

Linear Inequalities in Two Variables

Jonathan R. Bacolod

Sauyo High School

What is a Linear Inequality in Two Variables?

It is an inequality which can be written in any one of the following forms:

$$Ax + By < C$$

$$Ax + By > C$$

$$Ax + By \leq C$$

$$Ax + By \geq C$$

where A , B , and C are any real numbers.

Example

Tell which of the following is a linear inequality in two variables. Write YES or NO.

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1. $2x \leq 4 + y$ **YES**

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1. $2x \leq 4 + y$ **YES**

2. $y > 5x$

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Example

Tell which of the following is a linear inequality in two variables. Write YES or NO.

1. $2x \leq 4 + y$ **YES**

2. $y > 5x$ **YES**

3. $2x - 1 \geq y$

Example

Tell which of the following is a linear inequality in two variables. Write YES or NO.

1. $2x \leq 4 + y$ **YES**

2. $y > 5x$ **YES**

3. $2x - 1 \geq y$ **YES**

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Tell which of the following is a linear inequality in two variables. Write YES or NO.

1. $2x \leq 4 + y$ **YES**

2. $y > 5x$ **YES**

3. $2x - 1 \geq y$ **YES**

4. $\frac{1}{4}x < y$

Example

Tell which of the following is a linear inequality in two variables. Write YES or NO.

1. $2x \leq 4 + y$ **YES**

2. $y > 5x$ **YES**

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1. $2x \leq 4 + y$ **YES**

2. $y > 5x$ **YES**

3. $2x - 1 \geq y$ **YES**

4. $\frac{1}{4}x < y$ **YES**

5. $x = 2y$

Example

Tell which of the following is a linear inequality in two variables. Write YES or NO.

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5. $x = 2y$ **NO**

Example

Tell which of the following is a linear inequality in two variables. Write YES or NO.

1. $2x \leq 4 + y$ **YES** 6. $x \geq 1$

2. $y > 5x$ **YES**

3. $2x - 1 \geq y$ **YES**

4. $\frac{1}{4}x < y$ **YES**

5. $x = 2y$ **NO**

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5. $x = 2y$ **NO**

Example

Tell which of the following is a linear inequality in two variables. Write YES or NO.

1. $2x \leq 4 + y$ **YES** 6. $x \geq 1$ **NO**

2. $y > 5x$ **YES** 7. $x < 2y + 5$

3. $2x - 1 \geq y$ **YES**

4. $\frac{1}{4}x < y$ **YES**

5. $x = 2y$ **NO**

Example

Tell which of the following is a linear inequality in two variables. Write YES or NO.

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| 1. $2x \leq 4 + y$ | YES | 6. $x \geq 1$ | NO |
| 2. $y > 5x$ | YES | 7. $x < 2y + 5$ | YES |
| 3. $2x - 1 \geq y$ | YES | | |
| 4. $\frac{1}{4}x < y$ | YES | | |
| 5. $x = 2y$ | NO | | |

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Tell which of the following is a linear inequality in two variables. Write YES or NO.

1. $2x \leq 4 + y$ **YES**

6. $x \geq 1$ **NO**

2. $y > 5x$ **YES**

7. $x < 2y + 5$ **YES**

3. $2x - 1 \geq y$ **YES**

8. $9(x - 2) < 15$

4. $\frac{1}{4}x < y$ **YES**

5. $x = 2y$ **NO**

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| 3. $2x - 1 \geq y$ | YES | 8. $9(x - 2) < 15$ | NO |
| 4. $\frac{1}{4}x < y$ | YES | 9. $y \leq -6x - 4$ | |
| 5. $x = 2y$ | NO | | |

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| 4. $\frac{1}{4}x < y$ | YES | 9. $y \leq -6x - 4$ | YES |
| 5. $x = 2y$ | NO | 10. $2x + y < 8$ | |

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| 5. $x = 2y$ | NO | 10. $2x + y < 8$ | YES |

What are the Solutions of a Linear Inequality?

