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Study Guide

Linear Programming

The following example outlines the procedure used to solve **linear programming** problems.

Example **The B & W Leather Company wants to add handmade belts and wallets to its product line. Each belt nets the company $18 in profit, and each wallet nets $12. Both belts and wallets require cutting and sewing. Belts require 2 hours of cutting time and 6 hours of sewing time. Wallets require 3 hours of cutting time and 3 hours of sewing time. If the cutting machine is available 12 hours a week and the sewing machine is available 18 hours per week, what mix of belts and wallets will produce the most profit within the constraints?**

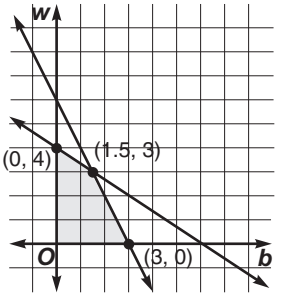
Define variables.

Let b = the number of belts.
Let w = the number of wallets.

Write inequalities.

$b \geq 0$
$w \geq 0$
$2b + 3w \leq 12$ cutting
$6b + 3w \leq 18$ sewing

Graph the system.



Write an equation.

Since the profit on belts is $18 and the profit on wallets is $12, the profit function is $B(b, w) = 18b + 12w$.

Substitute values.

$B(0, 0) = 18(0) + 12\ (0) = 0$
$B(0, 4) = 18(0) + 12(4) = 48$
$B(1.5, 3) = 18(1.5) + 12(3) = 63$
$B(3, 0) = 18(3) + 12(0) = 54$

Answer the problem.

The B & W Company will maximize profit if it makes and sells 1.5 belts for every 3 wallets.

When constraints of a linear programming problem cannot be satisfied simultaneously, then **infeasibility** is said to occur.

The solution of a linear programming problem is **unbounded** if the region defined by the constraints is infinitely large.