SEJA O PPL

$$\begin{array}{lll} \max Z = & 0{,}12x_1 + 0{,}06x_2 \\ s.a & 1x_1 + 2x_2 \le 240000 \\ & 1{,}5x_1 + 1x_2 \le 180000 \\ & x_1 \le 110000 \\ & x_1, x_2 \ge 0 \end{array} \quad \Rightarrow \quad \begin{array}{lll} \max Z = & 0{,}12x_1 + 0{,}06x_2 \\ s.a & 1x_1 + 2x_2 + x_3 = 240000 \\ & 1{,}5x_1 + 1x_2 + x_4 = 180000 \\ & x_1 + x_5 = 110000 \\ & x_1, x_2, x_3, x_4, x_5 \ge 0 \end{array}$$

I – SOLUÇÃO VIA QUADROS

Base	x_1 ↓	x_2	x_3	x_4	x_5	b
Z	-0,12	-0,06	0	0	0	0
x_3	1	2	1	0	0	240000
x_4	3/2	1	0	1	0	180000
x_5	$\boxed{1}$	0	0	0	1	110000 →

Base	x_1	x_2 ↓	x_3	x_4	x_5	b
Z	0	-0,06	0	0	0,12	13200
x_3	0	2	1	0	-1	130000
x_4	0	$\boxed{1}$	0	1	-3/2	15000 →
x_1	1	0	0	0	1	110000

Base	x_1	x_2	x_3	x_4	x_5	b
Z	0	0	0	0,06	0,03	14100
x_3	0	0	1	-2	2	100000
x_2	0	1	0	1	-3/2	15000
x_1	1	0	0	0	1	110000

II – SOLUÇÃO VIA SIMPLEX REVISADO

Iteração 0)

- $IVB = (3,4,5) \Rightarrow IVNB = (1,2)$
- $B = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \Rightarrow B^{-1} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \; N = \begin{pmatrix} 1 & 2 \\ 1{,}5 & 1 \\ 1 & 0 \end{pmatrix}$
- Atualizar c_N

$$\bar{c}_{IVNB} = c_{IVNB} - c_{IVB} B^{-1} N = (-0{,}12, -0{,}06) - (0,0,0) \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} 1 & 2 \\ 1{,}5 & 1 \\ 1 & 0 \end{pmatrix} = (-0{,}12, -0{,}06)$$

Iteração 1)

- Solução Ótima? **NÃO**
- Qual variável entra na base? $x_1 \Rightarrow$ pois traz maior lucro
- Qual variável sai da base? Atualizar b e A_1 para usar o teste do bloqueio

$$\bar{A}_1 = B^{-1}A_1 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}\begin{pmatrix} 1 \\ 1,5 \\ 1 \end{pmatrix} = \begin{pmatrix} 1 \\ 1,5 \\ 1 \end{pmatrix}$$

$$\bar{b} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}\begin{pmatrix} 240000 \\ 180000 \\ 110000 \end{pmatrix} = \begin{pmatrix} 240000 \\ 180000 \\ 110000 \end{pmatrix} \qquad \left(\frac{\bar{b}_R}{\bar{a}_{R1}} = \min_j \left\{ \frac{\bar{b}_j}{\bar{a}_{j1}},\ \bar{a}_{j1} > 0 \right\} \right)$$

$$\frac{\bar{b}_R}{\bar{a}_{R1}} = \min_j \left\{ \frac{240000}{1}, \frac{180000}{1,5}, \frac{110000}{1} \right\} = 110000 \Rightarrow x_5 \text{ sai da base}$$

