

Read in the following dictionary:

$x_9$	-2.0	-3.00 $x_1$	-2.00 $x_2$	-9.00 $x_3$	-5.00 $x_4$	+7.00 $x_5$	+1.00 $x_6$	-9.00 $x_7$	-3.00 $x_8$
$x_{10}$	3.0	+4.00 $x_1$	+3.00 $x_2$	-6.00 $x_3$	-6.00 $x_4$	-6.00 $x_5$	+3.00 $x_6$	+8.00 $x_7$	-2.00 $x_8$
$x_{11}$	3.0	-8.00 $x_1$	+5.00 $x_2$	-8.00 $x_3$	+2.00 $x_4$	-8.00 $x_5$			+2.00 $x_8$
$x_{12}$	-3.0	-10.00 $x_1$	-10.00 $x_2$		-10.00 $x_4$	+10.00 $x_5$	+4.00 $x_6$	-2.00 $x_7$	-3.00 $x_8$
$x_{13}$	3.0	-3.00 $x_1$	+9.00 $x_2$	+6.00 $x_3$	+1.00 $x_4$	-7.00 $x_5$	-3.00 $x_6$	+6.00 $x_7$	-5.00 $x_8$
$x_{14}$	-3.0	-7.00 $x_1$	+6.00 $x_2$	+2.00 $x_3$	+8.00 $x_4$	-5.00 $x_5$	+8.00 $x_6$		-5.00 $x_8$
$x_{15}$	-3.0	-1.00 $x_1$	-9.00 $x_2$	-8.00 $x_3$	-8.00 $x_4$	+6.00 $x_5$	+3.00 $x_6$	-7.00 $x_7$	-9.00 $x_8$
$x_{16}$	2.0	-2.00 $x_1$	+6.00 $x_2$	+5.00 $x_3$	+5.00 $x_4$	-8.00 $x_5$		+3.00 $x_7$	+3.00 $x_8$
$z$	0.0	-1.00 $x_1$	+4.00 $x_2$	+2.00 $x_3$	+5.00 $x_4$	+5.00 $x_5$	-2.00 $x_6$	-3.00 $x_7$	-3.00 $x_8$

## 0.1 Initialization Phase: Dual Problem Solving

New Objective in primal was changed to :

$$\max \sum_{j=1}^8 -x_j$$

Primal variable  $x_j$  corresponds to dual variable  $y_j$  for  $j = 1, \dots, 16$  Dual Dictionary (with objective changed is):

$y_1$	1.0	+3.00 $y_9$	-4.00 $y_{10}$	+8.00 $y_{11}$	+10.00 $y_{12}$	+3.00 $y_{13}$	+7.00 $y_{14}$	+1.00 $y_{15}$	+2.00 $y_{16}$
$y_2$	1.0	+2.00 $y_9$	-3.00 $y_{10}$	-5.00 $y_{11}$	+10.00 $y_{12}$	-9.00 $y_{13}$	-6.00 $y_{14}$	+9.00 $y_{15}$	-6.00 $y_{16}$
$y_3$	1.0	+9.00 $y_9$	+6.00 $y_{10}$	+8.00 $y_{11}$		-6.00 $y_{13}$	-2.00 $y_{14}$	+8.00 $y_{15}$	-5.00 $y_{16}$
$y_4$	1.0	+5.00 $y_9$	+6.00 $y_{10}$	-2.00 $y_{11}$	+10.00 $y_{12}$	-1.00 $y_{13}$	-8.00 $y_{14}$	+8.00 $y_{15}$	-5.00 $y_{16}$
$y_5$	1.0	-7.00 $y_9$	+6.00 $y_{10}$	+8.00 $y_{11}$	-10.00 $y_{12}$	+7.00 $y_{13}$	+5.00 $y_{14}$	-6.00 $y_{15}$	+8.00 $y_{16}$
$y_6$	1.0	-1.00 $y_9$	-3.00 $y_{10}$		-4.00 $y_{12}$	+3.00 $y_{13}$	-8.00 $y_{14}$	-3.00 $y_{15}$	
$y_7$	1.0	+9.00 $y_9$	-8.00 $y_{10}$		+2.00 $y_{12}$	-6.00 $y_{13}$		+7.00 $y_{15}$	-3.00 $y_{16}$
$y_8$	1.0	+3.00 $y_9$	+2.00 $y_{10}$	-2.00 $y_{11}$	+3.00 $y_{12}$	+5.00 $y_{13}$	+5.00 $y_{14}$	+9.00 $y_{15}$	-3.00 $y_{16}$
$z$	-0	+2.00 $y_9$	-3.00 $y_{10}$	-3.00 $y_{11}$	+3.00 $y_{12}$	-3.00 $y_{13}$	+3.00 $y_{14}$	+3.00 $y_{15}$	-2.00 $y_{16}$

