**1-6 Study Guide and Intervention**

**Solving Compound and Absolute Value Inequalities**

**Compound Inequalities** A compound inequality consists of two inequalities joined by the word **and** or the word **or**. To solve a compound inequality, you must solve each part separately.

<table>
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<tr>
<th>Compound Inequalities</th>
<th>The graph is the intersection of solution sets of two inequalities.</th>
<th>Example: $x &gt; -4$ and $x &lt; 3$</th>
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<tbody>
<tr>
<td>And</td>
<td>Example: $x &gt; -4$ and $x &lt; 3$</td>
<td>[Graph representation]</td>
</tr>
<tr>
<td>Or</td>
<td>Example: $x ≤ -3$ or $x &gt; 1$</td>
<td>[Graph representation]</td>
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</table>

**Example 1** Solve $-3 ≤ 2x + 5 ≤ 19$.
Graph the solution set on a number line.

$-3 ≤ 2x + 5$ and $2x + 5 ≤ 19$
$-8 ≤ 2x$ and $2x ≤ 14$
$-4 ≤ x ≤ 7$

**Example 2** Solve $3y − 2 ≥ 7$ or $2y − 1 ≤ −9$.
Graph the solution set on a number line.

$3y − 2 ≥ 7$ or $2y − 1 ≤ −9$
$3y ≥ 9$ or $2y ≥ -8$
$y ≥ 3$ or $y ≤ -4$

**Exercises**

Solve each inequality. Graph the solution set on a number line.

1. $-10 < 3x + 2 ≤ 14$
   \[ \{x \mid -4 < x ≤ 4\} \]

2. $3a + 8 < 23$ or $\frac{1}{4}a − 6 > 7$
   \[ \{a \mid a < 5 \text{ or } a > 52\} \]

3. $18 < 4x − 10 < 50$
   \[ \{x \mid 7 < x < 15\} \]

4. $5k + 2 < -13$ or $8k − 1 > 19$
   \[ \{k \mid k < -3 \text{ or } k > 2.5\} \]

5. $100 ≤ 5y − 45 ≤ 225$
   \[ \{y \mid 29 ≤ y ≤ 54\} \]

6. $\frac{2}{3}b − 2 > 10$ or $\frac{3}{4}b + 5 < -4$
   \[ \{b \mid b < -12 \text{ or } b > 18\} \]

7. $22 < 6w − 2 < 82$
   \[ \{w \mid 4 < w < 14\} \]

8. $4d − 1 > -9$ or $2d + 5 < 11$
   \[ \{d \mid \text{all real numbers}\} \]
Study Guide and Intervention (continued)

Solving Compound and Absolute Value Inequalities

Absolute Value Inequalities  Use the definition of absolute value to rewrite an absolute value inequality as a compound inequality.

For all real numbers \(a\) and \(b\), \(b > 0\), the following statements are true.

1. If \(|a| < b\), then \(-b < a < b\).
2. If \(|a| > b\), then \(a > b\) or \(a < -b\).

These statements are also true for \(\leq\) and \(\geq\), respectively.

**Example 1** Solve \(|x + 2| > 4\). Graph the solution set on a number line.

By statement 2 above, if \(|x + 2| > 4\), then \(x + 2 > 4\) or \(x + 2 < -4\). Subtracting 2 from both sides of each inequality gives \(x > 2\) or \(x < -6\).

![Graph](image)

**Example 2** Solve \(|2x - 1| < 5\). Graph the solution set on a number line.

By statement 1 above, if \(|2x - 1| < 5\), then \(-5 < 2x - 1 < 5\). Adding 1 to all three parts of the inequality gives \(-4 < 2x < 6\). Dividing by 2 gives \(-2 < x < 3\).

![Graph](image)

**Exercises**

Solve each inequality. Graph the solution set on a number line.

1. \(|3x + 4| < 8\) \(\{x \mid -4 < x < \frac{4}{3}\}\)

![Graph](image)

2. \(|4k + 1| > 27\) \(\{k \mid k < -6.5 \text{ or } k > 6.5\}\)

![Graph](image)

3. \(|\frac{c}{2} - 3| \leq 5\) \(\{c \mid -4 \leq c \leq 16\}\)

![Graph](image)

4. \(|a + 9| \geq 30\) \(\{a \mid a \leq -39 \text{ or } a \geq 21\}\)

![Graph](image)

5. \(|2f - 11| > 9\) \(\{f \mid f < 1 \text{ or } f > 10\}\)

![Graph](image)

6. \(|5w + 2| < 28\) \(\{w \mid -6 < w < 5.2\}\)

![Graph](image)

7. \(|10 - 2k| < 2\) \(\{k \mid 4 < k < 6\}\)

![Graph](image)

8. \(\left|\frac{x}{2} - 5\right| + 2 > 10\) \(\{x \mid x < -6 \text{ or } x > 26\}\)

![Graph](image)

9. \(|4b - 11| < 17\) \(\{b \mid -\frac{3}{2} < b < 7\}\)

![Graph](image)

10. \(|100 - 3m| > 20\) \(\{m \mid m < 26\frac{2}{3} \text{ or } m > 40\}\)

![Graph](image)