

LINEAR INEQUALITIES Guide Notes

LINEAR INEQUALITY: Looks exactly like a linear function, with the inequality sign replacing the equality sign. Inequalities are useful for describing real-world situations. The symbols used in inequalities are: $<$, $>$, \leq , \geq

INTERVAL NOTATION We write the beginning and ending numbers of the interval, like follows:

- Use $[-]$ for closed dots \geq, \leq
- Use $(-)$ for open dots $>, <$

SET NOTATION Represents a form to describe which items belong in a set and which do not.

$$\{x|x \in R, x < a\} = (-\infty, a)$$

$$\{x|x \in R, x > a\} = (a, \infty)$$

$$\{x|x \in R, x \leq a\} = (-\infty, a]$$

$$\{x|x \in R, x \geq a\} = [a, \infty)$$

$$\{x|x \in R, a \leq x \leq b\} = [a, b]$$

$$\{x|x \in R, a < x \leq b\} = (a, b]$$

$$\{x|x \in R, a \leq x < b\} = [a, b)$$

$$\{x|x \in R, a < x < b\} = (a, b)$$

Express the following intervals as sets

1. $[-5, 8]$: $\{x|x \in R, -5 \leq x \leq 8\}$

2. $(0, 6]$: $\{x|x \in R, 0 < x \leq 6\}$

3. $(-4, \infty)$: $\{x|x \in R, x > -4\}$

Express the following sets as intervals

4. $\{x|x \in R, x \geq 2\}$: $[2, \infty)$

5. $\{x|x \in R, -4 \leq x < 3\}$: $[-4, 3)$

6. $\{x|x \in R, x < 7\}$: $(-\infty, 7)$

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Sample Problem 1: Solve the following inequality:

$$6(x - 1) > 2(x - 5)$$

Applying distributive property:

$$6x - 6 > 2x - 10$$

$$6x - 2x > -10 + 6 \quad \rightarrow \quad 4x > -4$$

Multiplying by $\frac{1}{4}$ and solving for x:

$$\frac{1}{4}(4x) > \frac{1}{4}(-4) \quad \rightarrow \quad x > -1$$

SOLUTION: $(-1, \infty)$

Sample Problem 2: Solve the following inequality:

$$\frac{5x - 8}{4} \leq 3$$

Multiplying by 4:

$$4 \left(\frac{5x - 8}{4} \right) \leq 4(3)$$

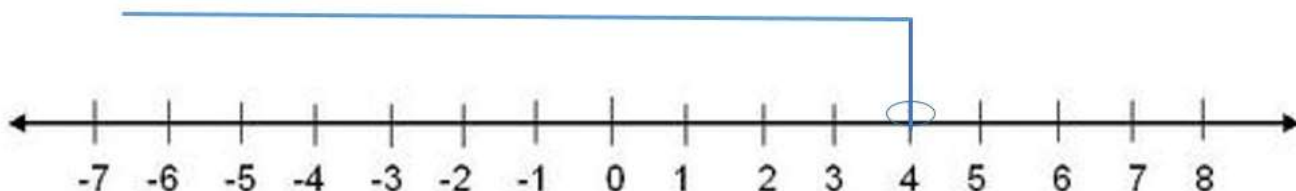
$$5x - 8 \leq 12 \quad \rightarrow \quad 5x \leq 12 + 8 \quad \rightarrow \quad 5x \leq 20$$

$$\frac{1}{5}(5x) \leq \frac{1}{5}(20) \quad \rightarrow \quad x \leq 4$$

SOLUTION: $(-\infty, 4]$

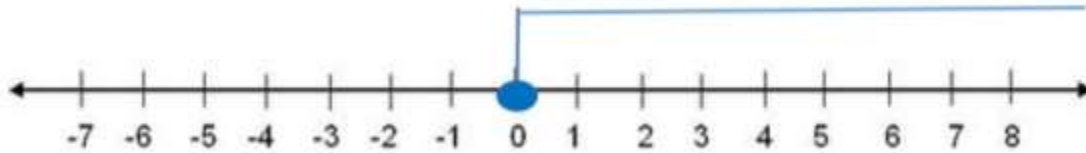
Sample Problem 3: Graph the solutions of the following inequalities:

- $x < 4 : (-\infty, 4)$



- $x \geq 0 : [0, \infty)$

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- $2 \leq x < 6$: $[2, 6)$