Initialization succeeded in finding final dual dictionary with 7 pivots

$y_1$	96.0	+4.00 $y_5$	-325.00 $y_{10}$	-137.33 $y_{11}$	-28.67 $y_{12}$	-22.67 $y_2$	-76.33 $y_6$	-759.67 $y_{14}$	-166.00 $y_{16}$
$y_{13}$	21.0	+1.00 $y_5$	-72.00 $y_{10}$	-33.00 $y_{11}$	-8.00 $y_{12}$	-5.00 $y_2$	-17.00 $y_6$	-171.00 $y_{14}$	-38.00 $y_{16}$
$y_3$	71.0	+2.00 $y_5$	-222.00 $y_{10}$	-89.67 $y_{11}$	-39.33 $y_{12}$	-16.33 $y_2$	-55.67 $y_6$	-555.33 $y_{14}$	-119.00 $y_{16}$
$y_4$	160.0	+7.00 $y_5$	-534.00 $y_{10}$	-244.67 $y_{11}$	-61.33 $y_{12}$	-37.33 $y_2$	-128.67 $y_6$	-1296.33 $y_{14}$	-285.00 $y_{16}$
$y_9$	4.0	-0.00 $y_5$	-12.00 $y_{10}$	-5.00 $y_{11}$	-2.00 $y_{12}$	-1.00 $y_2$	-3.00 $y_6$	-30.00 $y_{14}$	-6.00 $y_{16}$
$y_{15}$	20.0	+1.00 $y_5$	-69.00 $y_{10}$	-31.33 $y_{11}$	-8.67 $y_{12}$	-4.67 $y_2$	-16.33 $y_6$	-163.67 $y_{14}$	-36.00 $y_{16}$
$y_7$	51.0	+1.00 $y_5$	-167.00 $y_{10}$	-66.33 $y_{11}$	-28.67 $y_{12}$	-11.67 $y_2$	-39.33 $y_6$	-389.67 $y_{14}$	-81.00 $y_{16}$
$y_8$	298.0	+14.00 $y_5$	-1015.00 $y_{10}$	-464.00 $y_{11}$	-121.00 $y_{12}$	-70.00 $y_2$	-241.00 $y_6$	-2413.00 $y_{14}$	-535.00 $y_{16}$
$z$	5.0	-0.00 $y_5$	-18.00 $y_{10}$	-8.00 $y_{11}$	-3.00 $y_{12}$	-1.00 $y_2$	-4.00 $y_6$	-35.00 $y_{14}$	-8.00 $y_{16}$

Primal Dictionary is:

$x_5$	$1.16573417586e - 15$	$-4.00x_1$	$-1.00x_{13}$	$-2.00x_3$	$-7.00x_4$	$+0.00x_9$	$-1.00x_{15}$	$-1.00x_7$
$x_{10}$	18.0	$+325.00x_1$	$+72.00x_{13}$	$+222.00x_3$	$+534.00x_4$	$+12.00x_9$	$+69.00x_{15}$	$+167.00x_7$
$x_{11}$	8.0	$+137.33x_1$	$+33.00x_{13}$	$+89.67x_3$	$+244.67x_4$	$+5.00x_9$	$+31.33x_{15}$	$+66.33x_7$
$x_{12}$	3.0	$+28.67x_1$	$+8.00x_{13}$	$+39.33x_3$	$+61.33x_4$	$+2.00x_9$	$+8.67x_{15}$	$+28.67x_7$
$x_2$	1.0	$+22.67x_1$	$+5.00x_{13}$	$+16.33x_3$	$+37.33x_4$	$+1.00x_9$	$+4.67x_{15}$	$+11.67x_7$
$x_6$	4.0	$+76.33x_1$	$+17.00x_{13}$	$+55.67x_3$	$+128.67x_4$	$+3.00x_9$	$+16.33x_{15}$	$+39.33x_7$
$x_{14}$	35.0	$+759.67x_1$	$+171.00x_{13}$	$+555.33x_3$	$+1296.33x_4$	$+30.00x_9$	$+163.67x_{15}$	$+389.67x_7$
$x_{16}$	8.0	$+166.00x_1$	$+38.00x_{13}$	$+119.00x_3$	$+285.00x_4$	$+6.00x_9$	$+36.00x_{15}$	$+81.00x_7$
$z$	-5.0	$-96.00x_1$	$-21.00x_{13}$	$-71.00x_3$	$-160.00x_4$	$-4.00x_9$	$-20.00x_{15}$	$-51.00x_7$