- $IVB = (3,4,1) \Rightarrow IVNB = (2,5)$
- $B = \begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 1,5 \\ 0 & 0 & 1 \end{pmatrix} \Rightarrow B^{-1} = \begin{pmatrix} 1 & 0 & -1 \\ 0 & 1 & -3/2 \\ 0 & 0 & 1 \end{pmatrix},\ N = \begin{pmatrix} 2 & 0 \\ 1 & 0 \\ 0 & 1 \end{pmatrix}$
- Atualizar c_N

$$\bar{c}_{IVNB} = (-0,06,0) - (0,0,-0,12)\begin{pmatrix} 1 & 0 & -1 \\ 0 & 1 & -3/2 \\ 0 & 0 & 1 \end{pmatrix}\begin{pmatrix} 2 & 0 \\ 1 & 0 \\ 0 & 1 \end{pmatrix} = (-3/50, 3/25)$$

<u>Iteração 2)</u>

- Solução Ótima? **NÃO**
- Qual variável entra na base? $x_2 \Rightarrow$ pois traz maior lucro
- Qual variável sai da base? Atualizar b e A_2 para usar o teste do bloqueio

$$\bar{A}_2 = B^{-1}A_2 = \begin{pmatrix} 1 & 0 & -1 \\ 0 & 1 & -3/2 \\ 0 & 0 & 1 \end{pmatrix}\begin{pmatrix} 2 \\ 1 \\ 0 \end{pmatrix} = \begin{pmatrix} 2 \\ 1 \\ 0 \end{pmatrix}$$

$$\bar{b} = \begin{pmatrix} 1 & 0 & -1 \\ 0 & 1 & -3/2 \\ 0 & 0 & 1 \end{pmatrix}\begin{pmatrix} 240000 \\ 180000 \\ 110000 \end{pmatrix} = \begin{pmatrix} 130000 \\ 15000 \\ 110000 \end{pmatrix} \qquad \left(\frac{\bar{b}_R}{\bar{a}_{R1}} = \min_j \left\{ \frac{\bar{b}_j}{\bar{a}_{j1}},\ \bar{a}_{j1} > 0 \right\} \right)$$

$$\frac{\bar{b}_R}{\bar{a}_{R1}} = \min_j \left\{ \frac{130000}{2}, \frac{15000}{1} \right\} = 15000 \Rightarrow x_4 \text{ sai da base}$$

- $IVB = (3,2,1) \Rightarrow IVNB = (4,5)$
- $B = \begin{pmatrix} 1 & 2 & 1 \\ 0 & 1 & 1,5 \\ 0 & 0 & 1 \end{pmatrix} \Rightarrow B^{-1} = \begin{pmatrix} 1 & -2 & 2 \\ 0 & 1 & -3/2 \\ 0 & 0 & 1 \end{pmatrix},\ N = \begin{pmatrix} 0 & 0 \\ 1 & 0 \\ 0 & 1 \end{pmatrix}$
- Atualizar c_N

$$\bar{c}_{IVNB} = (0,0) - (0,-0,06,-0,12)\begin{pmatrix} 1 & -2 & 2 \\ 0 & 1 & -3/2 \\ 0 & 0 & 1 \end{pmatrix}\begin{pmatrix} 0 & 0 \\ 1 & 0 \\ 0 & 1 \end{pmatrix} = (3/50, 3/100)$$

Iteração 3)

- Solução Ótima? **SIM**
- $$\bar{b} = \begin{pmatrix} x_3 \\ x_2 \\ x_1 \end{pmatrix} = \begin{pmatrix} 1 & -2 & 2 \\ 0 & 1 & -3/2 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} 240000 \\ 180000 \\ 110000 \end{pmatrix} = \begin{pmatrix} 100000 \\ 15000 \\ 110000 \end{pmatrix}$$
- $(x_1, x_2) = (110000{,}15000)$
- $$\bar{Z} = c_{IVB} B^{-1} b = (0, 0{,}12,\ 0{,}06) \begin{pmatrix} 1 & -2 & 2 \\ 0 & 1 & -3/2 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} 240000 \\ 180000 \\ 110000 \end{pmatrix}$$

$$\bar{Z} = (0, 0{,}06,\ 0{,}12) \begin{pmatrix} 100000 \\ 15000 \\ 110000 \end{pmatrix} = 14100$$