

Name: _____

Date: _____

1. A thief is filling her backpack with two types of valuable substances. She can carry up to 20 kg, and her backpack can fit up to 10 liters.

Each bag of X has a weight of 4 kg, volume of 0.3 L, and value of 5 thousand USD.

Each bag of Y has a weight of 0.1 kg, volume of 0.07 L, and value of 0.4 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 1.6 bags of X and 136 bags of Y . We can use linear programming to see this.

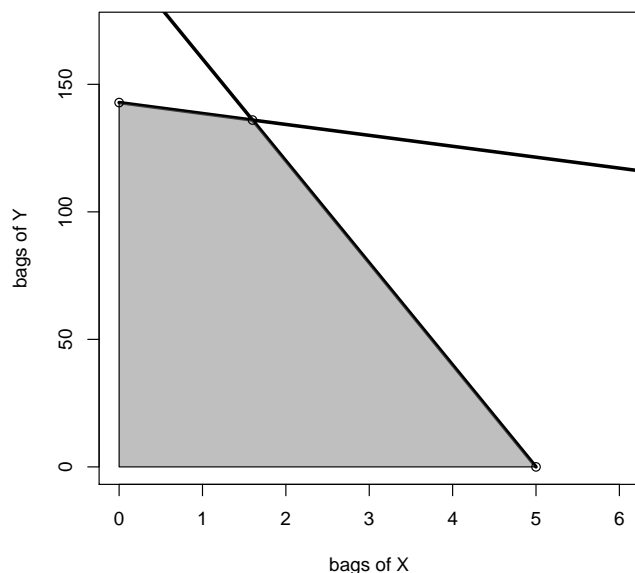
We write a weight inequality.

$$4x + 0.1y \leq 20$$

We write a volume inequality.

$$0.3x + 0.07y \leq 10$$

We graph the two inequalities, shading the feasible region.



There are three vertices of interest.

$$(0, 142.86)$$

$$(1.6, 136)$$

$$(5, 0)$$

We write a profit function (the objective function).

$$P(x, y) = 5x + 0.4y$$

We determine the profits.

$$P(0, 142.86) = 57.14$$

$$P(1.6, 136) = 62.4$$

$$P(5, 0) = 25$$

Thus, the thief should take 1.6 bags of X and 136 bags of Y .