

Read in the following dictionary:

$x_9$	-1.0	-1.00 $x_1$	+8.00 $x_2$	-6.00 $x_3$	-6.00 $x_4$	-9.00 $x_5$	+3.00 $x_6$	-7.00 $x_7$	+7.00 $x_8$
$x_{10}$	-68.0	+6.00 $x_1$	+6.00 $x_2$	+1.00 $x_3$	+7.00 $x_4$	-2.00 $x_5$	+2.00 $x_6$	+4.00 $x_7$	+6.00 $x_8$
$x_{11}$	-1.0	-8.00 $x_1$	-10.00 $x_2$		+8.00 $x_4$	+3.00 $x_5$	-2.00 $x_6$	-7.00 $x_7$	+8.00 $x_8$
$x_{12}$	17.0	-5.00 $x_1$	-4.00 $x_2$	+9.00 $x_3$	-5.00 $x_4$	+8.00 $x_5$	+9.00 $x_6$		-9.00 $x_8$
$x_{13}$	0.0	-1.00 $x_1$	+10.00 $x_2$	-8.00 $x_3$	-7.00 $x_4$	-2.00 $x_5$	-6.00 $x_6$	+8.00 $x_7$	+9.00 $x_8$
$x_{14}$	-17.0	-1.00 $x_1$	+7.00 $x_2$	-2.00 $x_3$	+7.00 $x_4$	-6.00 $x_5$	-3.00 $x_6$	-3.00 $x_7$	+9.00 $x_8$
$x_{15}$	29.0	+4.00 $x_1$	+3.00 $x_2$	+9.00 $x_3$	-10.00 $x_4$	-10.00 $x_5$	+5.00 $x_6$	-8.00 $x_7$	-5.00 $x_8$
$z$	0.0	-4.00 $x_1$	-2.00 $x_2$	+3.00 $x_3$	+1.00 $x_4$	+4.00 $x_5$	+4.00 $x_6$		-5.00 $x_8$

## 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  $j = 1, \dots, 15$  Dual Dictionary (with objective changed is):

$y_1$	1.0	+1.00 $y_9$	-6.00 $y_{10}$	+8.00 $y_{11}$	+5.00 $y_{12}$	+1.00 $y_{13}$	+1.00 $y_{14}$	-4.00 $y_{15}$
$y_2$	1.0	-8.00 $y_9$	-6.00 $y_{10}$	+10.00 $y_{11}$	+4.00 $y_{12}$	-10.00 $y_{13}$	-7.00 $y_{14}$	-3.00 $y_{15}$
$y_3$	1.0	+6.00 $y_9$	-1.00 $y_{10}$		-9.00 $y_{12}$	+8.00 $y_{13}$	+2.00 $y_{14}$	-9.00 $y_{15}$
$y_4$	1.0	+6.00 $y_9$	-7.00 $y_{10}$	-8.00 $y_{11}$	+5.00 $y_{12}$	+7.00 $y_{13}$	-7.00 $y_{14}$	+10.00 $y_{15}$
$y_5$	1.0	+9.00 $y_9$	+2.00 $y_{10}$	-3.00 $y_{11}$	-8.00 $y_{12}$	+2.00 $y_{13}$	+6.00 $y_{14}$	+10.00 $y_{15}$
$y_6$	1.0	-3.00 $y_9$	-2.00 $y_{10}$	+2.00 $y_{11}$	-9.00 $y_{12}$	+6.00 $y_{13}$	+3.00 $y_{14}$	-5.00 $y_{15}$
$y_7$	1.0	+7.00 $y_9$	-4.00 $y_{10}$	+7.00 $y_{11}$		-8.00 $y_{13}$	+3.00 $y_{14}$	+8.00 $y_{15}$
$y_8$	1.0	-7.00 $y_9$	-6.00 $y_{10}$	-8.00 $y_{11}$	+9.00 $y_{12}$	-9.00 $y_{13}$	-9.00 $y_{14}$	+5.00 $y_{15}$
$z$	-0	+1.00 $y_9$	+68.00 $y_{10}$	+1.00 $y_{11}$	-17.00 $y_{12}$		+17.00 $y_{14}$	-29.00 $y_{15}$

