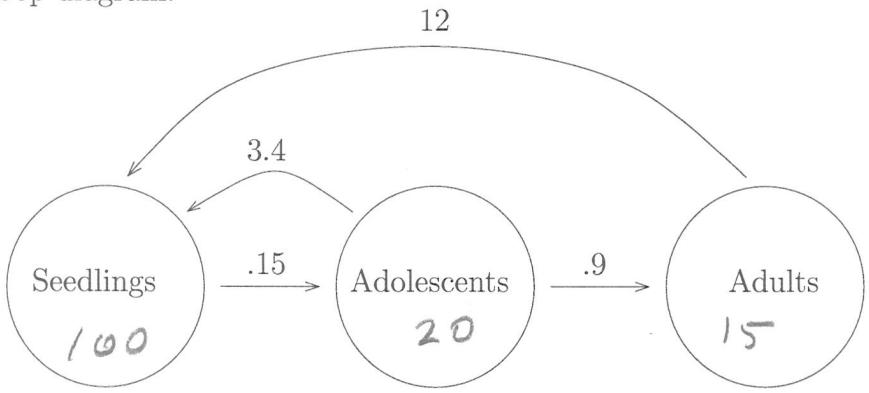
Mathematics 172

Quiz 14 Name: Key

You must show your work to get full credit.

1. A field has wild parsley growing in it. In the fall there are three types of the plants: seedlings, which sprouted that spring, adolescents, which sprouted the spring before, and adults which sprouted two springs previously. The proportion of seedlings that survive to be adolescents is .15. The proportion of adolescents that survive to be a adults is .9. Each adolescents produces on the average 3.4 seedlings and each adult produces an average of 12 seedlings. This is summarized in the following loop diagram:



If last fall there are 100 seedlings, 20 adolescents, and 15 adults, then compute the following

$(3.4)(20)+(12)(15)$ The number of seedlings this fall: 248

$(.15)(100)$ The number of adolescents this fall: 15

$(.9)(20) = 18$ The number of adults this fall: 18

2. A field of beets has a population of blister beetles. These insects breed just once a year and only live a year. The field is sprayed with an insecticide that kills 40% of that year's population. But each year the field is invaded by 500 of the beetles. Let N_t be the number of beetles in the field after t years.

(a) What is the difference equation satisfied by N_t?

The equation is $\Delta N = -.4N + 500$

(b) If there are 1,000 of the beetles in the field this year, then give a formula for N_t.

$N_* = \frac{500}{.4} = 1250$ $N_t =$ $1250 - 250e^{-.4t}$

$N_t = N_* + (N_0 - N_*)e^{-.4t}$

$= 1250 + (1000 - 1250)e^{-.4t}$

$= 1250 - 250e^{-.4t}$