

Decision Sciences

Exercise Integer Programming - Cutting Stock Problem

Mario Vanhoucke

Vlerick Business School

Ghent Campus: Reep 1, 9000 Gent, Belgium

Brussels Campus: Bolwerklaan 21 (32), 1210 Brussels, Belgium

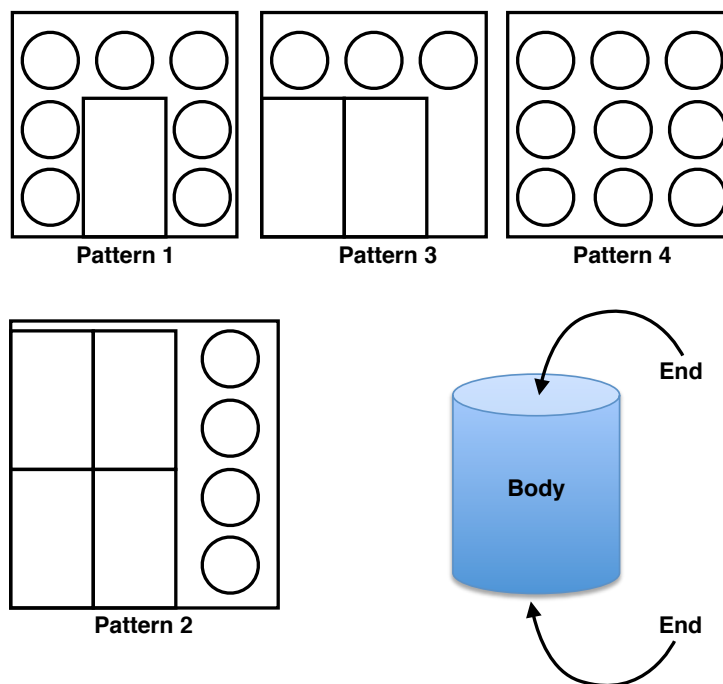
Leuven Campus: Vlamingenstraat 83, 3000 Leuven, Belgium

St.Petersburg Campus: Italyanskaya st. 17, St. Petersburg, 191186, Russia

Problem description

Consider the production of tin cans which are stamped from metal sheets. A can consists of a main body and two ends. We have 4 possible stamping patterns (involving 2 different types (sizes) of metal sheet) as shown in the picture below:

Figure: Four different patterns and one can



We have the following pattern information:

Table: Pattern information

	Pattern 1	Pattern 2	Pattern 3	Pattern 4
	1	2	3	4
Type of sheets used	1	2	1	1
Number of main bodies	1	4	2	0
Number of ends	7	4	3	9
Amount of scrap	s_1	s_2	s_3	s_4
Time to stamp	t_1	t_2	t_3	t_4

Note here that the s_i ($i = 1, 2, 3, 4$) and the t_i ($i = 1, 2, 3, 4$) are *not* variables but constants (which have a known value). Often in formulating LP's/IP's it is easier to use a symbol for a number rather than write out the number in full every time it occurs in a constraint or in the objective function.

Let P be the profit obtained from selling one can, C be the cost per unit of scrap, T be the total number of hours available per week, L_1 be the number of metal sheets of type 1 which are available for stamping per week and L_2 be the number of metal sheets of type 2 which are available for stamping per week.

At the start of the week there is nothing in stock. Each (unused) main body in stock at the end of the week incurs a stock-holding cost of c_1 . Similarly each (unused) end in stock at the end of the week incurs a stock-holding cost of c_2 . Assume that all cans produced one week are sold that week.

How many cans should be produced per week?

- Choose values for the unknown parameters: $P = 10$, $C = 3$, $c_1 = c_2 = 3$, $T = L_1 = L_2 = 10$, $s_i = 1$ and $t_i = 1$.
- Choose other values for the parameters and test the impact of changes in the data on the objective. This looks like a consultancy project since you test the impact of parameters on the objective function!