Writing and Graphing One-Variable Inequalities: Phrase to Number Line

Original tasks 1, 2, 3 / complete keys

Task 1

Translate and solve: five more than a number is less than twelve. Graph the solution on a number line.

Answer: $n + 5 < 12$, so $n < 7$. Graph an open circle at 7 with an arrow to the left.

Reason: Five more than a number is $n + 5$. Less than twelve gives $n + 5 < 12$. Subtract 5 from both sides to get $n < 7$. Because the symbol is strict, the circle at 7 is open, and values less than 7 lie to the left.

Check: Test $n = 0$: $0 + 5 = 5$, and $5 < 12$ is true, so the left arrow is correct. Test the boundary $n = 7$: $7 + 5 = 12$, and $12 < 12$ is false, so the open circle is correct.

Task 2

Translate and solve: three times a number is at least negative nine. Graph the solution on a number line.

Answer: $3n \geq -9$, so $n \geq -3$. Graph a closed circle at -3 with an arrow to the right.

Reason: Three times a number is $3n$. At least negative nine means greater than or equal to -9, so $3n \geq -9$. Divide both sides by 3, which is positive, so the symbol stays the same: $n \geq -3$. The boundary is included, so the circle is closed, and values greater than -3 lie to the right.

Check: Test $n = 0$: $3(0) = 0$, and $0 \geq -9$ is true, so the right arrow is correct. Test the boundary $n = -3$: $3(-3) = -9$, and $-9 \geq -9$ is true, so the closed circle is correct.

Task 3

Translate and solve: negative two times a number is greater than eight. Graph the solution on a number line.

Answer: $-2n > 8$, so $n < -4$. Graph an open circle at -4 with an arrow to the left.

Reason: Negative two times a number is $-2n$. Greater than eight gives $-2n > 8$. Divide both sides by -2 and reverse the symbol: $n < -4$. The strict symbol means an open circle at -4, and values less than -4 lie to the left.

Check: Test $n = -5$: $-2(-5) = 10$, and $10 > 8$ is true, so the left arrow is correct. Test the boundary $n = -4$: $-2(-4) = 8$, and $8 > 8$ is false, so the open circle is correct.

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Original tasks 4 / complete keys

Task 4

Translate and solve: a number divided by four is no more than two. Graph the solution on a number line.

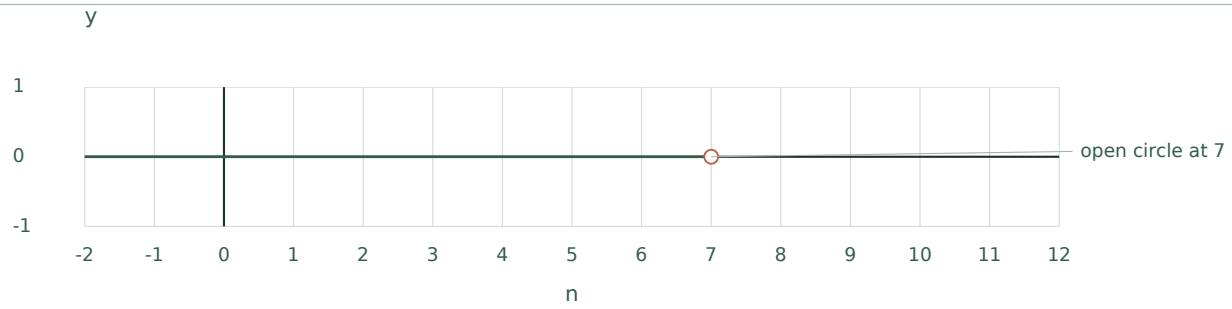
Answer: $n/4 \leq 2$, so $n \leq 8$. Graph a closed circle at 8 with an arrow to the left.

Reason: A number divided by four is $n/4$. No more than two means less than or equal to 2, so $n/4 \leq 2$. Multiply both sides by 4, which is positive, so the symbol stays the same: $n \leq 8$. The boundary is included, so the circle is closed, and values less than 8 lie to the left.

Check: Test $n = 0$: $0/4 = 0$, and $0 \leq 2$ is true, so the left arrow is correct. Test the boundary $n = 8$: $8/4 = 2$, and $2 \leq 2$ is true, so the closed circle is correct.

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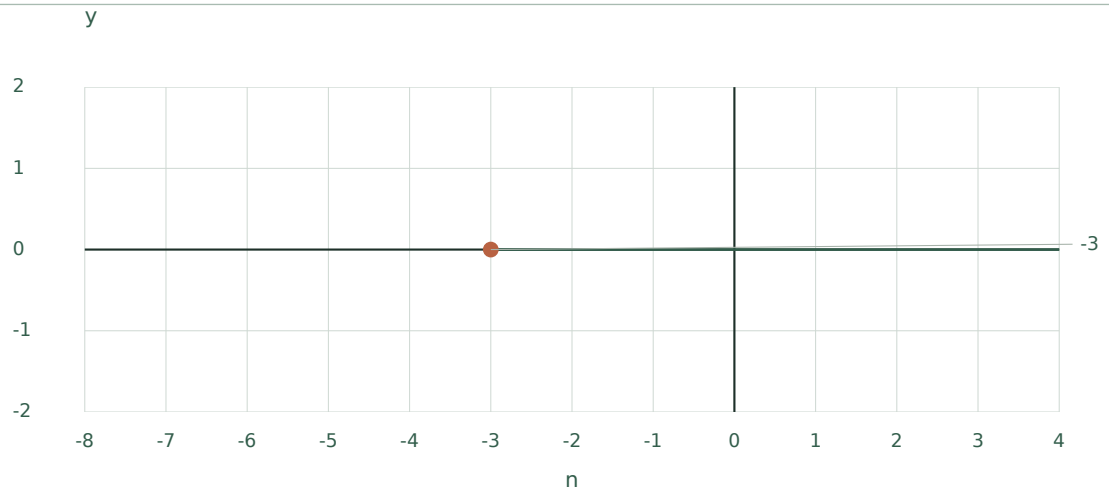
Solution graph for n < 7 on a number line



Open circle at 7; arrow points left to show n < 7. Coordinate labels sit outside the plot; thin grey leaders are annotations, not function curves.

