

Name: _____

Date: _____

1. A thief is filling her backpack with two types of valuable substances. She can carry up to 40 kg, and her backpack can fit up to 10 liters.

Each bag of X has a weight of 3 kg, volume of 0.2 L, and value of 4 thousand USD.

Each bag of Y has a weight of 0.3 kg, volume of 0.08 L, and value of 0.8 thousand USD.

There is no requirement to take full bags, so the thief can opt for a fraction of a bag.

How many bags of each should the thief take to maximize her profit?

1. The thief should take 1.11 bags of X and 122.22 bags of Y . We can use linear programming to see this.

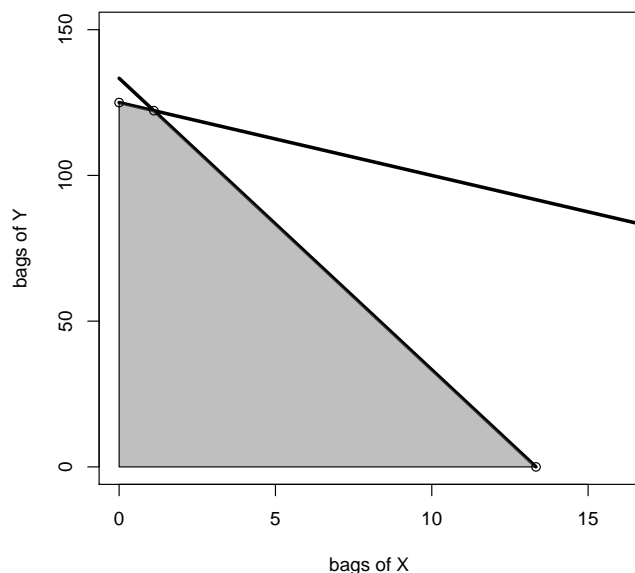
We write a weight inequality.

$$3x + 0.3y \leq 40$$

We write a volume inequality.

$$0.2x + 0.08y \leq 10$$

We graph the two inequalities, shading the feasible region.



There are three vertices of interest.

$$(0, 125)$$

$$(1.11, 122.22)$$

$$(13.33, 0)$$

We write a profit function (the objective function).

$$P(x, y) = 4x + 0.8y$$

We determine the profits.

$$P(0, 125) = 100$$

$$P(1.11, 122.22) = 102.22$$

$$P(13.33, 0) = 53.33$$

Thus, the thief should take 1.11 bags of X and 122.22 bags of Y .