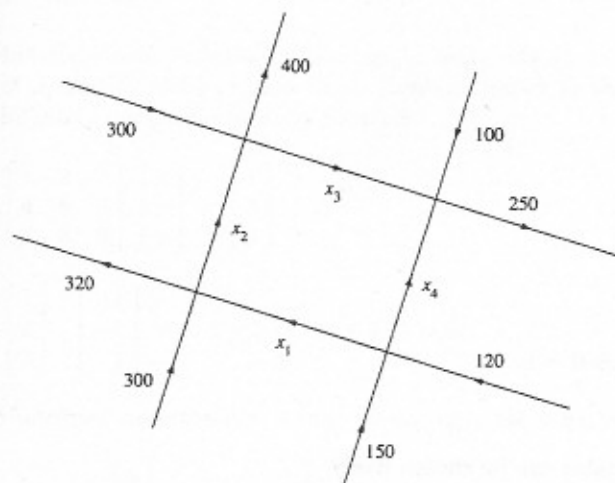


42. Let x_1, x_2, x_3 , and x_4 be the traffic volume at the four locations indicated below.



We are told that the number of cars coming into each intersection is the same as the number of cars coming out:

$$\begin{cases} x_1 + 300 = 320 + x_2 \\ x_2 + 300 = 400 + x_3 \\ x_3 + x_4 + 100 = 250 \\ 150 + 120 = x_1 + x_4 \end{cases} \quad \text{or} \quad \begin{cases} x_1 - x_2 = 20 \\ x_2 - x_3 = 100 \\ x_3 + x_4 = 150 \\ x_1 + x_4 = 270 \end{cases}$$

The solutions are of the form

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} 270 - t \\ 250 - t \\ 150 - t \\ t \end{bmatrix}.$$

Since the x_i must be positive integers (or zero), t must be an integer with $0 \leq t \leq 150$.

The lowest possible values are $x_1 = 120$, $x_2 = 100$, $x_3 = 0$, and $x_4 = 0$, while the highest possible values are $x_1 = 270$, $x_2 = 250$, $x_3 = 150$, and $x_4 = 150$.