



Writing & solving inequalities

GRADE 7 MATH

Answer keys for the exit ticket, practice worksheet, and homework, plus notes for the lesson slides. Each answer shows the steps and the most likely wrong answer (“If wrong”), so you can tell what a mistake means, not just that it is one. Questions go from **fluency** to **application** to **reasoning**.

Exit Ticket — answer key

Use: End of the inequalities lesson, closing G7 Expressions & Equations. 5–8 min, independent. Item 2 derives the flip rule rather than testing recall of it.

Timing: 5–8 min · independent. Item 4 separates the solution SET from the answer the context wants — a distinction that costs marks routinely.

1. $3x + 4 > 19$ **APPLICATION**

Answer: $x > 5$

1. Subtract 4: $3x > 15$. Divide by 3 (positive, so no flip): $x > 5$.
2. Test $x = 6$: $3(6) + 4 = 22$, and $22 > 19$ is true.
3. Test the boundary $x = 5$: $3(5) + 4 = 19$, and $19 > 19$ is false — so 5 itself is excluded, matching the strict $>$.

If wrong: Wrote $x > 5$ as a single answer of 5. An inequality has infinitely many solutions; 5 is the boundary, not the answer.

2. $-2x > 6$ **REASONING**

Answer: $x < -3$ — the sign reverses

1. Divide both sides by -2 . The boundary is $6 \div (-2) = -3$.
2. Test $x = -4$: $-2(-4) = 8$, and $8 > 6$ is TRUE. So -4 is a solution, and -4 is BELOW -3 .
3. Test $x = 0$: $-2(0) = 0$, and $0 > 6$ is FALSE. So 0 is not a solution, and 0 is ABOVE -3 .
4. The solutions lie below the boundary, so the answer is $x < -3$ — the inequality sign reversed.
5. What the tests show: you do not have to remember the flip rule. Two well-chosen values tell you which side of the boundary works.

If wrong: Answered $x > -3$ by keeping the sign. The test at $x = 0$ disproves it immediately, which is why testing beats remembering.

3. $5x - 3 \leq 12$; is $x = 3$ a solution? APPLICATION

Answer: $x \leq 3$, and yes, 3 is included

1. Add 3: $5x \leq 15$. Divide by 5: $x \leq 3$.
2. Test $x = 3$: $5(3) - 3 = 12$, and $12 \leq 12$ is true because $\leq$ allows equality.
3. So 3 IS a solution — the boundary is included whenever the symbol has the line underneath.

If wrong: Excluded 3, treating $\leq$ as $<$. The line under the symbol is what admits the boundary value.

4. Gym: \$8 to join, \$4 per visit, has \$32 REASONING

Answer: $8 + 4v \leq 32$, so $v \leq 6$ — at most 6 visits

1. Let v be the number of visits. Cost: $8 + 4v$.
2. They cannot spend more than they have: $8 + 4v \leq 32$.
3. Subtract 8: $4v \leq 24$. Divide by 4: $v \leq 6$.
4. Check $v = 6$: $8 + 24 = 32$, exactly affordable. Check $v = 7$: $8 + 28 = 36$, too much.
5. The largest number of visits is 6.
6. Note the answer to the QUESTION is a single number, 6, even though the solution SET is $v \leq 6$. The context asks for the maximum.

If wrong: Answered $v \leq 6$ and stopped. The question asked for the largest number of visits, which is one specific value from the set.

Quick answers for fast checking:

#	Level	Answer
1	application	$x > 5$
2	reasoning	$x < -3$, sign reverses
3	application	$x \leq 3$, yes
4	reasoning	$v \leq 6$, so 6 visits

Practice Worksheet — answer key

Use: During the lesson after the deck. Item 9 is the most valuable on the sheet: it shows the flip is avoidable, which reframes it as a consequence rather than a rule.

Timing: 15–25 min · pairs or independent · circulate on 7 and 9. Require both a test inside and a test outside the solution set.

1. $2x + 5 > 13$ FLUENCY

Answer: $x > 4$

1. Subtract 5: $2x > 8$. Divide by 2: $x > 4$.

If wrong: Answered $x = 4$. The solution is every value above 4.

2. Test $x = 5$ FLUENCY

Answer: **True** — $15 > 13$

1. $2(5) + 5 = 15$, and $15 > 13$ is true, so 5 is a solution.

If wrong: Substituted into the solved form rather than the original.

