LESSON 1: OPENER

Consider the inequality \( x > 7 \).

1. List five numbers that make the inequality true.
   - 8, 10, 11, 13, 15

2. Plot your five numbers on the number line.

3. Does an \( x \) value of 7.25 make the inequality true?
   - Yes

4. Does an \( x \) value of 6 \( \frac{1}{2} \) make the inequality true?
   - No

5. Write a sentence that describes all of the numbers that make this inequality true.
   - All numbers that make \( x > 7 \) true are greater than 7 or are to the right of 7 on the number line.

LESSON 1: CORE ACTIVITY

1. Graph the solutions for the following mathematical statements:

   a. \( x = -2.25 \)

   b. \( x < -4 \)

   c. \( x \geq 0 \)

   d. \( x > -7 \)

   e. \( x \leq \frac{2}{5} \)

   f. \( x \neq 5 \)
2. Consider this compound inequality:

\[ x < -1 \text{ or } x > 4 \]

a. Complete the table by determining whether the values for \( x \) make the statement true.

<table>
<thead>
<tr>
<th>Value for ( x )</th>
<th>Makes the statement true Yes/No</th>
</tr>
</thead>
<tbody>
<tr>
<td>-4</td>
<td>Yes</td>
</tr>
<tr>
<td>-2</td>
<td>Yes</td>
</tr>
<tr>
<td>0</td>
<td>No</td>
</tr>
<tr>
<td>( \pi )</td>
<td>No</td>
</tr>
<tr>
<td>7</td>
<td>Yes</td>
</tr>
<tr>
<td>12</td>
<td>Yes</td>
</tr>
</tbody>
</table>

b. List five additional numbers that make this compound inequality true.

Student responses will vary

3. a. Construct a graph on the number line to represent the inequality \( x < -1 \).

![Number Line for \( x < -1 \)]

b. Construct a graph on the number line to represent the inequality \( x > 4 \).

![Number Line for \( x > 4 \)]

c. Construct a graph on the number line to show ALL the numbers that make the compound inequality \( x < -1 \text{ or } x > 4 \) true. Use the graphs you sketched in 3a and 3b to help you.

![Number Line for Compound Inequality]

4. On a number line, show all of the numbers, \( x \), such that \( x > -2 \) or \( x < 7 \).

![Number Line for \( x > -2 \text{ or } x < 7 \)]
5. Consider the following compound inequality:

\[ x > -2 \text{ and } x < 7 \]

a. Complete the table by determining whether the values for \( x \) make the statement true.

<table>
<thead>
<tr>
<th>Value for ( x )</th>
<th>Makes the statement true Yes/No</th>
</tr>
</thead>
<tbody>
<tr>
<td>-4</td>
<td>No</td>
</tr>
<tr>
<td>-2</td>
<td>No</td>
</tr>
<tr>
<td>0</td>
<td>Yes</td>
</tr>
<tr>
<td>( \pi )</td>
<td>Yes</td>
</tr>
<tr>
<td>7</td>
<td>No</td>
</tr>
<tr>
<td>12</td>
<td>No</td>
</tr>
</tbody>
</table>

b. List five additional numbers that make this statement true.
   
   Student responses will vary

6. a. Construct a graph on the number line to represent the inequality \( x > -2 \).

b. Construct a graph on the number line to represent the inequality \( x < 7 \).

c. Construct a graph on the number line to show ALL the numbers that make the statement in question 5 true. To help you construct the final graph, consider your work from questions 5a and 5b.

7. On a number line, show all of the numbers, \( x \), such that \( x < -3 \) and \( x \geq 2 \).

No Solution Empty Set

There are no values that make both inequalities true.
8. Construct a graph on each number line to show the solution set for each compound inequality. Then, describe the solution set for each compound inequality using one of these four descriptions: (1) some but not all real numbers, (2) an empty set, (3) all real numbers, or (4) exactly one number.

**Graph**

**Solution set**

a. **$x < 4$ and $x > 6$**

![Graph of $x < 4$ and $x > 6$]

- Empty set

b. **$x < 6$ or $x > 4$**

![Graph of $x < 6$ or $x > 4$]

- All real numbers

c. **$x < 6$ and $x > 4$**

![Graph of $x < 6$ and $x > 4$]

- Some but not all real numbers

d. **$x < 4$ or $x > 6$**

![Graph of $x < 4$ or $x > 6$]

- Some but not all real numbers

e. **$x \leq 5$ or $x \geq 5$**

![Graph of $x \leq 5$ or $x \geq 5$]

- All real numbers

f. **$x \leq 5$ and $x \geq 5$**

![Graph of $x \leq 5$ and $x \geq 5$]

- Exactly one number

**LESSON 1: CONSOLIDATION ACTIVITY**

1. For each card numbered 1 through 10, work with your partner to find a match using the lettered cards. Then, write the letter of the matching card in the table.

<table>
<thead>
<tr>
<th>Inequality card number</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number line card letter</td>
<td>D</td>
<td>J</td>
<td>B</td>
<td>F</td>
<td>I</td>
<td>H</td>
<td>A</td>
<td>G</td>
<td>E</td>
<td>C</td>
</tr>
</tbody>
</table>

2. Write an equation or inequality that would produce the same number line graph as $x \leq 4$ and $x \geq 4$.

$x = 4$

3. Write an equation or inequality that would produce the same number line graph as $x < 5$ or $x \leq 4$.

$x < 5$

4. Write an equation or inequality that would produce the same number line graph as $x < 4$ or $x > 4$.

$x \neq 4$
LESSON 1: HOMEWORK

Notes or additional instructions based on whole-class discussion of homework assignment:

1. Match the inequality to its representation on a number line.
   a. \(x < -4.5\)  
   b. \(x \neq -4.5\)  
   c. \(x \geq -4.5\)  
   d. \(x = -4.5\)  
   e. \(x \leq -4.5\)  
   f. \(x > -4.5\)

   ![Number Line Diagrams]

2. Write an inequality statement whose solution is an empty set.
   Student responses will vary

3. Write an inequality statement whose solution is some but not all real numbers. Graph the solution on a number line.
   Student responses will vary

4. Write an inequality statement whose solution is all real numbers. Graph the solution on a number line.
   Student responses will vary

5. Write an inequality statement whose solution is exactly one number. Graph the solution on a number line.
   Student responses will vary

6. Write an inequality statement to represent the graph shown. \(x < -5 \text{ or } x > 2\)

   ![Graph with Open Circles]

7. Write an inequality statement to represent the graph shown. \(x < 2 \text{ and } x > -5\)

   ![Graph with Open Circles]
### LESSON 1: STAYING SHARP

#### Practicing skills & concepts

1. Select the appropriate symbol (<, >, or =) to describe the relationship between each pair of numbers.

   a. $1.09 \quad < \quad 1.1$
   b. $\frac{8}{7} \quad > \quad 1.1$
   c. $-1.09 \quad > \quad -1.1$
   d. $-\frac{8}{7} \quad < \quad -1.1$

#### Preparing for upcoming lessons

2. List the lines according to the value of their slopes. List them in order from the smallest slope value to the largest slope value.

   ![Graph showing four lines with different slopes.]

   Answer: D, A ↔ C, B

3. Which pair of $x$- and $y$-coordinates appears in the tables for both functions?

   **Table 1:**
   
   \[
   \begin{array}{c|c}
   x & y = 2x - 7 \\
   \hline
   -4 & -15 \\
   -3 & -13 \\
   -2 & -11 \\
   -1 & -9 \\
   0 & -7 \\
   1 & -5 \\
   2 & -3 \\
   3 & -1 \\
   4 & 1 \\
   \end{array}
   \]

   **Table 2:**
   
   \[
   \begin{array}{c|c}
   x & y = -3x + 8 \\
   \hline
   -4 & 20 \\
   -3 & 17 \\
   -2 & 14 \\
   -1 & 11 \\
   0 & 8 \\
   1 & 5 \\
   2 & 2 \\
   3 & -1 \\
   4 & -4 \\
   \end{array}
   \]

   Answer: (3, -1)

4. What are the coordinates of the point of intersection of the two lines in the graph?

   ![Graph showing two intersecting lines.]

