Name: _____

Date: _____

1. A thief is filling her backpack with two types of valuable substances. She can carry up to 30 kg, and her backpack can fit up to 35 liters.

   Each bag of X has a weight of 0.2 kg, volume of 0.3 L, and value of 50 thousand USD.

   Each bag of Y has a weight of 1 kg, volume of 0.9 L, and value of 200 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 66.67 bags of X and 16.67 bags of Y. We can use linear programming to see this.

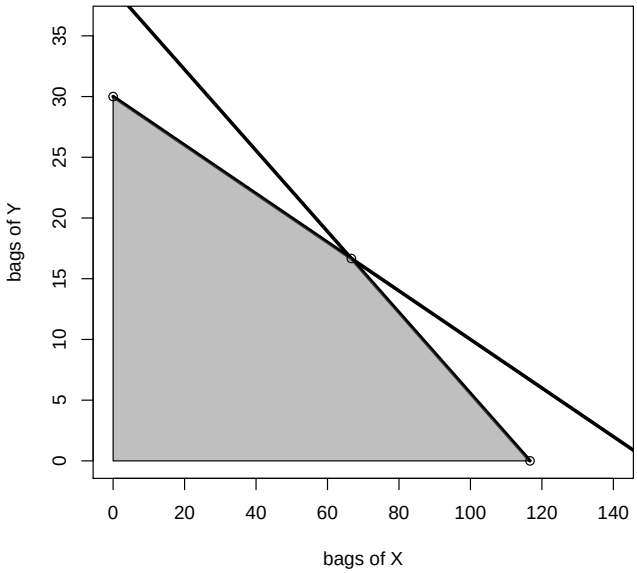
   We write a weight inequality.

   $$0.2x + 1y \leq 30$$

   We write a volume inequality.

   $$0.3x + 0.9y \leq 35$$

   We graph the two inequalities, shading the feasible region.



   There are three vertices of interest.

   $$(0, 30)$$

   $$(66.67, 16.67)$$

   $$(116.67, 0)$$

   We write a profit function (the objective function).

   $$P(x, y) = 50x + 200y$$

   We determine the profits.

   $$P(0, 30) = 6000$$

   $$P(66.67, 16.67) = 6666.67$$

   $$P(116.67, 0) = 5833.33$$

   Thus, the thief should take 66.67 bags of X and 16.67 bags of Y.