7. An organization estimates that 80% of the people in a certain area who vote one year will also vote the next year, and that 30% of those who do not vote one year will vote the next. Let x and y denote the number of people who vote in one year, respectively, and let u and v be the corresponding numbers for the following year. Then (decimals ok here)

$$.8x + .3y = u$$
$$.2x + .7y = v$$

a. Write this system of equations in matrix form. (5 pts)

$$\begin{bmatrix} .8 & .3 \\ .2 & .7 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} u \\ v \end{bmatrix}$$

$A \quad X = B$

other: $\begin{bmatrix} .6 & .1 \\ .4 & .9 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} u \\ v \end{bmatrix}$

b. Solve the resulting matrix equation for $\begin{bmatrix} x \\ y \end{bmatrix}$ (5 pts)

$D = +.56 - .06 = .5 = \frac{1}{2}$

$$\begin{bmatrix} .7 & .3 \\ .2 & .8 \end{bmatrix} \longrightarrow \begin{bmatrix} .7 & -.3 \\ -.2 & .8 \end{bmatrix} \longrightarrow \begin{bmatrix} 1.4 & -.6 \\ -.4 & 1.6 \end{bmatrix}$$

divide by $\frac{1}{2}$, mult by 2

$$\begin{bmatrix} 1.4 & -.6 \\ -.4 & 1.6 \end{bmatrix} \begin{bmatrix} u \\ v \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix}$$

other: $\begin{bmatrix} 1.8 & -.2 \\ -.8 & 1.2 \end{bmatrix} \begin{bmatrix} u \\ v \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix}$

c. Suppose that out of 100 people, 15 voted this year. How many voted last year? (5 pts)

$u = 15$ ← voted

$v = 85$ ← didn't vote

$u = 15$ ← contribute

$v = 85$ ← didn't contribute

$$\begin{bmatrix} 1.4 & -.6 \\ -.4 & 1.6 \end{bmatrix} \begin{bmatrix} 15 \\ 85 \end{bmatrix} = \begin{bmatrix} -30 \\ 130 \end{bmatrix}$$

$$\begin{bmatrix} 1.8 & -.2 \\ .8 & 1.2 \end{bmatrix} \begin{bmatrix} 15 \\ 85 \end{bmatrix} = \begin{bmatrix} 10 \\ 90 \end{bmatrix}$$

-30 voted.

10 contributed.