Initialization succeeded in finding final dual dictionary with 6 pivots

$y_1$	0.444883445279	+0.94 $y_2$	+0.86 $y_4$	-0.79 $y_8$	-0.45 $y_6$	-3.52 $y_9$	+7.83 $y_{14}$	-8.05 $y_{15}$
$y_{13}$	0.0370077703148	+0.00 $y_2$	+0.08 $y_4$	-0.08 $y_8$	-0.04 $y_6$	-1.10 $y_9$	-0.06 $y_{14}$	-0.53 $y_{15}$
$y_3$	0.232450941657	-0.17 $y_2$	+0.06 $y_4$	-0.04 $y_8$	+0.92 $y_6$	+6.73 $y_9$	-1.88 $y_{14}$	-5.32 $y_{15}$
$y_{10}$	0.214934808376	-0.05 $y_2$	-0.05 $y_4$	-0.04 $y_8$	-0.08 $y_6$	-0.63 $y_9$	-0.74 $y_{14}$	+0.07 $y_{15}$
$y_5$	0.664757013038	-0.50 $y_2$	-0.53 $y_4$	+0.50 $y_8$	+0.87 $y_6$	+14.30 $y_9$	+0.65 $y_{14}$	+15.68 $y_{15}$
$y_{12}$	0.094297379165	+0.03 $y_2$	+0.07 $y_4$	-0.06 $y_8$	-0.12 $y_6$	-0.99 $y_9$	+0.46 $y_{14}$	-0.89 $y_{15}$
$y_7$	0.0419465296984	+0.61 $y_2$	-0.27 $y_4$	+0.25 $y_8$	+0.37 $y_6$	+16.34 $y_9$	+6.51 $y_{14}$	+13.13 $y_{15}$
$y_{11}$	0.0282497036744	+0.06 $y_2$	+0.02 $y_4$	-0.08 $y_8$	-0.04 $y_6$	-0.28 $y_9$	+0.01 $y_{14}$	+0.17 $y_{15}$
$z$	13.0407612274	-3.74 $y_2$	-4.19 $y_4$	-1.51 $y_8$	-3.61 $y_6$	-25.16 $y_9$	-41.23 $y_{14}$	-8.83 $y_{15}$

Primal Dictionary is:

$x_2$	3.73600684841	$-0.94x_1 - 0.00x_{13} + 0.17x_3 + 0.05x_{10} + 0.50x_5 - 0.03x_{12} - 0.61x_7 - 0.06x_{11}$
$x_4$	4.18661925458	$-0.86x_1 - 0.08x_{13} - 0.06x_3 + 0.05x_{10} + 0.53x_5 - 0.07x_{12} + 0.27x_7 - 0.02x_{11}$
$x_8$	1.51033846964	$+0.79x_1 + 0.08x_{13} + 0.04x_3 + 0.04x_{10} - 0.50x_5 + 0.06x_{12} - 0.25x_7 + 0.08x_{11}$
$x_6$	3.60779665481	$+0.45x_1 + 0.04x_{13} - 0.92x_3 + 0.08x_{10} - 0.87x_5 + 0.12x_{12} - 0.37x_7 + 0.04x_{11}$
$x_9$	25.1640985118	$+3.52x_1 + 1.10x_{13} - 6.73x_3 + 0.63x_{10} - 14.30x_5 + 0.99x_{12} - 16.34x_7 + 0.28x_{11}$
$x_{14}$	41.2280389833	$-7.83x_1 + 0.06x_{13} + 1.88x_3 + 0.74x_{10} - 0.65x_5 - 0.46x_{12} - 6.51x_7 - 0.01x_{11}$
$x_{15}$	8.82911892533	$+8.05x_1 + 0.53x_{13} + 5.32x_3 - 0.07x_{10} - 15.68x_5 + 0.89x_{12} - 13.13x_7 - 0.17x_{11}$
$z$	-13.0407612274	$-0.44x_1 - 0.04x_{13} - 0.23x_3 - 0.21x_{10} - 0.66x_5 - 0.09x_{12} - 0.04x_7 - 0.03x_{11}$

