The Impossible Task

ID: 9317

Time required
60 minutes

Activity Overview

In this activity, students are given a manufacturing situation and asked to write an inequality to represent it. Once they have written the inequality, students examine its solution setting by testing values of the variable on a spreadsheet and viewing its graph. This is expanded in Parts 2 and 3.

Topic: Linear Systems

- *Graph a linear inequality in two variables and describe the three regions into which it divides the plane.*
- *Graph a pair of linear inequalities in two variables and describe the region of their intersection.*
- *Determine whether a given point belongs to the solution set of a pair of linear inequalities in two variables.*

Teacher Preparation and Notes

- *This activity is appropriate for students in Algebra 1. It is assumed that students are familiar with linear inequalities and their graphs, as well as systems of linear equations.*
- *This activity can be easily extended to include linear programming by introducing a profit function P(x, y).*
- *Notes for using the TI-Nspire™ Navigator™ System are included throughout the activity. The use of the Navigator System is not necessary for completion of this activity.*
- ***To download the student and solution TI-Nspire documents (.tns files) and student worksheet, go to education.ti.com/exchange and enter "9317" in the keyword search box.***

Associated Materials

- *ImpossibleTask_Student.doc*
- *ImpossibleTask.tns*
- *ImpossibleTask_Soln.tns*

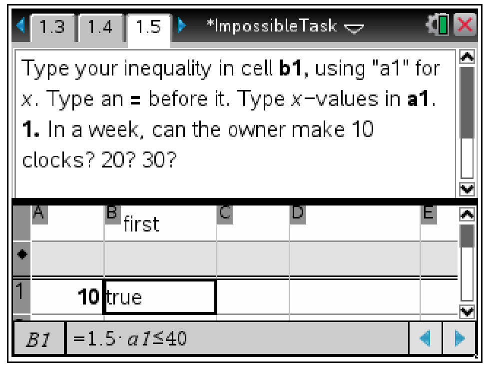
Suggested Related Activities

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

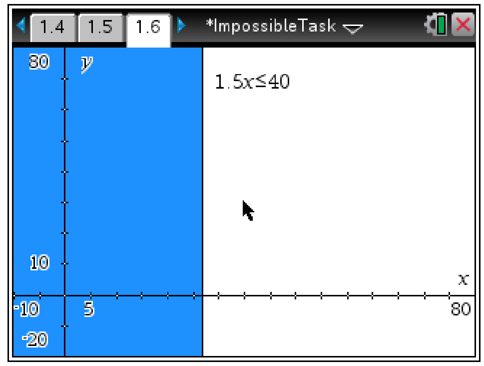
- *Border Patrol (TI-Nspire technology) — 11603*
- *Testing for Truth (TI-Nspire technology) — 12176*
- *Let's Go to the Furniture Market (TI-84 Plus family) — 5814*

Part 1 – The First Constraint

In this problem, students are given a manufacturing situation and asked to write an inequality to represent it. Caution students to be aware that some of the information in the problem is given in hours and others in minutes—they will need to convert one to the other to write their inequalities.

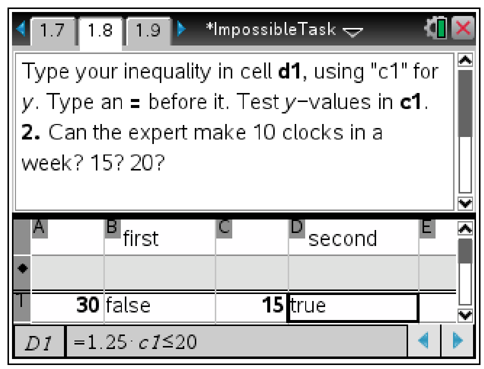


Once they have written the inequality, students examine its solution setting by testing values of the variable on a spreadsheet (page 1.5) and viewing its graph. The inequality is graphed for them on page 1.6.

