

Chapter 5 — Inequalities

Teacher Guide

Teacher Chapter-at-a-Glance

Materials

Student text, worksheets, ruler, number-line templates, coloured pencils or highlighters, optional floor number line or integer cards.

Pacing

Teach symbol meaning and graph interpretation before solving. Teach positive-coefficient inequalities first. Introduce the negative reversal rule only after students can explain symbols and graph direction.

Talk Prompt

“Why does multiplying by a negative number reverse the order of two values on a number line?”

If Ready-to-Learn Reveals a Gap

If students struggle with signed multiplication or two-step equations, provide a focused Chapter 4 review before teaching the reversal rule. If graph direction is weak, use value checks before asking students to draw an arrow.

Mastery Decision Guide

What a missed Tripwire item actually means, and what to do about it before moving on.

Missed Tripwire #1 → Forgetting to reverse the inequality after dividing by a negative

(Mistake 1). *Student divides by a negative coefficient but keeps the original inequality symbol.*

Review before the next chapter.

Missed Tripwire #2 → Graphing the boundary or direction incorrectly (Mistake 2). *The graph includes a value that fails the inequality or excludes a value that satisfies it.* Review before the next chapter.

Ready-to-Learn Check

Quick check before starting. A wrong answer below points to a specific gap worth closing first, not just a miss to shrug off.

1. Compare integers. Which number is greater: -3 or 5?

Correct answer: $5 > -3$

Likely wrong answer: $-3 > 5$

Misconception: The student may focus on the digit 3 rather than its position relative to 0 on a number line.

Next move: Review integer order on a number line. Numbers farther right are greater.

2. Solve a two-step equation. $3x - 4 = 11$

Correct answer: $x = 5$

Likely wrong answer: $x = 7/3$

Misconception: The student may divide by 3 before undoing the subtraction of 4.

Next move: Review the reverse-order routine: add 4 first, then divide by 3.

3. Multiply by a negative number. Calculate $-3(4)$.

Correct answer: -12

Likely wrong answer: 12

Misconception: The student may not be secure with the sign rule for one negative factor.

Next move: Review signed multiplication before solving inequalities involving negative coefficients.

4. Read a comparison statement. Write the correct symbol: 8 is less than or equal to 12.

Correct answer: $8 \leq 12$

Likely wrong answer: $8 < 12$

Misconception: The student may understand “less than” but overlook “or equal to.”

Next move: Review that $\leq$ and $\geq$ include the boundary value.

Common Mistakes

Students often run into the same kinds of trouble with this topic. Recognizing these patterns helps avoid them.

Mistake 1: Forgetting to reverse the inequality after dividing by a negative

What students do: Solving $-4x \geq 20$ and writing $x \geq -5$

Why this happens: The student divides correctly but treats the inequality like an equation. Negative multiplication reverses order on a number line.

What to do instead: Divide by -4 and reverse the symbol: $x \leq -5$.

Diagnostic trigger: Student divides by a negative coefficient but keeps the original inequality symbol.

Mistake 2: Graphing the boundary or direction incorrectly

What students do: Graphing $x < 3$ with a closed circle at 3, or graphing $x \leq -2$ with an arrow to the right.

Why this happens: The student may identify the boundary value but not test whether it is included, or may point the arrow without thinking about values that satisfy the inequality.

What to do instead: Test the boundary and one value from each side. For $x < 3$, 3 does not work, while 2 works. Use an open circle and arrow left.

Diagnostic trigger: The graph includes a value that fails the inequality or excludes a value that satisfies it.

Mistake 3: Treating an inequality as one answer

What students do: Solving $x > 5$ and writing $x = 6$

Why this happens: The student is used to equations producing one numerical solution.

What to do instead: Describe the complete solution range. $x > 5$ includes 6, 7, 8, and every number greater than 5.

Diagnostic trigger: Student gives one sample value instead of the full solution set.

Mistake 4: Ignoring the context after solving

What students do: Solving $12.50p > 500$ and writing $p > 40$ without stating how many products must be sold.

Why this happens: The student stops after the algebraic step and does not interpret what the variable represents.

What to do instead: If p counts whole products, the minimum whole number greater than 40 is 41.

