

# LINEAR PROGRAMMING Problems

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Module/submodel: Linear Programming  
 Problem title: LPP-Example1  
 Objective: Maximize

**Problem and Results** -----

X1	Basic	0
X2	Basic	14.2857
slack 1	NONBasic	0
slack 2	NONBasic	0
Optimal Value (Z)		171.4286

**Ranging** -----

Variable	Value	Reduced Cost	Original Value	Lower Bound	Upper Bound
X1	0	0	10	8.5714	10.2857
X2	14.2857	0	12	11.6667	14

Constraint	Dual Value	Slack/Surplus	Original Value	Lower Bound	Upper Bound
Constraint 1	.2857	0	100	83.3333	100
Constraint 2	.7143	0	200	200	240

**Original Problem w/answers** -----

	X1	X2	RHS
Maximize	10	12	
Constraint 1	5	7	<= 100
Constraint 2	12	14	<= 200
Solution	0	14.2857	171.4286

**Iterations** -----

Iteration 1

Cj-->	Quantity	X1	X2	slack 1	slack 2
Basic					
slack 1	100	5	7	1	0
slack 2	200	12	14	0	1
Zj	0	0	0	0	0
Cj-Zj		10	12	0	0

Iteration 2

Cj-->	Quantity	X1	X2	slack 1	slack 2
Basic					
X2	14.2857	0.7143	1	0.1429	0
slack 2	0	2.0	0	-2	1
Zj	171.4286	8.5714	12	1.7143	0
Cj-Zj		1.4286	0	-1.7143	0

Iteration 3

Cj-->	Quantity	X1	X2	slack 1	slack 2
Basic					
X2	14.2857	0	1	0.8571	-0.3571
X1	0	1	0	-1	0.5

Zj	171.4286	10	12	-0.2857	-0.7143
Cj-Zj		0	0	-0.2857	-0.7143

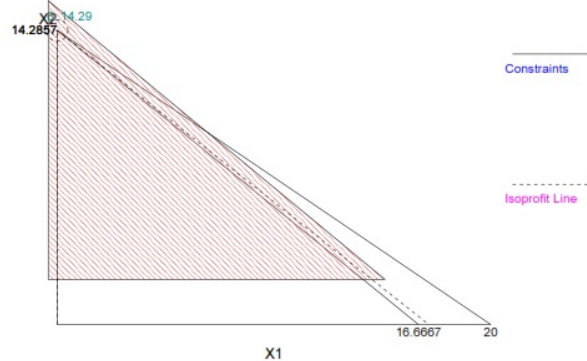
**Dual** -----

	y1	y2	
Minimize	100	200	
X1	5	12	>= 10
X2	7	14	>= 12

**Intercepts and Intersections** -----

	X1	X2	Profit
Point 1	0	0	0
Point 2	0	14.2857	171.4286
Point 3	16.6667	0	166.6667
Point 4	0	14.2857	171.4286

LPP-Example1



Module/submodel: Linear Programming  
 Problem title: LPP-Example2  
 Objective: Maximize

**Problem and Results** -----

X1	Basic	5.824
X2	Basic	3.427
slack 1	NONBasic	0
slack 2	NONBasic	0
Optimal Value (Z)		288.1648

**Ranging** -----

Variable	Value	Reduced Cost	Original Value	Lower Bound	Upper Bound
X1	5.824	0	23	14.6739	28.4211
X2	3.427	0	45	36.4167	70.5333

Constraint	Dual Value	Slack/Surplus	Original Value	Lower Bound	Upper Bound
Constraint 1	1.4345	0	135	101.1957	196
Constraint 2	.3858	0	245	168.75	326.8421

**Original Problem w/answers** -----

	X1	X2	RHS
Maximize	23	45	
Constraint 1	12	19	<= 135
Constraint 2	15	46	<= 245
<b>Solution</b>	<b>5.824</b>	<b>3.427</b>	<b>288.1648</b>

**Iterations** -----

Iteration 1

Cj-->	Quantity	X1	X2	slack 1	slack 2
Basic					
slack 1	135	12	19	1	0
slack 2	245	15	46	0	1
zj	0	0	0	0	0
cj-zj		23	45	0	0

Iteration 2

Cj-->	Quantity	X1	X2	slack 1	slack 2
Basic					
slack 1	33.8043	5.8043	0	1	-0.413
X2	5.3261	0.3261	1	0	0.0217
zj	239.6739	14.6739	45	0	.9783
cj-zj		8.3261	0	0	-0.9783

Iteration 3

Cj-->	Quantity	X1	X2	slack 1	slack 2
Basic					
X1	5.824	1	0	0.1723	-0.0712
X2	3.427	0	1	-0.0562	0.0449

zj	288.1648	23	45	1.4345	.3858
cj-zj		0	0	-1.4345	-0.3858

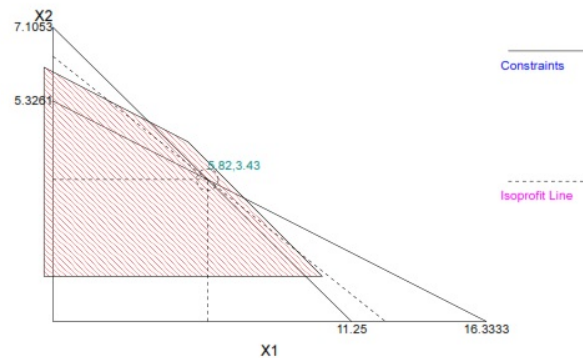
**Dual** -----

	y1	y2	
Minimize	135	245	
X1	12	15	>= 23
X2	19	46	>= 45

**Intercepts and Intersections** -----

	X1	X2	Profit
Point 1	0	0	0
Point 2	11.25	0	258.75
Point 3	0	5.3261	239.6739
Point 4	5.824	3.427	288.1648

LPP-Example2



Module/submodel: Linear Programming  
 Problem title: LPP-Example3  
 Objective: Maximize

**Problem and Results -----**

X1	NONBasic	0
X2	Basic	8.2105
X3	Basic	.6316
slack 1	NONBasic	0
slack 2	NONBasic	0
slack 3	Basic	363.1579
Optimal Value (Z)		107.3684

**Ranging -----**

Variable	Value	Reduced Cost	Original Value	Lower Bound	Upper Bound
X1	0	.5263	10	-Infinity	10.5263
X2	8.2105	0	12	11.2	13.0345
X3	.6316	0	14	12.8889	15

Constraint	Dual Value	Slack/ Surplus	Original Value	Lower Bound	Upper Bound
Constraint 1	.2105	0	240	208.8	243
Constraint 2	.1579	0	360	355.5555	413.7931
Constraint 3	0	363.1579	480	116.8421	Infinity

**Original Problem w/answers -----**

	X1	X2	X3	RHS
Maximize	10	12	14	
Constraint 1	23	27	29	<= 240
Constraint 2	36	40	50	<= 360
Constraint 3	50	10	55	<= 480
Solution	<b>0</b>	<b>8.2105</b>	<b>.6316</b>	<b>107.3684</b>

**Iterations -----**

Iteration 1

cj-->	Quantity	X1	X2	X3	slack 1	slack 2	slack 3
Basic							
slack 1	240	23	27	29	1	0	0
slack 2	360	36	40	50	0	1	0
slack 3	480	50	10	55	0	0	1
zj	0	0	0	0	0	0	0
cj-zj		10	12	14	0	0	0

Iteration 2

cj-->	Quantity	X1	X2	X3	slack 1	slack 2	slack 3
Basic							
slack 1	31.2	2.12	3.8	0	1	-0.58	0
X3	7.2	0.72	0.8	1	0	0.02	0
slack 3	84.0	10.4	-34	0	0	-1.1	1
zj	100.8	10.08	11.2	14	0	-.28	0
cj-zj		-0.08	0.8	0	0	-0.28	0

Iteration 3

cj-->	Quantity	X1	X2	X3	slack 1	slack 2	slack 3
Basic							
X2	8.2105	0.5579	1	0	0.2632	-0.1526	0
X3	0.6316	0.2737	0	1	-0.2105	0.1421	0
slack 3	363.1579	29.3684	0	0	8.9474	-6.2895	1
zj	107.3684	10.5263	12	14	.2105	.1579	0
cj-zj		-0.5263	0	0	-0.2105	-0.1579	0

**Dual -----**

	y1	y2	y3	
Minimize	240	360	480	
X1	23	36	50	>= 10
X2	27	40	10	>= 12
X3	29	50	55	>= 14

Module/submodel: Linear Programming  
 Problem title: LPP-Example4  
 Objective: Maximize

**Problem and Results** -----

X1	Basic	20
X2	NONBasic	0
X3	NONBasic	0
slack 1	Basic	200
slack 2	Basic	100
slack 3	NONBasic	0
Optimal Value (Z)		2000

**Ranging** -----

Variable	Value	Reduced Cost	Original Value	Lower Bound	Upper Bound
X1	20	0	100	93.75	Infinity
X2	0	10	150	-Infinity	160
X3	0	30	200	-Infinity	230

Constraint	Dual Value	Slack/Surplus	Original Value	Lower Bound	Upper Bound
Constraint 1	0	200	400	200	Infinity
Constraint 2	0	100	500	400	Infinity
Constraint 3	3.3333	0	600	-.0003	750

**Original Problem w/answers** -----

	X1	X2	X3	RHS
Maximize	100	150	200	
Constraint 1	10	18	39	<= 400
Constraint 2	20	38	59	<= 500
Constraint 3	30	48	69	<= 600
<b>Solution</b>	<b>20</b>	<b>0</b>	<b>0</b>	<b>2000</b>

**Iterations** -----

Iteration 1

Cj-->	Quantity	X1	X2	X3	slack 1	slack 2	slack 3
Basic	Quantity	X1	X2	X3	slack 1	slack 2	slack 3
slack 1	400	10	18	39	1	0	0
slack 2	500	20	38	59	0	1	0
slack 3	600	30	48	69	0	0	1
Zj	0	0	0	0	0	0	0
Cj-Zj	100	150	200	0	0	0	0

Iteration 2

Cj-->	Quantity	X1	X2	X3	slack 1	slack 2	slack 3
Basic	Quantity	X1	X2	X3	slack 1	slack 2	slack 3
slack 1	69.4915	-3.2203	-7.1186	0	1	-0.661	0
X3	8.4746	0.339	0.6441	1	0	0.0169	0
slack 3	15.2542	6.6102	3.5593	0	0	-1.1695	1
Zj	1,694.9153	67.7966	128.8136	200	0	3.3898	0
Cj-Zj		32.2034	21.1864	0	0	-3.3898	0

Iteration 3

Cj-->	Quantity	X1	X2	X3	slack 1	slack 2	slack 3
Basic	Quantity	X1	X2	X3	slack 1	slack 2	slack 3
slack 1	76.9231	0	-5.3846	0	1	-1.2308	0.4872
X3	7.6923	0	0.4615	1	0	0.0769	-0.0513
X1	2.3077	1	0.5385	0	0	-0.1769	0.1513
Zj	1,769.2308	100	146.1538	200	0	-2.3077	4.8718
Cj-Zj		0	3.8462	0	0	2.3077	-4.8718

