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 10 liters.

   Each bag of X has a weight of 0.09 kg, volume of 0.06 L, and value of 4 thousand USD.

   Each bag of Y has a weight of 3 kg, volume of 0.2 L, and value of 40 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 154.32 bags of X and 3.7 bags of Y. We can use linear programming to see this.

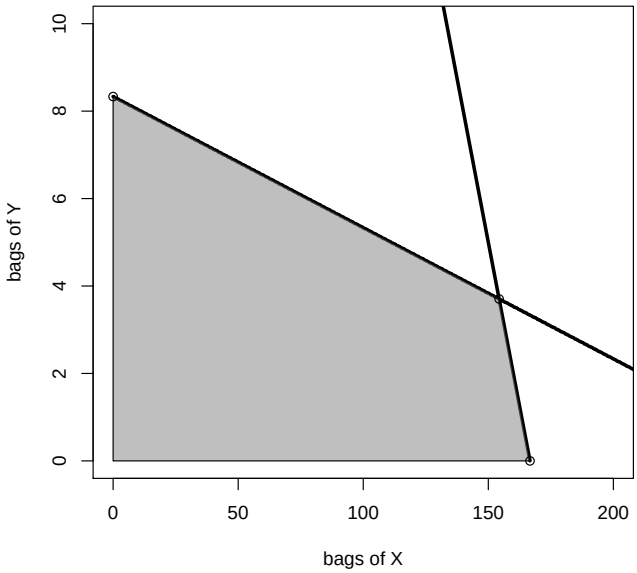
   We write a weight inequality.

   $$0.09x + 3y \leq 25$$

   We write a volume inequality.

   $$0.06x + 0.2y \leq 10$$

   We graph the two inequalities, shading the feasible region.



   There are three vertices of interest.

   $$(0, 8.33)$$

   $$(154.32, 3.7)$$

   $$(166.67, 0)$$

   We write a profit function (the objective function).

   $$P(x, y) = 4x + 40y$$

   We determine the profits.

   $$P(0, 8.33) = 333.33$$

   $$P(154.32, 3.7) = 765.43$$

   $$P(166.67, 0) = 666.67$$

   Thus, the thief should take 154.32 bags of X and 3.7 bags of Y.