BIOST 551/STAT 551: Autumn Quarter 2014
Homework 3
Due Tuesday, November 11, 2014

Show All Work

1. [60 points] A quantitative trait is influenced by two loci. Locus 1 has alleles A and a, and locus 2 has alleles B and b. Below are the frequencies for the different genotype combinations at the two loci in the population:

Genotypes at Locus 1 / Locus 2	Frequency
AA/BB	.02
AA/Bb	.04
AA/bb	.03
Aa/BB	.07
Aa/Bb	.20
Aa/bb	.15
aa/BB	.08
aa/Bb	.24
aa/bb	.17

Below is a table with the mean trait values for each of the genotype combinations at the two loci in the population:

	Locus 2		
Locus 1	BB	Bb	bb
AA	3.2	5.2	6.8
Aa	4.8	5.8	7.7
aa	4.2	9.0	13.4

(a) Calculate the mean trait value in the population.

(b) Calculate the additive effects and the additive variance component for the trait.

(c) Calculate the dominance effects and the dominance variance component for the trait.

(d) Calculate the additive $\times$ additive effects and the additive $\times$ additive variance component for the trait.

2. [40 points] Refer to the pedigree in Figure 1 below where two siblings, Sib1 and Sib2, have parents who are second cousins.

(a) Calculate the 9 condensed identity coefficients (i.e., the probability of each of the 9 condensed identity states) for Sib1 and Sib2?

(b) Calculate the kinship coefficient for Sib1 and Sib2.

(c) Calculate the inbreeding coefficient for Sib1.

(d) Calculate the kinship coefficient for Sib1 and Sib1's father.

Figure 1: