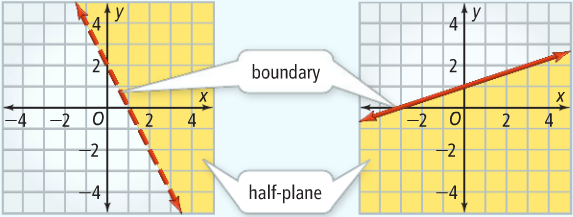
**Section 2–8A: Linear Inequalities**

**Introductions:**

In some situations you need to compare quantities. You can use inequalities for situations that involve these relationships: *less than* (), *less than or equal to* (), *greater than* (), and *greater than or equal to* ().

Graphing an inequality in two variables is similar to graphing a line. The graph of a linear inequality contains all points on one side of the line and may or may not include the points on the line.

A **linear inequality** is an inequality in two variables whose graph is a region of the coordinate plane bounded by a line. This line is the **boundary** of the graph. The boundary separates the coordinate plane into two **half-planes**, one of which consists of solutions of the inequality.

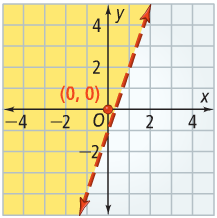


To determine which half-plane to shade, pick a **test point** that is *NOT* on the boundary. Check whether that point satisfies the inequality. If it does, shade the half-plane that includes the test point. If not, shade the other half-plane. **The origin, , is usually an easy test point as long as it is not on the boundary**.

**Example 1: Graphing Linear Inequalities**

What is the graph of each inequality? (a) and (b)

**Step 1: graph the boundary line**

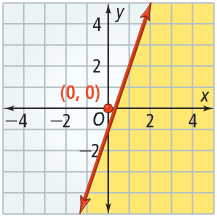
You should use a dashed boundary line because the inequality is *greater than*, and the points on the line doe not satisfy the inequality.

**Step 2: choose a test point,**

Substitute and into .

Since is true, shade the half-plane that includes .

**Step 1: graph the boundary line**

You should use a solid boundary line because the inequality is *less than or equal to*, and the points on the line doe satisfy the inequality.

**Step 2: choose a test point,**

Substitute and into .

Since is false, shade the half-plane that DOES NOT includes .

You can also inspect inequalities solved for , such as to determine which half-plane describes the solution. Since describes vertical position, the solution of will be ***above***the boundary line. The solution of will be ***below***the boundary line.

**Example 2: Using Linear Inequality**

**ENTERTAINMENT:** the map shows the number of tickets needed for small or large rides at the fair. You do not want to spend more than $15 on tickets. How many small or large rides can you ride?

Since each ticket is $0.25, you can buy 60 tickets with $15.

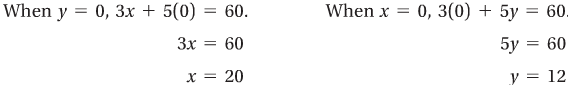
**Define:** Let *x* = the number of small rides.

Let *y* = the number of large rides.

**Relate:** # of tickets for small rides plus # of tickets for large rides is less than or equal to 60

**Write:**

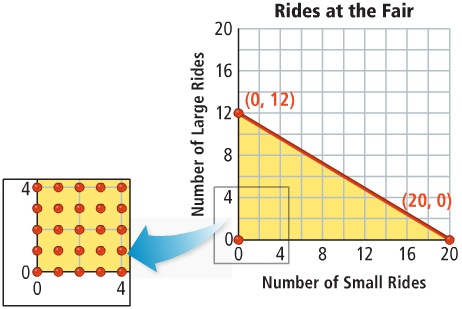
**Step 1: find the intercepts and use it to graph the boundary line**



Graph the line that connects the intercepts and . Since the inequality is , use a solid boundary line.

**Step 2: interpretation of the graph**

The region above the boundary line represents combinations of rides that require more than 60 tickets. You purchased a ***finite*** number of tickets, 60, so you will not be able to go on an infinite number of rides. **Shade the region below the boundary line**.



The number of small rides *x* and the number of large rides *y* are **whole numbers**. In math, such a situation is called *discrete*. All points with whole number coordinates in the shaded region represent possible combinations of small and large rides.