Name _____

Date _____

Linear Inequalities: Using Graphs & Tables — Student Worksheet

Overview

The **Overview** introduces the topics covered in **Observations** and **Activities**. Scroll through the **Overview** using ▶ (◀ to review, if necessary). Read each screen carefully. Look for new terms, definitions, and concepts.

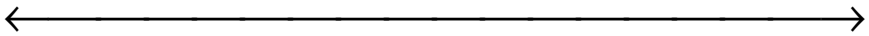
Observations

The **Observations** illustrate mathematical concepts relating to inequalities. Scroll through the **Observations** using ▶ (◀ to review, if necessary). Read each screen carefully. When you come to a **Write an Observation** screen, stop and write the answers to the questions on your worksheet.

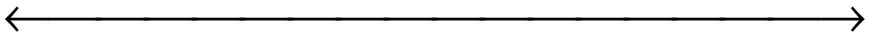
Observation 1

If **x** is a real number, draw the number line graph of each inequality. Remember to use open and closed notation and to label each number line correctly.

1. **$x < 3$**

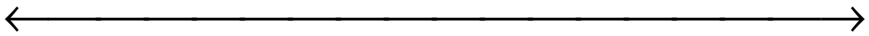


2. **$x \leq 3$**



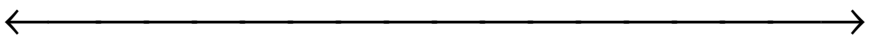
3. **$x > 6$**

4. **$x \geq 6$**

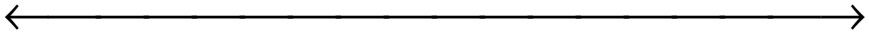


Draw the number line graphs for these inequalities (which are not in the Topics in Algebra 1 application).

5. **$x > -\frac{1}{2}$**



6. **$x \leq 1.25$**



Name _____

Date _____

Activities

The **Activities** help you practice using graphs and tables to solve inequalities. You can select from three different activities—**Build the Solution Set!, Worksheet Activity 1**, and **Worksheet Activity 2**. Follow these steps to play the activity and complete your worksheet.

1. Make sure you are in the **Activities** for this section.

2. Highlight an activity using ▲ or ▼, and press ENTER.

Scoring: There are five problems in each set. You get two attempts to solve for **x** for each problem. You get 2 points for a correct choice on the first try, and 1 point for a correct choice on the second try.

You can earn up to 10 points.

Build the Solution Set!

1. Use ◄ or ► to move the cursor along the number line. Press ENTER to select the first point to test. The point is displayed along with the result of the test.

2. Choose another point to test. After the point and result of the test for the second point are displayed, four possible solutions for **x** are displayed.

3. Press ◄ or ► to highlight the correct solution, and then press ENTER to select it. If you choose an incorrect solution on the first try, you get another try. If you choose an incorrect solution on the second try, the correct answer is displayed; press any key to go to the next problem. As you play the activity, write the inequalities and their solutions.

_____

_____

_____

_____

_____

4. What was your score? _____

Name _____

Date _____

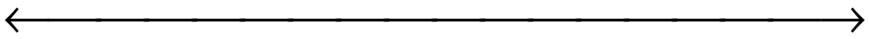
Activities (continued)

Note: Press ◄ or ► to leave this screen.

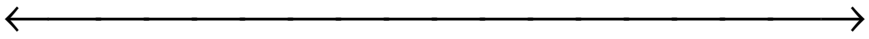
Worksheet Activity 1

Use the number lines below to estimate the solution set of the following inequalities. Use number sense to place a scale on each number line so that you are able to show the solution set. Check several points as shown in the previous activity. Show all of your work.

