Extension
Use after Lesson 3.3

Use Linear Programming

TEKS **2A.1.A, 2A.3.A, 2A.3.B, 2A.3.C**

GOAL Solve linear programming problems.

Key Vocabulary
- constraints
- objective function
- linear programming
- feasible region

BUSINESS A potter wants to make and sell serving bowls and plates. A bowl uses 5 pounds of clay. A plate uses 4 pounds of clay. The potter has 40 pounds of clay and wants to make at least 4 bowls.

Let x be the number of bowls made and let y be the number of plates made. You can represent the information above using linear inequalities called **constraints**.

$x \geq 4$	**Make at least 4 bowls.**
$y \geq 0$	**Number of plates cannot be negative.**
$5x + 4y \leq 40$	**Can use up to 40 pounds of clay.**

The profit on a bowl is \$35 and the profit on a plate is \$30. The potter's total profit P is given by the equation below, called the **objective function**.

$$P = 35x + 30y$$

It is reasonable for the potter to want to maximize profit subject to the given constraints. The process of maximizing or minimizing a linear objective function subject to constraints that are linear inequalities is called **linear programming**.

If the constraints are graphed, all of the points in the intersection are the combinations of bowls and plates that the potter can make. The intersection of the graphs is called the **feasible region**.

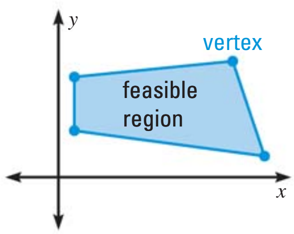
The following result tells you how to determine the optimal solution of a linear programming problem.

READING
A feasible region is *bounded* if it is completely enclosed by line segments.

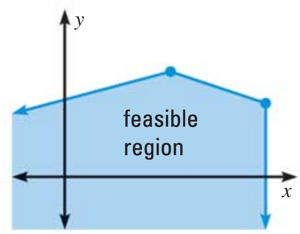
KEY CONCEPT *For Your Notebook*

Optimal Solution of a Linear Programming Problem

If the feasible region for a linear programming problem is bounded, then the objective function has both a maximum value and a minimum value on the region. Moreover, the maximum and minimum values each occur at a vertex of the feasible region.



Bounded region



Unbounded region