Graphing Inequalities on a Number Line

Name: _____	Date: _____	Score: _____ / 24

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. $x > 5$ _____

2. $x < 2$ _____

3. $x \geq 7$ _____

4. $x \leq 4$ _____

5. $x > 0$ _____

6. $x \leq 10$ _____

7. $x < 8$ _____

8. $x \geq 1$ _____

9. $x > 12$ _____

10. $x \leq 6$ _____

11. $x < 15$ _____

12. $x \geq 9$ _____

13. Is 5 a solution of $x > 3$? _____

14. Is 3 a solution of $x > 3$? _____

15. Is 4 a solution of $x \leq 4$? _____

16. Is 7 a solution of $x < 2$? _____

17. $x > 20$ _____

18. $x \leq 0$ _____

19. $x \geq 25$ _____

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

Step-by-Step Explanations

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

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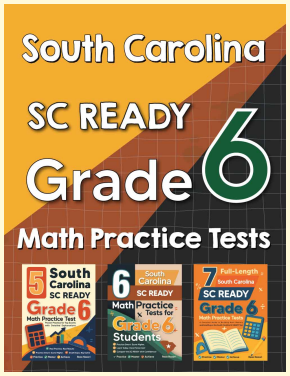

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