Iteration 4

Cj-->	Quantity	X1	X2	X3	slack 1	slack 2	slack 3
Basic	Quantity	X1	X2	X3	slack 1	slack 2	slack 3
slack 1	100.0	10.0	0	0	1	-3.0	2.0
X3	5.7143	-0.8571	0	1	0	0.2286	-0.181
X2	4.2857	1.8571	1	0	0	-0.3286	0.281
Zj	1,785.7143	107.1429	150	200	0	-3.5714	5.9524
Cj-Zj		-7.1429	0	0	0	3.5714	-5.9524

Iteration 5

Cj-->	Quantity	X1	X2	X3	slack 1	slack 2	slack 3
Basic	Quantity	X1	X2	X3	slack 1	slack 2	slack 3
slack 1	175.0	-1.25	0	13.125	1	0	-0.375
slack 2	25.0	-3.75	0	4.375	0	1	-0.7917
X2	12.5	0.625	1	1.4375	0	0	0.0208
Zj	1,875.0	93.75	150	215.625	0	0	3.125
Cj-Zj		6.25	0	-15.625	0	0	-3.125

Iteration 6

Cj-->	Quantity	X1	X2	X3	slack 1	slack 2	slack 3
Basic	Quantity	X1	X2	X3	slack 1	slack 2	slack 3
slack 1	200.0	0	2.0	16.0	1	0	-0.3333
slack 2	100.0	0	6.0	13.0	0	1	-0.6667
X1	20.0	1	1.6	2.3	0	0	0.0333
Zj	2,000.0	100	160	230	0	0	3.3333
Cj-Zj		0	-10.0	-30.0	0	0	-3.3333

**Dual** -----

	y1	y2	y3	
Minimize	400	500	600	
X1	10	20	30	>= 100
X2	18	38	48	>= 150
X3	39	59	69	>= 200

Module/submodel: Linear Programming  
 Problem title: LPP-Example5  
 Objective: Minimize

**Problem and Results -----**

X1	NONBasic	0
X2	Basic	12.7273
surplus 1	NONBasic	0
surplus 2	Basic	730
Optimal Value (Z)		152.7273

**Ranging -----**

Variable	Value	Reduced Cost	Original Value	Lower Bound	Upper Bound
X1	0	.8182	9	8.1818	Infinity
X2	12.7273	0	12	0	13.2

Constraint	Dual Value	Slack/Surplus	Original Value	Lower Bound	Upper Bound
Constraint 1	-1.5455	0	280	97.5	Infinity
Constraint 2	0	730	390	-Infinity	1120

**Original Problem w/answers -----**

	X1	X2	RHS
Minimize	9	12	
Constraint 1	15	22	>= 280
Constraint 2	45	88	>= 390
Solution	0	12.7273	152.7273

**Iterations -----**

Iteration 1

Cj-->	9	12	0	0	0	0	
Basic	Quantity	X1	X2	artfcl 1	surplus 1	artfcl 2	surplus 2
artfcl 1	280	15	22	1	-1	0	0
artfcl 2	390	45	88	0	0	1	-1
zj	670	-60	-110	1	1	1	1
cj-zj		60	110	0	-1	0	-1

Iteration 2

Cj-->	9	12	0	0	0	0	
Basic	Quantity	X1	X2	artfcl 1	surplus 1	artfcl 2	surplus 2
artfcl 1	182.5	3.75	0	1	-1	-0.25	0.25
X2	4.4318	0.5114	1	0	0	0.0114	-0.0114
zj	182.5	-3.75	0	1	1	2.25	-1.25
cj-zj		3.75	0	0	-1	-1.25	0.25

Iteration 3

Cj-->	9	12	0	0	0	0	
Basic	Quantity	X1	X2	artfcl 1	surplus 1	artfcl 2	surplus 2
artfcl 1	150	0	-7.3333	1	-1	-0.3333	0.3333
X1	8.6667	1	1.9556	0	0	0.0222	-0.0222

zj	150.0	0	7.3333	1	1	2.3333	-1.3333
cj-zj		0	-7.3333	0	-1	-1.3333	0.3333

Iteration 4

Cj-->	9	12	0	0	0	0	
Basic	Quantity	X1	X2	artfcl 1	surplus 1	artfcl 2	surplus 2
surplus 2	450	0	-22	3	-3	-1	1
X1	18.6667	1	1.4667	0.0667	-0.0667	0	0
zj	0.0	0	0	2	0	2	0
cj-zj		0	0	-1.0	0	-1.0	0

Iteration 5

Cj-->	9	12	0	0	0	0	
Basic	Quantity	X1	X2	artfcl 1	surplus 1	artfcl 2	surplus 2
surplus 2	450	0	-22	3	-3	-1	1
X1	18.6667	1	1.4667	0.0667	-0.0667	0	0
zj	168.0	9	10.8	-6	-6	0	0
cj-zj		0	1.2	0.6	-0.6	0	0

Iteration 6

Cj-->	9	12	0	0	0	0	
Basic	Quantity	X1	X2	artfcl 1	surplus 1	artfcl 2	surplus 2
surplus 2	730.0	15.0	0	4.0	-4.0	-1	1
X2	12.7273	0.6818	1	0.0455	-0.0455	0	0
zj	152.7273	9.8182	12	-1.5455	1.5455	0	0
cj-zj		-0.8182	0	0.5455	-0.5455	0	0

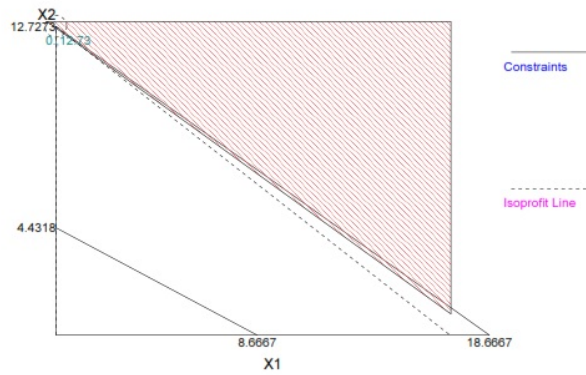
**Dual -----**

	y1	y2
Maximize	280	390
X1	15	45
X2	22	88

**Intercepts and Intersections -----**

	X1	X2	Cost
Point 1	0	12.7273	152.7273
Point 2	18.6667	0	168

### LPP-Example5



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SrinVas Raghavendra Rao          MBA-OR          SrinVas Raghavendra Rao
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Module/submodel: Linear Programming
Problem title: LPP-Min2-Example6
Objective: Minimize

Problem and Results -----
X1            NONBasic           0
X2            Basic              16.5
surplus 1     NONBasic           0
surplus 2     Basic              104.5
Optimal Value (Z)                                594

Ranging -----
Variable      Value      Reduced Cost    Original Value    Lower Bound    Upper Bound
-----
X1            0          6               18               12             Infinity
X2            16.5       0               36               0              54
Constraint    Dual      Slack/          Original Value    Lower Bound    Upper Bound
              Value      Surplus
Constraint 1  -6         0               99               9.4286        Infinity
Constraint 2   0        104.5           11              -Infinity     115.5

Original Problem w/answers -----
                   X1      X2                RHS
-----
Minimize           18      36
Constraint 1        2       6      >=      99
Constraint 2        5       7      >=      11
Solution           0      16.5      594

Iterations -----
Iteration 1
Cj-->
Basic   Quantity    18      36      0      0      0      0
         X1      X2      artfcl 1  surplus 1  artfcl 2  surplus 2
-----
artfcl 1  99       2       6       1       -1       0       0
artfcl 2  11       5       7       0       0       1       -1
zj        110      -7      -13      1       1       1       1
cj-zj     7        7      13       0       -1       0       -1

Iteration 2
Cj-->
Basic   Quantity    18      36      0      0      0      0
         X1      X2      artfcl 1  surplus 1  artfcl 2  surplus 2
-----
artfcl 1  89.5714 -2.2857  0       1       -1      -0.8571  0.8571
X2        1.5714  0.7143  1       0       0       0.1429  -0.1429
zj        89.5714  2.2857  0       1       1       2.8571  -0.8571
cj-zj    -2.2857 -2.2857  0       0       -1      -1.8571  0.8571

Iteration 3
Cj-->
Basic   Quantity    18      36      0      0      0      0
         X1      X2      artfcl 1  surplus 1  artfcl 2  surplus 2
-----
surplus 2  104.5   -2.6667  0       1.1667  -1.1667  -1       1
X2         16.5    0.3333  1       0.1667  -0.1667  0       0
    
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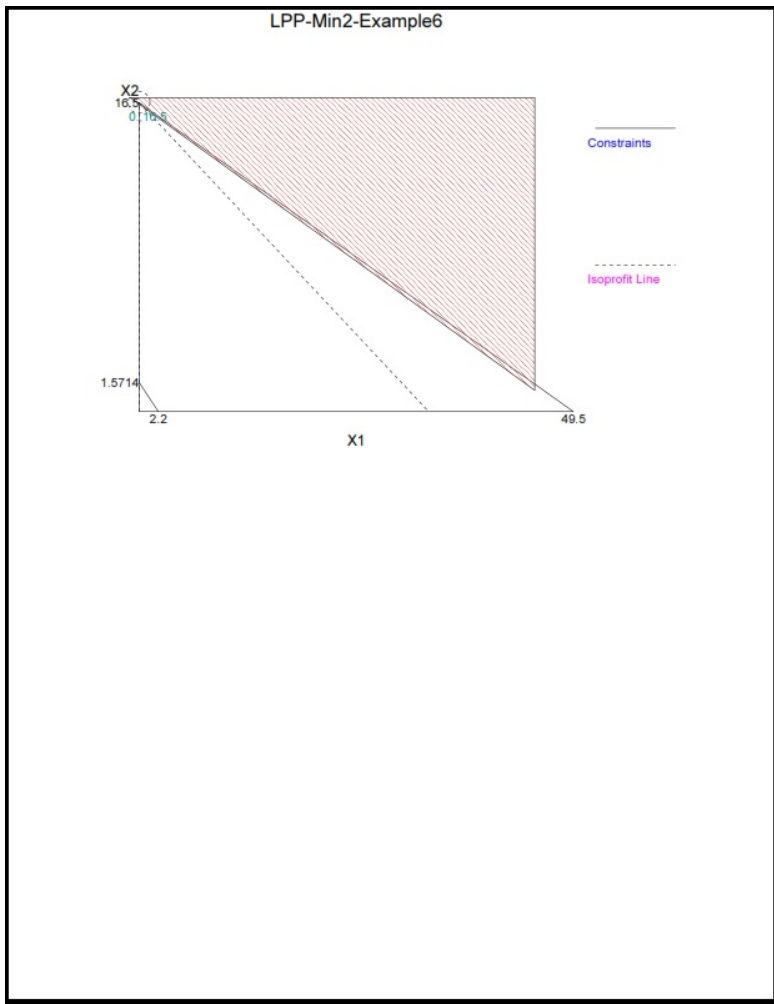
zj          0          0          0          -2          0          2          0
-zj-zj      0          0          0          -1.0         0          -1.0         0

