

Exercise Handout 1

$x_3 = 16$, all other variables are equal 0. Objective value is 16.

Exercise Handout 2

$x_1 = 2.75, x_2 = 2.25$, all other variables are equal 0. Objective value is 7.75.

Exercise Handout 3

$x_1 = 0.5, x_3 = 0.5$, all other variables are equal 0. Objective value is 1.

Exercise Handout 4

$x_2 = 1$, all other variables are equal 0. Objective value is 1.

Exercise Handout 5

- a) Let x_i be the number of employees that start working on day i , where monday is 1, tuesday 2 etc. We then get the following model

```
minimize
  x1 + x2 + x3 + x4 + x5 + x6 + x7
subject to
  x1 + x4 + x5 + x6 + x7 => 8
  x1 + x2 + x5 + x6 + x7 => 8
  x1 + x2 + x3 + x6 + x7 => 8
  x1 + x2 + x3 + x4 + x7 => 8
  x1 + x2 + x3 + x4 + x5 => 8
  x2 + x3 + x4 + x5 + x6 => 8
  x3 + x4 + x5 + x6 + x7 => 7
bounds
0<=x1<=INF
0<=x2<=INF
0<=x3<=INF
0<=x4<=INF
```

```

0<=x5<=INF
0<=x6<=INF
0<=x7<=INF
integer
x1
x2
x3
x4
x5
x6
x7
end

```

- b)** Optimal solution: $x_1 = 3, x_3 = 3, x_4 = 4, x_6 = 4$ (all other variables have a value of 0) with a value of 14.
- c)** Optimal solution: $x_1 = 2, x_2 = 2, x_3 = 1, x_4 = 2, x_5 = 1, x_6 = 2, x_7 = 1$ with a values of 11.
- d)** Each employee is working for 5 days so $5 \sum_1^7 x_i$ is the number of man days we are hiring, while $\sum_1^7 b_i$ is the number we need. So the surplus we are hiring can be computed as: $5 \sum_1^7 x_i - \sum_1^7 b_i$. For the two situations above we get 15 respectively 0.
- e)** For each day we have a specific cost of hiring people. These can be accumulated for the different patterns of 5 consecutive days that we are using. So we get a c_1 which is the cost if hiring a person starting on mondays etc. Our objective function then becomes $\sum_1^7 c_i x_i$.