Diagnostic trigger: Application answer gives only the algebraic inequality and omits the real-world interpretation.

Practice

TEACHING NOTE

Practice items are grouped by skill (A-C) so a teacher can assign a subset for targeted review rather than the full set.

Teacher solutions follow this practice set.

1. A. Symbols and Graphs

2. Write in words: $x < 6$ (Hint: read the inequality from left to right.)
3. Write in symbols: n is at least -3 . (Hint: “At least” includes the boundary.)
4. Describe the graph of: $q \leq -1$ (Hint: decide whether -1 is included, then decide which direction contains values less than -1 .)

5. B. Solve and Graph

6. Solve and graph: $x - 5 > 2$ (Hint: add 5 to both sides.)
7. Solve and graph: $-2r < 8$ (Hint: divide by -2 and reverse the symbol.)
8. Solve and graph: $2x + 3 \leq 11$ (Hint: subtract 3 first, then divide by 2.)
9. Solve and graph: $-3y - 4 > 5$ (Hint: add 4 first. Then divide by -3 and reverse the symbol.)
10. Solve and graph: $4a - 2 \geq 2a + 6$ (Hint: collect the variable terms before dividing.)

11. C. Applications

12. A student needs at least 40 volunteer hours. The student already has 14 hours and earns 3 hours each week. Write and solve an inequality for the number of weeks needed. (Hint: let w represent the number of weeks.)
13. A box can hold at most 30 kg. Each book weighs 1.5 kg. Write and solve an inequality for the maximum number of books. (Hint: let b represent the number of books.)
14. A company must earn more than \$500. Each product sells for \$12.50. Write and solve an inequality for the minimum whole number of products it must sell. (Hint: let p represent the number of products.)
15. A student solves $-5x \leq 15$ and writes $x \leq -3$. Find the error, write the correct solution, and describe the graph. (Hint: check whether the symbol must reverse.)

Practice Solutions

Use these concise solutions to check the method as well as the final answer.

2. Write in words: $x < 6$ (Hint: read the inequality from left to right.)

Solution: The symbol $<$ means 'is less than,' so $x < 6$ reads 'x is less than 6.'

3. Write in symbols: n is at least -3. (Hint: "At least" includes the boundary.)

Solution: 'At least -3' includes -3 and all greater values: $n \geq -3$.

4. Describe the graph of: $q \leq -1$ (Hint: decide whether -1 is included, then decide which direction contains values less than -1.)

Solution: For $q \leq -1$, use a closed circle at -1 and shade or draw the arrow left.

6. Solve and graph: $x - 5 > 2$ (Hint: add 5 to both sides.)

Solution: $x - 5 > 2$; add 5: $x > 7$. Use an open circle at 7 and shade right.

7. Solve and graph: $-2r < 8$ (Hint: divide by -2 and reverse the symbol.)

Solution: $-2r < 8$; divide by -2 and reverse the symbol: $r > -4$.

8. Solve and graph: $2x + 3 \leq 11$ (Hint: subtract 3 first, then divide by 2.)

Solution: $2x + 3 \leq 11$; $2x \leq 8$; $x \leq 4$.

9. Solve and graph: $-3y - 4 > 5$ (Hint: add 4 first. Then divide by -3 and reverse the symbol.)

Solution: $-3y - 4 > 5$; $-3y > 9$; divide by -3 and reverse: $y < -3$.

10. Solve and graph: $4a - 2 \geq 2a + 6$ (Hint: collect the variable terms before dividing.)

Solution: $4a - 2 \geq 2a + 6$; $2a \geq 8$; $a \geq 4$.

12. A student needs at least 40 volunteer hours. The student already has 14 hours and earns 3 hours each week. Write and solve an inequality for the number of weeks needed. (Hint: let w represent the number of weeks.)

Solution: $14 + 3w \geq 40$; $3w \geq 26$; $w \geq 26/3$. The minimum whole number is 9 weeks.

13. A box can hold at most 30 kg. Each book weighs 1.5 kg. Write and solve an inequality for the maximum number of books. (Hint: let b represent the number of books.)

Solution: $1.5b \leq 30$; divide by 1.5: $b \leq 20$. The box holds at most 20 books.

