


Lesson Format

Each lesson is broken into sections that review important skills and concepts for the topic. Sample problems are presented in a variety of formats and include explanations to show the student how to arrive at the correct answer.

Try this sample question. SAMPLE 2

Look at the graph below.



Write the inequality for which the solution set is shown in the graph.

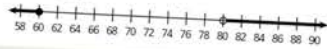
The graph has a solid dot at -3.5 and an open dot at 1 . Therefore the graph shows all real numbers greater than or equal to -3.5 and less than 1 . Algebraically, this is $-3.5 \leq x < 1$.

Interpreting Compound Inequalities

Compound inequalities represent many situations in real life that involve ranges of numbers. For example, a lasagna recipe calls for a baking time of at least 35 minutes and at most 45 minutes. If x is the baking time, then $x \geq 35$ and $x \leq 45$, or $35 \leq x \leq 45$.

Try this sample question. SAMPLE 3

A heat pump cools a house in hot weather and heats it in cold weather. The graph below shows what the outside temperatures are when the heat pump is operating. Write a compound inequality to describe this situation and explain what it means.



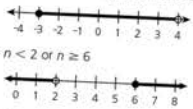
The graph shows a solid circle on 60 and an arrow to the left; this means the heat pump comes on if the temperature is 60° or below. The graph shows an open circle on 80 and an arrow to the right; this means the pump comes on if the temperature is above 80° . A compound inequality for this situation uses the word *or*: $x \leq 60$ or $x > 80$.

LESSON
4 Compound Linear Inequalities A1.L.8

Solving and Graphing Compound Inequalities

A **compound inequality** is formed when two inequalities are joined by the words *and* or *or*. A compound inequality can also be written as a single number sentence with two inequality signs. Examples of such inequalities and their graphs are shown below.

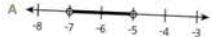
- $n \geq -3$ and $n < 4$, also written as $-3 \leq n < 4$
- $n < 2$ or $n \geq 6$




To find the solution to a compound inequality, solve each inequality separately. Sometimes it helps to rewrite inequalities containing *and* or *or* as two separate inequalities.

Try this sample question. SAMPLE 1


Which graph shows the solution to $7 < -3 - 2x < 11$?




A



B



C



D

Write the compound inequality as two separate inequalities joined by the word *and*. Then solve each inequality.

$$\begin{aligned} 7 < -3 - 2x & \text{ and } -3 - 2x < 11 \\ 10 < -2x & \quad -2x < 14 \\ -5 > x & \quad \quad \quad x > -7 \end{aligned}$$

Add 3 to each side.
Divide each side by -2 . Change the direction of each inequality symbol.

Note that $-5 > x$ is the same as $x < -5$. So, x is greater than -7 and less than -5 . Choice A is correct.

Lesson Format (cont.)

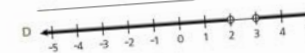
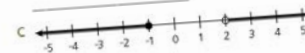
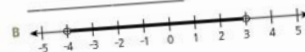
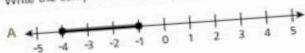
Independent practice completes the lessons using a variety of item types, including those on the grade 10 assessment.

INDEPENDENT PRACTICE

Read and solve each problem.

- 1 What is the solution to the compound inequality $5 + 3j < 2$ or $2j - 7 > -3$?

- 2 Write the compound inequality represented by the graph on each number line?



- 3 Students in a class took a timed test. No student finished the test in less than 20 minutes. All students had finished before time was called at 45 minutes. Represent the time range, m , in which students finished the test on the number line below.



- 4 Two sides of a triangle are 6 mm and 9 mm long. The possible lengths for the remaining side of the triangle, s , can be found using the inequality below.

$$6 + s > 9 \text{ and } 6 + 9 > s$$

- A Solve the inequality.

- B Graph the solution on the number line.



- 5 The optimal depth for a certain reservoir is between 50 and 60 feet, inclusive. Its depth reached a maximum of 64 feet on March 1st, and then began to decrease at a rate of 0.5 foot per week. The inequality below can be solved for n , the number of weeks after March 1st for which the reservoir will be at optimal depth.

$$50 \leq 64 - 0.5n \leq 60$$

According to this inequality, which statement is true?

