Activity

4-4 Linear Inequalities in Two Variables

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MODEL & DISCUSS

A flatbed trailer carrying a load can have a maximum total height of 13 feet, 6 inches. The photograph shows the height of the trailer before a load is placed on top. What are the possible heights of loads that could be carried on the trailer?

A. What type of model could represent this situation? Explain.

B. Will the type of model you chose show all the possible heights of the loads without going over the maximum height? Explain.

C. **Reason** Interpret the solutions of the model. How many solutions are there? Explain. MP.2

HABITS OF MIND

Make Sense and Persevere Suppose that the maximum load is transferred to a different flat bed. If the new flat bed has a maximum total height of 14 feet, what should the height of the new flatbed be to ensure the flatbed and the load do not exceed the maximum total height? MP.1

Inequalities → $<$, $\leq$, $>$, $\geq$

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less than, less than or equal, greater than, greater than or equal

Notes

Boundary Line

$<$, $>$ dashed

$\leq$, $\geq$ solid

Shading

$<$, $\leq$ shade below

$>$, $\geq$ shade above

Switch Inequality

- mult/divide by a negative #
- swap quantities

Assess

EXAMPLE 1 **Try It! Understand an Inequality in Two Variables**

1. Describe the graph of the solutions of each inequality.

a. $y < -3x + 5$.

- dashed
- shade below

$y = mx + b$ or $Ax + By = C$

b. $y \geq -3x + 5$

- solid
- shade above

EXAMPLE 2 **Try It! Rewrite an Inequality to Graph It**

2. Will the Science Club meet their goal if they sell 30 T-shirts and 90 key chains? Explain in terms of the graph of the inequality.

"x" T-shirt $10

"y" Key chains $2

$500 Goal

$10x + 2y \geq 500$

$10(30) + 2(90) \geq 500$

$300 + 180 \geq 500$

$480 \geq 500$ ☹

HABITS OF MIND

Communicate Precisely How is the graph of $y < 3x$ similar to the graph of $y \geq 3x$? How are the two graphs different? MP.6

- dashed
- shaded below

- solid
- shaded above

Same line

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$<, \leq, >, \geq$

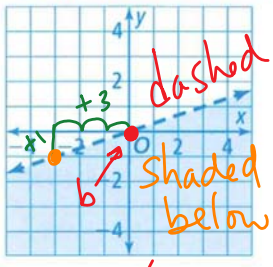
Notes

Assess

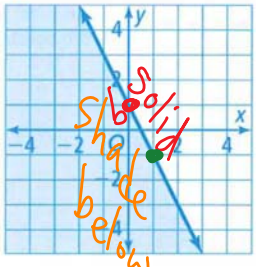
EXAMPLE 3 **Try It! Write an Inequality From a Graph**

3. What inequality does each graph represent?

a.



b.



Slope: $\frac{-2}{1}$

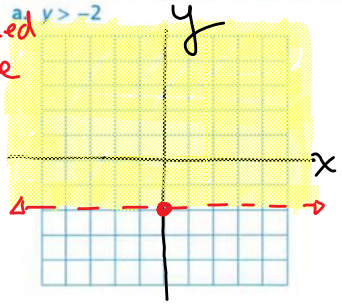
$y \boxed{<} mx+b$ $\quad$ $y < \frac{1}{3}x+0$

$y \boxed{\leq} mx+b$ $\quad$ $y \leq \frac{-2}{1}x+1$

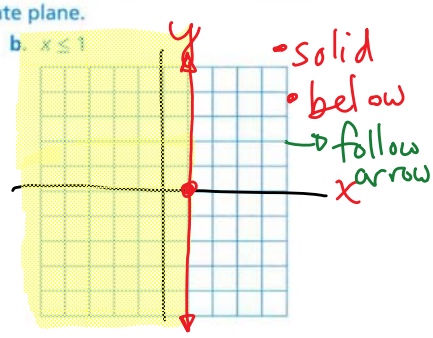
EXAMPLE 4 **Try It! Inequalities in One Variable in the Coordinate Plane**

4. Graph each inequality in the coordinate plane.

a. $y > -2$



b. $x \leq 1$



Make a Cross

- horiz or vertical line

HABITS OF MIND

Use Appropriate Tools Name two ways you could check if a point is a solution of an inequality. MP.5

Do You UNDERSTAND?

1. **ESSENTIAL QUESTION** How does the graph of a linear inequality in two variables help you identify the solutions of the inequality?

2. **Communicate Precisely** How many solutions does a linear inequality in two variables have? MP.6

3. **Vocabulary** In what form do you write one of the *solutions of an inequality in two variables*?

4. **Error Analysis** A student claims that the inequality $y < 1$ cannot be graphed on a coordinate grid since it has only one variable. Explain the error the student made. MP.3

Do You KNOW HOW?

Tell whether each ordered pair is a solution of the inequality $y > x + 1$.

5. (0, 1)

x y

$1 \stackrel{?}{>} 0+1$

$1 > 1$ ☹ False

6. (3, 5)

x y

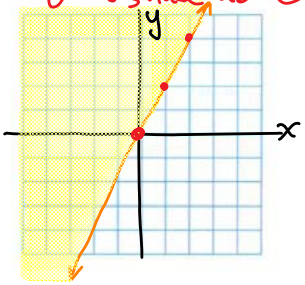
$5 \stackrel{?}{>} 3+1$

$5 > 4$ ☺ True

Graph each inequality in the coordinate plane.

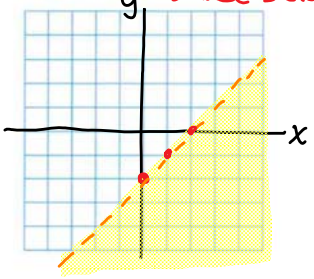
7. $y \geq 2x + 0$

slope 2, solid, shade above

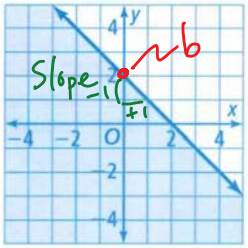


8. $y < x - 2$

dashed, shade below



9. What inequality is shown by the graph?



Slope $= -1 = \frac{-1}{+1}$, b

solid, below

$<, \leq, >, \geq$

$y \leq mx + b$

$y \leq -1x + 2$