6.4 Exploring Inverse **Functions** TEKS *a.3, a.5, a.6, 2A.4.C*

MATERIALS • graph paper • straightedge

QUESTION How are a function and its *inverse* related?

EXPLORE Find the inverse of $f(x) = \dfrac{x - 3}{2}$

STEP 1 *Graph function* Choose values of x and find the corresponding values of $y = f(x)$. Plot the points and draw the line that passes through them.

STEP 2 *Interchange coordinates* Interchange the x- and y-coordinates of the ordered pairs found in Step 1. Plot the new points and draw the line that passes through them.

STEP 3 *Write equation* Write an equation of the line from Step 2. Call this function g.

STEP 4 *Compare graphs* Fold your graph paper so that the graphs of f and g coincide. How are the graphs geometrically related?

STEP 5 *Describe functions* In words, f is the function that subtracts 3 from x and then divides the result by 2. Describe the function g in words.

STEP 6 *Find compositions* Predict what the compositions $f(g(x))$ and $g(f(x))$ will be. Confirm your predictions by finding $f(g(x))$ and $g(f(x))$.

The functions f and g are called *inverses* of each other.

DRAW CONCLUSIONS Use your observations to complete these exercises

Complete Exercises 1–3 for each function below.

$$f(x) = 3x + 2 \qquad f(x) = \dfrac{x - 1}{6} \qquad f(x) = 4 - \dfrac{3}{2}x$$

1. Complete Steps 1–3 above to find the inverse of the function.

2. Complete Step 4. How can you graph the inverse of a function without first finding ordered pairs (x, y)?

3. Complete Steps 5 and 6. How can you test to see if the function you found in Exercise 1 is indeed the inverse of the original function?