14. A company must earn more than \$500. Each product sells for \$12.50. Write and solve an inequality for the minimum whole number of products it must sell. (Hint: let p represent the number of products.)

Solution: $\$12.50p > \$500$; $p > 40$. The minimum whole number is 41 products.

15. A student solves $-5x \leq 15$ and writes $x \leq -3$. Find the error, write the correct solution, and describe the graph. (Hint: check whether the symbol must reverse.)

Solution: Dividing $-5x \leq 15$ by -5 reverses the symbol: $x \geq -3$; closed circle at -3 , arrow right.

Tripwire Check

These questions test whether the thinking is solid — not just whether the procedure was memorized. Each wrong answer below points to a specific misconception, not just "try again."

1. Does Dividing by a Negative Reverse the Range? A student solves $-3x+1 \geq 7$ as follows: $-3x \geq 6$, $x \geq -2$. Is the student correct? Explain the error, write the correct solution, and describe the graph.

Correct answer: Dividing by -3 requires reversing the symbol, so $x \leq -2$. Closed circle at -2 , arrow left.

Likely wrong answer: $x \geq -2$

Misconception: The student may solve the arithmetic correctly but treat negative division as though it does not change order.

Next move: Test $x=0$, then test $x=-3$ in the original inequality.

2. What Does the Graph Actually Include? A student graphs $x > 4$ with a closed circle at 4 and an arrow to the right. Is the graph correct? Explain whether 4 belongs to the solution set, then describe the correct graph.

Correct answer: The graph is not correct. $4 > 4$ is false, so use an open circle at 4 and an arrow right.

Likely wrong answer: Closed circle at 4, arrow right.

Misconception: The student may recognize direction but not distinguish $>$ from $\geq$.

Next move: Test the boundary value directly before choosing the circle.

Answer Key — Worksheets (Full Diagnostic)

Worksheet A: Guided Practice

1. Write in words: $x > 7$

1. x is greater than 7
Likely wrong answer: 7 is greater than x (reads the symbol in the wrong direction).
Misconception: The inequality is read right to left instead of left to right.

2. Describe the graph of: $p < 3$

2. Open circle at 3, arrow left Likely wrong answer: Closed circle at 3, arrow left.

Misconception: A strict inequality is graphed with a closed circle, including the boundary it should exclude.

3. Solve and graph: $x + 4 > 9$

3. $x > 5$ Likely wrong answer: $x > 13$ (adds 4 instead of subtracting). Misconception: The inverse of addition is applied as addition again instead of subtraction.

4. Solve and graph: $3s \geq 12$

4. $s \geq 4$ Likely wrong answer: $s \leq 4$ written with the wrong direction after dividing by a positive. Misconception: The inequality symbol is flipped even though the divisor is positive.

5. Solve and graph: $-2t < 10$

5. $t > -5$ Likely wrong answer: $t < -5$ (divides by a negative without reversing the symbol). Misconception: The inequality symbol is not flipped when dividing by a negative number.

6. A student needs at least 200 points. The student already has 75 points and earns 15 points each hour. Write and solve an inequality for the number of hours needed.

6. $75 + 15h \geq 200$, so $h \geq 25/3$; minimum 9 hours Likely wrong answer: $75 + 15h \geq 20$ (loses track of which number is the target total). Misconception: The target total and the starting amount are assigned to the wrong parts of the inequality.

7. List three values that satisfy: $n \leq -2$

7. Examples: -2, -3, -10 Likely wrong answer: -1, 0, 1 (excludes -2 and picks values on the wrong side). Misconception: Values greater than -2 are listed instead of values less than or equal to -2.

8. Write in symbols: m is no more than 4.

8. $m \leq 4$ Likely wrong answer: $m < 4$ (excludes the boundary that 'no more than' includes). Misconception: 'No more than' is treated as a strict inequality instead of one that includes the boundary.

9. Describe the graph of: $q \geq -5$

9. Closed circle at -5, arrow right Likely wrong answer: Open circle at -5, arrow right. Misconception: An inclusive inequality is graphed with an open circle, excluding the boundary it should include.

