Writing and Solving Inequalities

Spot mistakes, reason, and work backward

Name _____ **Date** _____ **Score** _____ / 10

QUICK REVIEW

A boundary makes both sides equal, even for a strict comparison. For $3x + C < 12$ with boundary 2, use $6 + C = 12$. To disprove a claim, test a value that gives a different yes/no result.

Worked example

The rule $6 - u \geq K$ should accept exactly the real values $u \leq -4$. Find K.

1. The boundary is $u = -4$, so $K = 6 - (-4) = 10$.
2. With $K = 10$, subtract 6 and reverse on division by -1: $u \leq -4$.
3. $u = -4$ passes at equality, but $u = -3$ gives $6 - (-3) = 9 < 10$.
Answer: $K = 10$.

Practice Problems

Show your thinking.

1. Leo solves $14 - 5x \leq -1$ as $x \leq 3$. Correct his work and give a value his answer wrongly excludes.

2. A packed box must weigh less than 20 kg, including 2 kg of packing. Inez writes $m + 2 \leq 20$ for contents of mass m. Repair and solve.

3. A tray starts with b seedlings. Adding 4 per row, six new rows fit within a cap of 36 seedlings, but seven do not. Find all possible b.

4. For a positive coefficient a, the rule $ax + 7 > 19$ has solution $x > 8$. Recover a and verify the solution.

5. A filter uses $2x - 5 \ ? \ 9$. It accepts 6 and 7, but rejects 8. Choose $<, \leq, >, \geq$ for the missing sign and solve.

6. Pia expands $3(y - 2) \geq 15$ to $3y - 2 \geq 15$. Correct the expansion and find the least real y.

7. Blocks each take 3.5 cm of a 22 cm shelf. Dez rounds $22/3.5$ up and says seven fit. Write and solve an inequality to check.

8. Which rule is stricter for real settings z: $z + 6 > -1$ or $-2z < 14$? Solve both to justify the comparison.

9. Fill in the comparison and k in $4 - 2s \ ? \ k$ so the solution is $s \geq 6$. Check $s = 5$.

10. A coach claims every whole setting a passing $3a + 1 > 13$ also passes $30 - 2a \geq 18$. Solve both and find a counterexample.

Answer Key

1. $x \geq 3$; for example, $x = 4$.
2. $m + 2 < 20$; $0 \leq m < 18$ kg.
3. $9, 10, 11, 12$ seedlings.
4. $a = \frac{3}{2}$.
5. $2x - 5 \leq 9$; $x \leq 7$.
6. $3y - 6 \geq 15$; least $y = 7$.
7. $3.5b \leq 22$; at most 6 blocks.
8. Neither; both require $z > -7$.
9. $4 - 2s \leq -8$; $s = 5$ fails.
10. $a > 4$ versus $a \leq 6$; $a = 7$ disproves the claim.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Subtract 14: $-5x \leq -15$.
2. Dividing by -5 reverses the comparison: $x \geq 3$.
3. $x = 4$ gives $14 - 5(4) = -6 \leq -1$, but Leo excludes 4.

Problem 2

1. Less than 20 excludes equality: $m + 2 < 20$.
2. Subtract 2 to get $m < 18$; mass is nonnegative.
3. $18 + 2 = 20$ kg is rejected, although Inez's rule accepts it.

Problem 3

1. Six rows fit: $b + 24 \leq 36$, so $b \leq 12$.
2. Seven rows do not: $b + 28 > 36$, so $b > 8$.
3. The whole counts in $8 < b \leq 12$ are $9, 10, 11, 12$.

Problem 4

1. At the boundary, $8a + 7 = 19$, so $8a = 12$.
2. Divide by 8: $a = \frac{12}{8} = \frac{3}{2}$.
3. With this coefficient, $\frac{3}{2}x > 12$ gives $x > 8$. At 8 the output is exactly 19.

Problem 5

1. The outputs for $6, 7, 8$ are $7, 9, 11$, respectively.
2. Accepting 7 and 9 as outputs but not 11 requires ≤ 9.
3. Add 5: $2x \leq 14$. Divide by 2: $x \leq 7$.

Problem 6

1. Multiply both terms by 3: $3y - 6 \geq 15$.
2. Add 6 and divide by 3: $y \geq 7$.
3. $3(7 - 2) = 15$, so the least value 7 is included.

Problem 7

1. For b blocks, $3.5b \leq 22$.
2. Divide by 3.5: $b \leq \frac{44}{7}$.
3. Six need 21 cm; seven need 24.5 cm. Rounding up exceeds the cap.

Problem 8

1. Subtract 6 from the first rule: $z > -7$.
2. Divide the second by -2 and reverse: $z > -7$.
3. Both exclude -7 and accept precisely the same values above -7.

Problem 9

1. At the boundary, $k = 4 - 2(6) = -8$.
2. Multiply $s \geq 6$ by -2 and reverse, then add 4: $4 - 2s \leq -8$.
3. $s = 5$ gives $4 - 2(5) = -6 > -8$, so it fails.

Problem 10

1. Subtract 1 and divide by 3 in the first: $a > 4$.
2. Subtract 30 and divide by -2 in the second: $a \leq 6$.
3. At $a = 7$, the first gives $22 > 13$ but the second gives $16 < 18$.

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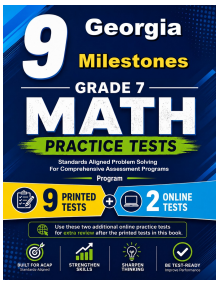

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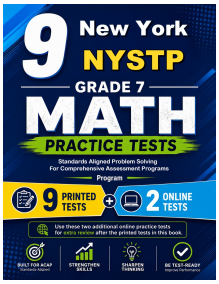

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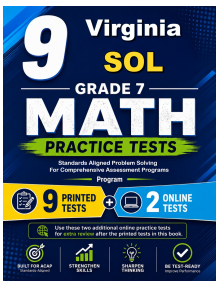

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