   Answer: (3, -1)

5. What is the slope of the line? A slope triangle is drawn for you.

   ![Graph showing a line with a slope triangle.]

   Answer: $\frac{1}{4}$

6. Write an equation for the line in Question 5.

   **Answer with supporting work:**
   
   \[
   \begin{align*}
   y & = \text{y-intercept} \\
   & = 0 \\
   \text{slope} & = \frac{1}{4} \\
   y & = \frac{1}{4} x + 0 \\
   y & = \frac{1}{4} x
   \end{align*}
   \]
Lesson 2: Introduction to solving linear inequalities

LESSON 2: OPENER
A car rental company charges $29.95 plus 16 cents per mile for each mile driven.

1. Write a function rule to describe the relationship between the cost of the rental, \( r \), and the number of miles you drove, \( m \).
   \[ r = 29.95 + 0.16m \]

2. What input value would result in an output value of $75?
   \[ 75 = 29.95 + 0.16m \]
   \[ 281.5625 \text{ miles} \]

LESSON 2: CORE ACTIVITY
1. Write an inequality to represent the situation below.
   A car rental company charges $29.95 plus 16 cents per mile for each mile driven. Your boss is very careful with the company's money. She wants you to plan your business trips so you will not spend more than $75 for car rental fees.
   \[ 75 \geq 29.95 + 0.16m, \text{ which can also be written as } 29.95 + 0.16m \leq 75 \]

2. Solve the inequality you wrote in question 1 to determine how many miles you could drive and spend $75 or less for the trip. Your teacher will assign you and your partner a particular method for solving the inequality. Create a poster presenting your solution. \( m \leq 281.5625 \) (In reality, since many rental companies round to the whole mile, \( m \leq 281 \).)

3. List the four methods you will be using in this topic to solve linear inequalities.
   Tables, Graphs, Variables, and Words

4. Complete a journal entry.

<table>
<thead>
<tr>
<th>Vocabulary term</th>
<th>My understanding of what the term means</th>
<th>An example that shows the meaning of the term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear inequality</td>
<td>Student responses will vary</td>
<td>Student responses will vary</td>
</tr>
</tbody>
</table>
LESSON 2: CONSOLIDATION ACTIVITY

Your boss is still trying to save money on car rentals. You compare Omega Car Rental, which charges $72.00 per day with unlimited free mileage, and Optimal Car Rental, which charges $22.90 plus 30 cents per mile.

1. Some days you drive many miles, and some days you drive fewer miles. Determine the range of daily mileage for which each company is the less expensive choice.

   **Omega:** \[ r = 72 \]

   **Optimal:** \[ r = 22.90 + 0.30m \]

   To find when the two companies charge the same: \[ 72 = 22.90 + 0.30m \]

   If you travel \( 163 \frac{2}{3} \) miles, the two companies will charge the same for rental.

   If you travel less than \( 163 \frac{2}{3} \) miles per day, Optimal Car Rental is the cheapest. If you travel more than \( 163 \frac{2}{3} \) miles per day, Omega Car Rental is cheaper.

2. Write a report to your boss that includes your recommendations about which car-rental company to use depending on the number of miles you plan to drive. Explain how you arrived at your recommendation. Use computations, graphs, or tables to provide support for your conclusions.

   Responses will use the answers found in question 1. Reports will be different for each student.
LESSON 2: HOMEWORK

Notes or additional instructions based on whole-class discussion of homework assignment:

1. Solve and graph the solutions to the inequalities below using any of the methods from class: a table, a graph, “undoing,” or algebraic operations. (You may need to use a separate sheet of notebook paper or graph paper.)

   Response types may vary
   
   a. \( x + 3 > 2 \)
   \( x > -1 \)

   b. \( 15x \leq 45 \)
   \( x \leq 3 \)

   c. \( 3 < 4x - 5 \)
   \( x > 2 \)

   d. \( 2x + 7 \geq 15 \)
   \( x \geq 4 \)

   e. \( 5 > x - 1 \)
   \( x < 6 \)

   f. \( 1.5x < 5.25 \)
   \( x < 3.5 \)

2. The students on the dance committee at Jefferson High School are planning a dance. They hope to make a profit of at least $150 to donate to a local animal shelter. The dance committee has decided to sell tickets for $5. They also know that the cost for the DJ will be $200.

   a. The inequality \( 150 \leq 5x - 200 \) can be used to determine if the dance committee met its goal. Explain how each part of this inequality fits the problem situation.
      
      \( 5x \) represents the amount of money made off of ticket sales. They must subtract the cost of the DJ, \(-$200\), since this takes away from the profit. They want the profit, \(5x - 200\), to be at least $150.

   b. Solve the inequality using a table, a graph, “undoing,” or algebraic operations. (You may need to use a separate sheet of graph paper.)
      
      \( 150 \leq 5x - 200 \)
      \( 150 + 200 \leq 5x - 200 + 200 \)
      \( 350 \leq 5x \)
      \( 350 \div 5 \leq 5x \div 5 \)
      \( 70 \leq x \)

   c. In a complete sentence, explain what your solution to part b means in the context of the problem situation.
      
      They need to sell 70 or more tickets to meet their goal of making a profit of $150 dollars or more.
LESSON 2: STAYING SHARP

1. Select the appropriate symbol (<, >, or =) to describe the relationship between each pair of numbers.
   a. \(2^1\) \(>\) \(1^2\)
   b. \(2^2\) \(=\) \(2^2\)
   c. \(2^3\) \(<\) \(3^2\)
   d. \(2^4\) \(=\) \(4^2\)
   e. \(2^5\) \(>\) \(5^2\)

2. On the coordinate plane, sketch a line that has an \(x\)-intercept of \((-2,0)\) and a \(y\)-intercept of \((0,6)\). Then, calculate the slope of the line.
   Slope of line: \(\frac{6}{2} = 3\)

3. Complete these tables to answer questions 3 and 4.
   **Table A**
   \[
   \begin{array}{l|l}
   x & y = -x + 4 \\
   \hline
   -4 & 8 \\
   -3 & 7 \\
   -2 & 6 \\
   -1 & 5 \\
   0 & 4 \\
   1 & 3 \\
   2 & 2 \\
   3 & 1 \\
   4 & 0 \\
   \end{array}
   \]

   **Table B**
   \[
   \begin{array}{l|l}
   x & y = 0.5x - 5 \\
   \hline
   -4 & -7 \\
   -3 & -6.5 \\
   -2 & -6 \\
   -1 & -5.5 \\
   0 & -5 \\
   1 & -4.5 \\
   2 & -4 \\
   3 & -3.5 \\
   4 & -3 \\
   \end{array}
   \]
   a. As \(x\) increases by 1, by how much does \(y\) change in Table A?
      \(-1\)
   b. As \(x\) increases by 1, by how much does \(y\) change in Table B?
      \(\frac{1}{2}\)

4. Will there be a common \((x,y)\) pair in the two tables if the tables are continued? Explain.
   Yes, the lines have different slopes so they are not parallel. They are approaching each other as \(x\) increases.