- A The reservoir will be at optimal depth for 20 weeks.
 B The reservoir will not reach optimal depth until October.
 C The reservoir will take over a year to reach optimal depth.
 D The reservoir will be at optimal depth 6 weeks after March 1st.

- 6 What is the solution to the inequality $7 \leq b + 8$ or $\frac{b}{3} - 2 \leq -7$? Show all the necessary steps.

- 7 Look at the inequality below.

$$-13 < 2k - 1 < 5$$

- A What solutions for k make this inequality true?

- B Explain how you know the solutions are correct.

Calculator Use

Calculator instructions for various procedures are included to help students practice using the technology.

One way to determine the graph is to choose some values for x and solve the equation for y . You can make a table to keep track of your pairs.

Month	1	2	3	4
Expenses (\$)	8,000	12,000	16,000	20,000

Rewrite the points shown in your table as the set of ordered pairs (1, 8,000), (2, 12,000), (3, 16,000), and (4, 20,000). Find the graph that contains these ordered pairs, choice C.

Another way to find the graph is to notice that the equation is in $y = mx + b$ form, in which m is the slope and b is the y -intercept. This means the graph will start at 4,000 on the y -axis and rise by an increment of 4,000 each month. Only choice C has these features.

Using a Graphing Calculator

If you know the equation, a graphing calculator can be used to graph it. These steps are for the TI-83/84, but most calculators will have similar steps.

Graphing an Equation

- Step 1:** From the home screen, press $Y=$.
- Step 2:** For an equation in the form $y = f(x)$, enter the equation next to $Y1=$.
- Step 3:** Press WINDOW.
- Step 4:** Enter values for the minimum, maximum, and intervals of each axis.
- Step 5:** Press GRAPH to see the graph of the function.

To find the graph of a function given in table form, first find the equation of the line using a graphing calculator. Follow the steps below to find the equation of a line, also called the regression line.

Finding the Equation of a Line

- Step 1:** From the home screen, press STAT.
- Step 2:** Select EDIT.
- Step 3:** Enter the x -values of the data set in L1.
- Step 4:** Enter the y -values of the data set in L2.
- Step 5:** Select STAT. Move cursor to the menu item CALC. Select option 4: LinReg($ax + b$)
- Step 6:** With option 4 on the screen, enter L1, L2, and Y1: LinReg($a + bx$) L1, L2, Y1
- Step 7:** Press ENTER to see the results.

To find values to enter in step 4, use the TABLE function. Press 2nd and TABLESET. Enter an appropriate initial value for the domain. Then press 2nd and TABLE. The resulting table gives you an idea of the domain and range values applicable to the function.

For Y1, select VARS and then Y-VARS. Select option 1: Function. Select and enter the Y1 value.

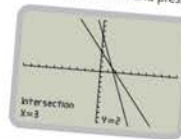
Next, it is necessary to find the point of intersection of the two lines. Often, the point of intersection will not be obvious, but a graphing calculator can be used to find the exact coordinates of the point. To find the point of intersection of two lines with a TI-83/84 graphing calculator, first enter the equations and then follow these steps:

Finding the Point of Intersection

- Step 1:** Press 2ND.
- Step 2:** Press TRACE.
- Step 3:** Select 5: INTERSECT.
- Step 4:** Press ENTER.
- Step 5:** When asked for the first curve, press ENTER.
- Step 6:** When asked for the second curve, make sure the cursor is on the other line and press ENTER.
- Step 7:** When asked for a guess, move the cursor near the point of intersection and press ENTER.

To graph two equations with a TI-83/84 graphing calculator, press MODE and make sure FUNC is highlighted on the fourth line. Then follow the steps on page 178.

Move the cursor using the arrow keys.



The point of intersection of the lines represented by the equations $y = -2x + 8$ and $y = -4x + 14$ is (3, 2). Since x represents the cost of bowling a game, and y represents the cost of renting shoes, the cost of bowling a game is \$3.00, and the cost of renting shoes is \$2.00.