Problem 1 – Soccer balls

Read the introduction to the problem on pages 1.2 and 1.3.

How many of each type of soccer ball should be produced daily to maximize the company's 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 on page 1.9.

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, choose the **Intersection Point(s)** tool. Select the two line(s) where you wish to find the intersection points.

What are the coordinates of the vertices?

On page 1.10, define the profit function. Type **Define p(x,y)=** followed by the function you found in Exercise 1.

Use the function to test the vertex points.

5. What production level maximizes the profit?

6. What is the maximum profit?

Problem 2 – Barbeque Catering

Read the introduction to the problem on pages 2.1 and 2.2.

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

7. What is the profit function if x is the tailgate special and y is the at home 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.

On page 2.6, graph the constraints. Then use the **Intersection Point(s)** tool to determine the coordinates of the vertices of the fundamental region.

On page 2.7, define the profit function, $P(x, y)$, to test the vertices.

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.*)