

Name: _____

Date: _____

1. A thief is filling her backpack with two types of valuable substances. She can carry up to 25 kg, and her backpack can fit up to 15 liters.
Each bag of X has a weight of 8 kg, volume of 0.9 L, and value of 2000 thousand USD.
Each bag of Y has a weight of 0.1 kg, volume of 0.1 L, and value of 30 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 1.41 bags of X and 137.32 bags of Y . We can use linear programming to see this.

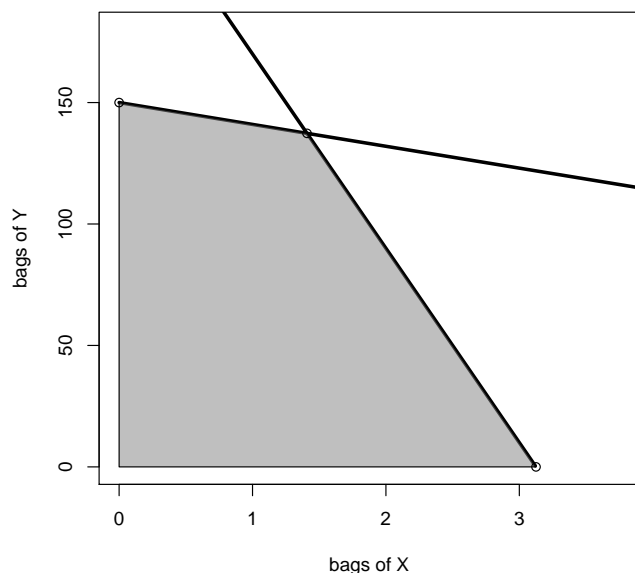
We write a weight inequality.

$$8x + 0.1y \leq 25$$

We write a volume inequality.

$$0.9x + 0.1y \leq 15$$

We graph the two inequalities, shading the feasible region.



There are three vertices of interest.

$$(0, 150)$$

$$(1.41, 137.32)$$

$$(3.12, 0)$$

We write a profit function (the objective function).

$$P(x, y) = 2000x + 30y$$

We determine the profits.

$$P(0, 150) = 4500$$

$$P(1.41, 137.32) = 6936.62$$

$$P(3.12, 0) = 6250$$

Thus, the thief should take 1.41 bags of X and 137.32 bags of Y .