Tri This!

ID: 12143

Activity Overview

In this activity, students will first investigate linear equations that form a triangle. They will determine which vertex is a solution to a system of equations. Students will also investigate the same triangle, but formed by linear inequalities. They will determine which points are solutions to the system of inequalities. At the end of the activity, students will compare the differences between the system of equations and the system of inequalities.

Topic: Linear systems

- *Verifying points as solutions*
- *Systems of linear equations*
- *Systems of linear inequalities*

Teacher Preparation and Notes

- *Students should already be familiar with the concept of the intersection point as a solution to a system of linear equations. They should also be familiar with systems of two linear inequalities.*
- *This activity is intended to introduce systems of inequalities with more than two inequalities and compare the difference in solutions between inequalities and equations. Students do not need to know how to solve the system.*
- *It would be helpful for students to know how to answer multiple choice questions by clicking on the choices, as well as how to enter text into an answer box in the Open Response form of a question.*
- ***To download the student and solution TI-Nspire documents (.tns files) and student worksheet, go to education.ti.com/exchange and enter "12143" in the quick search box.***

Associated Materials

- *TriThis.tns*
- *TriThis_Soln.tns*
- *TriThis_Student.doc*

Suggested Related Activities

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

- *Solving Systems of Linear Equations from Four Perspectives (TI-Nspire technology) — 9210*
- *Solving Systems of Equations with Linear Combinations (Elimination Method) (TI-Nspire CAS technology) — 8818*
- *The Impossible Task (TI-Nspire technology) — 9317*

Problem 1 – Systems of linear equations

On page 1.2, three linear equations have already been graphed. Students should see that the intersection points of these lines form a triangle. They can use the **Hide/Show** tool or the **Intersection Point(s)** tool to reveal the vertices of the triangle.

Students should understand that each vertex is a solution to a system of equations.
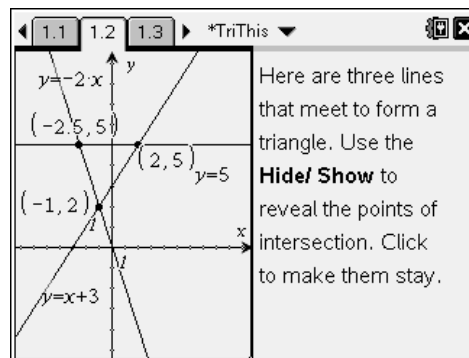
On page 1.4, students will enter the three linear systems of equations and the solution or intersection point for each system.

After answering the question on page 1.5, students should conclude that only one vertex of the triangle is a solution to a system of two equations.

Discuss if the system $\begin{cases} y = 5 \\ y = -2x \\ y = x + 3 \end{cases}$ can represent the

triangle and if it has a solution. (This system only has a solution if all three lines intersect at the same point.)
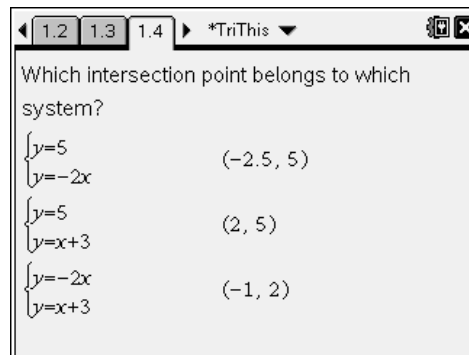
Students are asked to determine if a point inside the triangle is a solution to any of the systems on page 1.4. If needed, they can press ⏎ to use the *Scratchpad* to test the point in the equations.