The solution of an inequality in two variables are the ordered pairs of numbers that make the inequality true.

How to Determine Whether an Ordered Pair is a Solution to a Linear Inequality?

1. Substitute the values for x and y .

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1. Substitute the values for x and y .
2. Simplify the inequality.
3. Check whether the resulting inequality statement is true or false.

Example 1

Is $(1, 1)$ a solution to $y \geq 2x - 1$?

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Step 1: Substitute the values for x and y .

Is $(1, 1)$ a solution to $y \geq 2x - 1$?

Let: $x = 1$, $y = 1$

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Is $(1, 1)$ a solution to $y \geq 2x - 1$?

Let: $x = 1$, $y = 1$

$$y \geq 2x - 1$$

$$1 \geq 2(1) - 1$$

Example 1

Step 2: Simplify the inequality.

Is $(1, 1)$ a solution to $y \geq 2x - 1$?

Let: $x = 1, \quad y = 1$

$$y \geq 2x - 1$$

$$1 \geq 2(1) - 1 \quad \text{Substitution Property}$$

Example 1

Step 2: Simplify the inequality.

Is $(1, 1)$ a solution to $y \geq 2x - 1$?

Let: $x = 1, \quad y = 1$

$$y \geq 2x - 1$$

$$1 \geq 2(1) - 1 \quad \text{Substitution Property}$$

$$1 \geq 2 - 1$$

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Let: $x = 1, \quad y = 1$

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$$1 \geq 2(1) - 1 \quad \text{Substitution Property}$$

$$1 \geq 2 - 1 \quad \text{Simplification}$$

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Step 2: Simplify the inequality.

Is $(1, 1)$ a solution to $y \geq 2x - 1$?

Let: $x = 1, \quad y = 1$

$$y \geq 2x - 1$$

$$1 \geq 2(1) - 1 \quad \text{Substitution Property}$$

$$1 \geq 2 - 1 \quad \text{Simplification}$$

$$1 \geq 1$$

Example 1

Step 3: Check whether the resulting inequality statement is true or false.

Is $(1, 1)$ a solution to $y \geq 2x - 1$?

Let: $x = 1, \quad y = 1$

$$y \geq 2x - 1$$

$$1 \geq 2(1) - 1 \quad \text{Substitution Property}$$

$$1 \geq 2 - 1 \quad \text{Simplification}$$

$$1 \geq 1 \quad \text{Simplification}$$

Example 1

Is $(1, 1)$ a solution to $y \geq 2x - 1$?

Let: $x = 1, \quad y = 1$

$$y \geq 2x - 1$$

$$1 \geq 2(1) - 1 \quad \text{Substitution Property}$$

$$1 \geq 2 - 1 \quad \text{Simplification}$$

$$1 \geq 1 \quad \text{Simplification}$$

\therefore since the resulting inequality is true, $(1, 1)$ **is a solution** to $y \geq 2x - 1$.

Example 2

Is $(4, -1)$ a solution to $x + 3y \leq 8$?

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Is $(4, -1)$ a solution to $x + 3y \leq 8$?

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Is $(4, -1)$ a solution to $x + 3y \leq 8$?

Let: $x = 4,$ $y = -1$

$$x + 3y \leq 8$$

Example 2

Step 1: Substitute the values for x and y .

Is $(4, -1)$ a solution to $x + 3y \leq 8$?

Let: $x = 4,$ $y = -1$

$$x + 3y \leq 8$$

$$4 + 3(-1) \leq 8$$

Example 2

Step 2: Simplify the inequality.

Is $(4, -1)$ a solution to $x + 3y \leq 8$?

Let: $x = 4,$ $y = -1$

$$x + 3y \leq 8$$

$$4 + 3(-1) \leq 8 \quad \text{Substitution Property}$$

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Step 2: Simplify the inequality.