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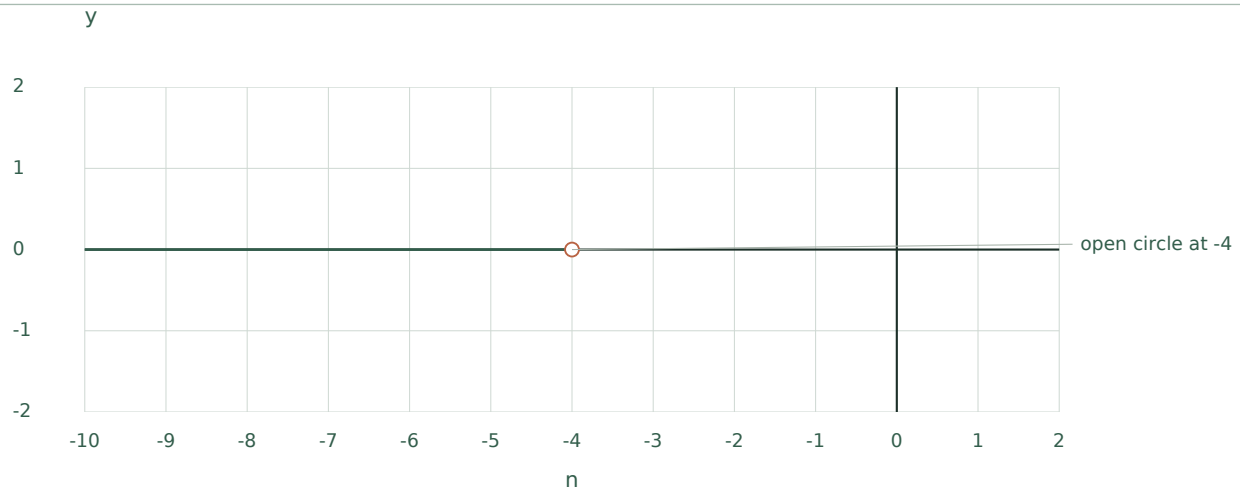
Solution graph for n ≥ -3



Closed circle at -3 with arrow to the right. Coordinate labels sit outside the plot; thin grey leaders are annotations, not function curves.

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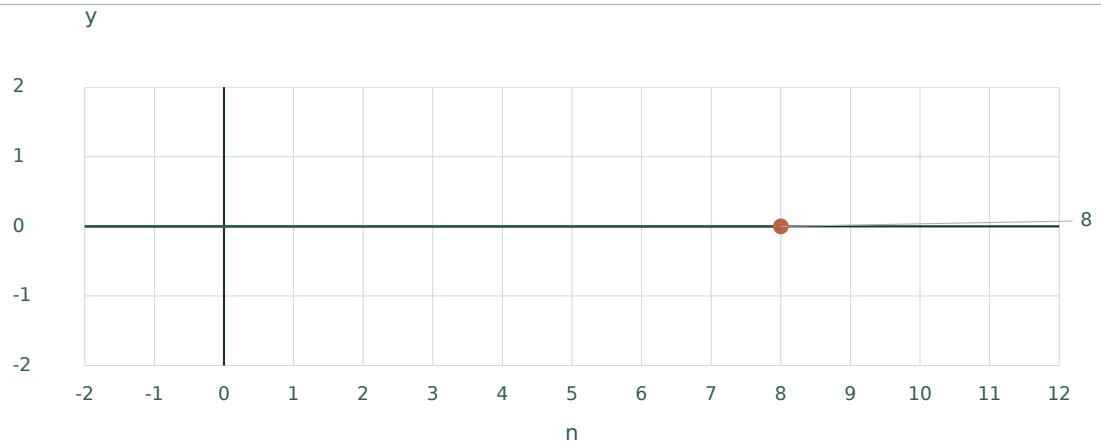
Solution graph for n < -4



Open circle at -4 with arrow to the left. Coordinate labels sit outside the plot; thin grey leaders are annotations, not function curves.

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Solution graph for n ≤ 8



Closed circle at 8 with arrow to the left. Coordinate labels sit outside the plot; thin grey leaders are annotations, not function curves.

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Source rubric / reflection

- [ ] Variable is defined in words before symbols are used.
- [ ] Inequality correctly matches the comparison phrase, including strict versus inclusive wording.
- [ ] Solution is obtained with valid inverse operations and the symbol is reversed only when multiplying or dividing by a negative.
- [ ] Number line has evenly spaced, labeled tick marks covering the boundary value.
- [ ] Circle type matches the inequality symbol: open for $<$ or $>$, closed for $\leq$ or $\geq$.
- [ ] Arrow direction matches the solution set and is confirmed by at least one test value.
- [ ] Handwriting and circle style may vary; any clearly drawn circle and arrow following the stated convention is accepted.

Reflection: What did you check, what did you change, and what will you try next?