Can I Graph You, Too?

ID: 11480

Time Required
15 minutes

Activity Overview

In this activity, students will explore absolute value inequalities graphically, numerically, and algebraically. They will rewrite absolute value inequalities as compound inequalities without absolute value, and then solve them.

Topic: Absolute Value Inequalities

- *Compound Inequalities*
- *Disjunctions and Conjunctions*

Teacher Preparation and Notes

- *Students should know how to graph linear inequalities by shading the appropriate half-plane. They should also know how to graph a linear absolute value function that produces a "v" shape.*
- *This activity can be paperless, or students may use the accompanying worksheet.*
- *Teachers may want to give more guidance regarding isolating the absolute value expression on the left-hand side of the inequality before writing the disjunction or the conjunction.*
- ***To download the student TI-Nspire document (.tns file) and student worksheet, go to education.ti.com/exchange and enter "11480" in the quick search box.***

Associated Materials

- *CanIGraphYouToo_Student.doc*
- *CanIGraphYouToo.tns*
- *CanIGraphYouToo_Soln.tns*

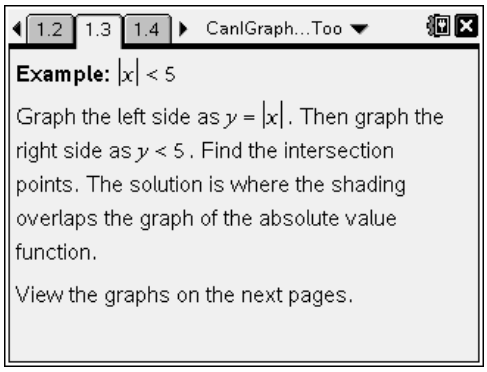
Suggested Related Activities

To download any activity listed, go to education.ti.com/exchange and enter the number in the quick search box.

- *Absolute Value Equations (TI-Nspire technology) — 10132*
- *Absolutely! (TI-Nspire technology) — 8791*
- *Introducing Absolute Value (TI-Nspire technology) — 8743*
- *What's the Equation? Absolute Value Functions (TI-Nspire technology) — 9185*
- *Writing Absolute Value Equations (TI-Nspire technology) — 10157*

Introduction to Disjunction and Conjunction

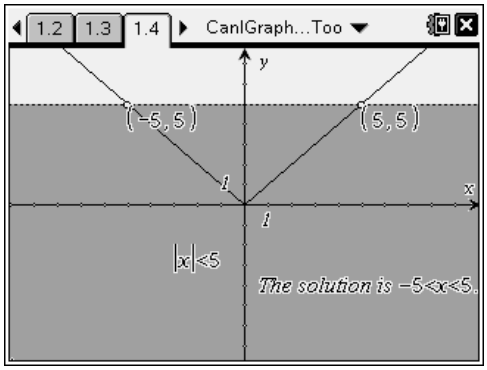
In this activity, students will explore absolute value inequalities graphically and numerically. Page 1.2 describes how students would solve the equation $|x| = 5$. It may be helpful to see this visually, in which case they would need to insert a *Graphs & Geometry* page and follow the description.



Students will use the same method to solve inequalities graphically.

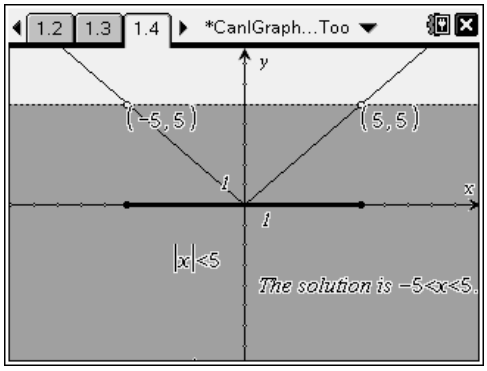
Examples of $|ax + b| < c$ and $|ax + b| > c$ are given on pages 1.4 and 1.6, respectively. You may want to further explain the terms conjunction and disjunction.

They should notice that the solution is an interval, not (*x*, *y*) points.



