**(Matilda)** Matilda loves cereals, but due to weight and cholesterol concerns, she has decided that she must plan her cereals carefully. There are two possible cereals she is considering: kellogg and fruit loops. After reading the nutrition labels on the kellogg and fruit loops packages, she learns that each serving of Kellogg weighs 37 grams and contains 120 calories and 5 grams of fat. Each serving of fruit loof weighs 65 grams and contains 160 calories and 10 grams of fat. Matilda will allow herself no more than 450 calories and 25 grams of fat in her daily cereals, she requires at least 120 grams of dessert per day. Also, she assigns a “taste index” to each gram of each dessert, where 0 is the lowest and 100 is the highest. She assigns a taste index of 65 to Kellogg and 75 to Fruit loofs. Use Solver to find the daily cereals plan that stays within her constraints and maximizes the total taste index of her cereals.

**Discussion: -**

In this problem, Matilda has two options (kellogg and fruit loops) to take daily. Each serving item has specific parameters (weights, calories, fat, taste index) which are our inputs. Let’s discuss about one parameter ‘weights’, which will help us in finding our decision variable. As per Matilda’s plan, she wants to take 120 grams of dessert in a day. Kellogg and Fruit loops contains 37 and 65 grams respectively. If we can decide the number of serving items we can calculate the total intake of desserts, which will help us in calculating the taste index. With the available inputs we can calculate only the taste index of only one serving. If we have the number of servings that Matilda is getting in a day, we can calculate the total taste index. So, our decision variable should be the number of servings. Our objective is to maximize the taste index value by deciding the number of serving items. Matilda will allow herself to take the serving in such a way that her intake calories, grams and fat are in control, which will be constraints in this problem.

**Mathematical Model: -**

*Parameters (Inputs):*

$$i ϵ 1,2, \left( Index for items Kellogg, Fruit loofs\right)$$

$W\_{i} :Weights of item i$

$$C\_{i} :Calories in item i $$

$$F\_{i} :Fat in item i $$

$$T\_{i} :Taste index to each gram of item i$$

$$W :Per day limitations of weight$$

$$C :Per day limitations of Calories$$

$$F :Per day limitations of fat $$

*Decision Variables:*

$$x\_{i} :Number of servings of item i $$

*Objective:*

$$Minimize Total Taste Index=\sum\_{i=1}^{2}(x\_{i}\*W\_{i}\*T\_{i})$$

*Constraints:*

$$x\_{i}\geq 0 \left(1\right)Non Negative constraint $$

$$\sum\_{i=1}^{2}(x\_{i}\*W\_{i})\geq W \left(2\right)Per day limitations of weight constraint$$

$$\sum\_{i=1}^{2}(x\_{i}\*C\_{i})\leq C (3)Per day limitations of Calories constraint$$

$$\sum\_{i=1}^{2}(x\_{i}\*F\_{i})\leq F (4)Per day limitations of fat constraint$$

*Excel Implementation:*

Please find the attached spreadsheet for solution.





As per the optimization model Maggie can take 1.25 serving of snack bar and 1.875 servings of ice creams. As our objective is to maximize the Total taste index, solver suggests ice cream over snack bar as it has higher per gram taste index.



If we put integer constraint for our decision variables, solution would be as given in screenshot 2. As per the optimization model Maggie can take 1 serving of snack bar and 2 servings of ice creams. To meet the Calories and Fat constraints, solver didn’t pick the 3rd unit of ice cream.