Homework 1
Solutions

1. Rewrite the following equations using For All and Summation. **Let I={1,2,3}**

   (a)

   $$x_1 \leq 2$$
   $$x_2 \leq 2$$
   $$x_3 \leq 2$$

   $$x_i \leq 2 \quad \forall i \in I$$

   (b)

   $$x_1 + x_2 + x_3 \leq 15$$
   $$\sum_{i \in I} x_i \leq 15$$

   (c)

   $$x_1 \leq a_1$$
   $$x_2 \leq a_2$$
   $$x_3 \leq a_3$$

   $$x_i \leq a_i \quad \forall i \in I$$

   (d)

   $$a_1 x_1 + a_2 x_2 + a_3 x_3 \leq 15$$
   $$\sum_{i \in I} a_i x_i \leq 15$$

2. Create a model for the following situation. You have 300 total ounces of soda available. You offer two different sizes of drinks, medium and large. You get $2 for a medium and $3 for a large when you sell them. A medium drink is 16 ounces, and a large is 20 ounces. You want to figure out how many of each to sell in order to maximize your revenue. You do not need to solve for the answer, just set up the problem, be sure to label all variables used.

For this case

Decision Variables:

- x_1: Number of medium drinks you make
- x_2: Number of large drinks you make

Problem:

$$\begin{aligned} \max \quad & 2x_1 + 3x_2 && (1) \\ \text{subject to} & \\ & 16x_1 + 20x_2 \leq 300 && (2) \\ & x_1 \geq 0 && (3) \\ & x_2 \geq 0 && (4) \end{aligned}$$