Iteration 4
cj-->
Basic      Quantity    X1      X2      artfcl 1  surplus 1  artfcl 2  surplus 2
-----
surplus 2  104.5      -2.6667  0      1.1667   -1.1667   -1         1
X2         16.5       0.3333  1      0.1667   -0.1667   0         0
zj         594.0       24       36       -6        6         0         0
-zj-zj     -6.0       -6.0     0       6.0      -6.0     0         0

Dual -----
                y1      y2
-----
Maximize      99       11
X1             2       5      <=      18
X2             6       7      <=      36

Intercepts and Intersections -----
                X1      X2      Cost
-----
Point 1        0      16.5     594
Point 2       49.5     0      891

```





Module/submodel: Linear Programming  
 Problem title: LPP-Min3-Example7  
 Objective: Minimize

**Problem and Results** -----

X1	Basic	20
X2	NONBasic	0
X3	NONBasic	0
surplus 1	Basic	60
surplus 2	Basic	40
surplus 3	NONBasic	0
Optimal Value (Z)		200

**Ranging** -----

Variable	Value	Reduced Cost	Original Value	Lower Bound	Upper Bound
X1	20	0	10	0	14.0625
X2	0	4.3333	15	10.6667	Infinity
X3	0	8.6667	20	11.3333	Infinity

Constraint	Dual Value	Slack/Surplus	Original Value	Lower Bound	Upper Bound
Constraint 1	0	60	100	-Infinity	160
Constraint 2	0	40	200	-Infinity	240
Constraint 3	-0.6667	0	300	250	Infinity

**Original Problem w/answers** -----

	X1	X2	X3	RHS
Minimize	10	15	20	
Constraint 1	8	9	10	>= 100
Constraint 2	12	13	14	>= 200
Constraint 3	15	16	17	>= 300
Solution	<b>20</b>	<b>0</b>	<b>0</b>	<b>200</b>

**Iterations** -----

Iteration 1

Cj-->	10	15	20	0	0	0	0	
Basic	Quantity	X1	X2	X3	artfcl 1	surplus 1	artfcl 2	surplus 2
artfcl 1	100	8	9	10	1	-1	0	0
artfcl 2	200	12	13	14	0	0	1	-1
artfcl 3	300	15	16	17	0	0	0	0
zj	600	-35	-38	-41	1	1	1	1
cj-zj		35	38	41	0	-1	0	-1

Cj-->	0	0
Basic	artfcl 3	surplus 3
artfcl 1	0	0
artfcl 2	0	0
artfcl 3	1	-1
zj	1	1
cj-zj	0	-1

Iteration 2

Cj-->	10	15	20	0	0	0	0	
Basic	Quantity	X1	X2	X3	artfcl 1	surplus 1	artfcl 2	surplus 2
X3	10	0.8	0.9	1	0.1	-0.1	0	0
artfcl 2	60	0.8	0.4	0	-1.4	1.4	1	-1
artfcl 3	130	1.4	0.7	0	-1.7	1.7	0	0
zj	190	-2.2	-1.1	0	5.1	-3.1	1	1
cj-zj		2.2	1.1	0	-4.1	3.1	0	-1

Cj-->	0	0
Basic	artfcl 3	surplus 3
X3	0	0
artfcl 2	0	0
artfcl 3	1	-1
zj	1	1
cj-zj	0	-1

Iteration 3

Cj-->	10	15	20	0	0	0	0	
Basic	Quantity	X1	X2	X3	artfcl 1	surplus 1	artfcl 2	surplus 2
X3	14.2857	0.8571	0.9286	1	0	0	0.0714	-0.0714
surplus 1	42.8571	0.5714	0.2857	0	-1	1	0.7143	-0.7143
artfcl 3	57.1429	0.4286	0.2143	0	0	0	-1.2143	1.2143
zj	57.1429	-4.286	-2.143	0	2	0	3.2143	-1.2143
cj-zj		0.4286	0.2143	0	-1.0	0	-2.2143	1.2143

Cj-->	0	0
Basic	artfcl 3	surplus 3
X3	0	0
surplus 1	0	0
artfcl 3	1	-1
zj	1	1
cj-zj	0	-1

Iteration 4

Cj-->	10	15	20	0	0	0	0	
Basic	Quantity	X1	X2	X3	artfcl 1	surplus 1	artfcl 2	surplus 2
X3	17.6471	0.8824	0.9412	1	0	0	0	0
surplus 1	76.4706	0.8235	0.4118	0	-1	1	0	0
surplus 2	47.0588	0.3529	0.1765	0	0	0	-1	1
zj	0.0	0	0	0	2	0	2	0
cj-zj		0	0	0	-1.0	0	-1.0	0

Cj-->	0	0
Basic	artfcl 3	surplus 3
X3	0.0588	-0.0588
surplus 1	0.5882	-0.5882
surplus 2	0.8235	-0.8235
zj	2	0
cj-zj	-1.0	0

Iteration 5

Cj-->	10	15	20	0	0	0	0	
Basic	Quantity	X1	X2	X3	artfcl 1	surplus 1	artfcl 2	surplus 2
X3	17.6471	0.8824	0.9412	1	0	0	0	0
surplus 1	76.4706	0.8235	0.4118	0	-1	1	0	0
surplus 2	47.0588	0.3529	0.1765	0	0	0	-1	1
zj	352.9412	2.3529	11.1765	20	0	0	0	0
cj-zj		7.6471	3.8235	0	0	0	0	0

```

Cj-->          0          0
Basic      artfcl 3 surplus 3
-----
X3          0.0588      -0.0588
surplus 1   0.5882      -0.5882
surplus 2   0.8235      -0.8235
zj          -1.1765       1.1765
cj-zj       1.1765      -1.1765

Iteration 6
Cj-->          0          0
Basic      Quantity      X1      X2      X3      artfcl 1 surplus 1 artfcl 2 surplus 2
-----
X1          20.0         1      1.0667   1.1333      0          0          0          0
surplus 1   60.0         0     -0.4667  -0.9333     -1          1          0          0
surplus 2   40.0         0          0     -0.4       0          0          -1         1
zj          200.0        10     19.3333  28.6667     0          0          0          0
cj-zj       0          0     -4.3333  -8.6667     0          0          0          0

Cj-->          0          0
Basic      artfcl 3 surplus 3
-----
X1          0.0667      -0.0667
surplus 1   0.5333     -0.5333
surplus 2   0.8         -0.8
zj          -0.6667     0.6667
cj-zj       0.6667     -0.6667

Dual -----
          y1      y2      y3
-----
Maximize  100     200     300
X1         8       12      15      <=    10
X2         9       13      16      <=    15
X3        10       14      17      <=    20

```

```

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Module/submodel: Linear Programming
Problem title: LPP-min3-Example8
Objective: Minimize

Problem and Results -----
X1          NONBasic          0
X2           Basic          35
X3          NONBasic          0
surplus 1    Basic         122
surplus 2    NONBasic          0
surplus 3    Basic          63
Optimal Value (Z)          385

Ranging -----
Variable      Value      Reduced Cost      Original Value      Lower Bound      Upper Bound
-----
X1            0          1.7143              8          6.2857          Infinity
X2           35            0              11          0          12.4444
X3            0          1.8571              16         14.1429          Infinity

Constraint      Dual Value      Slack/Surplus      Original Value      Lower Bound      Upper Bound
-----
Constraint 1      0          122              123          -Infinity          245
Constraint 2    -1.5714          0              245          208.25          Infinity
Constraint 3      0           63              357          -Infinity          420

Original Problem w/answers -----
          X1      X2      X3      RHS
-----
Minimize      8      11      16
Constraint 1      3       7      10      >=    123
Constraint 2      4       7       9      >=    245
Constraint 3      9      12      15      >=    357
Solution        0      35       0      385

Iterations -----
Iteration 1
Cj-->          0          0
Basic      Quantity      X1      X2      X3      artfcl 1 surplus 1 artfcl 2 surplus 2
-----
artfcl 1    123         3       7       10         1        -1          0          0
artfcl 2    245         4       7       9          0          0          1         -1
artfcl 3    357         9      12      15          0          0          0          0
zj          725        -16     -26     -34         1          1          1          1
cj-zj       16         26      34         0        -1          0         -1

Cj-->          0          0
Basic      artfcl 3 surplus 3
-----
artfcl 1      0          0
artfcl 2      0          0
artfcl 3      1         -1
zj            1          1
cj-zj         0         -1

