Project : Genetics (Questions)

Due': March 29th, 2001

Let us assume Auto-somal inheritance,(i.e. an individual inherits one gene from each of its parent's pairs of genes to form its own particular pair). Suppose a farmer has a large population of plants consisting of some distribution of all three possible genotypes AA,Aa, and aa.

		Genotype of parents					
		AA-AA	AA-Aa	AA-aa	Aa-Aa	Aa-aa	aa-aa
Genotype of offspring	AA	1	0.5	0	0.25	0	0
	Aa	0	0.5	1	0.5	0.5	0
	aa	0	0	0	0.25	0.5	1

The probabilities of the possible genotypes of the off-spring for all possible combinations of the genotypes of the parents be given by the above table. Note that all the table is saying is that any of each parent's two genes is equally likely to be inherited by the offspring.

Let a_0, b_0, c_0 denote the fractions of the initial population of genotypes AA,Aa,aa, respectively.

1. She desires to undertake a breeding program in which each plant in the population is always fertilized with a plant of genotype AA.
   (a) Derive an expression for the distribution of the three possible genotypes in the population in the first generations in terms of the fractions present in the initial population.
   (b) Derive an expression for the distribution of the three possible genotypes in the population after 'n' number of generations in terms of the fractions present in the $'n-1'th$ generation.
   (c) Use Diagonalisation [2], to derive an expression for the distribution of the three possible genotypes in the population after 'n' number of generations in terms of the fractions present in terms of the initial population.
   (d) Find the limiting genotype distribution as $n \to \infty$.
2. A friend of her's in another farm, modifies the fertilization program. He desires to undertake a breeding program in which each plant in the population is fertilized with a plant of its own genotype.

[1] **Office hours:** Monday 1:30-3pm, 5-6pm, Wednesday 2:30-3:30pm, Thursday 1:30-3:00pm, Friday: 11:30-12:30 or by appointment.

[2] This is discussed in Chapter 5. I can give you a brief course on it if you wish to tackle this part of the question before that

(a) Use the steps outlined in question (1) to derive an expression for the distribution of the three possible genotypes in the population after 'n' number of generations.

(b) Using Mapple (or otherwise) find a_8, b_8, c_8, and a_{25}, b_{25}, c_{25}

(c) Find the limiting genotype distribution as $n \to \infty$.