Primal Dictionary with original objective is:

$x_5$	$1.16573417586e - 15$	$-4.00x_1$	$-1.00x_{13}$	$-2.00x_3$	$-7.00x_4$	$+0.00x_9$	$-1.00x_{15}$	$-1.00x_7$
$x_{10}$	18.0	$+325.00x_1$	$+72.00x_{13}$	$+222.00x_3$	$+534.00x_4$	$+12.00x_9$	$+69.00x_{15}$	$+167.00x_7$
$x_{11}$	8.0	$+137.33x_1$	$+33.00x_{13}$	$+89.67x_3$	$+244.67x_4$	$+5.00x_9$	$+31.33x_{15}$	$+66.33x_7$
$x_{12}$	3.0	$+28.67x_1$	$+8.00x_{13}$	$+39.33x_3$	$+61.33x_4$	$+2.00x_9$	$+8.67x_{15}$	$+28.67x_7$
$x_2$	1.0	$+22.67x_1$	$+5.00x_{13}$	$+16.33x_3$	$+37.33x_4$	$+1.00x_9$	$+4.67x_{15}$	$+11.67x_7$
$x_6$	4.0	$+76.33x_1$	$+17.00x_{13}$	$+55.67x_3$	$+128.67x_4$	$+3.00x_9$	$+16.33x_{15}$	$+39.33x_7$
$x_{14}$	35.0	$+759.67x_1$	$+171.00x_{13}$	$+555.33x_3$	$+1296.33x_4$	$+30.00x_9$	$+163.67x_{15}$	$+389.67x_7$
$x_{16}$	8.0	$+166.00x_1$	$+38.00x_{13}$	$+119.00x_3$	$+285.00x_4$	$+6.00x_9$	$+36.00x_{15}$	$+81.00x_7$
$z$	-4.0	$-83.00x_1$	$-19.00x_{13}$	$-54.00x_3$	$-138.00x_4$	$-2.00x_9$	$-19.00x_{15}$	$-40.00x_7$

## 1 Optimization Phase Simplex

Starting Dictionary is:

$x_5$	$1.16573417586e - 15$	$-4.00x_1$	$-1.00x_{13}$	$-2.00x_3$	$-7.00x_4$	$+0.00x_9$	$-1.00x_{15}$	$-1.00x_7$
$x_{10}$	18.0	$+325.00x_1$	$+72.00x_{13}$	$+222.00x_3$	$+534.00x_4$	$+12.00x_9$	$+69.00x_{15}$	$+167.00x_7$
$x_{11}$	8.0	$+137.33x_1$	$+33.00x_{13}$	$+89.67x_3$	$+244.67x_4$	$+5.00x_9$	$+31.33x_{15}$	$+66.33x_7$
$x_{12}$	3.0	$+28.67x_1$	$+8.00x_{13}$	$+39.33x_3$	$+61.33x_4$	$+2.00x_9$	$+8.67x_{15}$	$+28.67x_7$
$x_2$	1.0	$+22.67x_1$	$+5.00x_{13}$	$+16.33x_3$	$+37.33x_4$	$+1.00x_9$	$+4.67x_{15}$	$+11.67x_7$
$x_6$	4.0	$+76.33x_1$	$+17.00x_{13}$	$+55.67x_3$	$+128.67x_4$	$+3.00x_9$	$+16.33x_{15}$	$+39.33x_7$
$x_{14}$	35.0	$+759.67x_1$	$+171.00x_{13}$	$+555.33x_3$	$+1296.33x_4$	$+30.00x_9$	$+163.67x_{15}$	$+389.67x_7$
$x_{16}$	8.0	$+166.00x_1$	$+38.00x_{13}$	$+119.00x_3$	$+285.00x_4$	$+6.00x_9$	$+36.00x_{15}$	$+81.00x_7$
$z$	-4.0	$-83.00x_1$	$-19.00x_{13}$	$-54.00x_3$	$-138.00x_4$	$-2.00x_9$	$-19.00x_{15}$	$-40.00x_7$

Final Dictionary Solution: -4.0 Num Pivots: 1