Iteration 2

```

Cj-->		8	11	16	0	0	0	0
Basic	Quantity	X1	X2	X3	artfcl 1	surplus 1	artfcl 2	surplus 2
X3	12.3	0.3	0.7	1	0.1	-0.1	0	0
artfcl 2	134.3	1.3	0.7	0	-0.9	0.9	1	-1
artfcl 3	172.5	4.5	1.5	0	-1.5	1.5	0	0
zj	306.8	-5.8	-2.2	0	4.4	-2.4	1	1
cj-zj		5.8	2.2	0	-3.4	2.4	0	-1
Cj--> 0 0								
Basic	artfcl 3	surplus 3						
X3	0	0						
artfcl 2	0	0						
artfcl 3	1	-1						
zj	1	1						
cj-zj	0	-1						
Iteration 3								
Cj-->		8	11	16	0	0	0	0
Basic	Quantity	X1	X2	X3	artfcl 1	surplus 1	artfcl 2	surplus 2
X3	0.8	0	0.6	1	0.2	-0.2	0	0
artfcl 2	84.4667	0	0.2667	0	-0.4667	0.4667	1	-1
X1	38.3333	1	0.3333	0	-0.3333	0.3333	0	0
zj	84.4667	0	-2.667	0	2.4667	-4.667	1	1
cj-zj		0	0.2667	0	-1.4667	0.4667	0	-1
Cj--> 0 0								
Basic	artfcl 3	surplus 3						
X3	-0.0667	0.0667						
artfcl 2	-0.2889	0.2889						
X1	0.2222	-0.2222						
zj	2.2889	-2.2889						
cj-zj	-1.2889	0.2889						
Iteration 4								
Cj-->		8	11	16	0	0	0	0
Basic	Quantity	X1	X2	X3	artfcl 1	surplus 1	artfcl 2	surplus 2
X3	23.8	0.6	0.8	1	0	0	0	0
artfcl 2	30.8	-1.4	-0.2	0	0	0	1	-1
surplus 1	115.0	3	1.0	0	-1	1	0	0
zj	30.8	1.4	2	0	2	0	1	1
cj-zj		-1.4	-0.2	0	-1.0	0	0	-1
Cj--> 0 0								
Basic	artfcl 3	surplus 3						
X3	0.0667	-0.0667						
artfcl 2	-0.6	0.6						
surplus 1	0.6667	-0.6667						
zj	2.6	-6						
cj-zj	-1.6	0.6						
Iteration 5								
Cj-->		8	11	16	0	0	0	0
Basic	Quantity	X1	X2	X3	artfcl 1	surplus 1	artfcl 2	surplus 2
X3	27.2222	0.4444	0.7778	1	0	0	0.1111	-0.1111
surplus 3	51.3333	-2.3333	-0.3333	0	0	0	1.6667	-1.6667
surplus 1	149.2222	1.4444	0.7778	0	-1	1	1.1111	-1.1111
zj	0.0	0	0	0	2	0	2	0
cj-zj		0	0	0	-1.0	0	-1.0	0

Cj-->		0	0					
Basic	artfcl 3	surplus 3						
X3	0	0						
surplus 3	-1	1						
surplus 1	0	0						
zj	2	0						
cj-zj	-1.0	0						
Iteration 6								
Cj-->		8	11	16	0	0	0	0
Basic	Quantity	X1	X2	X3	artfcl 1	surplus 1	artfcl 2	surplus 2
X3	27.2222	0.4444	0.7778	1	0	0	0.1111	-0.1111
surplus 3	51.3333	-2.3333	-0.3333	0	0	0	1.6667	-1.6667
surplus 1	149.2222	1.4444	0.7778	0	-1	1	1.1111	-1.1111
zj	435.5556	8.8889	9.5556	16	0	0	-1.7778	1.7778
cj-zj		-0.8889	1.4444	0	0	0	1.7778	-1.7778
Cj--> 0 0								
Basic	artfcl 3	surplus 3						
X3	0	0						
surplus 3	-1	1						
surplus 1	0	0						
zj	0	0						
cj-zj	0	0						
Iteration 7								
Cj-->		8	11	16	0	0	0	0
Basic	Quantity	X1	X2	X3	artfcl 1	surplus 1	artfcl 2	surplus 2
X2	35.0	0.5714	1	1.2857	0	0	0.1429	-0.1429
surplus 3	63.0	-2.1429	0	0.4286	0	0	1.7143	-1.7143
surplus 1	122.0	1.0	0	-1.0	-1	1	1.0	-1.0
zj	385.0	9.7143	11	17.8571	0	0	-1.5714	1.5714
cj-zj		-1.7143	0	-1.8571	0	0	1.5714	-1.5714
Cj--> 0 0								
Basic	artfcl 3	surplus 3						
X2	0	0						
surplus 3	-1	1						
surplus 1	0	0						
zj	0	0						
cj-zj	0	0						
Dual -----								
		y1	y2	y3				
Maximize	123	245	357					
X1	3	4	9	<=	8			
X2	7	12	<=	11				
X3	10	9	15	<=	16			

Module/submodel: Linear Programming  
 Problem title: LPP-2v-3c-max-Example9  
 Objective: Maximize

**Problem and Results** -----

X1	NONBasic	0
X2	Basic	1.2778
slack 1	NONBasic	0
slack 2	Basic	3.2778
slack 3	Basic	6.5556
Optimal Value (Z)		63.8889

**Ranging** -----

Variable	Value	Reduced Cost	Original Value	Lower Bound	Upper Bound
X1	0	23.3333	10	-Infinity	33.3333
X2	1.2778	0	50	15	Infinity

Constraint	Dual Value	Slack/ Surplus	Original Value	Lower Bound	Upper Bound
Constraint 1	2.7778	0	23	0	26.4706
Constraint 2	0	3.2778	25	21.7222	Infinity
Constraint 3	0	6.5556	27	20.4444	Infinity

**Original Problem w/answers** -----

	X1	X2	RHS
Maximize	10	50	
Constraint 1	12	18	<= 23
Constraint 2	13	17	<= 25
Constraint 3	14	16	<= 27
<b>Solution</b>	<b>0</b>	<b>1.2778</b>	<b>63.8889</b>

**Iterations** -----

Iteration 1

Cj-->	Quantity	X1	X2	slack 1	slack 2	slack 3
Basic						
slack 1	23	12	18	1	0	0
slack 2	25	13	17	0	1	0
slack 3	27	14	16	0	0	1
Zj	0	0	0	0	0	0
Cj-Zj		10	50	0	0	0

Iteration 2

Cj-->	Quantity	X1	X2	slack 1	slack 2	slack 3
Basic						
X2	1.2778	0.6667	1	0.0556	0	0
slack 2	3.2778	1.6667	0	-0.9444	1	0
slack 3	6.5556	3.3333	0	-0.8889	0	1
Zj	63.8889	33.3333	50	2.7778	0	0
Cj-Zj		-23.3333	0	-2.7778	0	0

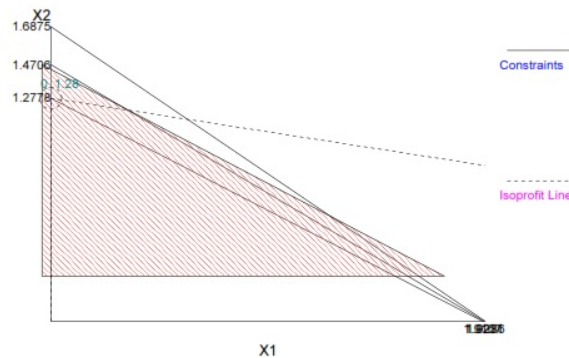
**Dual** -----

	y1	y2	y3	
Minimize	23	25	27	
X1	12	13	14	>= 10
X2	18	17	16	>= 50

**Intercepts and Intersections** -----

	X1	X2	Profit
Point 1	0	0	0
Point 2	0	1.2778	63.8889
Point 3	1.9167	0	19.1667

LPP-2v-3c-max-Example9



Module/submodel: Linear Programming  
 Problem title: LPP-2v3c-Max-Example10  
 Objective: Maximize

**Problem and Results** -----

X1	Basic	1.7333
X2	NONBasic	0
slack 1	Basic	1.4667
slack 2	NONBasic	0
slack 3	Basic	.2667
Optimal Value (Z)		32.9333

**Ranging** -----

Variable	Value	Reduced Cost	Original Value	Lower Bound	Upper Bound
X1	1.7333	0	19	18.5294	Infinity
X2	0	.5333	21	-Infinity	21.5333

Constraint	Dual Value	Slack/Surplus	Original Value	Lower Bound	Upper Bound
Constraint 1	0	1.4667	24	22.5333	Infinity
Constraint 2	1.2667	0	26	.0	26.25
Constraint 3	0	.2667	28	27.7333	Infinity

**Original Problem w/answers** -----

	X1	X2	RHS
Maximize	19	21	
Constraint 1	13	18	<= 24
Constraint 2	15	17	<= 26
Constraint 3	16	19	<= 28
<b>Solution</b>	<b>1.7333</b>	<b>0</b>	<b>32.9333</b>

**Iterations** -----

Iteration 1

Cj-->	Quantity	X1	X2	slack 1	slack 2	slack 3
Basic						
slack 1	24	13	18	1	0	0
slack 2	26	15	17	0	1	0
slack 3	28	16	19	0	0	1
Zj	0	0	0	0	0	0
Cj-Zj		19	21	0	0	0

Iteration 2

Cj-->	Quantity	X1	X2	slack 1	slack 2	slack 3
Basic						
X2	1.3333	0.7222	1	0.0556	0	0
slack 2	3.3333	2.7222	0	-0.9444	1	0
slack 3	2.6667	2.2778	0	-1.0556	0	1
Zj	28	15.1667	21	1.1667	0	0
Cj-Zj		3.8333	0	-1.1667	0	0

Iteration 3

Cj-->	Quantity	X1	X2	slack 1	slack 2	slack 3
Basic						
X2	0.4878	0	1	0.3902	0	-0.3171
slack 2	0.1463	0	0	0.3171	1	-1.1951
X1	1.1707	1	0	-0.4634	0	0.439
Zj	32.4878	19	21	-0.6098	0	1.6829
Cj-Zj		0	0	0.6098	0	-1.6829

Iteration 4

Cj-->	Quantity	X1	X2	slack 1	slack 2	slack 3
Basic						
X2	0.3077	0	1	0	-1.2308	1.1538
slack 1	0.4615	0	0	1	3.1538	-3.7692
X1	1.3846	1	0	0	1.4615	-1.3077
Zj	32.7692	19	21	0	1.9231	-0.6154
Cj-Zj		0	0	0	-1.9231	0.6154

Iteration 5

Cj-->	Quantity	X1	X2	slack 1	slack 2	slack 3
Basic						
slack 3	0.2667	0	0.8667	0	-1.0667	1
slack 1	1.4667	0	3.2667	1	-0.8667	0
X1	1.7333	1	1.1333	0	0.0667	0
Zj	32.9333	19	21.5333	0	1.2667	0
Cj-Zj		0	-0.5333	0	-1.2667	0

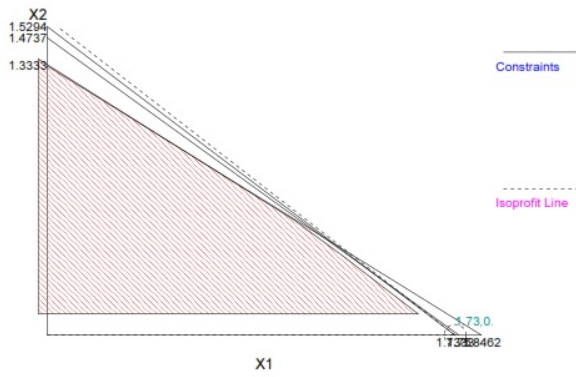
**Dual** -----

	y1	y2	y3	
Minimize	24	26	28	
X1	13	15	16	>= 19
X2	18	17	19	>= 21

**Intercepts and Intersections** -----

	X1	X2	Profit
Point 1	0	0	0
Point 2	0	1.3333	28
Point 3	1.7333	0	32.9333
Point 4	1.1707	.4878	32.4878
Point 5	1.3846	.3077	32.7692

LPP-2v3c-Max-Example10



```

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Module/submodel: Linear Programming
Problem title: LPP-3v2c-Max-Example11
Objective: Maximize

Problem and Results -----
X1          Basic          16.75
X2          NONBasic       0
X3          NONBasic       0
slack 1     Basic         1.5
slack 2     NONBasic       0
Optimal Value (Z)          201

Ranging -----
Variable      Value      Reduced Cost      Original Value      Lower Bound      Upper Bound
-----
X1            16.75      0                  12                  10                Infinity
X2            0         4                  20                 -Infinity         24
X3            0         11                 34                 -Infinity         45

Constraint    Dual Value      Slack/ Surplus      Original Value      Lower Bound      Upper Bound
-----
Constraint 1  0              1.5                 35                  33.5              Infinity
Constraint 2  3              0                   67                  0                  70

Original Problem w/answers -----
          X1      X2      X3      RHS
-----
Maximize  12     20     34
Constraint 1  2     7     13     <= 35
Constraint 2  4     8     15     <= 67
-----
Solution   16.75  0     0     201

Iterations -----
Iteration 1
Cj-->      12     20     34     0     0
Basic  Quantity  X1     X2     X3     slack 1     slack 2
-----
slack 1     35     2     7     13     1     0
slack 2     67     4     8     15     0     1
zj          0     0     0     0     0
cj-zj      12     20     34     0     0

Iteration 2
Cj-->      12     20     34     0     0
Basic  Quantity  X1     X2     X3     slack 1     slack 2
-----
X3        2.6923  0.1538  0.5385     1     0.0769     0
slack 2   26.6154  1.6923 -0.0769     0    -1.1538     1
zj        91.5385  5.2308 18.3077    34     2.6154     0
cj-zj     6.7692  1.6923     0    -2.6154     0

