

Graphing Inequalities on a Number Line

Name: _____ Date: _____ Score: _____ / 24

Q Quick Review

To **graph an inequality** on a number line, you mark the boundary number and then shade every value that makes the inequality true. Use an **open circle** for $<$ or $>$ — the boundary number itself is *not* included. Use a **closed (filled) circle** for \leq or \geq — the boundary number *is* included. Then shade and draw an **arrow**: shade to the **right** for “greater than” and to the **left** for “less than.” The shaded part shows every number that is a solution.

◊ **Example:** Describe the graph of $x \geq 3$ on a number line.

⇒ First we find the boundary number, which is 3. Because the symbol is \geq — “greater than or equal to” — the number 3 *is* a solution, so we use a **closed (filled) circle** at 3. Next, “greater than” means we want numbers larger than 3, so we shade to the **right** of 3 and draw an arrow pointing right. The graph shows 3 and everything above it.

Answer: closed circle at 3, shaded right

PRACTICE

Describe the graph of each inequality: circle type and shading direction.

- | | | | |
|----------------|-------|--|-------|
| 1. $x > 5$ | _____ | 11. $x < 15$ | _____ |
| 2. $x < 2$ | _____ | 12. $x \geq 9$ | _____ |
| 3. $x \geq 7$ | _____ | 13. Is 5 a solution of $x > 3$? | _____ |
| 4. $x \leq 4$ | _____ | 14. Is 3 a solution of $x > 3$? | _____ |
| 5. $x > 0$ | _____ | 15. Is 4 a solution of $x \leq 4$? | _____ |
| 6. $x \leq 10$ | _____ | 16. Is 7 a solution of $x < 2$? | _____ |
| 7. $x < 8$ | _____ | 17. $x > 20$ | _____ |
| 8. $x \geq 1$ | _____ | 18. $x \leq 0$ | _____ |
| 9. $x > 12$ | _____ | 19. $x \geq 25$ | _____ |
| 10. $x \leq 6$ | _____ | 20. Smallest whole-number solution of $x \geq 6$ | _____ |

◆ Word Problems

21. A sign says “ $x \leq 30$ mph.” On a number line, what kind of circle goes at 30 and which way is the shading? _____
22. A game needs more than 4 players, so $p > 4$. Describe its graph, and tell whether exactly 4 players is allowed. _____
23. To enter a contest you must be at least 8 years old, so $a \geq 8$. Describe its graph, and tell whether an 8-year-old can enter. _____
24. A budget allows fewer than 50 dollars of spending, so $c < 50$. Describe its graph, and tell whether spending exactly 50 dollars fits the budget. _____



Answer Keys

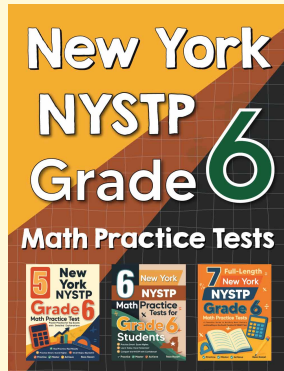
- | | |
|--------------------------------------|--|
| 1. open circle at 5, shaded right | 13. yes |
| 2. open circle at 2, shaded left | 14. no |
| 3. closed circle at 7, shaded right | 15. yes |
| 4. closed circle at 4, shaded left | 16. no |
| 5. open circle at 0, shaded right | 17. open circle at 20, shaded right |
| 6. closed circle at 10, shaded left | 18. closed circle at 0, shaded left |
| 7. open circle at 8, shaded left | 19. closed circle at 25, shaded right |
| 8. closed circle at 1, shaded right | 20. 6 |
| 9. open circle at 12, shaded right | 21. Closed circle at 30, shaded left |
| 10. closed circle at 6, shaded left | 22. Open circle at 4, shaded right; 4 is not allowed |
| 11. open circle at 15, shaded left | 23. Closed circle at 8, shaded right; yes, age 8 can enter |
| 12. closed circle at 9, shaded right | 24. Open circle at 50, shaded left; 50 does not fit |

Step-by-Step Explanations

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| <p>1. The symbol $>$ uses an open circle, and "greater than" shades right.</p> <p>2. The symbol $<$ uses an open circle, and "less than" shades left.</p> <p>3. The symbol \geq uses a closed circle, and "greater than" shades right.</p> <p>4. The symbol \leq uses a closed circle, and "less than" shades left.</p> <p>5. Open circle at 0 because of $>$, shaded right for "greater than."</p> <p>6. Closed circle at 10 because of \leq, shaded left for "less than."</p> <p>7. Open circle at 8 because of $<$, shaded left for "less than."</p> <p>8. Closed circle at 1 because of \geq, shaded right.</p> <p>9. Open circle at 12 for $>$, shaded right for "greater than."</p> <p>10. Closed circle at 6 for \leq, shaded left for "less than."</p> <p>11. Open circle at 15 for $<$, shaded left.</p> <p>12. Closed circle at 9 for \geq, shaded right.</p> <p>13. Since $5 > 3$ is true, 5 is a solution and would be in the shaded region.</p> <p>14. Since $3 > 3$ is false (with an open circle), 3 is not a solution.</p> | <p>15. Since $4 \leq 4$ is true (closed circle includes it), 4 is a solution.</p> <p>16. Since $7 < 2$ is false, 7 is not a solution.</p> <p>17. Open circle at 20 for $>$, shaded right.</p> <p>18. Closed circle at 0 for \leq, shaded left.</p> <p>19. Closed circle at 25 for \geq, shaded right.</p> <p>20. With \geq, the boundary 6 is included, so the smallest whole-number solution is 6.</p> <p>21. The symbol \leq includes 30, so the circle is closed. "Less than" shades left, toward slower speeds.</p> <p>22. The symbol $>$ uses an open circle, so 4 itself is not included. Shading goes right toward 5, 6, 7, . . .</p> <p>23. The symbol \geq uses a closed circle, so 8 is included. An 8-year-old can enter, and shading goes right.</p> <p>24. The symbol $<$ uses an open circle, so 50 is not included. Shading goes left toward smaller amounts.</p> |
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