Is $(4, -1)$ a solution to $x + 3y \leq 8$?

Let: $x = 4$, $y = -1$

$$x + 3y \leq 8$$

$$4 + 3(-1) \leq 8 \quad \text{Substitution Property}$$

$$4 - 3 \leq 8$$

Example 2

Step 2: Simplify the inequality.

Is $(4, -1)$ a solution to $x + 3y \leq 8$?

Let: $x = 4,$ $y = -1$

$$x + 3y \leq 8$$

$$4 + 3(-1) \leq 8 \quad \text{Substitution Property}$$

$$4 - 3 \leq 8 \quad \text{Simplification}$$

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Step 2: Simplify the inequality.

Is $(4, -1)$ a solution to $x + 3y \leq 8$?

Let: $x = 4,$ $y = -1$

$$x + 3y \leq 8$$

$$4 + 3(-1) \leq 8 \quad \text{Substitution Property}$$

$$4 - 3 \leq 8 \quad \text{Simplification}$$

$$1 \leq 8$$

Example 2

Step 3: Check whether the resulting inequality statement is true or false.

Is $(4, -1)$ a solution to $x + 3y \leq 8$?

Let: $x = 4,$ $y = -1$

$$x + 3y \leq 8$$

$$4 + 3(-1) \leq 8 \quad \text{Substitution Property}$$

$$4 - 3 \leq 8 \quad \text{Simplification}$$

$$1 \leq 8 \quad \text{Simplification}$$

Example 2

Is $(4, -1)$ a solution to $x + 3y \leq 8$?

Let: $x = 4$, $y = -1$

$$x + 3y \leq 8$$

$$4 + 3(-1) \leq 8 \quad \text{Substitution Property}$$

$$4 - 3 \leq 8 \quad \text{Simplification}$$

$$1 \leq 8 \quad \text{Simplification}$$

\therefore since the resulting inequality is true, $(4, -1)$
is a solution to $x + 3y \leq 8$.

Example 3

Is $(0, 0)$ a solution to $y < 4x - 5$?

Example 3

Step 1: Substitute the values for x and y .

Is $(0, 0)$ a solution to $y < 4x - 5$?

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Is $(0, 0)$ a solution to $y < 4x - 5$?

Let: $x = 0$, $y = 0$

$$y < 4x - 5$$

Example 3

Step 1: Substitute the values for x and y .

Is $(0, 0)$ a solution to $y < 4x - 5$?

Let: $x = 0$, $y = 0$

$$y < 4x - 5$$

$$0 < 4(0) - 5$$

Example 3

Step 2: Simplify the inequality.

Is $(0, 0)$ a solution to $y < 4x - 5$?

Let: $x = 0$, $y = 0$

$$y < 4x - 5$$

$$0 < 4(0) - 5 \quad \text{Substitution Property}$$

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Step 2: Simplify the inequality.

Is $(0, 0)$ a solution to $y < 4x - 5$?

Let: $x = 0$, $y = 0$

$$y < 4x - 5$$

$$0 < 4(0) - 5 \quad \text{Substitution Property}$$

$$0 < 0 - 5$$

Example 3

Step 2: Simplify the inequality.

Is $(0, 0)$ a solution to $y < 4x - 5$?

Let: $x = 0$, $y = 0$

$$y < 4x - 5$$

$$0 < 4(0) - 5 \quad \text{Substitution Property}$$

$$0 < 0 - 5 \quad \text{Simplification}$$

Example 3

Step 2: Simplify the inequality.

Is $(0, 0)$ a solution to $y < 4x - 5$?

Let: $x = 0$, $y = 0$

$$y < 4x - 5$$

$$0 < 4(0) - 5 \quad \text{Substitution Property}$$

$$0 < 0 - 5 \quad \text{Simplification}$$

$$0 < -5$$

Example 3

Step 3: Check whether the resulting inequality statement is true or false.

Is $(0, 0)$ a solution to $y < 4x - 5$?