10. Solve and graph: $r-6 \leq 2$

10. $r \leq 8$ Likely wrong answer: $r \geq 2$ (subtracts 6 instead of adding). Misconception: The inverse of subtraction is applied as subtraction again instead of addition.

11. Solve and graph: $2x-3 \leq 7$

11. $x \leq 5$ Likely wrong answer: $x \leq 2$ (subtracts 3 before dividing, in the wrong order). Misconception: The operations are undone in the order they were applied instead of reverse order.

12. Solve and graph: $-3y+2 > 11$

12. $y < -3$ Likely wrong answer: $y > -3$ (divides by -3 without reversing the symbol). Misconception: The inequality symbol is not flipped when dividing by a negative number.

13. Check whether $x=4$ is a solution to $2x-3 > 5$

13. No. $2(4)-3 > 5$ becomes $5 > 5$, which is false. Likely wrong answer: Yes (computes $2(4)-3$ but doesn't compare $5 > 5$ correctly). Misconception: A boundary value that makes both sides equal is mistaken for satisfying a strict inequality.

14. A package costs \$1.20 to mail plus \$0.05 per gram. You have \$3.20. Write and solve an inequality for the maximum number of grams.

14. $1.20+0.05g \leq 3.20$, so $g \leq 40$ grams Likely wrong answer: $1.20g+0.05 \leq 3.20$ (assigns the flat cost and per-gram rate to the wrong terms). Misconception: The flat cost and per-unit rate are assigned to the wrong parts of the inequality.

15. Explain what “at least” means in an inequality. Give one example.

15. At least means greater than or equal to; boundary included. Example: $x \geq 10$. Likely wrong answer: says the boundary is excluded. Misconception: ‘At least’ is treated as excluding its own boundary value instead of including it.

Worksheet B: Independent Practice

1. Solve and graph: $-4n \geq -20$

1. $n \leq 5$ Likely wrong answer: $n \geq -5$ (divides by -4 without reversing the symbol, and mishandles the sign). Misconception: The inequality symbol is not flipped when dividing by a negative number.

2. A box can hold at most 40 kg. Each item weighs 2.5 kg. Write and solve an inequality for the maximum number of items.

2. $2.5i \leq 40$, so $i \leq 16$ items Likely wrong answer: $2.5i \geq 40$ solved backwards as $i \geq 16$ with wrong direction reasoning. Misconception: The direction of the inequality is not checked against what 'at most' requires.

3. Solve and graph: $x - 7 < -3$

3. $x < 4$ Likely wrong answer: $x < -10$ (adds 7 instead of subtracting, or subtracts in the wrong direction). Misconception: The inverse of subtraction is applied incorrectly, changing the sign of the result.

4. Solve and graph: $-m > 5$

4. $m < -5$ Likely wrong answer: $m > -5$ (divides by -1 without reversing the symbol). Misconception: The inequality symbol is not flipped when dividing by a negative number.

5. A scholarship requires an average of at least 75 and at most 90. A student scores 88, 72, and 91. Does the student qualify?

5. $251 \div 3 \approx 83.67$; qualifies Likely wrong answer: adds the three scores and compares to 75 and 90 directly, without dividing by 3. Misconception: The average is not computed; the sum is compared to the range as if it were the average.

6. Solve and graph: $s \div 3 + 2 > 6$

6. $s > 12$ Likely wrong answer: $s > 24$ (multiplies by 3 before subtracting 2, in the wrong order). Misconception: The operations are undone in the order they were applied instead of reverse order.

7. Solve and graph: $7 - 2y > 15$

7. $y < -4$ Likely wrong answer: $y > -4$ (divides by -2 without reversing the symbol). Misconception: The inequality symbol is not flipped when dividing by a negative number.

8. Solve and graph: $4p - 3 \geq 2p + 5$

8. $p \geq 4$ Likely wrong answer: $p \geq 4$ found correctly but direction flipped anyway out of habit. Misconception: The symbol is reversed even though no negative multiplication or division occurred.

9. A student's grade average must be above 75 to pass. Scores are 68, 72, and 80. What score is needed on a fourth test?

9. $x > 80$; minimum whole score 81 Likely wrong answer: uses $\geq$ instead of $>$ for the fourth score, missing the boundary exclusion. Misconception: 'Above' is treated as inclusive instead of strict.

