

Ejercicio # 1

Objetivo; Simplex 2 Fases \rightarrow min

$$\min z = 8x + 2y$$

Sujeto a:

$$6x + 2y = 6$$

$$8x + 6y \geq 12$$

$$2x + 4y \leq 8$$

$$x, y \geq 0$$

Fase I

$$\min r = A_1 + A_2 \rightarrow r - A_1 - A_2 = 0$$

Sujeto a:

$$6x + 2y + A_1 = 0$$

$$8x + 6y - E_2 + A_2 = 12$$

$$2x + 4y + H_3 = 8$$

$$x, y \geq 0$$

Tabla inicial

Base	VD		Variables			VS
	x	y	A1	A2	H3	
x	6	2	1	0	0	0
A2	8	6	0	1	0	-1
H3	2	4	0	0	1	0
r	0	0	-1	-1	0	0

La tabla inicial es inconsistente porque
 A_1 y A_2 están en la base y no son 0

Penalización

Base	VD		Variables				VS
	X	y	A1	A2	H3	E2	
A1	6	2	1	0	0	0	6
A2	8	6	0	1	0	-1	12
H3	2	4	0	0	1	0	8
r	14	8	0	0	0	-1	18

$$\underline{VE = X} \quad \underline{RM} \quad \frac{6}{6} = 1 \quad \frac{12}{8} = 1.5 \quad \frac{8}{2} = 4$$

$$\underline{VS = A1}$$

Pivote Dividiendo todo entre 6

Base	VD		Variables				VS
	X	y	A1	A2	H3	E2	
A1 → X	1	$\frac{1}{3}$	$\frac{1}{6}$	0	0	0	1

A2	H3	r
$X = 8 - (8 \cdot 1) = 0$	$X = 2 - (2 \cdot 1) = 0$	$X = 14 - (14 \cdot 1) = 0$
$Y = 6 - (8 \cdot \frac{1}{3}) = \frac{10}{3}$	$Y = 4 - (2 \cdot \frac{1}{3}) = \frac{10}{3}$	$Y = 8 - (14 \cdot \frac{1}{3}) = \frac{10}{3}$
$A1 = 0 - (8 \cdot \frac{1}{6}) = -\frac{4}{3}$	$A1 = 0 - (2 \cdot \frac{1}{6}) = -\frac{1}{3}$	$A1 = 0 - (14 \cdot \frac{1}{6}) = -\frac{7}{3}$
$A2 = 1 - (8 \cdot 0) = 1$	$A2 = 0 - (2 \cdot 0) = 0$	$A2 = 0 - (14 \cdot 0) = 0$
$H3 = 0 - (8 \cdot 0) = 0$	$H3 = 1 - (2 \cdot 0) = 1$	$H3 = 0 - (14 \cdot 0) = 0$
$E2 = -1 - (8 \cdot 0) = -1$	$E2 = 0 - (2 \cdot 0) = 0$	$E2 = -1 - (14 \cdot 0) = -1$
$VS = 12 - (8 \cdot 1) = 4$	$VS = 8 - (2 \cdot 1) = 6$	$VS = 18 - (14 \cdot 1) = 4$

Tabla despues de los calculos

Base	VD	Variables				VS	
	X	y	A1	A2	H3	E2	
A1	1	$\frac{1}{3}$	$\frac{1}{6}$	0	0	0	1
A2	0	$\frac{10}{3}$	$-\frac{4}{3}$	1	0	-1	9
H3	0	$\frac{10}{3}$	$-\frac{1}{3}$	0	1	0	6
r	0	$\frac{10}{3}$	$-\frac{7}{3}$	0	0	-1	4

$$\underline{VE = r} \quad \underline{RM} \quad \underline{\frac{1}{3} = 3} \quad \underline{\frac{4}{\frac{10}{3}} = 12} \quad \underline{\frac{6}{\frac{10}{3}} = 18}$$

VS = A2

Pivote Multiplicando todo por $\frac{3}{10}$

Base	VD	Variables				VS	
	X	y	A1	A2	H3	E2	
$A2 \rightarrow r$	0	1	$-\frac{2}{5}$	$\frac{3}{10}$	0	$-\frac{3}{10}$	$\frac{6}{5}$

X	H3	r
$x = 1 - (\frac{1}{3} \cdot 0) = 1$	$x = 0 - (\frac{1}{3} \cdot 0) = 0$	$x = 0 - (\frac{1}{3} \cdot 0) = 0$
$y = \frac{2}{3} - (\frac{1}{3} \cdot 1) = 0$	$y = \frac{2}{3} - (\frac{1}{3} \cdot 1) = 0$	$y = \frac{2}{3} - (\frac{1}{3} \cdot 1) = 0$
$A1 = \frac{1}{6} - (\frac{1}{3} \cdot \frac{-2}{5}) = \frac{3}{10}$	$A1 = \frac{1}{3} - (\frac{1}{3} \cdot \frac{-2}{5}) = 1$	$A1 = \frac{1}{3} - (\frac{1}{3} \cdot \frac{-2}{5}) = -1$
$A2 = 0 - (\frac{1}{3} \cdot \frac{3}{10}) = -\frac{1}{10}$	$A2 = 0 - (\frac{1}{3} \cdot \frac{3}{10}) = -1$	$A2 = 0 - (\frac{1}{3} \cdot \frac{3}{10}) = -1$
$H3 = 0 - (\frac{1}{3} \cdot 0) = 0$	$H3 = 1 - (\frac{1}{3} \cdot 0) = 1$	$H3 = 0 - (\frac{1}{3} \cdot 0) = 0$
$E2 = 0 - (\frac{1}{3} \cdot -\frac{3}{10}) = \frac{1}{10}$	$E2 = 0 - (\frac{1}{3} \cdot -\frac{3}{10}) = 1$	$E2 = -1 - (\frac{1}{3} \cdot -\frac{3}{10}) = 0$
$VS = 1 - (\frac{1}{3} \cdot \frac{6}{5}) = \frac{3}{5}$	$VS = 6 - (\frac{1}{3} \cdot \frac{6}{5}) = 2$	$VS = 4 - (\frac{1}{3} \cdot \frac{6}{5}) = 0$

