41 (a) At intersection A incoming traffic is equal to $x+5$. The outgoing traffic is given by $y+7$. Therefore, $x+5=y+7$, which is the first equation. The incoming traffic at B is $z+6$ and the outgoing traffic is $x+3$, so $z+6=x+3$. Finally at intersection C, the incoming flow is $y+3$ and the outgoing flow is $z+4$, so $y+3=z+4$.

(b) These three equations can be written as

$$x-y=2$$
$$x-z=3$$
$$y-z=1$$

This system of linear equations can be represented by the following augmented matrix.

$$\left[\begin{array}{ccc|c} 1 & -1 & 0 & 2 \\ 1 & 0 & -1 & 3 \\ 0 & 1 & -1 & 1 \end{array}\right]$$

Begin by subtracting the first row from the second, followed by subtracting the second row from the third. Gaussian elimination results in the following augmented matrix.

$$\left[\begin{array}{ccc|c} 1 & -1 & 0 & 2 \\ 0 & 1 & -1 & 1 \\ 0 & 0 & 0 & 0 \end{array}\right]$$

The last row of zeros indicates that the linear system is dependent and has an infinite number of solutions. Back solving produces $y-z=1 \Rightarrow y=z+1$. Substituting into the first equation gives $x-(z+1)=2 \Rightarrow x=z+3$. Thus, the solution can be written as

$$\{(z+3,\ z+1,\ z) \mid z \text{ is any nonnegative real number}\}.$$

(c) There are an infinite number of solutions to the system. However, solutions such as $z=1000$, $x=1003$, and $y=1001$ are unlikely, unless a large number of people are simply driving around the block. In reality there is an average traffic flow rate for z that could be measured. From this, values for both x and y could be determined.