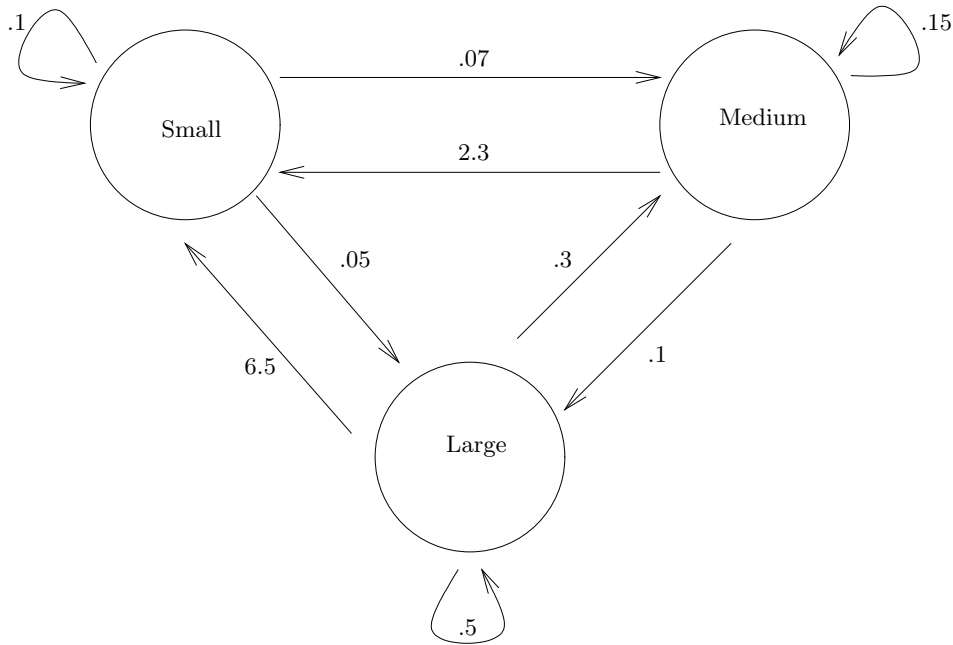# Homework assigned Monday, February 20.

A type of coral is categorized into three sizes, small, median, and large. The life history of this coral in a particular reef is summarized by the following loop diagram.

1. What is the Leslie matrix? *Answer:* $A = \begin{bmatrix} .1 & 2.3 & 6.5 \\ .07 & .15 & .3 \\ .05 & .1 & .5 \end{bmatrix}$

2. Starting with the initial distribution $\mathbf{n}(0) = \begin{bmatrix} 10 & 2 & 1 \end{bmatrix}$ compute $\mathbf{n}(30)$ and $\mathbf{n}(31)$ and use these to compute the stable age distribution and the per capita growth rate. *Answer:*

$$\mathbf{n}(30) = \begin{bmatrix} 69.22985 \\ 7.77021 \\ 7.51663 \end{bmatrix}, \qquad \mathbf{n}(31) = \begin{bmatrix} 73.65258 \\ 8.26661 \\ 7.99682 \end{bmatrix}$$

If r is the per capita growth rate and $\lambda = 1 + r$, then $\mathbf{n}(31) = \lambda \mathbf{n}(31)$ gives that

$$\lambda = \frac{73.65258}{69.22985} = \frac{8.26661}{7.77021} = \frac{7.99682}{7.51663} = 1.063$$

to three decimal places. Thus

$$r = \lambda - 1 = .063 = 6.3\%$$

is the per capita growth rate. The stable age distribution is

$$\mathbf{n} = \begin{bmatrix} .8191 \\ .0919 \\ .0889 \end{bmatrix}.$$