10. Write and graph a compound inequality for: x is greater than or equal to 1 and less than 6.

10. $1 \leq x < 6$ Likely wrong answer: $1 \leq x < 6$ written with both boundaries treated the same way. Misconception: The two different inequality symbols in a compound statement are not kept distinct.

11. Solve and graph: $2(3x-4) > 10$

11. $x > 3$ Likely wrong answer: $x > 7$ (distributes 2 across only $3x$, not the -4). Misconception: The multiplier is not distributed to every term inside the bracket before solving.

12. Solve and graph: $t \div (-4) - 1 \geq 3$

12. $t \leq -16$ Likely wrong answer: $t \geq -16$ (divides by -4 without reversing the symbol). Misconception: The inequality symbol is not flipped when dividing by a negative number.

13. Solve and graph: $-2r - 5 \leq 9$

13. $r \geq -7$ Likely wrong answer: $r \leq -7$ (divides by -2 without reversing the symbol). Misconception: The inequality symbol is not flipped when dividing by a negative number.

14. Solve and graph: $5x + 2 \leq 17$

14. $x \leq 3$ Likely wrong answer: $x \leq 3$ found correctly but direction flipped anyway out of habit. Misconception: The symbol is reversed even though no negative multiplication or division occurred.

15. Solve and graph: $3x + 4 < 5x - 6$

15. $x > 5$ Likely wrong answer: $x < 5$ (subtracts $5x$ from both sides instead of $3x$, mishandling the sign). Misconception: The smaller variable term is not the one chosen to eliminate, leading to a sign error.

16. A rectangular sign has a length of 12 cm and a width of $(3x-2)$ cm. Its perimeter must be less than 50 cm. Write and solve an inequality for x .

16. $2(12+3x-2) < 50$, so $x < 5$ Likely wrong answer: $12+3x-2 < 50$ (forgets to double both dimensions for perimeter). Misconception: Perimeter is built from one length and one width instead of two of each.

17. List three values that satisfy $x > -4$ and three values that do not satisfy it.

17. Satisfy: -3, 0, 4. Do not: -4, -5, -10. Likely wrong answer: lists -4 as satisfying $x > -4$. Misconception: A strict inequality's boundary value is treated as satisfying the inequality.

18. Write an inequality for: Three times a number decreased by 4 is at most 17. Then solve and graph.

18. $3x-4 \leq 17$, so $x \leq 7$ Likely wrong answer: $3x-4 \geq 17$ solved with the inequality symbol flipped unnecessarily. Misconception: The symbol is reversed even though no negative multiplication or division occurred.

19. A student solves $-6x \leq 18$ and writes $x \leq -3$. Identify the error and write the correct solution.

19. The symbol reverses. $x \geq -3$. Likely wrong answer: (already given) $x \leq -3$. Misconception: The inequality symbol is not flipped when dividing by a negative number.

20. Solve and graph: $5-2(x+3) \leq 11$

20. $x \geq -6$ Likely wrong answer: $x \leq -6$ (distributes -2 incorrectly, mishandling the sign on the second term). Misconception: The multiplier's sign is not carried to every term inside the bracket.

Worksheet C: Mixed Application

1. A ride requires a height of at least 132 cm. Marcus is 120 cm tall. Write and solve an inequality for how many centimetres he needs to grow.

1. $120+c\geq 132$, so $c\geq 12$ cm Likely wrong answer: $132+c\geq 120$ (assigns the target and starting height to the wrong parts). Misconception: The target value and the starting value are assigned to the wrong parts of the inequality.

2. A company needs total revenue of more than \$500. Each product sells for \$12.50. Write and solve an inequality for the minimum whole number of products to sell.

2. $p>40$; minimum 41 products Likely wrong answer: $p\geq 40$ (includes the boundary that a strict 'more than' excludes). Misconception: A strict inequality is treated as inclusive, changing which whole number is the true minimum.

3. A scholarship requires an average from 75 to 90 inclusive. A student scores 88, 72, and 91. Does the student qualify? Show the average and compare it to the required range.

3. $251\div 3\approx 83.67$; qualifies Likely wrong answer: computes the sum only and compares it to 75 and 90 directly. Misconception: The average is not computed; the sum is compared to the range as if it were the average.