5. Use the two slope triangles to answer Questions 5 and 6.
   a. Calculate the slope of the line using the smaller slope triangle.
      \(\frac{2}{3}\)
   b. Calculate the slope of the line using the larger slope triangle.
      \(\frac{4}{6} = \frac{2}{3}\)

6. Explain why the two slopes you calculated are equal.
   Student responses will vary
Lesson 3: Solving inequalities with algebraic operations

LESSON 3: OPENER

1. Complete each inequality statement with the correct symbol, either < or >.

   \[ \begin{align*}
   2 & \text{ < } 8 \\
   2 + 1 & \text{ < } 8 + 1 \\
   2 + 2 & \text{ < } 8 + 2 \\
   2 + 3 & \text{ < } 8 + 3 \\
   2 + 4 & \text{ < } 8 + 4 \\
   2 - 1 & \text{ < } 8 - 1 \\
   2 - 2 & \text{ < } 8 - 2 \\
   2 - 3 & \text{ < } 8 - 3 \\
   2 - 4 & \text{ < } 8 - 4
   \end{align*} \]

2. What do you notice about the relationship between the answers you get when you add the same number to 2 and to 8?  
   The relationship does not change

3. What do you notice about the relationship between the answers you get when you subtract the same number from 2 and from 8?  
   The relationship does not change

LESSON 3: CORE ACTIVITY

1. Complete each inequality statement with the correct symbol, either < or >.

   \[ \begin{align*}
   2 & \text{ < } 8 \\
   2 \cdot 1 & \text{ < } 8 \cdot 1 \\
   2 \cdot 2 & \text{ < } 8 \cdot 2 \\
   2 \cdot 3 & \text{ < } 8 \cdot 3 \\
   2 \div 1 & \text{ < } 8 \div 1 \\
   2 \div 2 & \text{ < } 8 \div 2 \\
   2 \div 3 & \text{ < } 8 \div 3 \\
   2 + 1 & \text{ < } 8 + 1 \\
   2 + 2 & \text{ < } 8 + 2 \\
   2 + 3 & \text{ < } 8 + 3 \\
   2 + 4 & \text{ < } 8 + 4 \\
   2 - 1 & \text{ < } 8 - 1 \\
   2 - 2 & \text{ < } 8 - 2 \\
   2 - 3 & \text{ < } 8 - 3 \\
   2 - 4 & \text{ < } 8 - 4
   \end{align*} \]

2. Study the pattern in question 1. When do you need to reverse the inequality sign?  
   When you multiply or divide each side by a negative number

3. Solve the equation \(2x + 5 = 11\) using algebraic operations.
   \[ \begin{align*}
   2x + 5 & = 11 - 5 \\
   2x & = 6 \\
   2x \div 2 & = 6 \div 2 \\
   x & = 3
   \end{align*} \]

4. Using the balance scale as a model and the fact that \(2x + 5\) weighs less than 11, explain why each of the following statements is true.
   a. \(2x\) will weigh less than 6.  
      \(5\) was taken off both sides so the inequality relationship did not change.
   b. \(x\) will weigh less than 3.  
      Each side was divided by a positive 2, so the original inequality relationship was maintained.
5. Solve $8 - 2x \geq 14$ by first subtracting 8 from both sides. Then complete solving the inequality.

\[
\begin{align*}
8 - 2x &\geq 14 \\
-2x &\geq 6 \\
x &\leq -3
\end{align*}
\]

6. This time, solve the inequality $8 - 2x \geq 14$ by first adding $2x$ to both sides.

\[
\begin{align*}
8 - 2x + 2x &\geq 14 + 2x \\
8 &\geq 14 + 2x \\
-2 &\geq 2x \\
-1 &\geq x
\end{align*}
\]

7. What do you notice about the processes you used to answer questions 5 and 6? They both yield the same solution. The process for question 5 required changing the direction of the sign, but the process for question 6 did not.

8. Use inverse operations and algebraic properties to solve the following inequalities. Use substitution to check your solutions.

a. \[\frac{8a - 5}{5} \leq 1 \]
   \[
   \begin{align*}
   8a - 5 &\leq 5 \\
   8a &\leq 10 \\
a &\leq \frac{5}{4}
   \end{align*}
   \]

b. \[6b - 1 > 3b + 8 \]
   \[
   \begin{align*}
   6b - 1 &> 3b + 8 \\
   3b &> 9 \\
b &> 3
   \end{align*}
   \]

c. \[0.25(16 - 12c) \leq 31 \]
   \[
   \begin{align*}
   16 - 12c &\leq 124 \\
   -12c &\leq 108 \\
c &\geq -9
   \end{align*}
   \]

d. \[\frac{1}{2}e + 3 \leq 4 + e \]
   \[
   \begin{align*}
   \frac{1}{2}e &\leq 1 + e \\
   -\frac{1}{2}e &\leq 1 \\
e &\geq -2
   \end{align*}
   \]

OR

\[
\begin{align*}
-1 &\leq \frac{1}{2}e \\
-2 &\leq e
\end{align*}
\]

e. \[3 < 3(-5d + 16) \]
   \[
   \begin{align*}
   3 &< -15d + 48 \\
-15d &> -45 \\
3 &> d
   \end{align*}
   \]

e. \[5f + 4(f - 1) \geq 2 + 5(2 + f) \]
   \[
   \begin{align*}
   5f + 4f - 4 &\geq 2 + 10 + 5f \\
9f &\geq 12 + 5f \\
4f &\geq 12 \\
f &\geq 4
   \end{align*}
   \]
1. Jacob solved four different inequalities, but he is not sure whether he solved them correctly. In fact, sometimes he makes more than one mistake when solving! Jacob's work is shown below. Decide whether Jacob solved each inequality correctly. If not, find the mistake(s) and explain what Jacob did wrong. Then, solve the inequality correctly.

<table>
<thead>
<tr>
<th>Jacob's solution:</th>
<th>Did Jacob solve correctly? If not, describe his mistake(s):</th>
<th>Show the correct solution (if needed):</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. $3x + 6 &gt; 8$</td>
<td>Jacob did not solve correctly. He added -6 to both sides of the equation, he incorrectly reversed the direction of the inequality sign. The direction of the sign should only be reversed when multiplying or dividing both sides by a negative number, not when adding a negative number to both sides.</td>
<td>$3x + 6 &gt; 8$</td>
</tr>
<tr>
<td>$3x + 6 + (-6) &gt; 8 + (-6)$</td>
<td>$3x &gt; 2$</td>
<td>$3x &gt; 2/3$</td>
</tr>
<tr>
<td>$3x &lt; 2$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$3x + 3 &lt; 2 + 3$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$x &lt; 2/3$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. $2x + 1 \geq x - 2$</td>
<td>Jacob solved correctly.</td>
<td>Not needed</td>
</tr>
<tr>
<td>$2x - x + 1 \geq x - x - 2$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$1x + 1 \geq -2$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$x + 1 - 1 \geq x - 2 - 1$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$x \geq -3$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. $4(x + 2) &gt; 5x + 1$</td>
<td>Jacob did not solve correctly. His first mistake is that he distributed 4 incorrectly. His second mistake is that when he multiplied each side by -1, he did not change the direction of the inequality.</td>
<td>$4(x + 2) &gt; 5x + 1$</td>
</tr>
<tr>
<td>$4x + 2 &gt; 5x + 1$</td>
<td></td>
<td>$4x + 8 &gt; 5x + 1$</td>
</tr>
<tr>
<td>$4x &gt; 5x - 1$</td>
<td></td>
<td>$4x \geq 5x - 7$</td>
</tr>
<tr>
<td>$x &gt; -1$</td>
<td></td>
<td>$-1x \geq -7$</td>
</tr>
<tr>
<td>d. $5x + 5 &gt; 10x + 30$</td>
<td>Jacob did not solve correctly. His first mistake is that when he divided the expressions on both sides of the $&gt; sign by 5, he did not divide all of the terms in each expression. He should have divided the 5 and the 30 by 5 as well. He also incorrectly reversed the $&gt; sign when subtracting x from both sides of the inequality.</td>
<td>$5x + 5 &gt; 10x + 30$</td>
</tr>
<tr>
<td>$5x + 5 &gt; 10x + 30$</td>
<td></td>
<td>$5x - 5x + 5 &gt; 10x - 5x + 30$</td>
</tr>
<tr>
<td>$x + 5 &gt; 2x + 30$</td>
<td></td>
<td>$5 &gt; 5x + 30$</td>
</tr>
<tr>
<td>$x + 5 + (-5) &gt; 2x + 30 + (-5)$</td>
<td></td>
<td>$5 - 30 &gt; 5x + 30 - 30$</td>
</tr>
<tr>
<td>$x &gt; 2x + 25$</td>
<td></td>
<td>$-25 &gt; 5x$</td>
</tr>
<tr>
<td>$x - x &lt; 2x - x + 25$</td>
<td></td>
<td>$-25 \geq 5x$</td>
</tr>
<tr>
<td>$0 &lt; x + 25$</td>
<td></td>
<td>$\frac{5}{5} &gt; \frac{5}{5}$</td>
</tr>
<tr>
<td>$0 - 25 &lt; x + 25 - 25$</td>
<td></td>
<td>$-5 &gt; x$</td>
</tr>
<tr>
<td>$-25 &lt; x$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. On your whiteboard, create your own inequality. Exchange your whiteboard with your partner and solve the problem your partner created. When both you and your partner are finished, discuss your solutions.
LESSON 3: HOMEWORK

