Part 1 – Soccer Balls

A company sells two different types of soccer balls, adult and youth. It operates a production level of at most 100 soccer balls a day.

Producing a youth soccer ball costs \$5. Producing an adult soccer ball costs \$10.

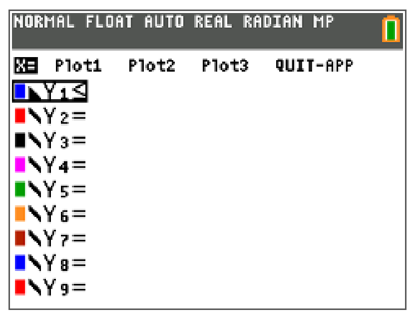
The daily operating budget for the company is \$900 a day.
The profit for producing a youth soccer ball is \$14 and an adult soccer ball is \$20.

How many of each type of soccer ball should the company produce to maximize its profit?

This is a typical problem that many businesses face. Linear programming breaks the problem down into multiple inequalities whose overlapping graphs form a region of solution called a fundamental region. The vertices of this region are used to compute what production level results in the highest profit.

1. What is the profit function if x is the number of youth soccer balls and y is the number of adult soccer balls?

Next, decide what the constraints are for the problem.

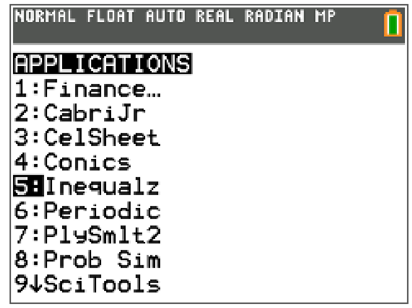


2. Why should you be sure to include $x \geq 0$ and $y \geq 0$ as part of the constraints?

3. Write an inequality for the production level.

4. Write an inequality for the daily operating budget.

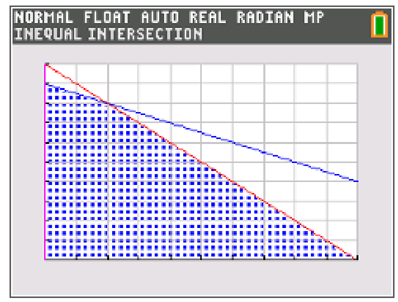
Graph the constraints, or inequalities using the Inequality Graphing app. To start it, press apps and choose it from the list. The set of inequalities will overlap to form the fundamental region. The intersection points of the inequalities are the vertices of the region.



To find the coordinates of the vertices, use the **Pol-Trace** tool.

What are the coordinates of the vertices?

Test the coordinates of each vertex point in the profit function.



5. What production level maximizes the profit?

6. What is the maximum profit?

Part 2 – Barbeque Catering

Each day, a barbeque catering business maintains a stock of 600 lb. of ribs, 180 lb. of brisket, and 250 lb. of pulled pork.

The business sells two kinds of catering set-ups, the *Tailgate* special and the *Home Viewer* special.

The *Tailgate* special requires 25 lb. of ribs, 10 lb. of brisket, and 15 lb. of pulled pork, and creates a profit of $80.

The *Home Viewer* special requires 8 lb. of ribs, 2 lb. of brisket, and 1 lb. of pulled pork and creates a profit of $30.

How many of each special should be sold to maximize profits?

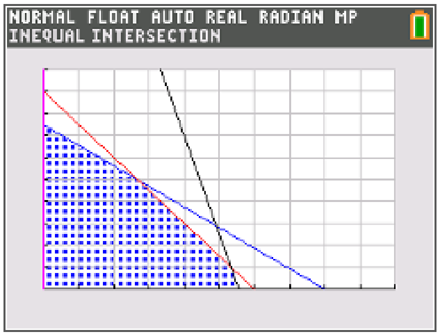
7. What is the profit function if x is the *Tailgate* special and y is the *Home Viewer* special?

Next, decide what the constraints are for the problem.

8. Why should you be sure to include $x \geq 0$ and $y \geq 0$ as part of the constraints?

9. Write an inequality for each type of smoked meat.

Graph the constraints. Then use the **Pol-Trace** tool to determine the coordinates of the vertices of the fundamental region.



Test the coordinates of each vertex point in the profit function.

10. How many of each special needs to be sold to maximize profit?

11. What is the maximum profit?

12. Why would this not be a wise decision for the company? (Hint: Think about the quantities of meat they are currently stocking.)