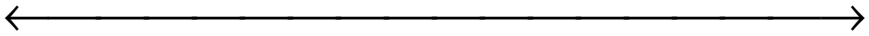
1. $x + 2.5 < 7$

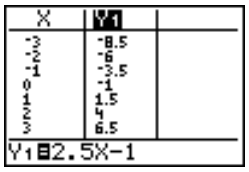


2. $x - 3.6 \leq -2$



3. $x + \frac{3}{4} > 4\frac{1}{8}$





Worksheet Activity 2

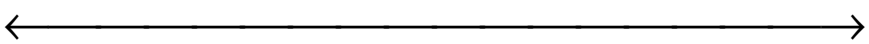
Use the table of the expression **2.5X–1** at the left to find out when **2.5X–1<3**. First estimate the answer, and then use number sense to determine the exact answer. Write your strategy for the solution, and draw the solution set on a number line.

_____

_____

_____

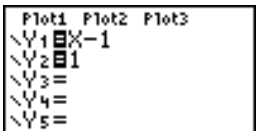
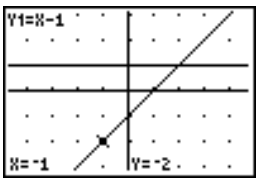
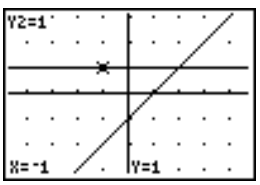
2.5X–1<3



Name _____
Date _____

Try-It!™ on Your TI-83 Plus or TI-73

Solution search using X-Y graphs: Find the solution set for the inequality **X–1<1**. Before you start, estimate the solution using number sense. Write your estimate here. _____

To Do This	Press	Display (TI-83 Plus shown)
1. Exit the Topics in Algebra 1 application and clear the Home screen.	2nd [QUIT] ⟨**EXIT**⟩ CLEAR	
2. Set your window format as shown. **Note:** See TIp™ 5: *Adjusting the Viewing Window* for more information.	TI-83: 2nd [FORMAT] ▼ ▼ ▶ ENTER TI-73: 2nd [FORMAT] ▼ ▶ ENTER	
3. Enter both sides of the inequality into the Y= editor as shown. **Note**: On the TI-73, use x rather than X,T,Θ,n. **Note**: You may need to deselect the other Y= functions. See TIp™ 3: *Graphing a Function in the Standard Window*.	Y= CLEAR X,T,Θ,n (–) **1** ▼ CLEAR **1**	
4. Select **ZDecimal** to set the viewing window and graph the functions.	TI-83: ZOOM **4:ZDecimal** TI-73: ZOOM **8:ZDecimal**	
5. Trace the functions. **Note**: The function displays in the upper left corner of the screen; the **X** and **Y** values are displayed on the bottom of the screen.	TRACE ◀ or ▶ to trace a function ▲ and ▼ to move between functions	
6. Compare **Y1** and **Y2** for the same **X** values. For example, notice that when **X = ⁻1**, **Y1= ⁻2** and **Y2=1** as shown on the screens. Where is **X –1 < 1**? _____ **Hint**: Trace **Y1** to find out when **Y1**< **Y2**. 7. Why? _____ _____ _____		 

Name _____

Date _____

Try-It!™ on Your TI-83 Plus or TI-73 (continued)

Additional Problems

Solution Search: On the following problems, first estimate the solution using number sense. Then search for the solution set for each inequality using graphs as shown in the previous example. Finally, draw your graphs from your graphing calculator and show your work.

Don't forget to set an appropriate viewing window in order to see your graphs.

Note: See TIp™ 5: *Adjusting the Viewing Window* for more information.

1. **2X+3** $\leq$ **7**

2. **X+4** $>$ **-3**

3. **0.5X**−**1** $<$ **2**

4. **X**−**2** $\geq$ **-3**

Linear Inequalities: Using Graphs & Tables Teacher Notes

Objectives

- To illustrate how to estimate the solution set, in the real numbers, of a linear inequality using graphical methods on a number line and on a Cartesian (x-y) graph.
- To illustrate how to estimate the solution set, in the real numbers, of a linear inequality using tables.

Math Highlights

In the number line method, students use a guess-and-test approach to search for the solution on a number line. A point is chosen to test, the substitution is shown and students see whether the statement is true or false. A point is plotted for a true statement. Students see an estimate of the solution set built on the number line.

In the table of values method, students see a table of values for each side of the inequality. They see where the inequality is satisfied, and then they see how to refine the estimate of the solution set.

In the x-y graphical method, students plot both sides of the inequality and use the graph to determine the solution set for the inequality by testing points. In the 2-D graph, students are able to see which graph is higher or lower than the other graph. This helps them estimate the solution set.

Note: The inequalities of the form $ax + b < c$ (for $<$, $\leq$, $>$, $\geq$) with $a < 0$ are not discussed in this section.

Common Student Errors

- Using graphs and tables can mislead students. They may think that they can always find the exact solution using graphs and table. Although they will often find exact solutions using these methods, using algebra will always give exact solutions for inequalities. For the graphing calculator example, $x + 2 \leq 1$, only integer values are tested. If the example had been $x + 2 < 1$, the students would need to test points closer and closer to $x = -1$ to see that the solution set contains values strictly less than -1. The endpoint (-1) is not included in the solution. Encourage students to pick many points. Remind them that they would have to test **all** points with these methods to get the exact solution, in the real numbers and that is physically impossible to test **all** points!
- At times, introducing the algebraic solution of inequalities gives students just the mechanics of doing a problem. Algebraic methods alone usually do not invite students to reason out the solution using number sense. The graphs and tables method gives students the opportunity to see the values of each side of the inequality as a graph or table so they can compare the size of the numbers, thus helping them create the solution set.
- Visual learners can benefit by seeing the graphs and numbers and using them as the tool to find the solution set.
- Some students may still have difficulty remembering the meaning of the symbols, **<**, **≤**, **>**, and **≥**.

Student Worksheet Notes with Answers

Overview

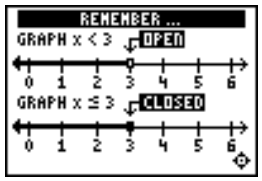
Tell students:

1. How to find the **Overview**, or tell them to review the instructions on the worksheet.
2. How to navigate the application, if they are not yet familiar with the application.
3. To scroll through the **Overview** on the graphing calculator. Point out new terms, definitions, and concepts, and tell students to look for them as they go through the **Overview**.

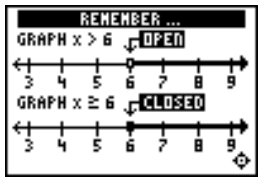
Observations

The **Observations** help students understand concepts about linear inequalities relating to graphs and tables. If necessary, tell students how to find the **Observations**.

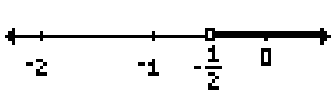
Observation 1



1. **x < 3**
2. **x ≤ 3**

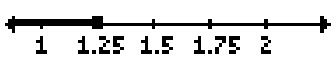


3. **x > 6**
4. **x ≥ 6**



5. **$x > -\frac{1}{2}$**

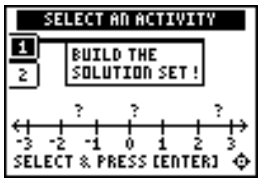
(Not in the Topics in Algebra 1 application.)



6. **x ≤ 1.25**

(Not in the Topics in Algebra 1 application.)

Activities



Scoring: There are five problems in each set. Students get two attempts to solve for **x** for each problem. You get 2 points for a correct choice on the first try, and 1 point for a correct choice on the second try.

Students can earn up to 10 points.

Build the Solution Set!

Tell students to:

1. Use ◄ or ► to move the cursor along the number line. Press ENTER to select the first point to test. The point is displayed along with the result of the test.
2. Choose another point to test. After the point and result of the test for the second point are displayed, four possible solutions for **x** are displayed.
3. Press ◄ or ► to highlight the correct solution, and then press ENTER to select it. If students choose an incorrect solution on the first try, they get another try. If they choose an incorrect solution on the second try, the correct answer is displayed. Students can press any key to go to the next problem. As they play the activity, they should write the inequalities and their solutions.
4. Record their scores.