Notes or additional instructions based on whole-class discussion of homework assignment:

1. Solve each of the following inequalities. Use substitution to check your solutions.

   a. \(4 - 2x \leq 5 - x + 1\)
      \[4 - 2x \leq 6 - x\]
      \[-2 - 2x \leq -x\]
      \[-2 \leq x\]

   b. \(\frac{4}{3}x + 7 > 3\)
      \[\times \frac{3}{4} x > -4\]
      \[x > -3\]

   c. \(2x - 3(x + 3) < 14\)
      \[2x - 9x - 9 < 14\]
      \[-7x < 23\]
      \[x > -3\]

   d. \(9x - 24x + 45 > 0\)
      \[-15x + 45 > 0\]
      \[-15x > -45\]
      \[x < 3\]

   e. \(3.1x - 1.4 \leq 1.3x + 6.7\)
      \[1.8x - 1.4 \leq 6.7\]
      \[1.8x \leq 8.1\]
      \[x \leq 4.5\]

   f. \(3x + 2(4x + 2) \geq 2(6x + 1)\)
      \[3x + 8x + 4 \geq 12x + 2\]
      \[11x + 4 \geq 12x + 2\]
      \[-x + 4 \geq 2\]
      \[x \geq -2\]
      \[x \leq 2\]

2. Suppose your friend is having trouble solving the inequality \(-2(3x - 8) < 5(4 - x)\). Show each step you would take to solve the inequality, and write an explanation of why you are taking that step.

   \[-6x + 16 < 20 - 5x\]
   \[-x < 4\]
   \[x > -4\]

   Student work will vary

3. Jessica was solving the inequality \(4x + 9 \geq 13\). She used inverse operations. To check her work, she chose a number greater than 1 and substituted it into the original inequality to see if it made a true inequality. The number she chose for \(x\) was 2. When she substituted it into the inequality, however, she ended up with an untrue inequality. Explain where Jessica made a mistake. Then solve the problem correctly and check your work.

   Incorrect solution:
   \[-4x + 9 \geq 13\]
   \[-4x + 9 - 9 \geq 13 - 9\]
   \[-4x \geq 4\]
   \[\frac{-4x}{-4} \geq \frac{4}{-4}\]
   \[x \geq 1\]

   Description of mistake:
   She forgot to change the direction of the inequality sign when she divided each side by -4.
   She also concluded that \(4/-4 = 1\) instead of -1.

   Corrected solution (with check step):
   \[-4x + 9 \geq 13\]
   \[-4x \geq 4\]
   \[-4x + -4 \geq 4 + -4\]
   \[x \leq -1\]
   Check:
   \[-4(-2) + 9 \geq 13 \Rightarrow 8 + 9 \geq 13 \Rightarrow 17 \geq 13\]
## LESSON 3: STAYING SHARP

### Practicing skills & concepts

1. Consider this inequality:
   
   \[ 2x > 5x \]

   a. List three values you can substitute for \( x \) to make the inequality statement true.
   
   \[ x = -1 \Rightarrow -2 > -5 \]
   
   \[ x = -4 \Rightarrow -8 > -20 \]
   
   \[ x = -10 \Rightarrow -20 > -50 \]

   b. List three values you can substitute for \( x \) to make the inequality statement false.
   
   \[ x = 3 \Rightarrow 6 > 15 \]
   
   \[ x = 10 \Rightarrow 20 > 50 \]
   
   \[ x = 100 \Rightarrow 200 > 500 \]

   (These are examples only. Answers will vary.)

2. List the lines according to the value of their slopes. List them in order from the smallest slope value to the largest slope value.

   ![Graph of lines](image)

   Answer: D, C, A, B

### Preparing for upcoming lessons

3. Consider the function rules \( y = 3x + 1 \) and \( y = 6x - 8 \).

4. Graph both functions on the coordinate plane. Label each line with its algebraic rule.

   ![Graph of functions](image)

5. Substitute the \( x \) and \( y \) values of the intersection point into both function rules to verify that the coordinates make both rules true.

   Intersection point = (3,10)

   First equation: \( 10 = 3(3) + 1 \Rightarrow 10 = 10 \)

   Second equation: \( 10 = 6(3) - 8 \Rightarrow 10 = 10 \)

   The coordinates make both rules true.

### Reviewing ideas from earlier grades

A lattice point has \( x \)- and \( y \)-coordinates that are both integers.

5. Mark two lattice points that are on the line.

6. Draw a slope triangle between the points you marked, and use the slope triangle to calculate the slope of the line.

   ![Slope triangle](image)

   Slope of line:

   \[ m = -\frac{5}{2} \]
Lesson 4: Solving absolute value inequalities

LESSON 4: OPENER

Earlier in the course, you created an absolute value function to model one of Terrence’s skates. The function you created for this graph was \( y = |x - 3| \).

1. Write an inequality that gives the times when Terrence is more than 2 meters from the cone.

   \[ |x - 3| > 2 \]

2. Write another inequality that gives the times when Terrence was within 2 meters of the cone.

   \[ |x - 3| \leq 2 \]

LESSON 4: CORE ACTIVITY

1. The inequality that represents the times that Terrence’s distance from the cone was less than or equal to 2 meters is \( |x - 3| \leq 2 \). What does this inequality mean? Can you break this inequality into two pieces that mean the same thing as the single inequality?

   This inequality represents the time when Terrence was less than 2 meters from the cone or when Terrence was exactly 2 meters from the cone. You can present each part of the absolute value inequality in two pieces: \( |x - 3| < 2 \) and \( |x - 3| = 2 \)

2. On the graph of \( |x - 3| \leq 2 \), where does \( |x - 3| = 2 \)? Where is \( |x - 3| < 2 \)? How do you write the solution to \( |x - 3| \leq 2 \)?

   \( |x - 3| = 2 \) at \( x = 1 \) and \( x = 5 \). \( |x - 3| < 2 \) when \( 1 < x < 5 \). The solution to the inequality \( |x - 3| \leq 2 \) is \( 1 \leq x \leq 5 \).
3. For what values of $x$ is $|x - 3| > 2$?

$$|x - 3| > 2$$ when $x$ is less than 1 or greater than 5: $x < 1$ or $x > 5$.

4. Three graphs are shown. Label each graph with an absolute value inequality or equation. Use the given inequalities and equation.

| $|5x - 10| < 15$ | $|5x - 10| = 15$ | $|5x - 10| \geq 15$ |
| --- | --- | --- |

![Graphs of absolute value functions](image)

$$|5x - 10| = 15$$ $$|5x - 10| \geq 15$$ $$|5x - 10| < 15$$

5. Now solve the equation $|5x - 10| \geq 15$ analytically. Start by using the definition of absolute value to create two inequalities. Complete the sentences to create these inequalities.

<table>
<thead>
<tr>
<th>$-5x + 10$</th>
<th>$-5x + 10 \geq 15$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$5x - 10$</td>
<td>$5x - 10 \geq 15$</td>
</tr>
</tbody>
</table>

- If $5x - 10 < 0$, then $|5x - 10| = -5x + 10$. Therefore, the first inequality is $-5x + 10 \geq 15$.

- If $5x - 10 \geq 0$, then $|5x - 10| = 5x - 10$. Therefore, the second inequality is $5x - 10 \geq 15$.

6. Solve the two inequalities you wrote in question 5.

When $5x - 10 < 0$, $-5x + 10 \geq 15$.

- $-5x + 10 \geq 15$
- $-5x \geq 5$
- $x \leq -1$

When $5x - 10 \geq 0$, $5x - 10 \geq 15$.

- $5x - 10 \geq 15$
- $5x \geq 25$
- $x \geq 5$

(Remember to change the direction of the inequality when you multiply or divide by a negative number.)

Therefore, the solution set consists of all numbers that are less than or equal to -1 or greater than or equal to 5. That is, $x \leq -1$ or $x \geq 5$. Graphically, when $x \leq -1$ or $x \geq 5$ the graph of the absolute value function lies above the line $y = 15$. 
7. Solve the inequality \(|2x - 6| < 10\).
   
   a. First, use the definition of absolute value to create two separate inequalities.

   When \(2x - 6 < 0\), \(|2x - 6| = -2x + 6\). Therefore, one inequality is \(-2x + 6 < 10\).

   When \(2x - 6 \geq 0\), \(|2x - 6| = 2x - 6\). The second inequality is therefore \(2x - 6 < 10\).

   b. Now solve these two inequalities algebraically.

   \[-2x + 6 < 10\]
   \[-2x < 4\]
   \[x > -2\]

   \[2x - 6 < 10\]
   \[2x < 16\]
   \[x < 8\]

   The solution set is all numbers \(x\) such that \(x > -2\) and \(x < 8\). Another way to say this is \(-2 < x < 8\).
7.

LESSON 4: CONSOLIDATION ACTIVITY

1. Consider the functions $y = |x + 4|$ and $y = 5$.
   a. Create a table of values for these functions.

   | $x$   | $|x + 4|$ | 5  |
   |-------|---------|----|
   | −10   |  6      |  5 |
   | −9    |  5      |  5 |
   | −8    |  4      |  5 |
   | −7    |  3      |  5 |
   | −6    |  2      |  5 |
   | −5    |  1      |  5 |
   | −4    |  0      |  5 |
   | −3    |  1      |  5 |
   | −2    |  2      |  5 |
   | −1    |  3      |  5 |
   |  0    |  4      |  5 |
   |  1    |  5      |  5 |
   |  2    |  6      |  5 |

   b. Use the table to solve the absolute value inequality $|x + 4| < 5$. What is the solution to this inequality? Explain.

   The values of $|x + 4|$ are less than 5 when $x$ is between −9 and 1, not including −9 and 1. This is written as $−9 < x < 1$.

   c. Use the table to solve the absolute value inequality $|x + 4| ≥ 5$. Explain.

   The values of $|x + 4|$ are greater than or equal to 5 when $x$ is less than or equal to −9 or $x$ is greater than or equal to 1. This is written as $x ≤ −9$ or $x ≥ 1$.

   d. Use the table to create a graph of the two functions. Use your graph to justify the solutions you found.

The graph of the absolute value function lies below the line $y = 5$ between −9 and 1. Therefore, the solution to the inequality $|x + 4| < 5$ is $−9 < x < 1$.

The graph of the absolute value function is above or equal to the line $y = 5$ when $x$ is less than or equal to −9 or $x$ is greater than or equal to 1. Therefore, the solution to the inequality $|x + 4| ≥ 5$ is $x ≤ −9$ or $x ≥ 1$. 
2. Consider the absolute value inequality \(|2x + 1| \leq 3\).

   a. Solve the inequality analytically, using the “two-for-one trade.”

   When \(2x + 1 \geq 0\), \(|2x + 1| = 2x + 1\). Therefore one inequality is \(2x + 1 \leq 3\). When \(2x + 1 < 0\), \(|2x + 1| = -2x - 1\). The second inequality is \(-2x - 1 \leq 3\).

   Solving these two inequalities gives:

   \[
   \begin{align*}
   2x + 1 & \leq 3 \\
   2x & \leq 2 \\
   x & \leq 1
   \end{align*}
   \]

   and

   \[
   \begin{align*}
   -2x - 1 & \leq 3 \\
   -2x & \leq 4 \\
   x & \geq -2
   \end{align*}
   \]

   The solutions to the inequality \(|2x + 1| \leq 3\) are \(x \leq 1\) and \(x \geq -2\).

   b. Verify your solutions using either a graph or a table.
      
      A graph is shown here.
3. You have used graphs to solve absolute value equations and inequalities by graphing both sides of the equation or inequality on the same axes.
   a. To solve an absolute value equation by graphing, what do you look for on the graph?
      The $x$-coordinate(s) of the point(s) of intersection are the solution(s) to the equation.

   b. To solve absolute value inequalities such as $|x + 4| > 5$ or $|x + 4| < 5$ by graphing, what do you look for on the graph?
      Look for the values of the independent variable for which the larger side’s graph lies above the smaller side’s graph.

4. You have also used tables to solve absolute value equations and inequalities. These tables have one column for the left side of the equation or inequality and another column for the right side.
   a. What do you look for in a table when solving an absolute value equation?
      Look for the same value on the left side and right side. The $x$-value for this line is the solution. Remember there may be more than one place where this happens.

   b. What do you look for in a table when solving an absolute value inequality?
      Look for the places where the values in the column for the larger side are larger than the values in the column for the smaller side. The corresponding $x$-values are the solution.

5. You have solved absolute equations and inequalities analytically, by graphing, and by using tables. Which method do you prefer? Why?
   Answers will vary.
LESSON 4: HOMEWORK

Notes or additional instructions based on whole-class discussion of homework assignment:

1. Solve $|x + 5| > 3$ analytically.

   First, solve the inequality when $x + 5 \geq 0$.
   If $x + 5 \geq 0$, then $|x + 5| = x + 5$. So the equation becomes:
   
   $x + 5 > 3
   
   x > -2$

   Next, solve the inequality when $x + 5 < 0$.
   If $x + 5 < 0$, then $|x + 5| = -x - 5$. So the equation becomes:
   
   $-x - 5 > 3
   
   -x > 8
   
   x < -8$

   The solution set is all real numbers $x$ such that $x < -8$ or $x > -2$.