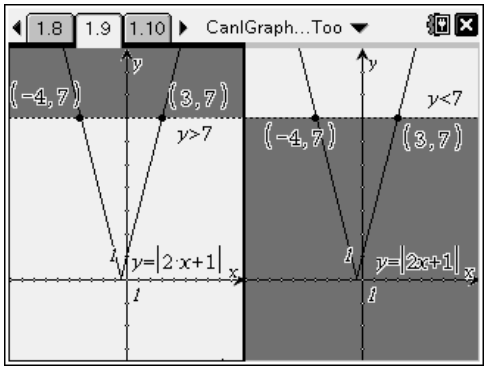
Challenge them to place a segment on the *x*-axis representing the solution, like they would on a number line.

Make sure that they understand that for a disjunction, the solution goes to negative and positive infinity.



It may be helpful to demonstrate an example of each. If you choose to do this, insert a *Graphs* page (ctrl + doc) and split it vertically into two (**DOC > Page Layout > Select Layout > Layout 2**).

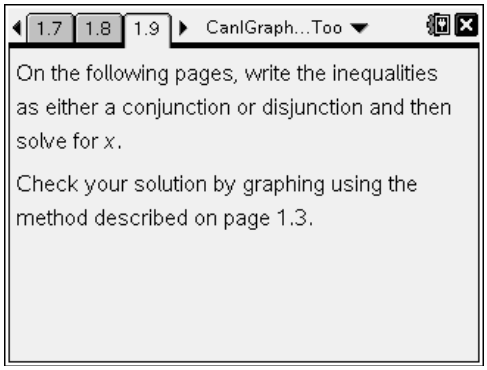
On the left side of the page, graph $|2x + 1| > 7$. Using the **Text** tool, write $y = |2x + 1|$ and $y > 7$ and drag them to the axes. Then use the **Intersection Point(s)** tool, selecting the horizontal line and the graph. On the right side of the page, graph $|2x + 1| < 7$ by writing $y = |2x + 1|$ and $y < 7$ and finding the intersection points.



They should see that the intersection points are the same, but the solution is $x < -4$ or $x > 3$ versus $-4 < x < 3$.

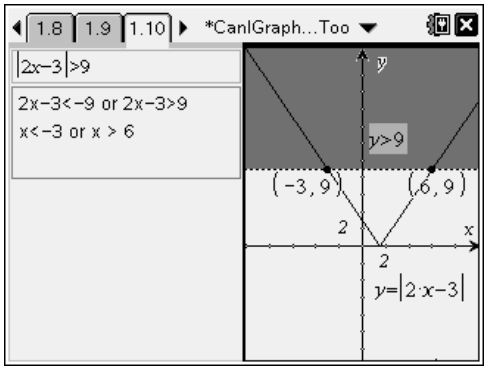
Application of Disjunction and Conjunction

Students will use what they've learned to solve inequalities graphically and algebraically. The first two problems (pages 1.10 and 1.11) the absolute values are by themselves, but for the second two problems, students will need to get the absolute value by itself on the left hand side before writing as a conjunction or disjunction.



When graphing, students should graph the left side and right side as they appear originally, not after getting the absolute value by itself.

To graph, students need to use the **Text** tool and then drag the expressions to the axes. They will need to adjust the window.



The absolute value can be entered using the template menu (menu) or type **abs**.

The inequality signs can be found in the symbol menu (ctrl + menu) or use the gray keys and enter <= for ≤ and >= for ≥.

Student Answers:

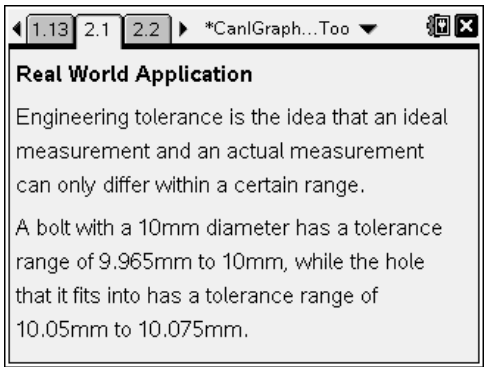
1.10: $x < -3$ or $x > 6$

1.11: $-3 \le x \le 63$

1.12: $x \le -2$ or $x \ge 2$

1.13: $0.25 < x < 3.25$

On page 2.2, students are introduced to the idea of engineering tolerance and how absolute value inequalities are used to express this concept. They are asked to express the given bolt and hole tolerances as absolute value inequalities.



To write these inequalities, students will have to find median of the two values and distance from the median to an end value. They can use the *Calculator* application at the bottom of the page to do this.

Student Answers:

bolt: $|x - 9.9825| \le 0.0175$

hole: $|x - 10.0625| \le 0.0125$