Graphing Solutions to Inequalities on a Number Line

Explore ideas and representations

Name _____ **Date** _____ **Score** _____ / 6

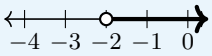
QUICK REVIEW

An open circle excludes the boundary; a closed circle includes it. For $x < 1$, use an open circle at 1 and shade left.

Worked example

Solve and graph $-3x + 1 < 7$.

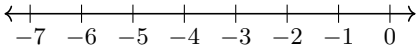
1. Subtract 1: $-3x < 6$.
2. Divide by -3 and reverse the comparison: $x > -2$.
3. At $x = -2$, $-3(-2) + 1 = 7$. $7 < 7$ is false: use an open circle.
4. At $x = -1$, $4 < 7$ is true. Shade right.
Answer: $x > -2$; open at -2, shade right.



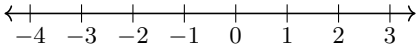
Practice Problems

Show your thinking.

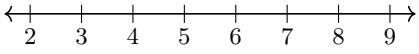
1. Graph $x < -4$. Is -4 a solution?



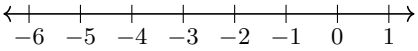
2. A gauge logs temperatures at or above $-1°$C. Write and graph the rule for T in degrees Celsius.



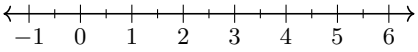
3. Solve $3x + 2 > 17$ and graph. Decide which of 5 and 6 is a solution.



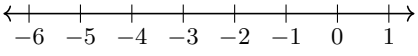
4. Graph the solutions of $-2x + 4 \geq 10$. Explain what happens to the sign when you divide.



5. Solve $2p - 1 \leq 4$ and graph it. Locate the exact boundary using the half-unit ticks.



6. Coordinate s is more than 2 units to the right of -5. Write and graph the rule.



Answer Key

1. $x < -4$; open at -4, shade left.
2. $T \geq -1$ °C; closed at -1, shade right.
3. $x > 5$; open at 5, shade right. 6 works; 5 does not.
4. $x \leq -3$; closed at -3, shade left.
5. $p \leq \frac{5}{2}$; closed at $\frac{5}{2}$, shade left.
6. $s > -3$; open at -3, shade right.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. The solution rule is already isolated: $x < -4$.
2. At $x = -4$, $(-4) = -4$. $-4 < -4$ is false: use an open circle.
3. At $x = -5$, $-5 < -4$ is true. Shade left.

Problem 2

1. At or above -1°C includes equality: $T \geq -1$.
2. At $T = -1$, $(-1) = -1$. $-1 \geq -1$ is true: use a closed circle.
3. At $T = 0$, $0 \geq -1$ is true. Shade right.

Problem 3

1. Subtract 2: $3x > 15$.
2. Divide by 3: $x > 5$.
3. At $x = 5$, $3(5) + 2 = 17$. $17 > 17$ is false: use an open circle.
4. At $x = 6$, $20 > 17$ is true. Shade right.

Problem 4

1. Subtract 4: $-2x \geq 6$.
2. Divide by -2 and reverse the comparison: $x \leq -3$.
3. At $x = -3$, $-2(-3) + 4 = 10$. $10 \geq 10$ is true: use a closed circle.
4. At $x = -4$, $12 \geq 10$ is true. Shade left.

Problem 5

1. Add 1: $2p \leq 5$.
2. Divide by 2: $p \leq \frac{5}{2}$.
3. At $p = \frac{5}{2}$, $2(\frac{5}{2}) - 1 = 4$. $4 \leq 4$ is true: use a closed circle.
4. At $p = \frac{3}{2}$, $2 \leq 4$ is true. Shade left.

Problem 6

1. The signed distance to the right of -5 is $s - (-5) = s + 5$. Require $s + 5 > 2$.
2. Subtract 5: $s > -3$.
3. At $s = -3$, $(-3) + 5 = 2$. $2 > 2$ is false: use an open circle.
4. At $s = -2$, $3 > 2$ is true. Shade right.

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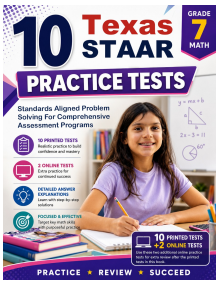

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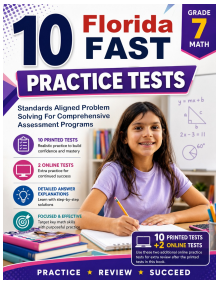

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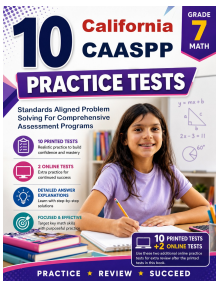

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