2. Solve $|4 - 2x| \leq 2$ analytically.

   First, solve the inequality when $4 - 2x > 0$.
   If $4 - 2x > 0$, then $|4 - 2x| = 4 - 2x$. So the equation becomes:
   
   $4 - 2x \leq 2
   
   -2x \leq -2
   
   x \geq 1$

   Next, solve the inequality when $4 - 2x < 0$.
   If $4 - 2x < 0$, then $|4 - 2x| = -4 + 2x$. So the equation becomes:
   
   $-4 + 2x \leq 2
   
   2x \leq 6
   
   x \leq 3$

   The solution set is all real numbers $x$ such that $x \geq 1$ and $x \leq 3$, or $1 \leq x \leq 3$.

3. Solve $|3x + 1| < 4$ analytically. Confirm your solution with either a table or a graph.

   First, solve the inequality when $3x + 1 > 0$.
   If $3x + 1 > 0$, then $|3x + 1| = 3x + 1$. So the equation becomes:
   
   $3x + 1 < 4
   
   3x < 3
   
   x < 1$

   Next, solve the inequality when $3x + 1 < 0$.
   If $3x + 1 < 0$, then $|3x + 1| = -3x - 1$. So the equation becomes:
   
   $-3x - 1 < 4
   
   -3x < 5
   
   x > \frac{-5}{3}$

   The solution set is all numbers $x$ such that $x < 1$ and $x > -\frac{5}{3}$, or $-\frac{5}{3} \leq x \leq 1$.

   Students may confirm with either a table or a graph.
4. Solve $|5x - 2| > 4$ analytically. Confirm your solution with either a table or a graph.

First, solve the inequality when $5x - 2 > 0$.

If $5x - 2 > 0$, then $|5x - 2| = 5x - 2$. So the equation becomes:

$5x - 2 > 4$
$5x > 6$

$x > \frac{6}{5}$

Second, solve the inequality when $5x - 2 < 0$.

If $5x - 2 < 0$, then $|5x - 2| = -5x + 2$. So the equation becomes:

$-5x + 2 > 4$
$-5x > 2$

$x < -\frac{2}{5}$

The solution set is all numbers $x$ such that $x < -\frac{2}{5}$ or $x > \frac{6}{5}$.

Students may confirm with either a table or a graph.

<table>
<thead>
<tr>
<th>$X$</th>
<th>$Y_1$</th>
<th>$Y_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>-0.5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>0.5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$X$</th>
<th>$Y_1$</th>
<th>$Y_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>-0.5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>0.5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

5. Solve the absolute value inequality $|4 - 2x| > 2$ using the method of your choice.

Analytically

If $4 - 2x < 0$, $|4 - 2x| = -4 + 2x$

$-4 + 2x > 2$
$2x > 6$

$x > 3$

If $4 - 2x \geq 0$, $|4 - 2x| = 4 - 2x$

$4 - 2x > 2$

$-2x > -2$

$x < 1$

Graphically

Using a table

<table>
<thead>
<tr>
<th>$x$</th>
<th>$4 - 2x$</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>

The solution to this inequality is the set of $x$ values less than 1 or greater than 3. This is written as $x < 1$ or $x > 3$. This solution can be inferred using either a table or a graph, or solved for analytically.
LESSON 4: STAYING SHARP

1. On the coordinate plane, sketch a line that has a slope of zero and that passes through the point (-3,5). Then, write an equation for the line.

   Equation of line: \( y = 0x + 5 \) or \( y = 5 \)

2. On the coordinate plane, sketch a line that passes through the points (3,-5) and (3,3). Then write an equation for the line.

   Equation of line: \( x = 3 \)

3. Complete these tables to answer questions 3 and 4.

<table>
<thead>
<tr>
<th>Table A</th>
<th>Table B</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y = -2 + 3x )</td>
<td>( y = 4 + 3x )</td>
</tr>
<tr>
<td>-4</td>
<td>-4</td>
</tr>
<tr>
<td>-3</td>
<td>-3</td>
</tr>
<tr>
<td>-2</td>
<td>-2</td>
</tr>
<tr>
<td>-1</td>
<td>-1</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

   a. As \( x \) increases by 1, by how much does \( y \) increase in Table A?

      \( \Delta y = 3 \)

   b. As \( x \) increases by 1, by how much does \( y \) increase in Table B?

      \( \Delta y = 3 \)

4. Will there be a common \((x,y)\) pair in the two tables if the tables are extended? Explain.

   No, there will not. Each function is increasing at the same rate but have different \( y \)-intercepts. They are parallel.

5. Write an equation of the line in slope-intercept form.

   \( y = 2x - 2 \)

6. On the line, there is a point with an \( x \)-coordinate of 7. Find that point’s \( y \)-coordinate. Explain how you found the answer.

   \( y = 2(7) - 2 \)
   \( y = 14 - 2 \)
   \( y = 12 \)
Lesson 5: Inequalities in the plane

LESSON 5: OPENER
Earlier Math each point with a description of its coordinate.

<table>
<thead>
<tr>
<th>x ≥ 5 and y &lt; -1</th>
<th>x ≥ 5 and y &gt; 1</th>
<th>x &gt; 5 and y &gt; 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>x &lt; -1 and y &lt; -5</td>
<td>x &lt; -5 and y ≥ 5</td>
<td>x &lt; -1 and y &lt; -4</td>
</tr>
</tbody>
</table>

1. Point A
   \[ x \geq 5 \text{ and } y < -1 \]
2. Point B
   \[ x \geq 5 \text{ and } y > 1 \]
3. Point C
   \[ x < -5 \text{ and } y \geq 5 \]
4. Point D
   \[ x < -1 \text{ and } y < -4 \]

LESSON 5: CORE ACTIVITY
Suppose you and some friends go to the movies and buy some snacks. The snack bar charges $2 for a box of candy and $6 for the “combo.” The combo is a medium drink and popcorn.

1. If \( x \) = the number of boxes of candy purchased and \( y \) = the number of combos purchased, write an expression that represents the total amount you could spend at the snack bar on candy and combos.
   \[ 2x + 6y \]

2. After buying the movie tickets, you have $12 left to spend for snacks. Use your cost expression from question 1 to write an inequality that indicates that you would get change from your snack bar purchase.
   \[ 2x + 6y < 12 \]

3. a. Use substitution to determine whether (5,1) is a solution to the inequality you wrote in question 2.
   \[ 2(5) + 6(1) < 12 \]
   \[ 10 + 6 < 12 \]
   \[ 16 < 12 \]
   \( (5,1) \) is NOT a solution to \( 2x + 6y < 12 \)

   b. What does the coordinate pair (5,1) mean in the context of the problem?
   It represents the purchase of 5 boxes of candy and 1 combo.

4. Is (2,1) a solution to the inequality \( 2x + 6y < 12 \)? What does the ordered pair (2,1) mean in the context of the problem?
   \[ 2(2) + 6(1) < 12 \]
   \[ 4 + 6 < 12 \]
   \[ 10 < 12 \]
   \( (2,1) \) is a solution to \( 2x + 6y < 12 \). It represents buying 2 boxes of candy and 1 combo.
5. a. Which of the given ordered pairs are solutions to the inequality you wrote in question 2? Explain how you know.

(3,2) (0,1) (9,-1) (6,-2) (-4,2) (5,0)

(0,1) (6,-2) (-4,2) and (5,0) are solutions to the inequality.
When you substitute their x and y values into the inequality they yield true inequalities.

T

b. What do the solutions mean in the context of the problem?

They represent amounts of candies and combos you can buy together, and still get change back when paying $12.00 (however, you can not buy negative amounts of candies or combos).

6. Graph the line $2x + 6y = 12$ and plot all of the points listed in question 5. Label points that are solutions to the inequality $2x + 6y < 12$ with the letter “T” and the non-solutions with the letter “F.” Where do all the solutions lie?

