

Name _____

SHOW AS MUCH WORK AS POSSIBLE BECAUSE YOU MAY RECEIVE PARTIAL CREDIT FOR THE WORK YOU DO IF YOUR ANSWER IS INCORRECT.

1. A certain population of loggerhead sea turtles is made up of hatchlings, juveniles, adults, and elderly adults. Every year, 67% of hatchlings survive to become juveniles, but only 5% of juveniles survive to become adults, while 80% of adults survive to become elderly adults, and 80% of all elderly adults die. Only adults and elderly adults are mature enough to reproduce. Each adult lays an average of 127 eggs every year while mature adults only lay an average of 84 eggs each year. Construct a Leslie matrix for this population.

$$L = \begin{bmatrix} 0 & 0 & 127 & 84 \\ 0.67 & 0 & 0 & 0 \\ 0 & 0.05 & 0 & 0 \\ 0 & 0 & 0.8 & 0.2 \end{bmatrix}$$

2. The following Leslie matrix describes the change in a population of blowflies every two weeks.

$$L = \begin{bmatrix} 0 & 0 & 40 \\ 0.5 & 0 & 0 \\ 0 & 0.4 & 0 \end{bmatrix}$$

Find L^2 (which describes how the population changes every 4 weeks).

$$L^2 = \begin{bmatrix} 0 & 0 & 40 \\ 0.5 & 0 & 0 \\ 0 & 0.4 & 0 \end{bmatrix} \begin{bmatrix} 0 & 0 & 40 \\ 0.5 & 0 & 0 \\ 0 & 0.4 & 0 \end{bmatrix} = \begin{bmatrix} 0 & 16 & 0 \\ 0 & 0 & 20 \\ 0.2 & 0 & 0 \end{bmatrix}$$

3. The following Leslie matrix describes the change from year to year in a population made up of juveniles and adults.

$$L = \begin{bmatrix} 0 & 1 \\ 1 & 1 \end{bmatrix}$$

If the population currently has 100 juveniles and 150 adults, how many juveniles and adults were there last year?

$$\begin{bmatrix} 100 \\ 150 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} j \\ a \end{bmatrix} = \begin{bmatrix} a \\ j+a \end{bmatrix} \Rightarrow \begin{matrix} 100 = a \\ 150 = j+a \end{matrix} \Rightarrow 150 = j+100 \Rightarrow j = 50$$

$$\Rightarrow \begin{bmatrix} j \\ a \end{bmatrix} = \begin{bmatrix} 50 \\ 100 \end{bmatrix}$$