1.5 Inequalities

1. Determine which is the greater of two numbers.

2. Find the absolute value of a number.

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1. **Determine Which Is the Greater of Two Numbers**

   The number line, which shows numbers increasing from left to right, can be used to explain inequalities (see Fig. 1.14). When comparing two numbers, the number to the right on the number line is the greater number, and the number to the left is the lesser number. The symbol > is used to represent the words “is greater than.” The symbol < is used to represent the words “is less than.”

   ![Number Line Diagram](image)

   **FIGURE 1.14**

   **EXAMPLE 1** Insert either > or < in the shaded area between each pair of numbers to make a true statement.

   a) \(-4 < -2\)  
   b) \(-\frac{3}{2} < 2.5\)  
   c) \(\frac{1}{2} > \frac{1}{4}\)  
   d) \(-2 < 4\)

   **Solution** The points given are shown on the number line (Fig. 1.15).

   ![Number Line Diagram with Points](image)

   **EXAMPLE 2** Insert either > or < in the shaded area between each pair of numbers to make a true statement.

   a) \(-3 < 3\)  
   b) \(-3 > -4\)  
   c) \(-4 < 0\)  
   d) \(-1.08 > -1.8\)

   **Solution** The numbers given are shown on the number line (Fig. 1.16).

   ![Number Line Diagram with Points](image)
2 Find the Absolute Value of a Number

The concept of absolute value can be explained with the help of the number line shown in Figure 1.17 on page 37. The absolute value of a number can be considered the distance between the number and 0 on a number line. Thus, the absolute value of 3, written $|3|$, is 3 since it is 3 units from 0 on a number line. Similarly, the absolute value of $\text{-}3$, written $|-3|$, is also 3 since $-3$ is 3 units from 0.

$$|3| = 3 \quad \text{and} \quad |-3| = 3$$

![Figure 1.17](image)

Since the absolute value of a number measures the distance (without regard to direction) of a number from 0 on the number line, the absolute value of every number will be either positive or zero.

<table>
<thead>
<tr>
<th>Number</th>
<th>Absolute Value of Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>$</td>
</tr>
<tr>
<td>$-6$</td>
<td>$</td>
</tr>
<tr>
<td>0</td>
<td>$</td>
</tr>
<tr>
<td>$\frac{1}{2}$</td>
<td>$</td>
</tr>
</tbody>
</table>
EXAMPLE 3 ▶ Insert either $>$, $<$, or $=$ in each shaded area to make a true statement.

a) $\begin{array}{c} |3| \hfill 3 \\ \hline 3 = 3 \end{array}$

b) $\begin{array}{c} |2| \hfill 2 \\ \hline \frac{1}{2} = 2 \end{array}$

c) $\begin{array}{c} -2 \hfill -4 \\ \hline -2 < 4 \end{array}$

d) $\begin{array}{c} |2| \hfill -4 \\ \hline 2 < 4 \end{array}$

e) $\begin{array}{c} -2 \hfill -0.42 \\ \hline \frac{2}{5} = 0.4 < 0.42 \end{array}$

$\frac{2}{5} \approx 0.4 < 0.42$

$\frac{-4}{5} = -0.8$
24. $-6 \square -4$
28. $-0.2 \square -0.4$
32. $-\frac{3}{4} \square -1$
36. $-9 \square -12$
40. $-1.0 \square -0.7$
44. $-0.006 \square -0.007$
48. $\frac{9}{2} \square \frac{7}{2}$
52. $\frac{9}{20} \square 0.42$
60. \(|-4| = 3\)
64. \(|-5| = -6\)
68. \(|\frac{-8}{3}| = 3.5\)