

GRADE 6 · EXPRESSIONS & EQUATIONS · ANSWER KEY

WRITING & GRAPHING INEQUALITIES

Today's goal: I can write inequalities in the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world problem, write inequalities in the form $x > c$ or $x < c$ to represent a constraint or condition in a mathematical problem, identify that inequalities in the form $x > c$ or $x < c$ have infinitely many solutions and represent solutions of inequalities in the form $x > c$ or $x < c$ on number line diagrams.



How to use this key. Problem numbers match the student sheets. Each answer shows the steps and the slip Mr DJ sees most, so a wrong answer tells you what to reteach. Pepper levels: **Mild** warm-up, **Medium** stretch, **Spicy** challenge, **Extra Spicy** big brain.

Practice

8 problems + Mr DJ's worked example

Use: During the lesson after the mini-lesson/deck. Item 7 uses a real speed limit, where the inclusive reading actually matters; item 8 targets the single-answer expectation. **Timing:** 15–25 min · pairs or independent · circulate on 7–9. Items 1–3 fluency, 4–6 application, 7–9 reasoning. Ask for a decimal solution whenever a student lists only whole numbers.

- 1 $x > 7$; no 2 0 and 1 3 $x \leq 25$; closed circle at 25, arrow left 4 5 yes; 4 no 5 $x < 100$; no
6 $x \geq 13$; closed circle at 13, arrow right; e.g. 13, 14, 40 7 $x \leq 65$; 65 is the maximum allowed, 70 exceeds it
8 Wrong — every positive number is a solution, infinitely many

1 **MILD** More than 7; is 7 a solution?

$x > 7$; no

1. Strictly greater, so 7 itself does not qualify ($7 > 7$ is false).

Watch for: Included 7.

2 **MILD** $x < 3$ in {0, 1, 3, 5}?

0 and 1

1. $0 < 3$ true; $1 < 3$ true; $3 < 3$ false; $5 < 3$ false.

Watch for: Included 3.

3 **MEDIUM** At most 25; graph?

$x \leq 25$; closed circle at 25, arrow left

1. 'At most' means 25 or fewer.

2. Closed circle (25 counts), arrow left toward smaller values.

Watch for: Drew the arrow to the right — 'at most' caps the value, so the range extends downward.

4 **MEDIUM** $x > 4.5$: is 5? is 4?

5 yes; 4 no

1. $5 > 4.5$ true.

2. $4 > 4.5$ false.

3. Note 4.6 and 4.51 also work — the boundary need not be a whole number.

Watch for: Assumed only whole numbers count.

5 **MEDIUM** Fewer than 100; is 100 a solution?

$x < 100$; no

1. 'Fewer than' is strict, so 100 is excluded.

2. 99 works, and so does 99.9.

Watch for: Included 100.

6 **SPICY** At least 13; graph; three values?

$x \geq 13$; closed circle at 13, arrow right; e.g. 13, 14, 40

1. 'At least 13' means 13 or older: $x \geq 13$.

2. Closed circle at 13, arrow right.

3. $13 \geq 13$ ✓, $14 \geq 13$ ✓, $40 \geq 13$ ✓ — and any age above 13 also works.

Watch for: Gave $x > 13$ (excluding 13-year-olds, which the rule allows) or listed only one value.

7 **SPICY** Speed limit 65; why is 65 legal and 70 not?

$x \leq 65$; 65 is the maximum allowed, 70 exceeds it

1. A limit of 65 means you may drive up to and including 65: $x \leq 65$.
2. $65 \leq 65$ is true, so exactly 65 is legal.
3. $70 \leq 65$ is false, so 70 breaks the limit.
4. The graph has a closed circle at 65 with the arrow pointing left.

Watch for: Wrote $x < 65$, which would make driving at exactly the limit illegal. Real-world limits are almost always inclusive.

8 **EXTRA SPICY** Jess: $x > 0$ has one solution, namely 1?

Wrong — every positive number is a solution, infinitely many

1. 1 IS a solution, but so are 2, 7, 100, 0.5, 0.001...
2. Every number greater than 0 satisfies it, and there are infinitely many.
3. 0 itself is NOT a solution, because $0 > 0$ is false.
4. That is why we draw an open circle at 0 with an arrow right, instead of listing values.

Watch for: Treated the inequality like an equation with one answer. The comparison symbol is exactly what turns one answer into a range.

Homework

7 problems + Mr DJ's worked example

Use: Parallels the practice sheet. Item 6 has a real consequence attached to the symbol choice, which makes the distinction stick. **Timing:** ~15 min at home · independent · review item 7 as the next-day warm-up.

1 $x > 9$; no

2 1 and 5

3 $x \leq 40$; closed circle at 40, arrow left

4 3 yes; e.g. 2.6 or 2.51

5 $x < 50$; no

6 $x \geq 48$; closed circle at 48, arrow right; yes, exactly 48 can ride

7 Because every positive number satisfies it — infinitely many solutions

1 **MILD** More than 9; is 9?

$x > 9$; no

1. $9 > 9$ is false.

Watch for: Included 9.

2 **MILD** $x < 6$ in {1, 5, 6, 9}?

1 and 5

1. $6 < 6$ is false; 9 is too big.

Watch for: Included 6.