Iteration 3
Cj-->      12     20     34     0     0
Basic  Quantity  X1     X2     X3     slack 1     slack 2
-----

```

X3	0.2727	0	0.5455	1	0.1818	-0.0909
X1	15.7273	1	-0.0455	0	-0.6818	0.5909
Zj	198.0	12	18	34	-2	4
Cj-Zj		0	2.0	0	2.0	-4.0

Iteration 4

Cj-->		12	20	34	0	0
Basic	Quantity	X1	X2	X3	slack 1	slack 2
X2	0.5	0	1	1.8333	0.3333	-0.1667
X1	15.75	1	0	0.0833	-0.6667	0.5833
Zj	199.0	12	20	37.6667	-1.3333	3.6667
Cj-Zj		0	0	-3.6667	1.3333	-3.6667

Iteration 5

Cj-->		12	20	34	0	0
Basic	Quantity	X1	X2	X3	slack 1	slack 2
slack 1	1.5	0	3.0	5.5	1	-0.5
X1	16.75	1	2.0	3.75	0	0.25
Zj	201.0	12	24	45	0	3
Cj-Zj		0	-4.0	-11.0	0	-3.0

Dual -----

		y1	y2	
Minimize		35	67	
X1	2	4	>=	12
X2	7	8	>=	20
X3	13	15	>=	34

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01-31-2014 17:21:16

Module/submodel: Linear Programming  
Problem title: LPP-3v2c-max-Example12  
Objective: Maximize

**Problem and Results -----**

X1	Basic	17.5
X2	NONBasic	0
X3	NONBasic	0
slack 1	Basic	5.5
slack 2	NONBasic	0
Optimal Value (Z)		332.5

**Ranging -----**

Variable	Value	Reduced Cost	Original Value	Lower Bound	Upper Bound
X1	17.5	0	19	8.8	Infinity
X2	0	25.5	22	-Infinity	47.5
X3	0	70	25	-Infinity	95

Constraint	Dual Value	Slack/Surplus	Original Value	Lower Bound	Upper Bound
Constraint 1	0	5.5	23	17.5	Infinity
Constraint 2	9.5	0	35	0	46

**Original Problem w/answers -----**

	X1	X2	X3	RHS
Maximize	19	22	25	
Constraint 1	1	6	12	<= 23
Constraint 2	2	5	10	<= 35

**Solution**      17.5      0      0      332.5

**Iterations -----**

Iteration 1

Cj-->		19	22	25	0	0
Basic	Quantity	X1	X2	X3	slack 1	slack 2
slack 1	23	1	6	12	1	0
slack 2	35	2	5	10	0	1
Zj	0	0	0	0	0	0
Cj-Zj		19	22	25	0	0

Iteration 2

Cj-->		19	22	25	0	0
Basic	Quantity	X1	X2	X3	slack 1	slack 2
X3	1.9167	0.0833	0.5	1	0.0833	0
slack 2	15.8333	1.1667	0	0	-0.8333	1
Zj	47.9167	2.0833	12.5	25	2.0833	0
Cj-Zj		16.9167	9.5	0	-2.0833	0

Iteration 3

Cj-->		19	22	25	0	0
Basic	Quantity	X1	X2	X3	slack 1	slack 2

X3	0.7857	0	0.5	1	0.1429	-0.0714
X1	13.5714	1	0	0	-0.7143	0.8571
Z1	277.5	19	12.5	25	-10	14.5
Cj-Zj		0	9.5	0	10.0	-14.5

Iteration 4

Cj-->		19	22	25	0	0
Basic	Quantity	X1	X2	X3	slack 1	slack 2
slack 1	5.5	0	3.5	7.0	1	-0.5
X1	17.5	1	2.5	5.0	0	0.5
Zj	332.5	19	47.5	95	0	9.5
Cj-Zj		0	-25.5	-70.0	0	-9.5

Dual -----

		y1	y2		
Minimize		23	35		
X1		1	2	>=	19
X2		6	5	>=	22
X3		12	10	=	25

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Module/submodel: Linear Programming  
 Problem title: LPP-2v3c-min-Example13  
 Objective: Minimize

Problem and Results -----

X1	Basic	2.2143
X2	NONBasic	0
surplus 1	Basic	1.5714
surplus 2	Basic	1.7857
surplus 3	NONBasic	0
Optimal Value (z)		2.2143

Ranging -----

Variable	Value	Reduced Cost	Original Value	Lower Bound	Upper Bound
X1	2.2143	0	1	0	7
X2	0	7.7143	9	1.2857	Infinity

Constraint	Dual Value	Slack/Surplus	Original Value	Lower Bound	Upper Bound
Constraint 1	0	1.5714	25	-Infinity	26.5714
Constraint 2	0	1.7857	27	-Infinity	28.7857
Constraint 3	-0.714	0	31	29.1667	Infinity

Original Problem w/answers -----

	X1	X2	RHS	
Minimize	1	9		
Constraint 1	12	14	>=	25
Constraint 2	13	16	>=	27
Constraint 3	14	18	>=	31
Solution	2.2143	0		2.2143

Iterations -----

Iteration 1

Cj-->		1	9	0	0	0	0	0
Basic	Quantity	X1	X2	artfcl 1	surplus 1	artfcl 2	surplus 2	artfcl 3
artfcl 1	25	12	14	1	-1	0	0	0
artfcl 2	27	13	16	0	0	1	-1	0
artfcl 3	31	14	18	0	0	0	0	1
Zj	83	-39	-48	1	1	1	1	1
Cj-Zj		39	48	0	-1	0	-1	0

Cj-->	0
Basic	surplus 3
artfcl 1	0
artfcl 2	0
artfcl 3	-1
Zj	1
Cj-Zj	-1

Iteration 2

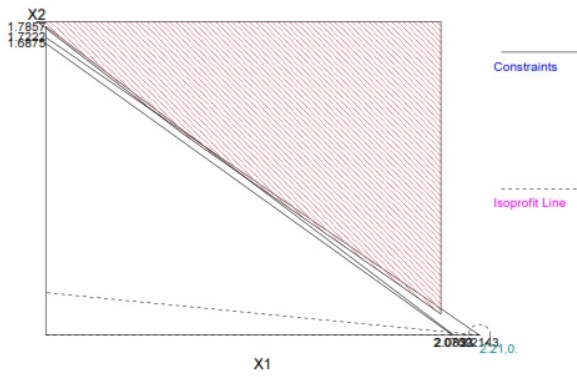
Cj-->		1	9	0	0	0	0	0
Basic	Quantity	X1	X2	artfcl 1	surplus 1	artfcl 2	surplus 2	artfcl 3



artfcl 1	1.375	0.625	0	1	-1	-0.875	0.875	0
X2	1.6875	0.8125	1	0	0	0.0625	-0.0625	0
artfcl 3	0.625	-0.625	0	0	0	-1.125	1.125	1
zj	2	0	0	1	1	4	-2	1
cj-zj	0	0	0	0	-1	-3	2	0
Cj--> 0								
Basic surplus 3								
-----								
artfcl 1	0							
X2	0							
artfcl 3	-1							
zj	1							
cj-zj	-1							
Iteration 3								
Cj--> 0 0 0 0 0 0 0 0 0								
Basic Quantity X1 X2 artfcl 1 surplus 1 artfcl 2 surplus 2 artfcl 3								
-----								
artfcl 1	0.8889	1.1111	0	1	-1	0	0	-0.7778
X2	1.7222	0.7778	1	0	0	0	0	0.0556
surplus 2	0.5556	-0.5556	0	0	0	-1	1	0.8889
zj	0.8889	-1.1111	0	1	1	2	0	2.7778
cj-zj	0.8889	-1.1111	0	0	-1	-1	0	-1.7778
Cj--> 0								
Basic surplus 3								
-----								
artfcl 1	0.7778							
X2	-0.0556							
surplus 2	-0.8889							
zj	-0.7778							
cj-zj	0.7778							
Iteration 4								
Cj--> 0 0 0 0 0 0 0 0 0								
Basic Quantity X1 X2 artfcl 1 surplus 1 artfcl 2 surplus 2 artfcl 3								
-----								
X1	0.8	1	0	0.9	-0.9	0	0	-0.7
X2	1.1	0	1	-0.7	0.7	0	0	0.6
surplus 2	1.0	0	0	0.5	-0.5	-1	1	0.5
zj	0	0	0	2	0	2	0	2
cj-zj	0	0	0	-1.0	0	-1	0	-1.0
Cj--> 0								
Basic surplus 3								
-----								
X1	0.7							
X2	-0.6							
surplus 2	-0.5							
zj	0							
cj-zj	0							
Iteration 5								
Cj--> 0 0 0 0 0 0 0 0 0								
Basic Quantity X1 X2 artfcl 1 surplus 1 artfcl 2 surplus 2 artfcl 3								
-----								
X1	0.8	1	0	0.9	-0.9	0	0	-0.7
X2	1.1	0	1	-0.7	0.7	0	0	0.6
surplus 2	1.0	0	0	0.5	-0.5	-1	1	0.5
zj	10.7	1	9	5.4	-5.4	0	0	-4.7
cj-zj	0	0	0	-5.4	5.4	0	0	4.7

Cj--> 0								
Basic surplus 3								
-----								
X1	0.7							
X2	-0.6							
surplus 2	-0.5							
zj	4.7							
cj-zj	-4.7							
Iteration 6								
Cj--> 0 0 0 0 0 0 0 0 0								
Basic Quantity X1 X2 artfcl 1 surplus 1 artfcl 2 surplus 2 artfcl 3								
-----								
X1	2.2143	1	1.2857	0	0	0	0	0.0714
surplus 1	1.5714	0	1.4286	-1	1	0	0	0.8571
surplus 2	1.7857	0	0.7143	0	0	-1	1	0.9286
zj	2.2143	1	16.7143	0	0	0	0	-0.714
cj-zj	0	0	-7.7143	0	0	0	0	0.714
Cj--> 0								
Basic surplus 3								
-----								
X1	-0.0714							
surplus 1	-0.8571							
surplus 2	-0.9286							
zj	0.714							
cj-zj	-0.0714							
Dual -----								
y1 y2 y3								
-----								
Maximize	25	27	31					
X1	12	13	14	<=	1			
X2	14	16	18	<=	9			
Intercepts and Intersections -----								
X1 X2 Cost								
-----								
Point 1	0	1.7857	16.0714					
Point 2	2.2143	0	2.2143					
Point 3	.8	1.1	10.7					

LPP-2v3c-min-Example13



```

SrinVas Raghavendra Rao          MBA-OR          SrinVas Raghavendra Rao
                                01-31-2014  18:47:37

Module/submodel: Linear Programming
Problem title: LPP-2v3c-Min-Example14
Objective: Minimize

Problem and Results -----
X1          Basic          1.5
X2          NONBasic       0
surplus 1   NONBasic       0
surplus 2   Basic         1
surplus 3   Basic         2
Optimal Value (z)                10.5