Primal Dictionary with original objective is:

$x_2$	3.73600684841	$-0.94x_1 - 0.00x_{13} + 0.17x_3 + 0.05x_{10} + 0.50x_5 - 0.03x_{12} - 0.61x_7 - 0.06x_{11}$
$x_4$	4.18661925458	$-0.86x_1 - 0.08x_{13} - 0.06x_3 + 0.05x_{10} + 0.53x_5 - 0.07x_{12} + 0.27x_7 - 0.02x_{11}$
$x_8$	1.51033846964	$+0.79x_1 + 0.08x_{13} + 0.04x_3 + 0.04x_{10} - 0.50x_5 + 0.06x_{12} - 0.25x_7 + 0.08x_{11}$
$x_6$	3.60779665481	$+0.45x_1 + 0.04x_{13} - 0.92x_3 + 0.08x_{10} - 0.87x_5 + 0.12x_{12} - 0.37x_7 + 0.04x_{11}$
$x_9$	25.1640985118	$+3.52x_1 + 1.10x_{13} - 6.73x_3 + 0.63x_{10} - 14.30x_5 + 0.99x_{12} - 16.34x_7 + 0.28x_{11}$
$x_{14}$	41.2280389833	$-7.83x_1 + 0.06x_{13} + 1.88x_3 + 0.74x_{10} - 0.65x_5 - 0.46x_{12} - 6.51x_7 - 0.01x_{11}$
$x_{15}$	8.82911892533	$+8.05x_1 + 0.53x_{13} + 5.32x_3 - 0.07x_{10} - 15.68x_5 + 0.89x_{12} - 13.13x_7 - 0.17x_{11}$
$z$	3.59409982879	$-5.13x_1 - 0.32x_{13} - 1.28x_3 + 0.10x_{10} + 2.55x_5 + 0.18x_{12} + 1.25x_7 - 0.14x_{11}$

## 1 Optimization Phase Simplex

Starting Dictionary is:

$x_2$	3.73600684841	$-0.94x_1 - 0.00x_{13} + 0.17x_3 + 0.05x_{10} + 0.50x_5 - 0.03x_{12} - 0.61x_7 - 0.06x_{11}$
$x_4$	4.18661925458	$-0.86x_1 - 0.08x_{13} - 0.06x_3 + 0.05x_{10} + 0.53x_5 - 0.07x_{12} + 0.27x_7 - 0.02x_{11}$
$x_8$	1.51033846964	$+0.79x_1 + 0.08x_{13} + 0.04x_3 + 0.04x_{10} - 0.50x_5 + 0.06x_{12} - 0.25x_7 + 0.08x_{11}$
$x_6$	3.60779665481	$+0.45x_1 + 0.04x_{13} - 0.92x_3 + 0.08x_{10} - 0.87x_5 + 0.12x_{12} - 0.37x_7 + 0.04x_{11}$
$x_9$	25.1640985118	$+3.52x_1 + 1.10x_{13} - 6.73x_3 + 0.63x_{10} - 14.30x_5 + 0.99x_{12} - 16.34x_7 + 0.28x_{11}$
$x_{14}$	41.2280389833	$-7.83x_1 + 0.06x_{13} + 1.88x_3 + 0.74x_{10} - 0.65x_5 - 0.46x_{12} - 6.51x_7 - 0.01x_{11}$
$x_{15}$	8.82911892533	$+8.05x_1 + 0.53x_{13} + 5.32x_3 - 0.07x_{10} - 15.68x_5 + 0.89x_{12} - 13.13x_7 - 0.17x_{11}$
$z$	3.59409982879	$-5.13x_1 - 0.32x_{13} - 1.28x_3 + 0.10x_{10} + 2.55x_5 + 0.18x_{12} + 1.25x_7 - 0.14x_{11}$

