

# 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

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. open circle at 5, shaded right</li> <li>2. open circle at 2, shaded left</li> <li>3. closed circle at 7, shaded right</li> <li>4. closed circle at 4, shaded left</li> <li>5. open circle at 0, shaded right</li> <li>6. closed circle at 10, shaded left</li> <li>7. open circle at 8, shaded left</li> <li>8. closed circle at 1, shaded right</li> <li>9. open circle at 12, shaded right</li> <li>10. closed circle at 6, shaded left</li> <li>11. open circle at 15, shaded left</li> <li>12. closed circle at 9, shaded right</li> </ol> | <ol style="list-style-type: none"> <li>13. yes</li> <li>14. no</li> <li>15. yes</li> <li>16. no</li> <li>17. open circle at 20, shaded right</li> <li>18. closed circle at 0, shaded left</li> <li>19. closed circle at 25, shaded right</li> <li>20. 6</li> <li>21. Closed circle at 30, shaded left</li> <li>22. Open circle at 4, shaded right; 4 is not allowed</li> <li>23. Closed circle at 8, shaded right; yes, age 8 can enter</li> <li>24. Open circle at 50, shaded left; 50 does not fit</li> </ol> |
|--|---|

### Step-by-Step Explanations

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|---|---|
| <ol style="list-style-type: none"> <li>1. The symbol <math>&gt;</math> uses an open circle, and "greater than" shades right.</li> <li>2. The symbol <math>&lt;</math> uses an open circle, and "less than" shades left.</li> <li>3. The symbol <math>\geq</math> uses a closed circle, and "greater than" shades right.</li> <li>4. The symbol <math>\leq</math> uses a closed circle, and "less than" shades left.</li> <li>5. Open circle at 0 because of <math>&gt;</math>, shaded right for "greater than."</li> <li>6. Closed circle at 10 because of <math>\leq</math>, shaded left for "less than."</li> <li>7. Open circle at 8 because of <math>&lt;</math>, shaded left for "less than."</li> <li>8. Closed circle at 1 because of <math>\geq</math>, shaded right.</li> <li>9. Open circle at 12 for <math>&gt;</math>, shaded right for "greater than."</li> <li>10. Closed circle at 6 for <math>\leq</math>, shaded left for "less than."</li> <li>11. Open circle at 15 for <math>&lt;</math>, shaded left.</li> <li>12. Closed circle at 9 for <math>\geq</math>, shaded right.</li> <li>13. Since <math>5 &gt; 3</math> is true, 5 is a solution and would be in the shaded region.</li> <li>14. Since <math>3 &gt; 3</math> is false (with an open circle), 3 is not a solution.</li> </ol> | <ol style="list-style-type: none"> <li>15. Since <math>4 \leq 4</math> is true (closed circle includes it), 4 is a solution.</li> <li>16. Since <math>7 &lt; 2</math> is false, 7 is not a solution.</li> <li>17. Open circle at 20 for <math>&gt;</math>, shaded right.</li> <li>18. Closed circle at 0 for <math>\leq</math>, shaded left.</li> <li>19. Closed circle at 25 for <math>\geq</math>, shaded right.</li> <li>20. With <math>\geq</math>, the boundary 6 is included, so the smallest whole-number solution is 6.</li> <li>21. The symbol <math>\leq</math> includes 30, so the circle is closed. "Less than" shades left, toward slower speeds.</li> <li>22. The symbol <math>&gt;</math> uses an open circle, so 4 itself is not included. Shading goes right toward 5, 6, 7, . . .</li> <li>23. The symbol <math>\geq</math> uses a closed circle, so 8 is included. An 8-year-old can enter, and shading goes right.</li> <li>24. The symbol <math>&lt;</math> uses an open circle, so 50 is not included. Shading goes left toward smaller amounts.</li> </ol> |
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