4. A student solves $-6x\geq 18$ and writes $x\geq -3$. Is the student correct? If not, find the error and solve correctly.

4. Incorrect. $x\leq -3$. Likely wrong answer: agrees $x\geq -3$ is correct. Misconception: The inequality symbol is not flipped when dividing by a negative number, and the proposed solution is accepted without checking.

5. A student must earn an average above 75 on four tests. Scores so far are 68, 72, and 80. What score is needed on the fourth test?

5. $x>80$; minimum whole score 81 Likely wrong answer: uses $\geq$ instead of $>$ for the fourth score, missing the boundary exclusion. Misconception: 'Above' is treated as inclusive instead of strict.

6. A triangle has side lengths 8 cm, 9 cm, and $2x+1$ cm. Its perimeter must be less than 30 cm. Write and solve an inequality for x .

6. $x<6$ Likely wrong answer: forgets to add all three sides before setting the sum less than 30. Misconception: Not all given side lengths are included in the perimeter expression.

7. Write and solve an inequality for: A number x multiplied by 3 is at most 12.

7. $x \leq 4$ Likely wrong answer: $x \geq 4$ written with the direction flipped unnecessarily. Misconception: The symbol is reversed even though no negative multiplication or division occurred.

8. Solve, graph, and verify with one value from the solution region: $3x - 2 > 2x + 1$

8. $x > 3$ Likely wrong answer: $x > -3$ (subtracts $3x$ from both sides instead of $2x$, mishandling the sign). Misconception: The smaller variable term is not the one chosen to eliminate, leading to a sign error.

9. A freight elevator can carry at most 900 kg. A shipment already weighs 240 kg. Each crate added weighs 55 kg. Write and solve an inequality for the maximum number of crates c that can be added. Include a sentence answer.

9. $240 + 55c \leq 900$, so $c \leq 12$ crates Likely wrong answer: $240 + 55c \geq 900$ (reverses which direction the capacity limit points). Misconception: A maximum-capacity situation is modeled with $\geq$ instead of $\leq$.

10. A school fundraiser has already collected \$180. Each additional coupon book sold adds \$14. The school wants to collect at least \$600. Write and solve an inequality for the number of additional coupon books b that must be sold. Include a sentence answer.

10. $180 + 14b \geq 600$, so $b \geq 30$ coupon books Likely wrong answer: $180 + 14b \leq 600$ (reverses which direction the fundraising goal points). Misconception: A minimum-target situation is modeled with $\leq$ instead of $\geq$.

11. Write and graph a compound inequality for: x is no more than 5 and at least 3.

11. $3 \leq x \leq 5$ Likely wrong answer: $3 \leq x < 5$ written with one boundary excluded incorrectly. Misconception: 'No more than' and 'at least' are not both translated as inclusive boundaries.

12. Explain with a numerical example why the inequality symbol flips when both sides are multiplied by a negative number.

12. $2 < 5$ becomes $-2 > -5$ after multiplying by -1 Likely wrong answer: gives an example where both sides stay positive, so the flip is never actually shown. Misconception: The example chosen does not involve a negative multiplier, so it fails to demonstrate why the symbol flips.

13. Solve, graph, and check: $-2(x-4) < 6$

13. $x > 1$ Likely wrong answer: $x < 1$ (distributes -2 incorrectly, mishandling the sign on the second term). Misconception: The multiplier's sign is not carried to every term inside the bracket.

14. Non-Routine: A student graphs $x \leq 2$ with an open circle at 2 and an arrow to the left. The student explains, "The arrow is correct because the values are less than 2." Is the graph complete and correct? Explain whether 2 belongs to the solution set, then describe the corrected graph. Use a value check to support the explanation.

14. Correct answer: The graph is not complete and correct. The arrow direction is correct, but the circle must be closed because $x \leq 2$ includes 2. Check: $2 \leq 2$ is true. Correct graph: closed circle at 2, arrow left. Likely wrong answer: Open circle at 2, arrow left. Misconception: The student may identify direction but not distinguish $\leq$ from $<$. Next move: Test the boundary value directly. If it makes the inequality true, the circle is closed.