3 **MEDIUM** At most 40; graph?

$x \leq 40$; closed circle at 40, arrow left

1. 'At most' caps the value at 40, which is itself allowed.

Watch for: Drew the arrow right.

4 **MEDIUM** $x > 2.5$: is 3? a non-whole solution?

3 yes; e.g. 2.6 or 2.51

1. $3 > 2.5$ true.
2. $2.6 > 2.5$ is also true — solutions do not have to be whole numbers.

Watch for: Gave only whole numbers, missing that the range is continuous.

5

MEDIUM

Fewer than 50; is 50?

 $x < 50$; no1. $50 < 50$ is false; 49.9 works.**Watch for:** Included 50.

6

SPICY

At least 48 inches; exactly 48?

 $x \geq 48$; closed circle at 48, arrow right; yes, exactly 48 can ride

1. 'At least 48' means 48 or taller: $x \geq 48$.
2. $48 \geq 48$ is true, so someone exactly 48 inches qualifies.
3. Closed circle at 48 with the arrow pointing right shows that.

Watch for: Wrote $x > 48$ and turned away a rider who actually meets the requirement — a real consequence of the wrong symbol.

7

SPICY

Why can $x > 0$ not have one answer?**Because every positive number satisfies it — infinitely many solutions**

1. Any number greater than 0 makes it true: 1, 2, 50, 0.5, 0.0001...
2. There is no smallest positive number to name, so no single answer exists.
3. 0 is excluded because $0 > 0$ is false.
4. Graph: open circle at 0, arrow pointing right. In words: all numbers greater than zero.

Watch for: Named one value. An inequality answers 'which numbers work?', and here the honest answer is a whole region.**Exit Ticket**

4 problems

Use: End of the inequalities lesson. 5–8 min, independent. Builds on checking solutions (the "Checking solutions by substitution" sheet (Grade 6)). **Timing:** 5–8 min · independent. Item 4 tests the infinitely-many idea; a student who names one number has not grasped what an inequality describes.

1 $x > 12$; a 12-year-old cannot ride

2 2 and 4

3 $x \geq 18$; closed circle at 18, arrow right

4 $x \leq 60$; closed circle at 60, arrow left; infinitely many solutions

1 **MILD** More than 12 years old?

$x > 12$; a 12-year-old cannot ride

1. 'More than' means strictly greater: $x > 12$.
2. $12 > 12$ is false, so a 12-year-old does not qualify.
3. They would need to be 13 or older (or 12.5, if fractional ages counted).

Watch for: Wrote $x \geq 12$ and let the 12-year-old ride. 'More than' excludes the number itself.

2 **MEDIUM** Solutions of $x < 5$ in $\{2, 4, 5, 8\}$?

2 and 4

1. $2 < 5$ true. $4 < 5$ true. $5 < 5$ false. $8 < 5$ false.
2. Solutions from this set: 2 and 4.

Watch for: Included 5. 'Less than' excludes the boundary value.

3 **MEDIUM** At least 18, and its graph?

$x \geq 18$; closed circle at 18, arrow right

1. 'At least' means 18 or more: $x \geq 18$.
2. Closed (filled) circle at 18 because 18 IS a solution.
3. Arrow pointing right to show every value above 18.

Watch for: Wrote $x > 18$ with an open circle. 'At least' includes the boundary.

4 **SPICY** At most 60 kg; graph; why infinite?

$x \leq 60$; closed circle at 60, arrow left; infinitely many solutions

1. 'At most' means 60 or less: $x \leq 60$.
2. Closed circle at 60 (60 is allowed), arrow pointing left.
3. Infinitely many because every value below 60 works — 59, 59.5, 59.99, and so on. You could never finish listing them, which is why we draw the range instead.

Watch for: Answered '60' as if there were one solution, or listed a few whole numbers and stopped. The decimals between the whole numbers are solutions too.

Lesson slides

teaching notes & timing

Slide	Time	What to do
1	0:00	Frame the skill: conditions become inequalities, and solutions become regions.
2	1:00	Hook — poll yes/no for the 12-year-old. Do NOT resolve. The strict-vs-inclusive distinction is the whole lesson.
3	3:00	The four phrases. Have students say the symbol AND whether the boundary counts.
4	5:00	WE1 — resolve the hook. Open circle drawn deliberately, and say why it is hollow.
5	7:00	WE2 — the speed limit. A real inclusive limit makes $\leq$ feel natural rather than arbitrary.
6	11:00	Infinitely many. Ask for a decimal solution; students default to whole numbers and miss the continuity.
7		Show the problem and the slip. Pairs: what went wrong, and what is the right answer? Take two answers before moving on.
8		Solve it together, one step at a time. It is also the worked example at the top of the practice sheet, so students can look back at it.
9	9:00	CFU — all-student response. Answer $x \geq 18$, closed circle, arrow right. Watch for the open circle. Whiteboards: everyone tries Mild, then climbs. These are #1, #3, #6 on the practice sheet.
10		Fingers up: 3 = got it, 2 = almost, 1 = not yet. Pull the 1s for a quick reteach while everyone else starts the practice sheet.
11	13:00	Launch the in-class practice sheet. Launch the practice sheet. Exit ticket in the last 5–8 minutes.