Tabla despues de los calculos

Base	VD			Variables			VS
	X	y	A1	A2	H3	E2	
X	1	0	$\frac{3}{10}$	$-\frac{1}{10}$	0	$\frac{1}{10}$	$\frac{3}{5}$
y	0	1	$-\frac{2}{5}$	$\frac{3}{10}$	0	$-\frac{3}{10}$	$\frac{6}{5}$
H3	0	0	1	-1	1	1	2
r	0	0	-1	-1	0	0	0

Antes de pasar a fase 2

Existen artificiales en la base? NO

VS en r=0? Si

Entonces podemos pasar a fase 2

Fase 2

$$\min z = 8x + 2y \rightarrow z - 8x - 2y = 0$$

Eliminando las variables artificiales

Base	VD			Variables		VS
	X	y	H3	E2		
X	1	0	0	$\frac{1}{10}$	$\frac{3}{5}$	
y	0	1	0	$-\frac{3}{10}$	$\frac{6}{5}$	
H3	0	0	1	1	2	
z	-8	-2	0	0	0	

Cambio del F0

Paso 1: Convertir x a cero en z \rightarrow fila 1(x).8 + z

Base	VD	Varrables	VS		
	x	y	H3	E2	
X.8	8	0	0	$\frac{8}{10}$	$\frac{24}{5}$
Z	-8	-2	0	0	0
nuevo Z	0	-2	0	$\frac{4}{5}$	$\frac{24}{5}$

Tabla modificada despues del paso 1

Base	VD	Varrables	VS		
	x	y	H3	E2	
X	1	0	0	$\frac{1}{10}$	$\frac{3}{5}$
Y	0	1	0	$-\frac{3}{10}$	$\frac{6}{5}$
H3	0	0	1	1	2
Z	0	-2	0	$\frac{4}{5}$	$\frac{24}{5}$

Paso 2: Convertir y a cero en z \rightarrow fila 2(y).2 + z

Base	VD	Varrables	VS		
	x	y	H3	E2	
Y.2	0	2	0	$-\frac{6}{10}$	$\frac{72}{5}$
Z	0	-2	0	$\frac{4}{5}$	$\frac{24}{5}$
nuevo Z	0	0	0	$\frac{1}{5}$	$\frac{36}{5}$

Tabla modificada despues del paso 2

Base	VD		Variables		VS
	X	y	H3	E2	
X	1	0	0	$\frac{1}{10}$	$\frac{3}{5}$
y	0	1	0	$-\frac{3}{10}$	$\frac{6}{5}$
H3	0	0	1	1	2
Z	0	0	0	$\frac{1}{5}$	$\frac{36}{5}$

$$\underline{VE = E2} \quad \underline{RM} \quad \underline{\frac{3}{5}} = 6 \quad \text{Las negativas} \\ \underline{\frac{1}{10}} \quad \text{se ignoran}$$

$$\underline{VS = H3}$$

Pivote Multiplicando todo por $\frac{3}{10}$

Base	VD		Variables		VS
	X	y	H3	E2	
$H3 \rightarrow E2$	0	0	1	1	2

Haciendo Gauss Jordan

$$\text{Fila } X \rightarrow X - \frac{1}{10} \cdot E2$$

Base	VD		Variables		VS
	X	y	H3	E2	
$\frac{1}{10} \cdot E2$	0	0	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{5}$
X	1	0	0	$\frac{1}{10}$	$\frac{3}{5}$
nuevo X	1	0	$-\frac{1}{10}$	0	$\frac{2}{5}$

Haciendo Gauss Jordan

$$\text{Fila } Y \rightarrow Y + \frac{3}{10}E_2$$

Base	VD		Variables		VS
	X	Y	H3	E2	
$\frac{3}{10} \cdot E_2$	0	0	$\frac{3}{10}$	$\frac{3}{10}$	$\frac{3}{5}$
X	0	1	0	$-\frac{3}{10}$	$\frac{6}{5}$
nuevo X	0	1	$\frac{3}{10}$	0	$\frac{9}{5}$

Haciendo Gauss Jordan

$$\text{Fila } Z \rightarrow Z - \frac{1}{5} \cdot E_2$$

Base	VD		Variables		VS
	X	Y	H3	E2	
$\frac{1}{5} \cdot E_2$	0	0	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{2}{5}$
X	0	0	0	$\frac{1}{5}$	$\frac{36}{5}$
nuevo X	0	0	$-\frac{1}{5}$	0	$\frac{39}{5}$

Tabla final

Base	VD		Variables		VS
	X	Y	H3	E2	
X	1	0	$-\frac{1}{10}$	0	$\frac{2}{5}$
Y	0	1	$\frac{3}{10}$	0	$\frac{9}{5}$
E2	0	0	1	1	2
Z	0	0	$-\frac{1}{5}$	0	$\frac{39}{5}$

$$X = \frac{2}{5}$$

$$Y = \frac{9}{5}$$

$$\min Z = 8 \cdot \frac{2}{5} + 2 \cdot \frac{9}{5} = \frac{39}{5}$$

Tipo de caso: Solución Única