True means that the point satisfies the equation and **false** means that the point does not satisfy the equation.
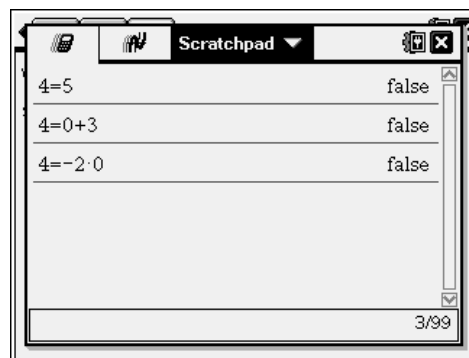
Problem 2 – System of linear inequalities

On page 2.1, the three equations from Problem 1 have been graphed and the coordinates of the intersection points are shown. Students double click on the equations on the screen and change the = symbol to a ≤ or ≥ symbol so that the darkest shaded region forms the triangle.

Students are then given the system of three linear inequalities whose solution describes the triangle on page 2.2.
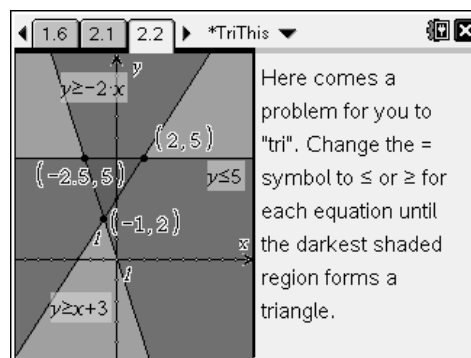
On page 2.3, students are to test each vertex in the three inequalities to determine if the point is a solution to the system. They can test the coordinates as shown or they can store the *x*- and *y*-values and enter the inequalities as they appear on page 2.2. Both ways are shown in the solution TI-Nspire document.
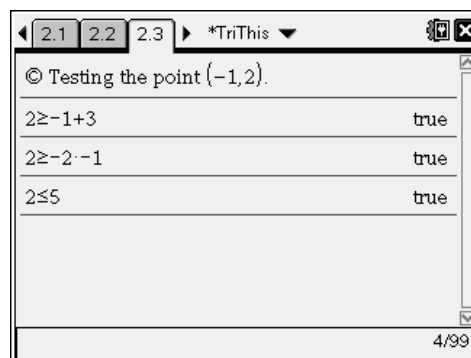
Students should conclude that all three vertices are solutions to the system. They will then test points inside the triangle and conclude that they are also solutions to the system.

As further exploration you could also have them test points on the lines.

Students are asked to determine how many of the vertices would be solutions to the system if the inequalities were changed. They should see that none of the vertices would be solutions. If needed, students can press ⊜ to use the *Scratchpad* to test the points. If any test of the point in an inequality results in *false*, the point is not a solution.
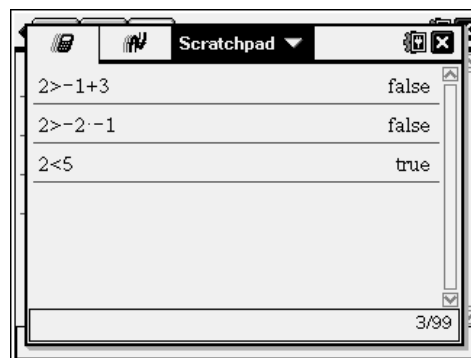
Students will conclude the activity by describing any differences they found in solutions between the systems of equations and the system of inequalities.

Solutions – student worksheet

Problem 1

- 3

- 1

- $\begin{cases} y = 5 \\ y = -2x \end{cases}$ $(-2.5, 5)$

  $\begin{cases} y = 5 \\ y = x + 3 \end{cases}$ $(2, 5)$

  $\begin{cases} y = -2x \\ y = x + 3 \end{cases}$ $(-1, 2)$

- No, it cannot be a solution because that point does not satisfy the equation $y = -2x$.

- No, it does not satisfy any of the equations.

Problem 2

- 3

- Infinite

- None

- Sample answer: One vertex of the triangle satisfies only one system of two equations, whereas three vertices satisfy the system of three inequalities with ≤ and ≥ symbols. Points in the middle of the triangle do not satisfy any of the systems of equations, but do satisfy the system of inequalities.