

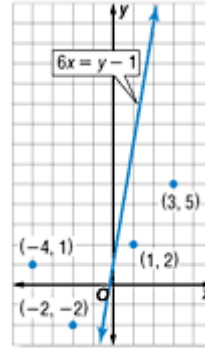
## Lesson 6-6

### Example 1 Ordered Pairs that Satisfy an Inequality

From the set  $\{(3, 5), (-4, 1), (1, 2), (-2, -2)\}$ , which ordered pairs are part of the solution set for  $6x \geq y - 1$ ?

Use a table to substitute the  $x$  and  $y$  values of each ordered pair into the inequality.

| $x$ | $y$ | $6x \geq y - 1$                     | True or False |
|-----|-----|-------------------------------------|---------------|
| 3   | 5   | $6(3) \geq 5 - 1$<br>$18 \geq 4$    | true          |
| -4  | 1   | $6(-4) \geq 1 - 1$<br>$-24 \geq 0$  | false         |
| 1   | 2   | $6(1) \geq 2 - 1$<br>$6 \geq 1$     | true          |
| -2  | -2  | $6(-2) \geq -2 - 1$<br>$-12 \geq 1$ | false         |



The ordered pairs  $\{(3, 5), (1, 2)\}$  are part of the solution set of  $6x \geq y - 1$ . In the graph, notice the location of the two ordered pairs that are solutions for  $6x \geq y - 1$  in relation to the line.

### Example 2 Graph an Inequality

Graph  $2(x - y) < 8$ .

**Step 1** Solve for  $y$  in terms of  $x$ .

$$2(x - y) < 8$$

$$2x - 2y < 8$$

$$2x - 2y - 2x < 8 - 2x$$

$$-2y < -2x + 8$$

$$\frac{-2y}{-2} > \frac{-2x + 8}{-2}$$

$$y > x - 4 \quad \text{Simplify.}$$

Original inequality

Distributive Property

Subtract  $2x$  from each side.

Simplify.

Divide each side by  $-2$  and change  $<$  to  $>$ .

**Step 2** Graph  $y = x - 4$ . The boundary should be dashed since the inequality is only greater than, not equal to.

**Step 3** Select a point in one of the half-planes and test it. Let's use  $(0, 0)$ .

$$y > x - 4$$

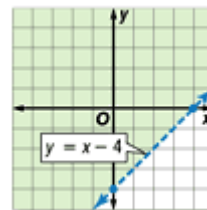
$$0 > 0 - 4$$

$$0 > -4$$

Original inequality

$$x = 0, y = 0$$

true



Since the statement is true, the half-plane containing the origin is part of the solution. Shade the half-plane.

**Check** Test a point in the other half-plane, for example, (4, -2).

$$y > x - 4 \quad \text{Original inequality}$$

$$-2 > 4 - 4 \quad x = 4, y = -2$$

$$-2 > 0 \quad \text{false}$$

Since the statement is false, the half-plane containing (4, -2) should not be shaded. The graph of the solution is correct.

### Example 3 Write and Solve an Inequality

**Kami earns extra money by making and selling necklaces and earrings. She makes \$2 every time she sells a necklace and \$1 every time she sells a pair of earrings. She wants to make more than \$20 per day on her sales. How many earrings can she sell?**

**Step 1** Let  $x$  equal the profit from necklaces. Let  $y$  equal the profit from earrings. Write an open sentence representing this situation.

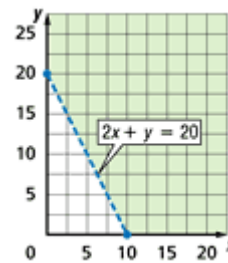
$$\underbrace{\$2}_{2} \quad \underbrace{\text{times}}{\cdot} \quad \underbrace{\text{number of necklaces}}{x} \quad \underbrace{\text{plus}}{+} \quad \underbrace{\$1}_{1} \quad \underbrace{\text{times}}{\cdot} \quad \underbrace{\text{number of earrings}}{y} \quad \underbrace{\text{more than}}{>} \quad \underbrace{\$20}_{20}$$

**Step 2** Solve for  $y$  in terms of  $x$ .

$$2x + y > 20 \quad \text{Original inequality}$$

$$2x + y - 2x > 20 - 2x \quad \text{Subtract } 2x \text{ from each side.}$$

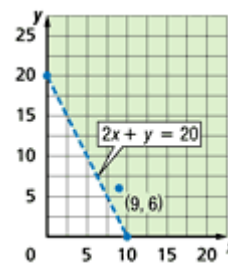
$$y > 20 - 2x \quad \text{Simplify.}$$



**Step 3** Since the open sentence does not include the equation, graph  $y > 20 - 2x$  as a dotted line. Test a point in one of the half-planes, for example (0, 0). Shade the half-plane that does not contain (0, 0) since  $0 > 20 - 2(0)$  is false.

**Step 4** Examine the solution.

- Ellen cannot sell a negative number of necklaces or earrings. Therefore, the domain and range contain only nonnegative numbers.
- She also cannot sell half a necklace or half of a pair of earrings. Thus, only points in the shaded half-plane whose  $x$ - and  $y$ -coordinates are whole numbers are possible solutions.



One solution is (6, 9). This represents 6 necklaces and 9 pairs of earrings.