Unit 3 · Linear Inequalities Cheat Sheet

Unit 3 focus: writing, solving and graphing inequalities

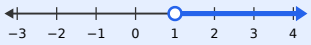
1 SYMBOLS & KEY PHRASES

Symbol	Means	Phrases
$<$	less than	fewer than, below
$>$	greater than	more than, above
$\leq$	less than or equal to	**at most**, no more than
$\geq$	greater than or equal to	**at least**, no less than
$\neq$	not equal to	is not

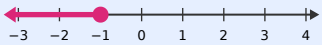
2 GRAPHING ON A NUMBER LINE

- **Open circle** for $<$ or $>$: the endpoint is not included.
- **Closed circle** for $\leq$ or $\geq$: the endpoint is included.
- With the variable on the left, shade the way the sign points: $<$ left, $>$ right.

x > 1



x ≤ −1



3 SOLVING: LIKE AN EQUATION

Use inverse operations. Keep the variable on one side.

Example: Solve $3x - 7 \leq 8$.
Add 7: $3x \leq 15$
Divide by 3: $x \leq 5$

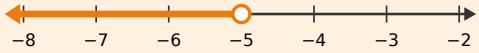
Answer: $x \leq 5$

4 REVERSE THE SIGN!

When you **multiply or divide by a negative**, flip the inequality symbol.

Example: Solve $-2p > 10$.
Divide by -2 and flip: $p < -5$

Answer: $p < -5$



5 CHECK A SOLUTION

Is $x = 6$ a solution of $x + 4 > 9$? $6 + 4 = 10 > 9$	✔ **yes**
Is $x = 4$ a solution? $4 + 4 = 8$, and $8 > 9$ is false	✘ **no**
Test a point on the shaded side to check your graph.	**test point**

6 QUICK REMINDERS & COMMON MISTAKES

✔ Do remember

- Open circle: $<$, $>$. Closed circle: $\leq$, $\geq$.
- Flip the sign only when multiplying or dividing by a negative.
- Check a value from your answer in the original inequality.

✘ Common mistakes

- "5 less than x": is $x - 5$, not $5 - x$
- Flipping when you add or subtract a negative: no flip needed
- Shading the wrong way: test a point

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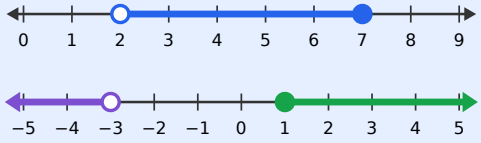
More practice: compound inequalities, absolute value and inequalities in context

1 WRITING INEQUALITIES

A number x is at least 6.	$x \geq 6$
A number n is less than 12.	$n < 12$
7 more than y is no more than 19.	$y + 7 \leq 19$
Twice p is greater than 14.	$2p > 14$

2 COMPOUND INEQUALITIES

- **AND**: both are true, so shade the **overlap**. $2 < x \leq 7$
- **OR**: either is true, so shade **both** parts. $x < -3$ or $x \geq 1$



3 SOLVE A COMPOUND INEQUALITY

For a three-part inequality, do the same step to all three parts.

Example: Solve $3 < x + 2 \leq 8$.
Subtract 2: $1 < x \leq 6$
Answer: $1 < x \leq 6$

4 ABSOLUTE VALUE

Type	Rewrite as
$\lvert x - 3 \rvert = 5$	$x - 3 = 5$ or $x - 3 = -5$: $x = 8$ or $x = -2$
$\lvert x \rvert < 4$ **(less: AND)**	$-4 < x < 4$
$\lvert x \rvert \geq 4$ **(greater: OR)**	$x \leq -4$ or $x \geq 4$

Isolate the absolute value first. $\lvert x \rvert < -2$ has no solution.

5 INEQUALITIES IN CONTEXT

Write the constraint, solve, and keep answers that make sense (often whole numbers).

Example: Songs cost $1.29. Ava has $10. How many songs can she buy?
Inequality: $1.29s \leq 10$
Divide: $s \leq 7.75$
Answer: at most 7 songs

6 SPECIAL CASES

$2x + 1 < 2x - 4 \rightarrow 1 < -4$ is false	**no solution**
$4(x + 1) \geq 4x + 1 \rightarrow 4 \geq 1$ is true	**all real numbers**
Variables on both sides: $5x + 3 > 2x + 12 \rightarrow 3x > 9$	$x > 3$