3. Test $x = 4$ — what about the boundary? REASONING

Answer: **False** — $13 > 13$ is not true, so 4 is excluded

1. $2(4) + 5 = 13$, and $13 > 13$ is FALSE.

2. So $x = 4$ is not a solution: the boundary itself is excluded.

3. That matches the strict symbol $>$, which means 'greater than' and not 'greater than or equal to'.

4. On a number line this is drawn as an OPEN circle at 4 — the point is the edge of the solutions but not one of them.

If wrong: Said 4 works because it is the boundary. The boundary is where the truth changes, so with a strict symbol it belongs to the false side.

4. $-3x < 9$ APPLICATION

Answer: $x > -3$

1. Divide by -3 and reverse: $x > -3$.

2. Boundary: $9 \div (-3) = -3$.

If wrong: Answered $x < -3$ by keeping the sign.

5. Test $x = 0$ APPLICATION

Answer: **True — $0 < 9$**

1. $-3(0) = 0$, and $0 < 9$ is true. So 0 is a solution.
2. 0 is ABOVE the boundary of -3 .

If wrong: Assumed 0 could not be tested because it is neither positive nor negative.

6. Test $x = -4$ APPLICATION

Answer: **False — $12 < 9$ is not true**

1. $-3(-4) = 12$, and $12 < 9$ is false. So -4 is not a solution.
2. -4 is BELOW the boundary.

If wrong: Computed -12 by dropping a negative, which would wrongly make it a solution.

7. State the set and justify from the tests REASONING

Answer: **$x > -3$, confirmed by the two tests**

1. The boundary is -3 .
2. $x = 0$ is above it and WORKS. $x = -4$ is below it and FAILS.
3. So the solutions lie above the boundary: $x > -3$.
4. This confirms the reversal. Dividing by -3 flipped $<$ into $>$, and the tests show that flip was right without needing to recall the rule.
5. Testing one value on each side of the boundary determines the direction every time — it is a method, not a check.

If wrong: Stated the set without linking it to the tests. The tests are the evidence, and the question asks for the reasoning.

8. $4x - 1 \geq 11$ APPLICATION

Answer: **$x \geq 3$**

1. Add 1: $4x \geq 12$. Divide by 4 (positive, no flip): $x \geq 3$.
2. Test $x = 3$: $4(3) - 1 = 11$, and $11 \geq 11$ is true, so 3 is included.

If wrong: Excluded 3. The line under $\geq$ includes the boundary.

9. Solve $-3x < 9$ by adding $3x$ REASONING

Answer: $0 < 9 + 3x$, giving $x > -3$ — no flip because nothing was multiplied by a negative

1. Add $3x$ to both sides: $0 < 9 + 3x$.
2. Subtract 9: $-9 < 3x$.
3. Divide by 3, which is POSITIVE, so no reversal: $-3 < x$, which is the same as $x > -3$.
4. Same answer as before.
5. Why no flip: reversal is needed only when multiplying or dividing by a negative. This route never does that — it only adds and divides by a positive.
6. So the flip is not a mysterious extra rule; it is avoidable entirely by keeping the variable's coefficient positive. Some students find this route safer.

If wrong: Expected a different answer from the different method. Both routes must agree — they are the same inequality.

Quick answers for fast checking:

#	Level	Answer
1	fluency	$x > 4$
2	fluency	true
3	reasoning	false — boundary excluded
4	application	$x > -3$
5	application	true
6	application	false
7	reasoning	$x > -3$ from the tests
8	application	$x \geq 3$
9	reasoning	same answer, no flip needed

Homework — answer key

Use: Closes G7 Expressions & Equations. Item 8 confronts the over-generalisation that the flip is a final step, which is what happens when the rule is learned without its condition.

Timing: ~15 min at home · independent · review items 7 and 8 as the next-day warm-up.

1. $6x + 2 < 20$ **FLUENCY**

Answer: $x < 3$

1. Subtract 2: $6x < 18$. Divide by 6: $x < 3$.

If wrong: Answered $x = 3$.

2. Test $x = 2$ **FLUENCY**

Answer: **True — $14 < 20$**

1. $6(2) + 2 = 14$, and $14 < 20$ is true.

If wrong: Used the solved form.

3. Test $x = 3$ **APPLICATION**

Answer: **False — $20 < 20$ is not true, so 3 is not a solution**

1. $6(3) + 2 = 20$, and $20 < 20$ is false.

2. The strict symbol $<$ excludes the boundary, so 3 is not included.

If wrong: Said 3 works because the answer was $x < 3$. The boundary sits just outside.

