# Lesson 5. Work Scheduling Models

**Problem 2.3 from Rader** A film packaging plant can manufacture four different thicknesses (1, 3, 5, and 0.5 mm) in any combination. Each thickness requires time on each of the three machines in minutes per square yard of film, as shown in the table below. Each machine is available 60 hours per week. The table also gives revenue and cost per square yard for each thickness. Variable labor costs are \$25 per hour for machines 1 and 2, and \$35 per hour for machine 3. Formulate and solve a profit-maximizing LP model for this problem, given the maximum demands for each thickness.

| | Time (min) | | | | | |
|---|---|---|---|---|---|---|
| Thickness | 1 | 2 | 3 | Max Demand | Revenue | Cost |
| 1 mm | 5 | 8 | 9 | 400 | 110 | 30 |
| 3 mm | 4 | 7 | 5 | 250 | 90 | 10 |
| 5 mm | 4 | 5 | 4 | 200 | 60 | 10 |
| 0.5mm | 6 | 10 | 6 | 450 | 100 | 20 |

**Problem.** Postal employees in Simplexville work for 5 consecutive days, followed by 2 days off, repeated weekly. Below are the minimum number of employees needed for each day of the week:

| Day | Employees needed |
|---|---|
| Monday (1) | 7 |
| Tuesday (2) | 8 |
| Wednesday (3) | 7 |
| Thursday (4) | 6 |
| Friday (5) | 6 |
| Saturday (6) | 4 |
| Sunday (7) | 5 |

Write a linear program that determines the minimum total number of employees needed.

*Hint.* Define the following decision variables:

$x_1$ = number of employees who start work on Monday and work though Friday
$x_2$ = number of employees who start work on Tuesday and work though Saturday
$\vdots$
$x_7$ = number of employees who start work on Sunday and work through Thursday