

Simplex method example: Revisiting the furniture manufacturing problem

1. Introduce slack variables ✓
2. Rearrange the objective function ✓
3. Construct the simplex tableau ✓

Maximize Profit:	$p = 80c + 70s$	$p - 80c - 70s$	$= 0$
Subject to,			
Carpentry hours:	$6c + 3s \leq 96$	$6c + 3s + u$	$= 96$
Finishing hours:	$c + s \leq 18$	$c + s + v$	$= 18$
<u>Upholstery hours:</u>	$2c + 6s \leq 72$	$2c + 6s + w$	$= 72$
Formal constraints:	$c \geq 0, s \geq 0$		

	c	s	u	v	w	p	
u	6	3	1	0	0	0	96
v	1	1	0	1	0	0	18
w	2	6	0	0	1	0	72
p	-80	-70	0	0	0	1	0

① Pivot here. (Arrow from -80 to 6)

② Ratios:

96/6 = 16 ← ③

18/1 = 18

72/2 = 36

4. While negative values remain in left part of bottom row:

- a) Pivot column: most negative value in bottom row
- b) Pivot element: smallest non-negative ratio of constant/coefficient
- c) Pivot tableau ; update row label

	c	s	u	v	w	p	
c	1	1/2	1/6	0	0	0	16
v	0	1/2	-1/6	1	0	0	2
w	0	5	-1/3	0	1	0	40

Ratios

16/(1/2) = 32

2/(1/2) = 4 ←

40/5 = 8

$$p \left[\begin{array}{cccccc|c} 0 & -30 & 13\frac{1}{3} & 0 & 0 & 1 & 1280 \end{array} \right]$$

$$\begin{array}{l} \rightarrow C \\ \rightarrow S \\ \rightarrow W \\ \rightarrow P \end{array} \left[\begin{array}{cc|cc|cc|c} 1 & 0 & 1/3 & -1 & 0 & 0 & 14 \\ 0 & 1 & -1/3 & 2 & 0 & 0 & 4 \\ 0 & 0 & 4/3 & -10 & 1 & 0 & 20 \\ 0 & 0 & 3\frac{1}{3} & 60 & 0 & 1 & 1400 \end{array} \right]$$

$$\begin{array}{l} C = 14 \\ S = 4 \\ W = 20 \\ P = \$1,400 \end{array}$$

All +ve!

$\therefore$ done.

- Manufacture 14 chairs, 4 sofas
- to make \$1,400.
- 20 surplus hours of upholstery.