4. $-5x \geq 15$ **APPLICATION**

Answer: $x \leq -3$

1. Divide by -5 and reverse: $x \leq -3$.

2. Boundary: $15 \div (-5) = -3$.

If wrong: Answered $x \geq -3$ by keeping the sign.

5. Test -3 and -2 REASONING

Answer: -3 works, -2 does not — so solutions lie at and below -3

1. $x = -3$: $-5(-3) = 15$, and $15 \geq 15$ is TRUE. Included, because $\geq$ allows equality.
2. $x = -2$: $-5(-2) = 10$, and $10 \geq 15$ is FALSE.
3. So -3 is a solution and -2 , which is above it, is not.
4. The solutions lie at and below the boundary: $x \leq -3$, confirming the reversal.
5. Two tests, one on the boundary and one just above it, settle both the direction AND whether the boundary is included.

If wrong: Tested only one value. One test tells you a point is in or out; two on either side tell you the direction.

6. Club: \$10 to join, \$3 per event, has \$25 REASONING

Answer: $10 + 3e \leq 25$, so $e \leq 5$ — at most 5 events

1. Let e be the number of events. Cost: $10 + 3e$.
2. $10 + 3e \leq 25$. Subtract 10: $3e \leq 15$. Divide by 3: $e \leq 5$.
3. Check $e = 5$: $10 + 15 = 25$, exactly affordable. Check $e = 6$: $10 + 18 = 28$, too much.
4. The most they can attend is 5 events.

If wrong: Wrote $10e + 3 \leq 25$. The joining fee is paid once.

7. Solution set vs largest whole number REASONING

Answer: $n \leq 5$ is a set of infinitely many values; the largest whole number is 5

1. Solving $3n \leq 15$ gives $n \leq 5$ — every number at or below 5, including 4.7, 0 and -100 .
2. The second question asks for one specific member of that set: the largest WHOLE number, which is 5.
3. So one answer is a set and the other is a single value drawn from it.
4. Context usually decides which is wanted. You cannot attend 4.7 events, so a real-world question almost always wants the whole-number answer.
5. Giving the set when a number is asked for, or a number when the set is asked for, are both incomplete answers.

If wrong: Treated the two questions as identical. The solution set is the mathematical answer; the context question selects from it.

8. Is a flip always needed? REASONING

Answer: **No — only when multiplying or dividing by a negative**

1. Example with no flip: $2x + 5 > 13 \rightarrow 2x > 8 \rightarrow x > 4$. Dividing by a positive 2, so the sign is unchanged.
2. Example with a flip: $-2x > 6 \rightarrow x < -3$. Dividing by -2 reverses it.
3. The rule: reverse **ONLY** when you multiply or divide both sides by a negative number.
4. Adding or subtracting a negative never reverses anything: $x - 5 > 2$ gives $x > 7$, no flip, even though a negative appeared.
5. Flipping automatically at the end is as wrong as never flipping — it just fails on different problems.

If wrong: Agreed with the student. Habitually flipping breaks every inequality solved by dividing by a positive, which is most of them.

Quick answers for fast checking:

#	Level	Answer
1	fluency	$x < 3$
2	fluency	true
3	application	false, not a solution
4	application	$x \leq -3$
5	reasoning	-3 in, -2 out
6	reasoning	$e \leq 5$; 5 events
7	reasoning	set vs single value
8	reasoning	only for negatives

Lesson slides — teaching notes & timing

Mini-lesson deck: ~12–15 min, then the practice sheet. Closes G7 Expressions & Equations. Slide 3's testing method is the lesson; the flip rule is its consequence.

Slide	~Time	Note
1/8	0:00	Frame it: an inequality has infinitely many solutions, so the answer is a region, not a point.
2/8	1:00	Hook — poll the two answers. Do NOT resolve. Some will remember a flip rule and misapply it.
3/8	2:30	Test rather than tell. Pick values on each side of the boundary and evaluate them out loud.
4/8	5:00	WE — the reversal emerges from the tests. Students who derive it can rebuild it under pressure.
5/8	7:00	State the CONDITION , not just the rule. Over-flipping is as common as under-flipping and harder to spot.

6/8	9:00	CFU — all-student response. $x \leq 3$, and yes, 3 is included. Watch for the boundary being excluded.
7/8	11:00	Set versus answer. In context the question usually wants one number from the set.
8/8	13:30	Launch the in-class practice sheet. This closes G7 Expressions & Equations.