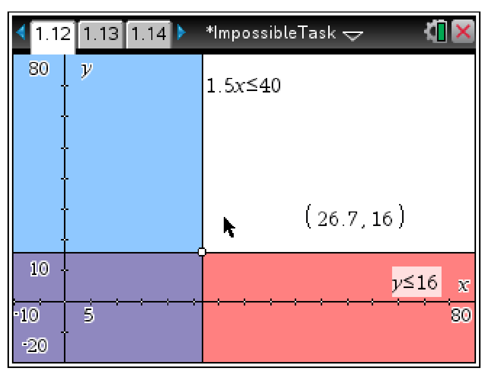


Part 2 – Another Constraint

A second constraint and a second variable are added to the situation. Again, students should be aware of units as they write their inequalities. The solution set to this inequality is explored in the spreadsheet on page 1.8. The idea of a system of inequalities, with a solution set equal to the intersection of the two inequalities in the system, is introduced on page 1.9 and further explored on page 1.10.



Students are to graph the second inequality on top of the first inequality on page 1.12, and then compare the resulting solution set shown with that found by testing values. Students must solve the inequality for *y* before they can graph it. Instruct students to change the fill color of the new inequality to help differentiate between the inequalities.

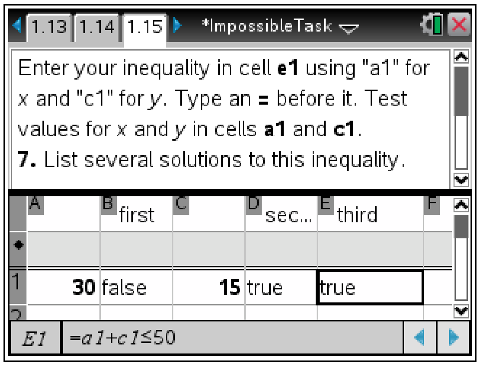


TI-Nspire™ Navigator™ Opportunity: *Class Capture*

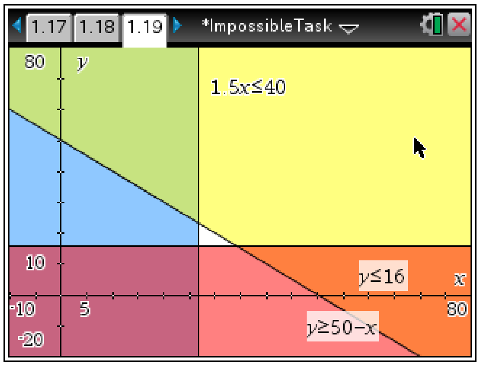
See Note 1 at the end of this lesson.

Part 3 – A Final Constraint

A third constraint is then introduced and explored in a similar fashion. First the solution set of the inequality by itself is discussed, and then students are prompted to search for solutions to the system created by all three inequalities taken together.



They should find that there are no such (*x*, *y*) pairs and conclude that the task is impossible. This conclusion is verified when they graph the system on page 1.19 and see that there is no area where all three solution sets (shaded areas) overlap. Again, instruct students to change the fill colors of the graphs to help differentiate between the inequalities.



Solutions

1. 10: yes; 20: yes; 30: no
2. 10: yes; 15: yes; 20: no
3. It means that in one week, the owner can make 10 clocks and the expert can make 15.
4. Answers will vary. Sample answer: (10, 10), (10, 15), (15, 10), (15, 15), (20, 10), (20, 15), (25, 10), (25, 15).
5. Answers will vary. Sample answer: (10, 10), (10, 15), (15, 10), (15, 15), (20, 10), (20, 15), (25, 10), (25, 15).
6. The solutions to the system (the answer to Question 4) are points within the intersection (answer to Question 5).
7. Answers will vary. Sample answer: (25, 25), (25, 30), (25, 40), (30, 25), (30, 30), (30, 40), (40, 25), (40, 30), (40, 40).
8. There are no such (x, y) pairs.
9. This system has no solution.
10. No.
11. This system has no solution.

Challenge: At most, they can make 32 clocks (the owner can make a maximum of 26 clocks a week and the expert can make a maximum of 16 clocks a week).

TI-Nspire™ Navigator™ Opportunities

Note 1
Pages 1.12 and 1.19: ***Class Capture and/or Live Presenter***
Use Class Capture to verify students are following the instructions correctly and have entered the inequality properly.