![Graph of line and points](image)

7. How would you shade your graph to show ALL the ordered pairs that make the inequality true?

Shade the region that is under the line. However, in the context of the snack bar problem, shading below the line, but on and above the x-axis and on and to the right of the y-axis, is all that makes sense since it does not make sense to have a negative number of combos or a negative number of boxes of candy.
8. Match each of the inequalities with its corresponding graph. Write the inequality in the blank space beneath the graph it represents.

\[ y > -5 \quad 5x - 4y > 20 \quad x < y \]
\[ x < -5 \quad 5x - 4y \leq 20 \quad 5x - 4y < 20 \]

LESSON 5: ONLINE ASSESSMENT

Today you will take an online assessment.
LESSON 5: HOMEWORK

Notes or additional instructions based on whole-class discussion of homework assignment:

A snack bar charges $3 for a box of candy and $5 for the “combo.” The combo is a medium drink and popcorn.

1. Write an expression that represents the total amount you could spend at the snack bar on candy and combos.
   \[ x = \text{# boxes of candy}, \quad y = \text{# combos} \]
   \[ 3x + 5y \]

2. Suppose you can spend at most $12. Create an inequality that represents this restraint. Then find at least three ordered-pair solutions representing the number of boxes of candy and combos you can buy.
   \[ 3x + 5y \leq 12 \]
   Ordered pairs will vary.

3. Suppose you want to spend at least $12. Create an inequality that represents this restraint. Then find at least three ordered-pair solutions representing the number of boxes of candy and combos you can buy.
   \[ 3x + 5y \geq 12 \]
   Ordered pairs will vary.

4. Suppose you want to spend exactly $12. Find an ordered pair solution representing the number of boxes of candy and combos you can buy.
   The only solution (that makes sense in the context) is buying 4 boxes of candy and no combos: (4,0).

5. Using the expression you wrote in question 1, write an equation to represent the situation in question 4, in which you spend exactly $12. Graph the equation. Then plot all seven ordered-pair solutions to questions 2-4 on the graph.

   a. Describe the region of the graph where you find the solutions to question 2.
      These fall in the area bounded by the x-axis, the y-axis, and \( 3x + 5y = 12 \).

   b. Describe the region of the graph where you find the solutions to question 3.
      These fall anywhere in the first quadrant except the area described in part a.

   c. Describe the region of the graph where you find the solution to question 4.
      These fall on the line itself.
6. Tanya’s mother will pay for Tanya’s entire cell phone bill as long as the usage charge is less than $35 for the month. On Tanya’s cell phone plan, the usage charge is $0.15 per text message and $0.10 per minute for calls.

   a. Write an inequality that expresses the number of text messages Tanya may send, $t$, and the number of minutes Tanya may talk, $m$, so that her mother will pay the entire cell phone bill for the month.

   \[(0.15)t + (0.10)m < 35\]

   b. Create a graph showing all of the possible combinations of texts and minutes so that Tanya’s mother will pay the entire bill.

   ![Graph](image)

   c. Use the graph you constructed to find five possible combinations of texts and minutes that would keep Tanya’s usage charge under $35.

   *Answers will vary. Some possible ordered pairs: (0, 349), (233, 0), (0, 0), (80, 200), (200, 20), (120, 120)*
7. For each inequality, create a graph showing all of the coordinate pairs that make the inequality true.

a. \( y \geq \frac{1}{2}x - 3 \)

b. \( 5x - 6y < 30 \)

c. \( x > -3 \)
### Lesson 5: Staying Sharp

<table>
<thead>
<tr>
<th>1. Solve the following inequality for (x):</th>
</tr>
</thead>
<tbody>
<tr>
<td>(8x + 7 \geq 11)</td>
</tr>
<tr>
<td>Answer with supporting work:</td>
</tr>
<tr>
<td>(8x + 7 \geq 11)</td>
</tr>
<tr>
<td>(8x + 7 - 7 \geq 11 - 7)</td>
</tr>
<tr>
<td>(8x \geq 4)</td>
</tr>
<tr>
<td>(8x + 8 \geq 4 + 8)</td>
</tr>
<tr>
<td>(x \geq \frac{1}{2})</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Write an equation for a line that has a slope of 4 and passes through the point ((1,6)). Then, name the coordinates of one other point that the line passes through.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Answer with supporting work:</td>
</tr>
<tr>
<td>(y = 4x + b)</td>
</tr>
<tr>
<td>(6 = 4(1) + b)</td>
</tr>
<tr>
<td>(6 - 4 = b)</td>
</tr>
<tr>
<td>(2 = b \Rightarrow y = 4x + 2)</td>
</tr>
<tr>
<td>Another point on the line is ((3,14)) (responses will vary).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. Report the point of intersection for the graph. Include the context of the situation represented in the graph.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intersection point:</td>
</tr>
<tr>
<td>The intersection point is ((20,40)). This represents 20 regular sodas and 40 diet sodas..</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4. The functions (y = 2x + 4) and (y = 2x + 1) are graphed here. How can you tell from their equations that the two lines will never intersect each other?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Answer: They both have the same slope ((m=2)), so they are parallel.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5. Graph the line with a (y)-intercept of ((0,-2)) and a slope of (\frac{4}{3}) on the coordinate plane. (Consider using slope triangles to graph efficiently.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(y)-intercept: (y = -2)</td>
</tr>
<tr>
<td>slope: (m = \frac{4}{3})</td>
</tr>
<tr>
<td>(y = \frac{4}{3}x - 2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6. Write an equation of the line you graphed in question 5.</th>
</tr>
</thead>
</table>
Lesson 6: Compound inequalities in the plane

LESSON 6: OPENER

1. Graph the following compound inequality on a number line:
   \[ x < -1 \text{ or } x > 4 \]

2. Graph the following inequalities on the plane:
   a. \[ x < -1 \]
   b. \[ x > 4 \]

3. Using the graphs you constructed in questions 1 and 2, predict what the graph of \( x < -1 \text{ or } x > 4 \) would look like in the plane. Sketch your prediction. Explain why you think your graph is correct.
LESSON 6: CORE ACTIVITY

1. How close was your prediction of the graph of \( x < -1 \) or \( x > 4 \) in the plane to the correct graph? Explain.  
   Student responses will vary

2. Graph the inequality \( x > -2 \) and \( x < 7 \) on the number line.

3. Graph the inequality \( x > -2 \) and \( x < 7 \) on the plane. How is the graph related to the graph you constructed in question 2?

4. For each inequality, create a graph showing all of the coordinate pairs that make the inequality true.  
   a. \( y \geq -4 \)  
   b. \( x \geq -2 \)

5. Graph the following compound inequalities in the plane:  
   a. \( y \geq -4 \) or \( x \geq -2 \)  
   b. \( y \geq -4 \) and \( x \geq -2 \)

Neither include \( x = -2 \) or \( x = 7 \). Both include all the numbers between \( x = -2 \) and \( x = 7 \).  
Student responses may vary.
### LESSON 6: REVIEW ONLINE ASSESSMENT

You will work with your class to review the online assessment questions.

<table>
<thead>
<tr>
<th>Problems we did well on:</th>
<th>Skills and/or concepts that are addressed in these problems:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Problems we did not do well on:</th>
<th>Skills and/or concepts that are addressed in these problems:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Addressing areas of incomplete understanding

Use this page and notebook paper to take notes and re-work particular online assessment problems that your class identifies.

<table>
<thead>
<tr>
<th>Problem #_____</th>
<th>Work for problem:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Problem #_____</th>
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<tr>
<th>Problem #_____</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
LESSON 6: HOMEWORK

Notes or additional instructions based on whole-class discussion of homework assignment:

Next class period, you will take an end-of-unit assessment. One good study skill to prepare for tests is to review the important skills and ideas you have learned. Use this list to help you review these skills and concepts, especially by reviewing related course materials.