$x_5$  enters and  $x_{15}$  leaves

$x_2$	4.01801801802	$-0.69x_1 + 0.01x_{13} + 0.34x_3 + 0.05x_{10} - 0.03x_{15} + 0.00x_{12} - 1.03x_7 - 0.07x_{11}$
$x_4$	4.48676368676	$-0.58x_1 - 0.06x_{13} + 0.12x_3 + 0.04x_{10} - 0.03x_{15} - 0.04x_{12} - 0.18x_7 - 0.03x_{11}$
$x_8$	1.22910602911	$+0.54x_1 + 0.06x_{13} - 0.13x_3 + 0.04x_{10} + 0.03x_{15} + 0.03x_{12} + 0.17x_7 + 0.08x_{11}$
$x_6$	3.11808731809	$+0.01x_1 + 0.01x_{13} - 1.21x_3 + 0.09x_{10} + 0.06x_{15} + 0.08x_{12} + 0.36x_7 + 0.05x_{11}$
$x_9$	17.1133749134	$-3.83x_1 + 0.62x_{13} - 11.59x_3 + 0.69x_{10} + 0.91x_{15} + 0.18x_{12} - 4.37x_7 + 0.43x_{11}$
$x_{14}$	40.8623700624	$-8.16x_1 + 0.03x_{13} + 1.66x_3 + 0.74x_{10} + 0.04x_{15} - 0.50x_{12} - 5.96x_7 - 0.01x_{11}$
$x_5$	0.563132363132	$+0.51x_1 + 0.03x_{13} + 0.34x_3 - 0.00x_{10} - 0.06x_{15} + 0.06x_{12} - 0.84x_7 - 0.01x_{11}$
$z$	5.03007623008	$-3.82x_1 - 0.24x_{13} - 0.41x_3 + 0.09x_{10} - 0.16x_{15} + 0.32x_{12} - 0.88x_7 - 0.16x_{11}$

$x_{10}$  enters and  $x_5$  leaves

$x_2$	9.71857923497	$+4.51x_1$	$+0.36x_{13}$	$+3.78x_3$	$-10.12x_5$	$-0.68x_{15}$	$+0.57x_{12}$	$-9.51x_7$	$-0.18x_{11}$
$x_4$	9.7349726776	$+4.20x_1$	$+0.26x_{13}$	$+3.28x_3$	$-9.32x_5$	$-0.63x_{15}$	$+0.49x_{12}$	$-7.98x_7$	$-0.13x_{11}$
$x_8$	5.99726775956	$+4.89x_1$	$+0.35x_{13}$	$+2.75x_3$	$-8.47x_5$	$-0.51x_{15}$	$+0.51x_{12}$	$-6.92x_7$	$-0.01x_{11}$
$x_6$	13.8360655738	$+9.78x_1$	$+0.65x_{13}$	$+5.25x_3$	$-19.03x_5$	$-1.16x_{15}$	$+1.15x_{12}$	$-15.58x_7$	$-0.16x_{11}$
$x_9$	101.827868852	$+73.44x_1$	$+5.70x_{13}$	$+39.50x_3$	$-150.43x_5$	$-8.68x_{15}$	$+8.69x_{12}$	$-130.34x_7$	$-1.18x_{11}$
$x_{14}$	131.642076503	$+74.63x_1$	$+5.48x_{13}$	$+56.40x_3$	$-161.20x_5$	$-10.24x_{15}$	$+8.62x_{12}$	$-140.95x_7$	$-1.74x_{11}$
$x_{10}$	122.112021858	$+111.37x_1$	$+7.33x_{13}$	$+73.64x_3$	$-216.84x_5$	$-13.83x_{15}$	$+12.27x_{12}$	$-181.58x_7$	$-2.33x_{11}$
$z$	15.6557377049	$+5.87x_1$	$+0.40x_{13}$	$+5.99x_3$	$-18.87x_5$	$-1.37x_{15}$	$+1.39x_{12}$	$-16.68x_7$	$-0.37x_{11}$

$x_1$  enters and Unbounded Dictionary!

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