
- How many lines of symmetry does your design have? How do you know?
- If you did not find a line of symmetry, could you change your design so it would have at least one line of symmetry?
- Could you change your design to have more than one line of symmetry?
- Does a reflection verify that a shape has symmetry? Why?

Listen for . . .

- Does the student use mathematical vocabulary to describe symmetry?
- Does the student use the word "reflection" to define symmetry?
- Can the student describe what it means for shapes to have symmetry?

Look for . . .

- Is the design accurate?
- Can the student use reflection to verify that a shape has symmetry?
- Can the student identify lines of symmetry?
- Can the student identify all the lines of symmetry in a shape?
- Does the student self-correct?

TAKS Connection
1. Which pair of figures shows a reflection?

A  

B

C  

D