Important skills and ideas you have learned in the unit **Linear equations and inequalities**:

- Analyze situations involving linear functions and formulate linear equations and inequalities to solve problems
- Use various methods to solve linear equations and inequalities: inspection, tables, graphs, and use of algebraic operations in connection with the properties of equality
- Interpret and determine the reasonableness of solutions to linear equations for given contexts
- Apply techniques for solving equations in one variable to solve literal equations
- Graph solutions to linear inequalities in one variable on a number line
- Graph solutions to linear inequalities in two variables on a coordinate plane
- Graph solutions of compound linear inequalities in two variables on a coordinate plane

**Homework Assignment**

**Part I:** Study for the end-of-unit assessment by reviewing the key ideas listed above.

**Part II:** Complete the online *More practice* in the topic **Solving linear inequalities**. Note the skills and ideas for which you need more review, and refer back to related activities and animations from this topic to help you study.

**Part III:** Complete *Lesson 6: Staying Sharp*. 
Lesson 6: Staying Sharp

1. a. Find a number that satisfies the inequality \( x < -3 \).
   
   \( -10 = x \Rightarrow -10 < -3 \)

   b. Check if the number you found in part a also satisfies the inequality \( -3x < 9 \).
   
   \( -3(-10) < 9 \)
   
   \( 30 < 9 \)
   
   No, it does not satisfy the inequality.

   c. Will any number that satisfies \( x < -3 \) also satisfy \( -3x < 9 \)? Explain.
   
   No. Student Reasoning will vary.

2. Write an equation for a line that passes through the points (3,5) and (6,3).

   Answer with supporting work:

   \[
   \text{Slope} = \frac{5 - 3}{6 - 3} = \frac{-2}{3}
   \]

   \[ y = \frac{-2}{3} x + b \]

   \[ 5 = \frac{-2}{3} (3) + b \]

   \[ 5 = -2 + b \]

   \[ 7 = b \]

   \[ y = \frac{-2}{3} x + 7 \]

3. Complete this input-output table for both function rules.

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y = 4x + 18 )</th>
<th>( y = -2x + 6 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-3</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>-2</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>-1</td>
<td>14</td>
<td>8</td>
</tr>
<tr>
<td>0</td>
<td>18</td>
<td>6</td>
</tr>
<tr>
<td>1</td>
<td>22</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>26</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
<td>0</td>
</tr>
</tbody>
</table>

4. A classmate has been away and missed several lessons. Explain to that classmate how to use the table you created in question 3 to find the intersection point of the two function rules, and how to check that the coordinates of that intersection point are correct.

   Look for the same \( y \)-value in each table at one chosen \( x \)-value (\((-2,10)\) in this case). To check if it’s correct, substitute the \( x \)-value into each equation and check if it yields the \( y \)-value in each case.

5. A line passes through the point (2,3) and has a slope of –2. Graph the line on the coordinate grid. (Consider using slope triangles to graph efficiently.)

6. Write an equation of the line you graphed in question 5.

   \[ \text{Slope: } m = -2 \]

   \[ y\text{-intercept: } y = 7 \]

   \[ y = -2x + 7 \]
LESSON 7: OPENER

Bianca and Joe are starting their own pet grooming business called House of Groom. They figure that they can spend no more than $50 a month on pet shampoo. A local dealer of pet shampoo, The Pet Pantry, sells quart bottles of shampoo for $4.00 a bottle plus a $5.00 handling fee per order.

1. Write an expression that represents the amount of money charged by The Pet Pantry for an order of shampoo.
   \[ 4x + 5 \]

2. Write an inequality that represents the amount House of Groom is willing to pay per month for The Pet Pantry's shampoo.
   \[ 50 \geq 4x + 5 \]

3. Solve the inequality you wrote in question 2 using any method.
   \[
   \begin{align*}
   50 & \geq 4x + 5 \\
   45 & \geq 4x \\
   11.25 & \geq x
   \end{align*}
   \]
   Since you can only buy whole bottles of shampoo, 11 bottles is the maximum that can be purchased per month.

LESSON 7: END-OF-UNIT ASSESSMENT

Today you will take the end-of-unit assessment.
LESSON 7: CONSOLIDATION ACTIVITY

1. For each numbered card, find a match using the lettered cards. Record the matches here.

   1 - C; 2 - F, 3 - D, 4 - A, 5 - H, 6 - G, 7 - B, 8 - E

2. Answer the following questions to reflect on your performance and effort this unit.
   a. Summarize your thoughts on your performance and effort in math class over the course of this unit of study. Which areas were strong? Which areas need improvement? What are the reasons that you did well or did not do as well as you would have liked?

   b. Set a new goal for the next unit of instruction. Make your goal SMART.
      • Description of goal:
      • Description of enabling goals that will help you achieve your goal:
LESSON 7: HOMEWORK

Notes or additional instructions based on whole-class discussion of homework assignment:

1. Explain the phrase “compound inequality in the plane” in your own words.

   A compound inequality in the plane is when you have two (or more) inequalities in two variables that you are looking for solutions to.

   Student responses will vary

2. Graph each compound inequality on the coordinate plane provided.

   a. $x < 5$ and $x > -3$
   b. $y < 4$ and $y \geq 0$
   c. $x \geq -2$ and $y < 3$
   d. $y < -5$ or $y > 5$
   e. $x \leq 7$ or $x > 2$
   f. $y \leq -3$ or $x \geq -1$
1. A line with a slope of \(\frac{1}{3}\) passes through the point (3,6).
   Write an equation for this line.

   Answer with supporting work:
   \[ y = \frac{1}{3}x + 5 \]
   Since the slope is \(\frac{1}{3}\), as \(y\) increases by one, \(x\) increases by 3. Also, as \(y\) decreases by one, \(x\) decreases by 3. To find the \(y\)-intercept, we need a coordinate pair with an \(x\)-value of 0. If we use the point (3,6), we can decrease the \(x\) value by three, which means we have to decrease the \(y\) value by one. So, (0,5) is another point on the graph of the line. So, the \(y\)-intercept is \(b = 5\).
   (Student reasoning may vary.)

2. Which of the following points are on the line with equation \(y = \frac{1}{2}x + 7\)?

   - (4,5) No: \(\frac{1}{2}(4) + 7 = 2 + 7 = 9 \neq 5\)
   - (–4,3) No: \(\frac{1}{2}(-4) + 7 = -2 + 7 = 5 \neq 3\)
   - (4,3) No: \(\frac{1}{2}(4) + 7 = 2 + 7 = 9 \neq 3\)
   - (–4,5) Yes: \(\frac{1}{2}(-4) + 7 = -2 + 7 = 5\)

3. Graph the function rules \(y = 4x - 3\) and \(y = -2x + 9\) on the coordinate plane. Then write the coordinates of their point of intersection.

   Intersection point: (2,5)

4. Complete this input-output table for the function rules.

<table>
<thead>
<tr>
<th>(x)</th>
<th>(y = 4x - 3)</th>
<th>(y = -2x + 9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-3</td>
<td>9</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>13</td>
<td>1</td>
</tr>
</tbody>
</table>

   a. For what \(x\) value are the \(y\)-values of the two functions equal?
      \(x = 2\)

   b. How does your answer to question 4a relate to your answer to question 3?
      It is the \(x\)-value of the point where the two graphs intersect. It is also the solution to the equation \(4x - 3 = -2x + 9\).

5. Use slope triangles to graph each function rule on the coordinate grid.

   a. \(y = \frac{1}{2}x + 2\)
   b. \(y = -\frac{2}{3}x + 9\)

6. In which quadrant do the two lines intersect?
   Quadrant I