Note: Students can press ◄ or ► to leave this screen.

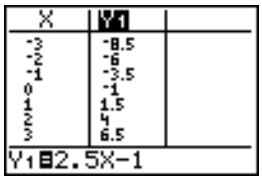
Worksheet Activity 1

Tell students to:

1. Use number sense to estimate the solution set for the following three inequalities on the number lines provided.
2. Place the appropriate scale on each number line so that they are able to show the solution set appropriately.
3. Check several points as shown in the activity above.
4. Show all of their work.

1. $x + 2.5 < 7$ *when* $x < 4.5$
2. $x - 3.6 \leq -2$ *when* $x \leq 1.6$
3. $x + \frac{3}{4} > 4\frac{1}{8}$ *when* $x > 3\frac{3}{8}$

Activities (continued)



Worksheet Activity 2

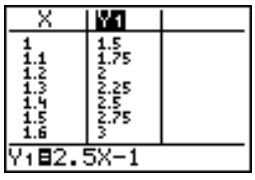
Tell students to:

Use the table of the expression **2.5X–1** shown on their worksheets (shown at left) to find out when **2.5X–1<3** by first estimating the answer, and then using number sense to determine the exact answer. Remind them to write their strategy for the solution and to draw the solution set on a number line.

From the table, students should see that they need to test more values between **X=1** *and* **X=2** *to find where* **2.5X–1<3**.

If you wish the students to continue the activity on their graphing calculators, tell them to enter the function in the Y= editor. Then on the **TABLE SETUP** *screen (*2nd [TBLSET]*), they can refine their search as shown in the screens below.*

The students see that **2.5X–1** *is equal to* **3** *at* **X=1.6**, *but they need to figure out when* **2.5X–1< 3**. *Students can go to the* **TABLE SETUP** *screen and change the settings to* **TblStart=1** *and* **ΔTbl=.1**, *and then investigate further. This problem should be discussed to show that the search should still continue because the endpoint of* **1.6** *is not in the solution set. The answer is* **X<1.6**. *To investigate further, refine the table values by changing* **TblStart=1.5**, *and* **ΔTbl=.01.**

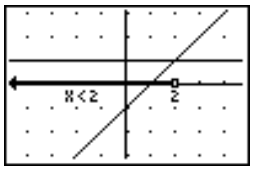


Try-It!™ on Your TI-83 Plus or TI-73

Solution Search Using X-Y Graphs: Tell students to first estimate the solution for the inequality **X–1<1** using number sense and then find the solution set using a graphing calculator.

6. **X–1 < 1** *when* **X< 2**.

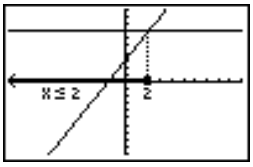
7. *Answers may vary*. Students can trace the graph to see the result.



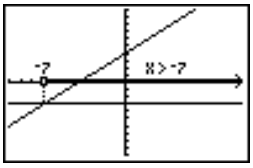
Additional Problems

Students investigate inequalities using **X-Y** *graphs to compare numbers in order to create the solution set. See the student worksheet for graphing calculator details. Students must set appropriate graphing windows in order to see the graphs. Graphing windows shown use* ZOOM **ZStandard**, *which sets* **X** *and* **Y** *values so that* **-10** ≤ *value* ≤ **10**.

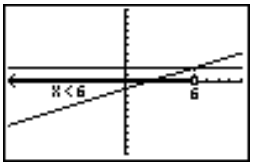
1. **2X+3** ≤ **7**



2. **X+4** > **-3**



3. **0.5X**–**1** < **2**



4. **X**–**2** ≥ **-3**