15. Non-Routine: A student says that $-3 \leq x \leq 4$ means x can be any number less than 4, so -10 is a solution. Is the student correct? Explain what both parts of the compound inequality require. Give one value that works and one value that does not work. Then describe the graph.

15. Correct answer: The student is not correct. $-3 \leq x \leq 4$ means $x \geq -3$ and $x \leq 4$. A solution must satisfy both conditions. -10 fails because $-10 \geq -3$ is false. A value that works is 0. A value that does not work is 5. Graph: closed circle at -3 , closed circle at 4 , shading between. Likely wrong answer: Any value less than 4 works. Misconception: The student may read only one condition and ignore the lower boundary. Next move: Split the compound inequality into two conditions and identify values that satisfy both.

Answer Key — Exit Ticket

1. $x \leq 5$; closed circle 5, arrow left
2. $m < -3$; open circle -3 , arrow left
3. $-2 \leq y \leq 6$

Worksheet 1: Guided Practice

1. x is greater than 7
2. Open circle at 3, arrow left
3. $x > 5$

4. $s \geq 4$
5. $t > -5$
6. $75 + 15h \geq 200$, so $h \geq 25/3$; minimum 9 hours
7. Examples: -2, -3, -10
8. $m \leq 4$
9. Closed circle at -5, arrow right
10. $r \leq 8$
11. $x \leq 5$
12. $y < -3$
13. No. $2(4) - 3 > 5$ becomes $5 > 5$, which is false.
14. $1.20 + 0.05g \leq 3.20$, so $g \leq 40$ grams
15. At least means greater than or equal to; boundary included. Example: $x \geq 10$.

Worksheet 2: Independent Practice

1. $n \leq 5$
2. $2.5i \leq 40$, so $i \leq 16$ items
3. $x < 4$
4. $m < -5$
5. $251 \div 3 \approx 83.67$; qualifies
6. $s > 12$
7. $y < -4$
8. $p \geq 4$
9. $x > 80$; minimum whole score 81
10. $1 \leq x < 6$
11. $x > 3$
12. $t \leq -16$
13. $r \geq -7$
14. $x \leq 3$
15. $x > 5$
16. $2(12 + 3x - 2) < 50$, so $x < 5$
17. Satisfy: -3, 0, 4. Do not: -4, -5, -10.
18. $3x - 4 \leq 17$, so $x \leq 7$

19. The symbol reverses. $x \geq -3$.

20. $x \geq -6$

Worksheet 3: Mixed Practice & Application

Item 14 (Non-Routine)

Correct answer: The graph is not complete and correct. The arrow direction is correct, but the circle must be closed because $x \leq 2$ includes 2. Check: $2 \leq 2$ is true. Correct graph: closed circle at 2, arrow left.

Likely wrong answer: Open circle at 2, arrow left.

Misconception: The student may identify direction but not distinguish $\leq$ from $<$.

Next move: Test the boundary value directly. If it makes the inequality true, the circle is closed.

Item 15 (Non-Routine)

Correct answer: The student is not correct. $-3 \leq x \leq 4$ means $x \geq -3$ and $x \leq 4$. A solution must satisfy both conditions. -10 fails because $-10 \geq -3$ is false. A value that works is 0. A value that does not work is 5. Graph: closed circle at -3, closed circle at 4, shading between.

Likely wrong answer: Any value less than 4 works.

Misconception: The student may read only one condition and ignore the lower boundary.

Next move: Split the compound inequality into two conditions and identify values that satisfy both.

1. $120 + c \geq 132$, so $c \geq 12$ cm
2. $p > 40$; minimum 41 products
3. $251 \div 3 \approx 83.67$; qualifies
4. Incorrect. $x \leq -3$.
5. $x > 80$; minimum whole score 81
6. $x < 6$
7. $x \leq 4$
8. $x > 3$
9. $240 + 55c \leq 900$, so $c \leq 12$ crates
10. $180 + 14b \geq 600$, so $b \geq 30$ coupon books
11. $3 \leq x \leq 5$
12. $2 < 5$ becomes $-2 > -5$ after multiplying by -1
13. $x > 1$
14. (see diagnostic above)
15. (see diagnostic above)