Let: $x = 0, \quad y = 0$

$$y < 4x - 5$$

$$0 < 4(0) - 5 \quad \text{Substitution Property}$$

$$0 < 0 - 5 \quad \text{Simplification}$$

$$0 < -5 \quad \text{Simplification}$$

Example 3

Is $(0, 0)$ a solution to $y < 4x - 5$?

Let: $x = 0$, $y = 0$

$$y < 4x - 5$$

$$0 < 4(0) - 5 \quad \text{Substitution Property}$$

$$0 < 0 - 5 \quad \text{Simplification}$$

$$0 < -5 \quad \text{Simplification}$$

\therefore since the resulting inequality is false, $(0, 0)$
is not a solution to $y < 4x - 5$.

Example 4

Is $(4, \frac{1}{2})$ a solution to $\frac{1}{2}x + y > 5$?

Example 4

Step 1: Substitute the values for x and y .

Is $(4, \frac{1}{2})$ a solution to $\frac{1}{2}x + y > 5$?

Let: $x = 4, \quad y = \frac{1}{2}$

Example 4

Step 1: Substitute the values for x and y .

Is $(4, \frac{1}{2})$ a solution to $\frac{1}{2}x + y > 5$?

Let: $x = 4$, $y = \frac{1}{2}$

$$\frac{1}{2}x + y > 5$$

Example 4

Step 1: Substitute the values for x and y .

Is $(4, \frac{1}{2})$ a solution to $\frac{1}{2}x + y > 5$?

Let: $x = 4, \quad y = \frac{1}{2}$

$$\frac{1}{2}x + y > 5$$

$$\frac{1}{2}(4) + \frac{1}{2} > 5$$

Example 4

Step 2: Simplify the inequality.

Is $(4, \frac{1}{2})$ a solution to $\frac{1}{2}x + y > 5$?

Let: $x = 4, \quad y = \frac{1}{2}$

$$\frac{1}{2}x + y > 5$$

$$\frac{1}{2}(4) + \frac{1}{2} > 5 \quad \text{Substitution Property}$$

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Step 2: Simplify the inequality.

Is $(4, \frac{1}{2})$ a solution to $\frac{1}{2}x + y > 5$?

Let: $x = 4, \quad y = \frac{1}{2}$

$$\frac{1}{2}x + y > 5$$

$$\frac{1}{2}(4) + \frac{1}{2} > 5 \quad \text{Substitution Property}$$

$$2 + \frac{1}{2} > 5$$

Example 4

Step 2: Simplify the inequality.

Is $(4, \frac{1}{2})$ a solution to $\frac{1}{2}x + y > 5$?

Let: $x = 4, \quad y = \frac{1}{2}$

$$\frac{1}{2}x + y > 5$$

$$\frac{1}{2}(4) + \frac{1}{2} > 5 \quad \text{Substitution Property}$$

$$2 + \frac{1}{2} > 5 \quad \text{Simplification}$$

Example 4

Step 3: Check whether the resulting inequality statement is true or false.

Is $(4, \frac{1}{2})$ a solution to $\frac{1}{2}x + y > 5$?

$$\text{Let: } x = 4, \quad y = \frac{1}{2}$$

$$\frac{1}{2}x + y > 5$$

$$\frac{1}{2}(4) + \frac{1}{2} > 5 \quad \text{Substitution Property}$$

$$2 + \frac{1}{2} > 5 \quad \text{Simplification}$$

$$2\frac{1}{2} > 5 \quad \text{Simplification}$$

Example 4

Is $(4, \frac{1}{2})$ a solution to $\frac{1}{2}x + y > 5$?

$$\text{Let: } x = 4, \quad y = \frac{1}{2}$$

$$\frac{1}{2}x + y > 5$$

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\therefore since the resulting inequality is false, $(4, \frac{1}{2})$
is not a solution to $\frac{1}{2}x + y > 5$.

Thank you for watching.