

Algebra 1 - Linear Inequalities in Two Variables and Systems - Lesson

Common Core A-REI.D.12, A-CED.A.3 · maths-pdf.fr/en/

A linear inequality in two variables has a graph that is a half-plane bounded by a line. Graph the boundary, using a solid line for $\leq$ or $\geq$ and a dashed line for $<$ or $>$. Test a point such as $(0, 0)$ to choose the side to shade. A system is solved where the shaded regions overlap.

Algebra 1 · Common Core State Standards: **A-REI.D.12, A-CED.A.3**

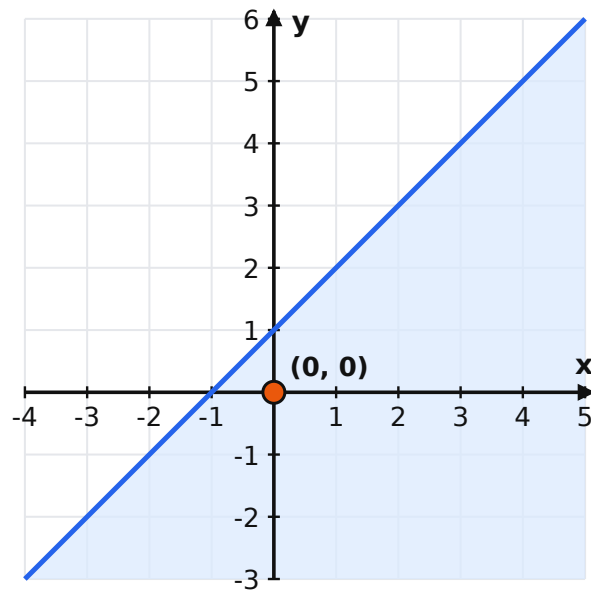
Key facts

- A solution of an inequality in two variables is an ordered pair that makes it true.
- The boundary line is solid for $\leq$ and $\geq$, and dashed for $<$ and $>$.
- Test a point not on the line to decide which side to shade.
- For $y > mx + b$, shade above; for $y < mx + b$, shade below.
- The solution of a system is the overlap of the shaded regions.

What is a linear inequality in two variables?

Linear inequality in two variables

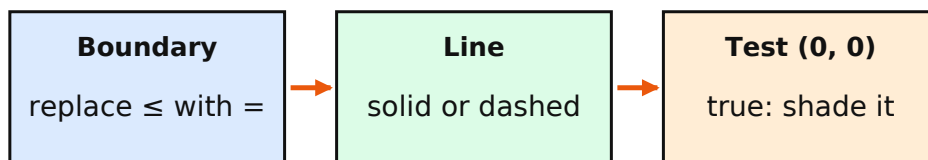
A **linear inequality in two variables** uses $<$, $>$, $\leq$, or $\geq$ with expressions in x and y . A **solution** is an ordered pair that makes it true. The graph is a **half-plane** bounded by a line.



The graph of $y \leq x+1$: a solid boundary and shading below the line. The test point $(0,0)$ is in the shaded region.

How do you graph a linear inequality?

1. Replace the inequality symbol with $=$ and graph the boundary line.
2. Use a solid line for $\leq$ and $\geq$. Use a dashed line for $<$ and $>$.
3. Test a point not on the line, such as $(0,0)$.
4. Shade the side of the line that contains the solution.

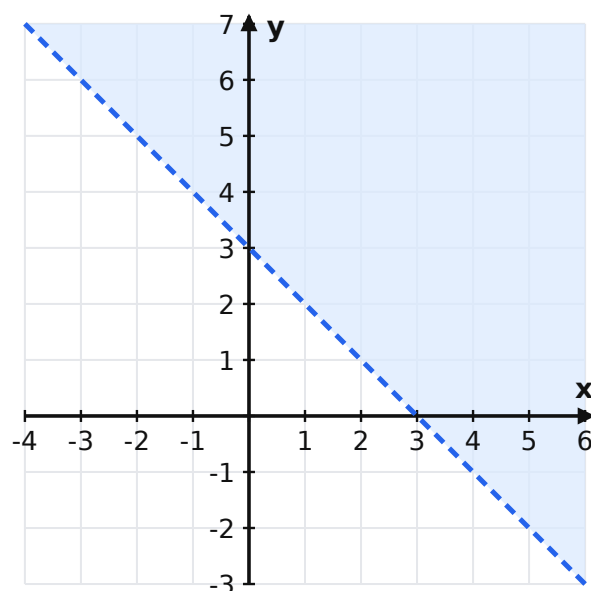


Three steps for graphing a linear inequality.

For $y \leq x+1$, the test point $(0,0)$ gives $0 \leq 0+1$, which is true, so shade the side containing the origin: below the line.

Why is the line solid or dashed?

A solid line says that points on the line are solutions. A dashed line says they are not.

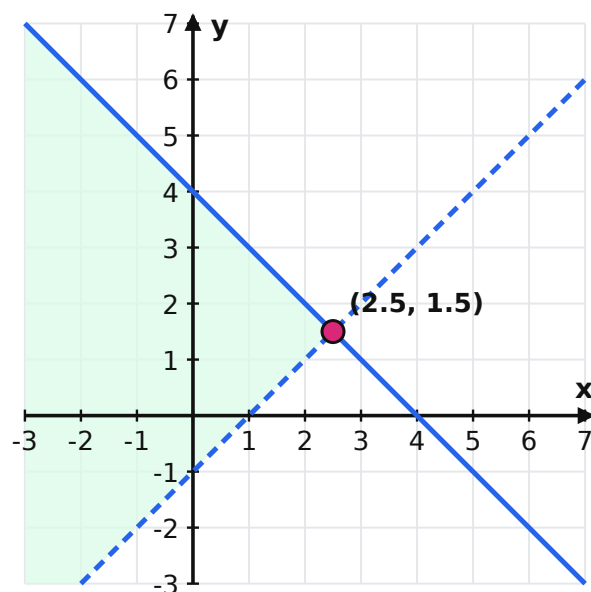


The graph of $y > -x + 3$: a dashed boundary, because points on the line are not solutions.

For inequalities in slope-intercept form, $y > mx + b$ means shade above the line and $y < mx + b$ means shade below. If you multiply or divide by a negative number, reverse the symbol.

How do you graph a system of inequalities?

Graph each inequality on the same plane. The solution is the region where all the shaded regions overlap. A corner of the region is found where two boundary lines meet.



The solution of the system is the overlap of the two shaded regions.

Example: The point $(3,2)$ is a solution of the system $y > x - 1$ and $y \leq -x + 4$, because $2 > 3 - 1$ and $2 \leq -3 + 4$.

How do you use inequalities in a real situation?

Real constraints often limit two quantities. If sandwiches cost \$4 and drinks cost \$2 and the budget is \$20, then $4x + 2y \leq 20$. Only points with whole, nonnegative coordinates make sense in the shaded region.

Questions about linear inequalities in two variables and systems

When is the boundary line dashed?

Use a dashed line when the inequality is strict ($<$ or $>$), because points on the line do not make the statement true.

How do you decide which side to shade?

Pick a test point that is not on the line, usually $(0, 0)$. If it makes the inequality true, shade its side; otherwise shade the other side.

What does the shaded region represent?

Every point in the shaded region is a solution of the inequality, and every solution is in the region (or on a solid boundary).

How do you solve a system of inequalities?

Graph each inequality on the same coordinate plane. The solution set is the region where all the shaded areas overlap.

Why do word problems often use only part of the region?

Quantities such as tickets or hours cannot be negative, and many must be whole numbers, so only some points in the region fit the situation.