Ranging -----
Variable      Value      Reduced Cost      Original Value      Lower Bound      Upper Bound
-----
X1            1.5          0          7          0          15.1111
X2            0          9.125       17          7.875       Infinity
Constraint    Dual Value      Slack/Surplus      Original Value      Lower Bound      Upper Bound
-----
Constraint 1  -.875          0          12          11.2         Infinity
Constraint 2    0          1          14          -Infinity    15
Constraint 3    0          2          19          -Infinity    21

Original Problem w/answers -----
          X1      X2      RHS
-----
Minimize    7      17
Constraint 1    8      9      >=    12
Constraint 2   10     18     >=    14
Constraint 3   14     21     >=    19
Solution     1.5     0      10.5

Iterations -----
Iteration 1
Cj-->
Basic      Quantity    X1      X2      artfcl 1  surplus 1  artfcl 2  surplus 2  artfcl 3
-----
artfcl 1   12          8       9       1        -1         0         0         0
artfcl 2   14          10      18      0         0         1        -1         0
artfcl 3   19          14      21      0         0         0         0         1
zj         45          -32     -48      1         1         1         1         1
cj-zj     -1           32      48      0         -1         0         -1         0

Cj-->
Basic      surplus 3
-----
artfcl 1   0
artfcl 2   0
artfcl 3   -1
zj         1
cj-zj     -1

