Food:

Goal: Find quantity to maximize happiness with the constraints of money and calories

Variables

x	Quantity of food x
y	Quantity of food y
t_1x	Healthiness of food x
t_1y	Healthiness of food y
t_2x	Happiness of food x
t_2y	Happiness of food y
t_3x	Calories of food x
t_3y	Calories of food y
t_3x	Money of food x
t_3y	Money of food y
S	Money constraint
C	Calories Constraint
H1	Importance of happiness
H2	Importance of healthiness

Constraints: $xt3x + yt3y \leq C$ and $xt4x + yt4y \leq s$

Utility function= U(x,y) = $x^{\frac{1}{ay}} + y^{\frac{1}{ax}}, 0 < an < 1$

The alpha values are reversed in the utility equation above because, the greater the alpha, the less weight on the variable. So if Y has a strong weight, we want to essentially decrease X's power.

where: $an = \frac{H1t1n + H2t2n}{(H1 + H2) * ML}$

ML is the machine learning parameter.

Approach: we will use Legrange optimization to solve this.

I have not written down the the entire solution, as it varies from problem to problem, but this is by fundamental approach.

Exercise:

Goal: Find quantity to maximize happiness and minimize time with the constraint of minimum calories

Variables

x1, x2…	Quantity of food x1, x2…
t	Time
h1, h2…	Happiness
h	How happy
a1, a2…	Alpha parameter

Constraints: $x1 + x2 \leq t$

Utility function= U(x1,x2,x3,x4,x5) = $x1^{\frac{1}{ax1}} + x2^{\frac{1}{ax2}} + \ldots, 0 < an < 1$

The alpha values are reversed in the utility equation above because, the greater the alpha, the less weight on the variable. So if Y has a strong weight, we want to essentially decrease X's power.

where: $an = \frac{1}{(2(h)(hn) * ML}$

ML is the machine learning parameter.

Approach: we will use Legrange optimization to solve this.

I have not written down the the entire solution, as it varies from problem to problem, but this is by fundamental approach.