Math 364: Principles of Optimization, Lecture 6

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Spring 2012

Staffing Problem: Linear Programming Formulation

Smalltown Police staffing problem (WW-IMP Page 75)

2 During each 4-hour period, the Smalltown police force requires the following number of on-duty police officers: 12 midnight to 4 A.M.—8; 4 to 8 A.M.—7; 8 A.M. to 12 noon—6; 12 noon to 4 P.M.—6; 4 to 8 P.M.—5; 8 P.M. to 12 midnight—4. Each police officer works two consecutive 4-hour shifts. Formulate an LP that can be used to minimize the number of police officers needed to meet Smalltown's daily requirements.

This is a typical staffing problem. In most such problems, a diagram detailing the shifts and shared officers between shifts is quite helpful.

d.v.'s: x_i = # officers starting duty at the beginning of shift i, $i = 1, \ldots, 6$.

Note: x_6 = # officers starting at shift 6, and continuing on to shift 1 of next day.

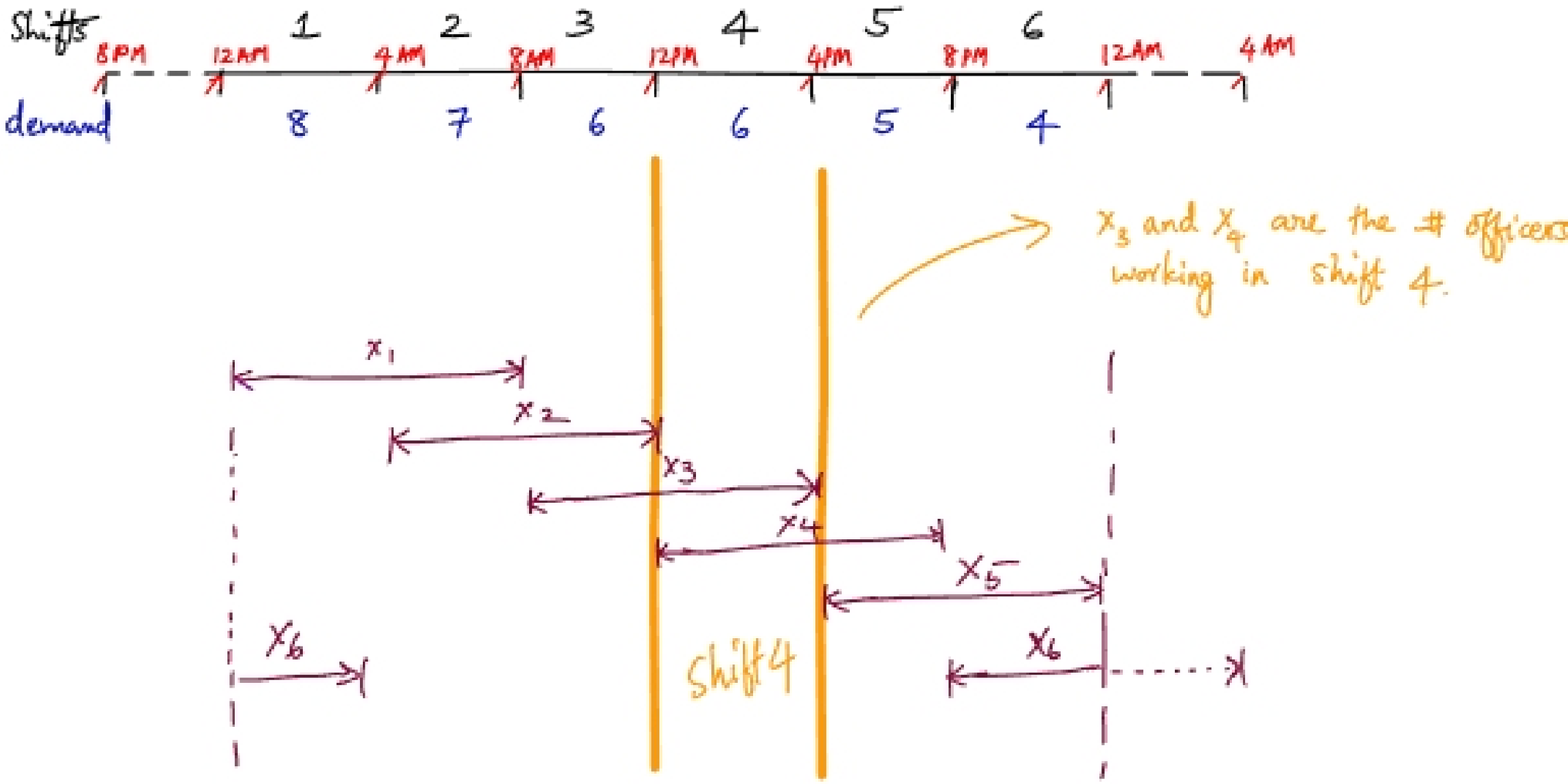

Figure: Two consecutive shifts and constraints