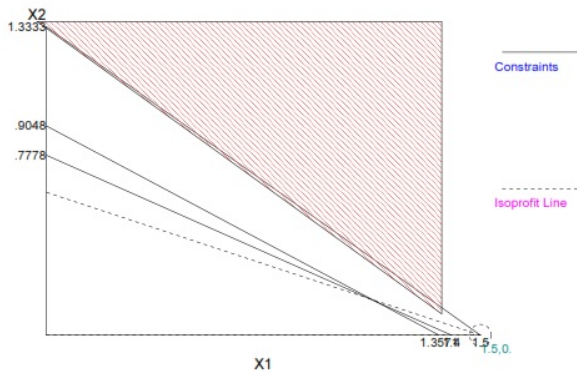
Iteration 2
Cj-->
Basic      Quantity    X1      X2      artfcl 1  surplus 1  artfcl 2  surplus 2  artfcl 3
-----

```

artfcl 1	5	3	0	1	-1	-0.5	0.5	0
X2	0.7778	0.5556	1	0	0	0.0556	-0.0556	0
artfcl 3	2.6667	2.3333	0	0	0	-1.1667	1.1667	1
zj	7.6667	-5.3333	0	1	1	3.6667	-1.6667	1
cj-zj		5.3333	0	0	-1	-2.6667	1.6667	0
Cj--> 0								
Basic	surplus 3							
-----								
artfcl 1	0							
X2	0							
artfcl 3	-1							
zj	1							
cj-zj	-1							
Iteration 3								
Cj-->								
Basic	Quantity	7	17	0	0	0	0	0
-----								
artfcl 1	1.5714	0	0	1	-1	1	-1	-1.2857
X2	0.1429	0	1	0	0	0.3333	-0.3333	-0.2381
X1	1.1429	1	0	0	0	-0.5	0.5	0.4286
zj	1.5714	0	0	1	1	1	1	3.2857
cj-zj		0	0	0	-1	0	-1.0	-2.2857
Cj--> 0								
Basic	surplus 3							
-----								
artfcl 1	1.2857							
X2	0.2381							
X1	-0.4286							
zj	-1.2857							
cj-zj	1.2857							
Iteration 4								
Cj-->								
Basic	Quantity	7	17	0	0	0	0	0
-----								
artfcl 1	0.8	0	-5.4	1	-1	-0.8	0.8	0
surplus 3	0.6	0	4.2	0	0	1.4	-1.4	-1
X1	1.4	1	1.8	0	0	0.1	-0.1	0
zj	0.8	0	5.4	1	1	2.8	-0.8	2
cj-zj		0	-5.4	0	-1	-1.8	0.8	-1.0
Cj--> 0								
Basic	surplus 3							
-----								
artfcl 1	0							
surplus 3	1							
X1	0							
zj	0							
cj-zj	0							
Iteration 5								
Cj-->								
Basic	Quantity	7	17	0	0	0	0	0
-----								
surplus 2	1.0	0	-6.75	1.25	-1.25	-1	1	0
surplus 3	2.0	0	-5.25	1.75	-1.75	0	0	-1
X1	1.5	1	1.125	0.125	-0.125	0	0	0
zj	0	0	0	2	0	2	0	2
cj-zj		0	0	-1.0	0	-1.0	0	-1.0

Cj--> 0								
Basic	surplus 3							
-----								
surplus 2	0							
surplus 3	1							
X1	0							
zj	0							
cj-zj	0							
Iteration 6								
Cj-->								
Basic	Quantity	7	17	0	0	0	0	0
-----								
surplus 2	1.0	0	-6.75	1.25	-1.25	-1	1	0
surplus 3	2.0	0	-5.25	1.75	-1.75	0	0	-1
X1	1.5	1	1.125	0.125	-0.125	0	0	0
zj	10.5	7	26.125	-0.875	0.875	0	0	0
cj-zj		0	-9.125	0.875	-0.875	0	0	0
Cj--> 0								
Basic	surplus 3							
-----								
surplus 2	0							
surplus 3	1							
X1	0							
zj	0							
cj-zj	0							
Dual -----								
	y1	y2	y3					
-----								
Maximize	12	14	19					
X1	8	10	14	<=		7		
X2	9	18	21	<=		17		
Intercepts and Intersections -----								
	X1	X2	Cost					
-----								
Point 1	0	1.3333	22.6667					
Point 2	1.5	0	10.5					

LPP-2v3c-Min-Example14



SrinVas Raghavendra Rao                      MBA-OR                      SrinVas Raghavendra Rao  
 01-31-2014 21:13:49

Module/submodel: Linear Programming  
 Problem title: LPP-3v2c-Min  
 Objective: Minimize

**Problem and Results** -----

X1	NONBasic		0
X2	Basic		1.8235
X3	NONBasic		0
surplus 1	Basic		4.5294
surplus 2	NONBasic		0
Optimal Value (z)			18.2353

**Ranging** -----

Variable	Value	Reduced Cost	Original Value	Lower Bound	Upper Bound
X1	0	1.3529	9	7.6471	Infinity
X2	1.8235	0	10	0	11.7692
X3	0	7.6471	20	12.3529	Infinity

Constraint	Dual Value	Slack/Surplus	Original Value	Lower Bound	Upper Bound
Constraint 1	0	4.5294	21	-Infinity	25.5294
Constraint 2	-.5882	0	31	25.5	Infinity

**Original Problem w/answers** -----

	X1	X2	X3	RHS
Minimize	9	10	20	
Constraint 1	11	14	17	>= 21
Constraint 2	13	17	21	>= 31

Solution                      **0    1.8235    0                      18.2353**

**Iterations** -----

Iteration 1

Cj-->		9	10	20	0	0	0	0
Basic	Quantity	X1	X2	X3	artfcl 1	surplus 1	artfcl 2	surplus 2
artfcl 1	21	11	14	17	1	-1	0	0
artfcl 2	31	13	17	21	0	0	1	-1
Zj	52	-24	-31	-38	1	1	1	1
Cj-Zj		24	31	38	0	-1	0	-1

Iteration 2

Cj-->		9	10	20	0	0	0	0
Basic	Quantity	X1	X2	X3	artfcl 1	surplus 1	artfcl 2	surplus 2
X3	1.2353	0.6471	0.8235	1	0.0588	-0.0588	0	0
artfcl 2	5.0588	-0.5882	-0.2941	0	-1.2353	1.2353	1	-1
Zj	5.0588	.5882	.2941	0	3.2353	-1.2353	1	1
Cj-Zj		-0.5882	-0.2941	0	-2.2353	1.2353	0	-1

Iteration 3

Cj-->		9	10	20	0	0	0	0
Basic	Quantity	X1	X2	X3	artfcl 1	surplus 1	artfcl 2	surplus 2

X3	1.4762	0.619	0.8095	1	0	0	0.0476	-0.0476
surplus 1	4.0952	-0.4762	-0.2381	0	-1	1	0.8095	-0.8095
Zj	0	0	0	0	2	0	2	0
Cj-Zj	0	0	0	0	-1.0	0	-1.0	0
Iteration 4								
Cj-->		9	10	20	0	0	0	0
Basic	Quantity	X1	X2	X3	artfcl 1	surplus 1	artfcl 2	surplus 2
X3	1.4762	0.619	0.8095	1	0	0	0.0476	-0.0476
surplus 1	4.0952	-0.4762	-0.2381	0	-1	1	0.8095	-0.8095
Zj	29.5238	5.619	3.8095	20	0	0	-0.9524	0.9524
Cj-Zj		3.381	6.1905	0	0	0	0.9524	-0.9524
Iteration 5								
Cj-->		9	10	20	0	0	0	0
Basic	Quantity	X1	X2	X3	artfcl 1	surplus 1	artfcl 2	surplus 2
X2	1.8235	0.7647	1	1.2353	0	0	0.0588	-0.0588
surplus 1	4.5294	-0.2941	0	0.2941	-1	1	0.8235	-0.8235
Zj	18.2353	10.3529	10	27.6471	0	0	-0.5882	0.5882
Cj-Zj		-1.3529	0	-7.6471	0	0	0.5882	-0.5882
Dual -----								
		y1	y2					
Maximize		21	31					
X1		11	13	<=	9			
X2		14	17	<=	10			
X3		17	21	<=	20			

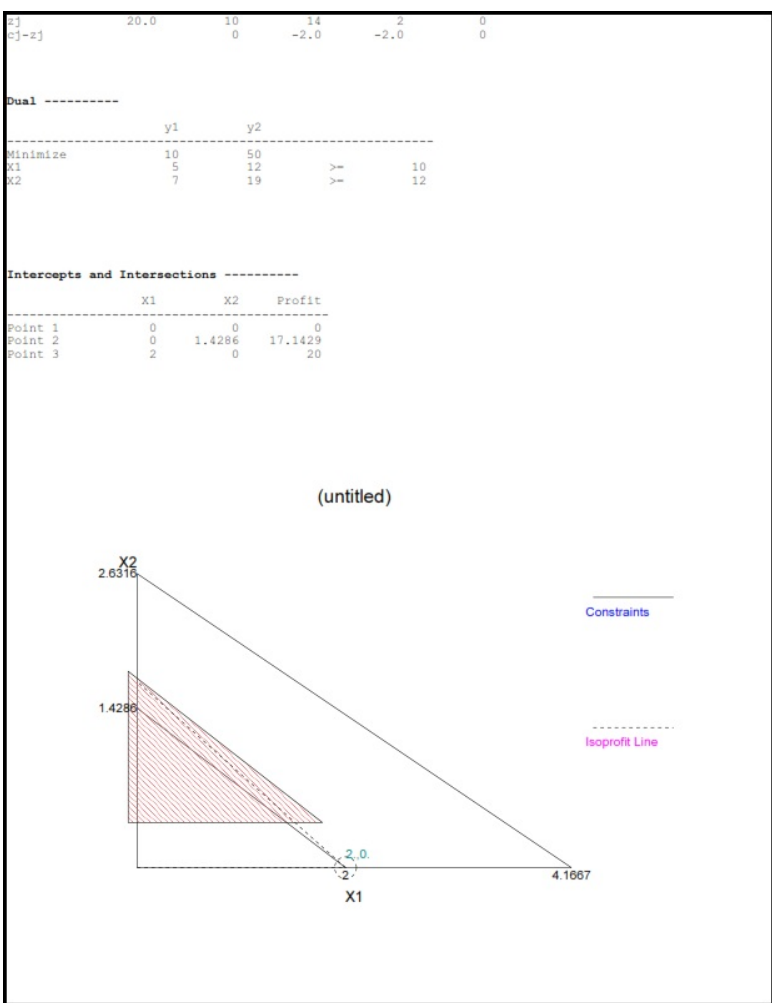
SrinVas Raghavendra Rao	MDA-OR	SrinVas Raghavendra Rao						
	01-31-2014 21:16:50							
Module/submodel: Linear Programming								
Problem title: LPP-3v2c-Min								
Objective: Minimize								
Problem and Results -----								
X1	NONBasic	0						
X2	NONBasic	0						
X3	Basic	1.4444						
surplus 1	NONBasic	0						
surplus 2	Basic	18.5556						
Optimal Value (Z)		41.8889						
Ranging -----								
Variable	Value	Reduced Cost	Original Value	Lower Bound	Upper Bound			
X1	0	.8889	17	16.1111	Infinity			
X2	0	3.6667	23	19.3333	Infinity			
X3	1.4444	0	29	0	30.6			
Constraint	Dual Value	Slack/Surplus	Original Value	Lower Bound	Upper Bound			
Constraint 1	-3.2222	0	13	6.5769	Infinity			
Constraint 2	0	18.5556	19	-Infinity	37.5556			
Original Problem w/answers -----								
	X1	X2	X3	RHS				
Minimize	17	23	29					
Constraint 1	5	6	9	>=	13			
Constraint 2	12	19	26	>=	19			
Solution	0	0	1.4444		41.8889			
Iterations -----								
Iteration 1								
Cj-->		17	23	29	0	0	0	0
Basic	Quantity	X1	X2	X3	artfcl 1	surplus 1	artfcl 2	surplus 2
artfcl 1	13	5	6	9	1	-1	0	0
artfcl 2	19	12	19	26	0	0	1	-1
Zj	32	-17	-25	-35	1	1	1	1
Cj-Zj		17	25	35	0	-1	0	-1
Iteration 2								
Cj-->		17	23	29	0	0	0	0
Basic	Quantity	X1	X2	X3	artfcl 1	surplus 1	artfcl 2	surplus 2
artfcl 1	6.4231	0.8462	-0.5769	0	1	-1	-0.3462	0.3462
X3	0.7308	0.4615	0.7308	1	0	0	0.0385	-0.0385
Zj	6.4231	-0.8462	0.5769	0	1	1	2.3462	-0.3462
Cj-Zj		0.8462	-0.5769	0	0	-1	-1.3462	0.3462
Iteration 3								
Cj-->		17	23	29	0	0	0	0
Basic	Quantity	X1	X2	X3	artfcl 1	surplus 1	artfcl 2	surplus 2

artfcl 1	5.0833	0	-1.9167	-1.8333	1	-1	-0.4167	0.4167
X1	1.5833	1	1.5833	2.1667	0	0	0.0833	-0.0833
X2	5.0833	0	1.9167	1.8333	1	1	2.4167	-4.167
cj-zj		0	-1.9167	-1.8333	0	-1	-1.4167	0.4167
Iteration 4								
cj-->		17	23	29	0	0	0	0
Basic	Quantity	X1	X2	X3	artfcl 1	surplus 1	artfcl 2	surplus 2
surplus 2	12.2	0	-4.6	-4.4	2.4	-2.4	-1	1
X1	2.6	1	1.2	1.8	0.2	-0.2	0	0
X2	0	0	0	0	2	0	2	0
cj-zj		0	0	0	-1.0	0	-1.0	0
Iteration 5								
cj-->		17	23	29	0	0	0	0
Basic	Quantity	X1	X2	X3	artfcl 1	surplus 1	artfcl 2	surplus 2
surplus 2	12.2	0	-4.6	-4.4	2.4	-2.4	-1	1
X1	2.6	1	1.2	1.8	0.2	-0.2	0	0
X2	44.2	17	25.6	27.4	-3.4	3.4	0	0
cj-zj		0	-2.6	1.6	3.4	-3.4	0	0
Iteration 6								
cj-->		17	23	29	0	0	0	0
Basic	Quantity	X1	X2	X3	artfcl 1	surplus 1	artfcl 2	surplus 2
surplus 2	18.5556	2.4444	-1.6667	0	2.8889	-2.8889	-1	1
X3	1.4444	0.5556	0.6667	1	0.1111	-0.1111	0	0
X2	41.8889	17.8889	26.6667	29	-3.2222	3.2222	0	0
cj-zj		-0.8889	-3.6667	0	3.2222	-3.2222	0	0
Dual -----								
		y1	y2					
Maximize		13	19					
X1		5	12	<=	17			
X2		6	19	<=	23			
X3		9	26	<=	29			

SrinVas Raghavendra Rao		MBA-OR		SrinVas Raghavendra Rao				
		01-31-2014 19:06:32						
Module/submodel: Linear Programming								
Problem title: LPP-IPP-problem-3v2c-Min								
Objective: Minimize								
Problem and Results -----								
X1	Basic				2.1429			
X2	NONBasic				0			
X3	NONBasic				0			
surplus 1	Basic				15.2857			
surplus 2	NONBasic				0			
Optimal Value (z)					21.4286			
Ranging -----								
Variable	Value	Reduced Cost	Original Value	Lower Bound	Upper Bound			
X1	2.1429	0	10	0	13.3636			
X2	0	3.5238	14	10.4762	Infinity			
X3	0	7.0476	18	10.9524	Infinity			
Constraint	Dual Value	Slack/Surplus	Original Value	Lower Bound	Upper Bound			
Constraint 1	0	15.2857	34	-Infinity	49.2857			
Constraint 2	-4.762	0	45	31.0435	Infinity			
Original Problem w/answers -----								
	X1	X2	X3		RHS			
Minimize	10	14	18					
Constraint 1	23	24	25	>=	34			
Constraint 2	21	22	23	>=	45			
Solution					2.1429 0 0 21.4286			
Iterations -----								
Iteration 1								
cj-->		10	14	18	0	0	0	0
Basic	Quantity	X1	X2	X3	artfcl 1	surplus 1	artfcl 2	surplus 2
artfcl 1	34	23	24	25	1	-1	0	0
artfcl 2	45	21	22	23	0	0	1	-1
X1	79	-44	-46	-48	1	1	1	1
cj-zj		44	46	48	0	-1	0	-1
Iteration 2								
cj-->		10	14	18	0	0	0	0
Basic	Quantity	X1	X2	X3	artfcl 1	surplus 1	artfcl 2	surplus 2
X3	1.36	0.92	0.96	1	0.04	-0.04	0	0
artfcl 2	13.72	-0.16	-0.08	0	-0.92	0.92	1	-1
X2	13.72	.16	.08	0	2.92	-0.92	1	1
cj-zj		-0.16	-0.08	0	-1.92	0.92	0	-1
Iteration 3								
cj-->		10	14	18	0	0	0	0
Basic	Quantity	X1	X2	X3	artfcl 1	surplus 1	artfcl 2	surplus 2

X3	1.9565	0.913	0.9565	1	0	0	0.0435	-0.0435
surplus 1	14.913	-0.1739	-0.087	0	-1	1	1.087	-1.087
zj	0	0	0	0	2	0	2	0
cj-zj	0	0	0	0	-1.0	0	-1.0	0
Iteration 4								
cj-->		10	14	18	0	0	0	0
Basic	Quantity	X1	X2	X3	artfcl 1	surplus 1	artfcl 2	surplus 2
X3	1.9565	0.913	0.9565	1	0	0	0.0435	-0.0435
surplus 1	14.913	-0.1739	-0.087	0	-1	1	1.087	-1.087
zj	35.2174	3.5652	10.7826	18	0	0	-0.7826	0.7826
cj-zj		6.4348	3.2174	0	0	0	0.7826	-0.7826
Iteration 5								
cj-->		10	14	18	0	0	0	0
Basic	Quantity	X1	X2	X3	artfcl 1	surplus 1	artfcl 2	surplus 2
X1	2.1429	1	1.0476	1.0952	0	0	0.0476	-0.0476
surplus 1	15.2857	0	0.0952	0.1905	-1	1	1.0952	-1.0952
zj	21.4286	10	17.5238	25.0476	0	0	-0.4762	0.4762
cj-zj		0	-3.5238	-7.0476	0	0	0.4762	-0.4762
Dual -----								
		y1	y2					
Maximize		34	45					
X1		23	21	<=	10			
X2		24	22	<=	14			
X3		25	23	<=	18			

SrinVas Raghavendra Rao		MBA-OR		SrinVas Raghavendra Rao	
		02-01-2014		07:43:37	
Module/submodel: Linear Programming					
Problem title: (untitled)					
Objective: Maximize					
Problem and Results -----					
X1	Basic				2
X2	NONBasic				0
slack 1	NONBasic				0
slack 2	Basic				26
Optimal Value (Z)					20
Ranging -----					
Variable	Value	Reduced Cost	Original Value	Lower Bound	Upper Bound
X1	2	0	10	8.5714	Infinity
X2	0	2	12	-Infinity	14
Constraint	Dual Value	Slack/Surplus	Original Value	Lower Bound	Upper Bound
Constraint 1	2	0	10	0	20.8333
Constraint 2	0	26	50	24	Infinity
Original Problem w/answers -----					
	X1	X2			RHS
Maximize	10	12			
Constraint 1	5	7	<=		10
Constraint 2	12	19	<=		50
Solution	2	0			20
Iterations -----					
Iteration 1					
cj-->		10	12	0	0
Basic	Quantity	X1	X2	slack 1	slack 2
slack 1	10	5	7	1	0
slack 2	50	12	19	0	1
zj	0	0	0	0	0
cj-zj		10	12	0	0
Iteration 2					
cj-->		10	12	0	0
Basic	Quantity	X1	X2	slack 1	slack 2
X2	1.4286	0.7143	1	0.1429	0
slack 2	22.8571	-1.5714	0	-2.7143	1
zj	17.1429	8.5714	12	1.7143	0
cj-zj		1.4286	0	-1.7143	0
Iteration 3					
cj-->		10	12	0	0
Basic	Quantity	X1	X2	slack 1	slack 2
X1	2	1	1.4	0.2	0
slack 2	26.0	0	2.2	-2.4	1



Module/submodel: Linear Programming  
 Problem title: (untitled)  
 Objective: Maximize

Problem and Results -----

	X1	X2	X3	X4	X5	RHS
Maximize	12	14	16	18	21	
Constraint 1	14	16	18	21	25	<= 123
Constraint 2	23	23	34	31	34	<= 134
Constraint 3	25	25	45	42	45	<= 145
Constraint 4	26	26	56	53	56	<= 156
Constraint 5	28	32	67	65	67	<= 167
Solution	0	5.2188	0	0	0	73.0625

Dual

Maximize	
Constraint 1	0
Constraint 2	0
Constraint 3	0
Constraint 4	0
Constraint 5	.4375

Solution  
 The optimal solution value is = 73.0625

Ranging -----

Variable	Value	Reduced Cost	Original Value	Lower Bound	Upper Bound
X1	0	.25	12	-Infinity	12.25
X2	5.2188	0	14	13.7143	Infinity
X3	0	13.3125	16	-Infinity	29.3125
X4	0	10.4375	18	-Infinity	28.4375
X5	0	8.3125	21	-Infinity	29.3125

Constraint	Dual Value	Slack/Surplus	Original Value	Lower Bound	Upper Bound
Constraint 1	0	39.5	123	83.5	Infinity
Constraint 2	0	13.9688	134	120.0313	Infinity
Constraint 3	0	14.5313	145	130.4688	Infinity
Constraint 4	0	20.3125	156	135.6875	Infinity
Constraint 5	.4375	0	167	0	185.6

Solution list -----

Variable	Status	Value
X1	NONBasic	0
X2	Basic	5.2188
X3	NONBasic	0
X4	NONBasic	0
X5	NONBasic	0
slack 1	Basic	39.5
slack 2	Basic	13.9688
slack 3	Basic	14.5313
slack 4	Basic	20.3125
slack 5	NONBasic	0
Z	Optimal	73.0625

Iterations -----

Iteration 1

Cj-->	12	14	16	18	21	0	0	0
Basic	X1	X2	X3	X4	X5	slack 1	slack 2	slack 3
slack 1	14	16	18	21	25	1	0	0
slack 2	23	23	34	31	34	0	1	0
slack 3	25	25	45	42	45	0	0	1
slack 4	26	26	56	53	56	0	0	0



slack 5	28	32	67	65	67	0	0	0
zj	0	0	0	0	0	0	0	0
cj-zj	12	14	16	18	21	0	0	0
Cj-->	0	0						
Basic	slack 4	slack 5	Quantity					
slack 1	0	0	123					
slack 2	0	0	134					
slack 3	0	0	145					
slack 4	1	0	156					
slack 5	0	1	167					
zj	0	0	0					
cj-zj	0	0						
Iteration 2								
Cj-->	12	14	16	18	21	0	0	0
Basic	X1	X2	X3	X4	X5	slack 1	slack 2	slack 3
slack 1	3.5522	4.0597	-7	-3.2537	0	1	0	0
slack 2	8.791	6.7612	0	-1.9851	0	0	1	0
slack 3	6.194	3.5075	0	-1.6567	0	0	0	1
slack 4	2.597	-0.7463	0	-1.3284	0	0	0	0
X5	0.4179	0.4776	1	0.9701	1	0	0	0
zj	8.7761	10.0299	21	20.3731	21	0	0	0
cj-zj	3.2239	3.9701	-5	-2.3731	0	0	0	0
Cj-->	0	0						
Basic	slack 4	slack 5	Quantity					
slack 1	0	-0.3731	60.6866					
slack 2	0	-0.5075	49.2537					
slack 3	0	-0.6716	32.8358					
slack 4	1	-0.8358	16.4179					
X5	0	0.0149	2.4925					
zj	0	.3134	52.3433					
cj-zj	0	-0.3134						
Iteration 3								
Cj-->	12	14	16	18	21	0	0	0
Basic	X1	X2	X3	X4	X5	slack 1	slack 2	slack 3
slack 1	0	0	-15.5	-11.5	-8.5	1	0	0
slack 2	2.875	0	-14.1563	-15.7188	-14.1563	0	1	0
slack 3	3.125	0	-7.3438	-8.7813	-7.3438	0	0	1
slack 4	3.25	0	1.5625	0.1875	1.5625	0	0	0
X2	0.875	1	2.0938	2.0313	2.0938	0	0	0
zj	12.25	14	29.3125	28.4375	29.3125	0	0	0
cj-zj	-0.25	0	-13.3125	-10.4375	-8.3125	0	0	0
Cj-->	0	0						
Basic	slack 4	slack 5	Quantity					
slack 1	0	-0.5	39.5					
slack 2	0	-0.7188	13.9687					
slack 3	0	-0.7813	14.5312					
slack 4	1	-0.8125	20.3125					
X2	0	0.0313	5.2188					
zj	0	.4375	73.0625					
cj-zj	0	-0.4375						
Dual -----								
	y1	y2	y3	y4	y5			
Minimize	123	134	145	156	167			
X1	14	23	25	26	28	>=	12	
X2	16	23	25	26	32	>=	14	

X3	18	34	45	56	67	>=	16
X4	21	31	42	53	65	>=	18
X5	25	34	45	56	67	>=	21

Module/submodel: Linear Programming  
 Problem title: (untitled)  
 Objective: Maximize

**Problem and Results** -----

	X1	X2	X3	X4	X5		RHS
Maximize	23	25	32	43	54		
Constraint 1	13	45	18	21	25	<=	160
Constraint 2	23	23	34	31	34	<=	170
Constraint 3	34	56	78	89	109	<=	180
Constraint 4	26	26	56	53	134	<=	190
Constraint 5	56	32	67	65	167	<=	200
Solution	<b>2.199</b>	<b>0</b>	<b>0</b>	<b>1.1824</b>	<b>0</b>		<b>101.4203</b>

**Dual**

Maximize	
Constraint 1	0
Constraint 2	0
Constraint 3	.3291
Constraint 4	0
Constraint 5	.2109
Solution	

The optimal solution value is = 101.4203

**Ranging** -----

Variable	Value	Reduced Cost	Original Value	Lower Bound	Upper Bound
X1	2.199	0	23	16.9038	23.6288
X2	0	.1795	25	-Infinity	25.1795
X3	0	7.8014	32	-Infinity	39.8014
X4	1.1824	0	43	42.7568	60.2059
X5	0	17.093	54	-Infinity	71.093
Constraint	Dual Value	Slack/Surplus	Original Value	Lower Bound	Upper Bound
Constraint 1	0	106.5826	160	53.4175	Infinity
Constraint 2	0	82.7686	170	87.2314	Infinity
Constraint 3	.3291	0	180	121.4286	273.8462
Constraint 4	0	70.1586	190	119.8414	Infinity
Constraint 5	.2109	0	200	131.4607	296.4706

**Solution list** -----

Variable	Status	Value
X1	Basic	2.199
X2	NONBasic	0
X3	NONBasic	0
X4	Basic	1.1824
X5	NONBasic	0
slack 1	Basic	106.5826
slack 2	Basic	82.7686
slack 3	NONBasic	0
slack 4	Basic	70.1586
slack 5	NONBasic	0
Z	Optimal	101.4203

**Iterations** -----

Iteration 1

Cj-->	23	25	32	43	54	0	0	0
Basic	X1	X2	X3	X4	X5	slack 1	slack 2	slack 3
slack 1	13	45	18	21	25	1	0	0
slack 2	23	23	34	31	34	0	1	0
slack 3	34	56	78	89	109	0	0	1
slack 4	26	26	56	53	134	0	0	0

