

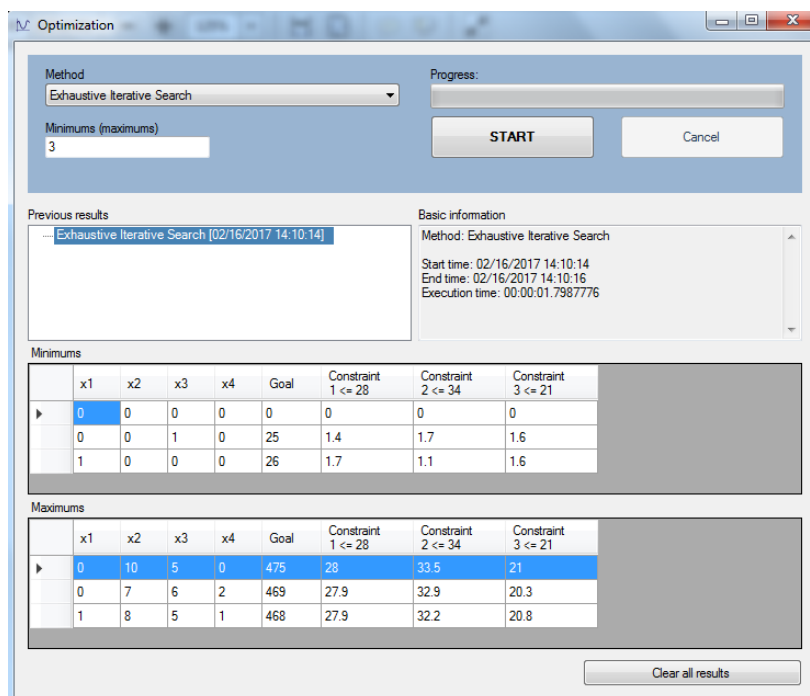
LINEAR PROGRAMMING (LP) - PRODUCT-MIX EXAMPLE

Consider a product-mix example where one is concerned with what mix of 4 products he should produce during the upcoming week. Production of each product requires a given amount of production time on each of three machines, and each machine has a certain available production time per week. If each product provides certain profit, one need to determine an optimal product-mix so as to maximize profit while considering constraints related to the limited production capacity of machines. Example data for product-mix are given in the following table [Hillier].

Machine for	Production time per unit (h)				Production time available per week (h)
	A	B	C	D	
Rolling	1.7	2.1	1.4	2.4	28
Cutting	1.1	2.5	1.7	2.6	34
Welding	1.6	1.3	1.6	0.8	21
Profit per unit (\$)	26	35	25	37	

The above described product-mix problem can be formulated as follows:

$$\begin{aligned}
 & \text{Maximize } 26x_1 + 35x_2 + 25x_3 + 37x_4 \\
 & \text{subject to: } 1.7x_1 + 2.1x_2 + 1.4x_3 + 2.4x_4 \leq 28 \\
 & \qquad \qquad \qquad 1.1x_1 + 2.5x_2 + 1.7x_3 + 2.6x_4 \leq 34 \\
 & \qquad \qquad \qquad 1.6x_1 + 1.3x_2 + 1.6x_3 + 0.8x_4 \leq 21
 \end{aligned}$$



The obtained optimization solutions indicate that one should produce 10 units of product B and 5 units of product C so as to obtain maximal profit of 475\$. The optimization solution of the LINGO is the same as could be observed from the given report [Hillier].

Variable	Value	Reduced Cost
PRODUCE(P01)	0.0000000	3.577921
PRODUCE(P02)	10.00000	0.0000000
PRODUCE(P03)	5.000000	0.0000000
PRODUCE(P04)	0.0000000	1.441558

Row	Slack or Surplus	Dual Price
1	475.0000	1.000000
2	0.0000000	15.25974
3	0.5000000	0.0000000
4	0.0000000	2.272727

Beside this optimal solution, in BRUTOMIZER© the user is provided with other solutions which are close to optimal solution. For example, production of 7 units of product B, 6 units of product C and 2 units of product D yield profit of 469\$. Similarly, production of 1 unit of product A, 8 units of product B, 5 units of product C and 1 unit of product D yield profit of 468\$.

References:

[[Hillier](#)] Frederick S. Hillier, Gerald J. Lieberman, Introduction to Operations Research, McGraw-Hill, 2001.