110 WORKSHEET 9.2

NAME _____Solutions_____

A large city has three competing newspapers, The Herald, The Post, and The Times. It has been discovered that of the people who buy the Herald on a given day, 50% will buy The herald the next day, 40% will buy The Post and 10% will buy The Times. Of the people who bought The Post, 30% of them will buy The Herald the next day and 70% will buy The Post again the next day. Of the people who buy The Times, 20% of them will buy The Times again the next day, 70% will buy The Post and 10% will buy The Herald the next day.

A.   Write & **label** the **transition matrix** for this situation. Call this matrix P.

$$P = \begin{array}{c} \\ H \\ P \\ T \end{array} \begin{array}{ccc} H & P & T \\ \begin{bmatrix} .5 & .4 & .1 \\ .3 & .7 & 0 \\ .1 & .7 & .2 \end{bmatrix} \end{array}$$

B.   Suppose that people in this city buy a paper every day and that on Monday 30% of the People buy The Herald, 30% buy The Post, and 40% buy The Times. Write the **initial-state distribution matrix** for this situation. Call this matrix S_0.

$$S_0 = \begin{array}{ccc} H & P & T \\ \begin{bmatrix} .3 & .3 & .4 \end{bmatrix} \end{array}$$

C.   What is the percentage will buy The Post on Thursday? Indicate the matrix multiplication that you performed in terms of S_0 and P.

$S_3 = S_0 P^3 = \begin{bmatrix} .3568 & .5998 & .0434 \end{bmatrix}$ 59.98% will buy the Post on Thursday.

D.   What is the percentage will buy The Herald on Saturday? Indicate the matrix multiplication that you performed in terms of S_0 and P.

$S_5 = S_0 P^5 = \begin{bmatrix} .3637 & .5912 & .0451 \end{bmatrix}$ 36.37% will buy the Herald on Saturday.

E.   If this trend continues indefinitely, what percentage of people will buy each paper in the long run?

$$P^{100} = \begin{bmatrix} .36 & .59 & .05 \\ .36 & .59 & .05 \\ .36 & .59 & .05 \end{bmatrix} \qquad S_{100} = S_0 P^{100} = \begin{bmatrix} .36 & .59 & .05 \end{bmatrix}$$

36% will buy the Herald, 59% will buy the Post, and 5% will buy the Times

F.   Based on your answer to part E, which paper would you say is the favorite? Explain.

The Post, because percentage of people who buy the Post is larger than the percentage of people who buy the Herald and the Times
5% < 36% < 59%