```

slack 5      56      32      67      65      167      0      0      0
zj           0       0       0       0       0       0      0      0
zj-zj       23      25      32      43      54       0      0      0

Cj-->       0       0
Basic      slack 4  slack 5  Quantity
-----
slack 1      0       0       160
slack 2      0       0       170
slack 3      0       0       180
slack 4      1       0       190
slack 5      0       1       200
zj           0       0       0
zj-zj       0       0

Iteration 2
Cj-->       23      25      32      43      54      0      0      0
Basic      X1      X2      X3      X4      X5  slack 1  slack 2  slack 3
-----
slack 1      4.6168  40.2096  7.9701  11.2695  0      1      0      0
slack 2     11.5988  16.485  20.3593  17.7665  0      0      1      0
slack 3     -2.5509  35.1138  34.2695  46.5749  0      0      0      1
slack 4    -18.9341  0.3234  2.2395  0.8443  0      0      0      0
X5          0.3353  0.1916  0.4012  0.3892  1      0      0      0
zj         18.1078  10.3473  21.6647  21.018  54      0      0      0
zj-zj       4.8922  14.6527  10.3353  21.982  0      0      0      0

Cj-->       0       0
Basic      slack 4  slack 5  Quantity
-----
slack 1      0    -0.1497  130.0599
slack 2      0    -0.2036  129.2814
slack 3      0    -0.6527  49.4611
slack 4      1    -0.8024  29.521
X5           0     0.006  1.1976
zj           0     .3234  64.6707
zj-zj        0    -0.3234

Iteration 3
Cj-->       23      25      32      43      54      0      0      0
Basic      X1      X2      X3      X4      X5  slack 1  slack 2  slack 3
-----
slack 1      5.234  31.7133  -0.3219  0      0      1      0     -0.242
slack 2     12.5719  3.0905  7.2868  0      0      0      1    -0.3815
X4          -0.0548  0.7539  0.7358  1      0      0      0     0.0215
slack 4    -18.8879  -0.3132  1.6183  0      0      0      0    -0.0181
X5          0.3566  -0.1018  0.1148  0      1      0      0   -0.0084
zj         16.9038  26.92  37.8389  43      54      0      0     .472
zj-zj       6.0962  -1.92  -5.8389  0      0      0      0    -0.472

Cj-->       0       0
Basic      slack 4  slack 5  Quantity
-----
slack 1      0     0.0082  118.0921
slack 2      0     0.0454  110.414
X4           0     -0.014  1.062
slack 4      1    -0.7906  28.6243
X5           0     0.0114  0.7843
zj           0     .0153  88.0149
zj-zj        0    -0.0153

Iteration 4
Cj-->       23      25      32      43      54      0      0      0
Basic      X1      X2      X3      X4      X5  slack 1  slack 2  slack 3
-----
slack 1      0  33.2076  -2.0068  0  -14.6756  1      0    -0.1193
slack 2      0  6.6799  3.2397  0  -35.2502  0      1   -0.0869
X4           0  0.7383  0.7534  1  0.1536  0      0   0.0202
slack 4      0  -5.7058  7.6986  0  52.9596  0      0  -0.4607

```

X1	1	-0.2855	0.3219	0	2.8039	0	0	-0.0234
xj	23	25.1795	39.8014	43	71.093	0	0	.3291
xj-zj	0	-0.1795	-7.8014	0	-17.093	0	0	-0.3291

Cj-->	0	0						
Basic	slack 4	slack 5	Quantity					
-----								
slack 1	0	-0.1597	106.5826					
slack 2	0	-0.358	82.7686					
X4	0	-0.0123	1.1824					
slack 4	1	-0.1846	70.1586					
X1	0	0.0321	2.199					
xj	0	.2109	101.4203					
xj-zj	0	-0.2109						

Dual -----

		y1	y2	y3	y4	y5		
-----								
Minimize	160	170	180	190	200			
X1	13	23	34	26	56	>=	23	
X2	45	23	56	26	32	>=	25	
X3	18	34	78	56	67	>=	32	
X4	21	31	89	53	65	>=	43	
X5	25	34	109	134	167	>=	54	

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