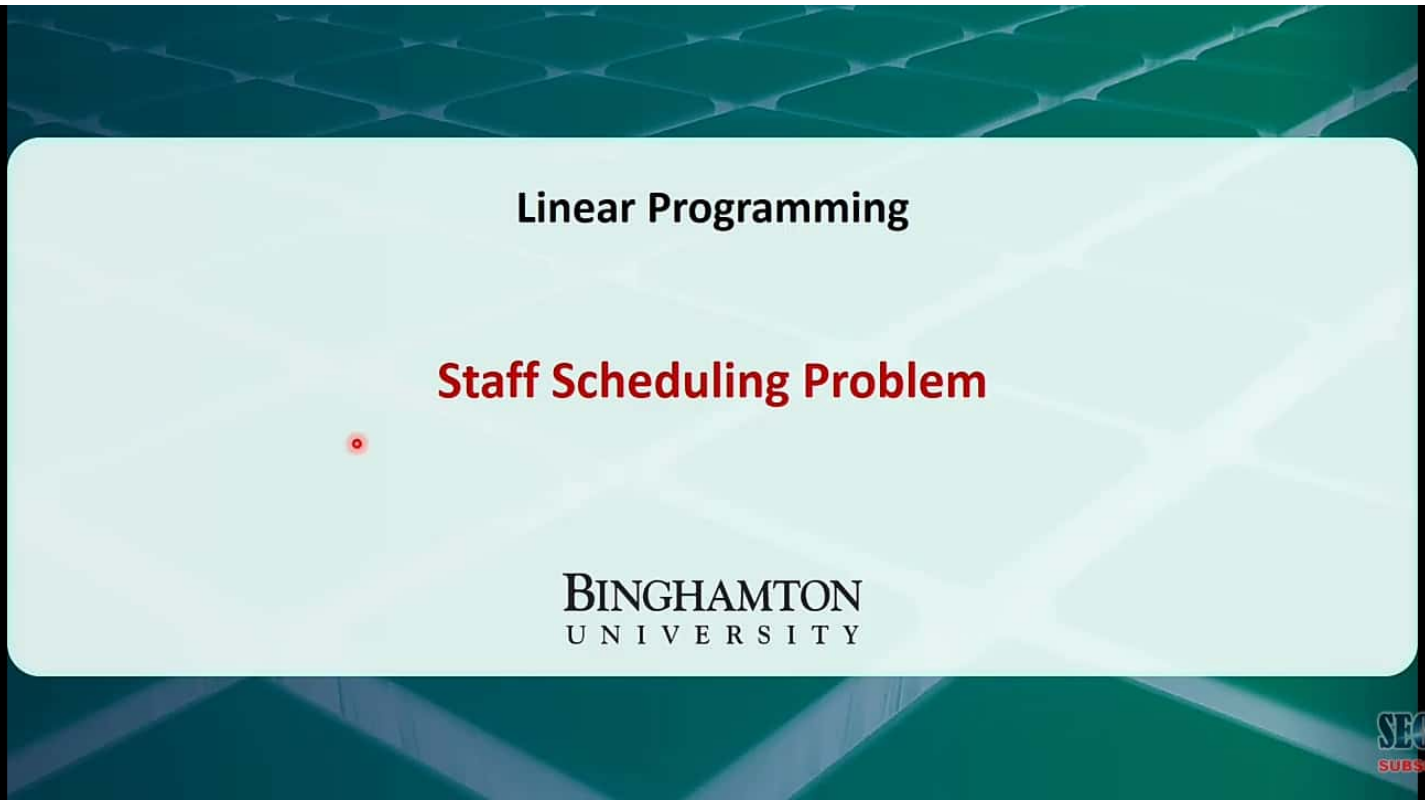

Staff Scheduling Problem

- A company requires different numbers of employees on different days of the week
- Each employee must work five consecutive days and then receive two days off
- Formulate LP to minimize the number of employees who must be hired

Day	# Employees Required
Mon	10
Tue	12
Wed	20
Thu	17
Fri	15
Sat	12
Sun	5

Wrong Problem Formulation

x_i the number of employees working on day i

(Assume fraction numbers)

$$
\begin{aligned}
min \quad & z = x_1 + x_2 + x_3 + x_4 + x_5 + x_6 + x_7 \\
s.t. \quad & x_1 \qquad\qquad\qquad\qquad\qquad\qquad \geq 10 \\
& \quad x_2 \qquad\qquad\qquad\qquad\qquad \geq 12 \\
& \qquad x_3 \qquad\qquad\qquad\qquad \geq 20 \\
& \qquad\quad x_4 \qquad\qquad\qquad \geq 17 \\
& \qquad\qquad x_5 \qquad\qquad \geq 15 \\
& \qquad\qquad\quad x_6 \qquad \geq 12 \\
& \qquad\qquad\qquad x_7 \geq 5 \\
& x_i \geq 0 \ (i = 1, \dots, 7)
\end{aligned}
$$

Correct Problem Formulation

x_i = number of employees beginning to work on day i (Assume fraction numbers)

	x_1	x_2	x_3	x_4	x_5	x_6	x_7	Req
M	√			√	√	√	√	10
Tu	√	√			√	√	√	12
W	√	√	√			√	√	20
Th	√	√	√	√				17
F	√	√	√	√	√			15
Sa		√	√	√	√	√	√	12
Su			√	√	√	√	√	5

Correct Problem Formulation

$$
\begin{aligned}
min \quad z = {} & x_1 + x_2 + x_3 + x_4 + x_5 + x_6 + x_7 \\
s.t. \quad & x_1 + x_4 + x_5 + x_6 + x_7 \geq 10 \\
& x_1 + x_2 + x_5 + x_6 + x_7 \geq 12 \\
& x_1 + x_2 + x_3 + x_6 + x_7 \geq 20 \\
& x_1 + x_2 + x_3 + x_4 + x_7 \geq 17 \\
& x_1 + x_2 + x_3 + x_4 + x_5 \geq 15 \\
& x_2 + x_3 + x_4 + x_5 + x_6 \geq 12 \\
& x_3 + x_4 + x_5 + x_6 + x_7 \geq 5 \\
& x_i \geq 0 \ (i = 1, \dots, 7)
\end{aligned}
$$