

Genetics 320 Problem Set Three
Due 11 am MONDAY, 12 September

1 (1 point): In a cross involving two marked loci, you recover 150 parental gametes and 50 recombinant gametes. What is the recombination frequency between these loci?

2 (2 points): Consider two coat-color loci ($R/r, G/g$), where the genotypes have the following phenotypes $R-G-$ = yellow, $rrG-$ = green, $R-gg$ = red, $rrgg$ = white. Two yellow parents (which we denote P1 and P2) are chosen and crossed to several different parents, and the following data are observed:

- When crossed to a purebreeding green parent, both yellow parents gave equal number of yellow and Green offspring.
- When crossed to a purebreeding red parent, both yellow parents gave equal numbers of red and yellow offspring.
- When crossed to a white parent, the first (P1) yellow parent gave equal numbers of yellow and white offspring.
- When crossed to a white parent, the second (P2) yellow parent gave equal numbers of red and green offspring.

Provide a complete genetic model accounting for these data.

3 (2 points): Consider two X-linked loci, A/a and B/b . The A locus controls hair color, with (in males) AY = red-heads, aY = yellow hair. The B locus controls baldness, with BY = bald, bY = full head of hair. Females with genotype AB/ab are crossed to random males. If the A and B loci are far enough apart on the X chromosome to be considered unlinked, what are the expected frequencies of the three phenotypes (bald, red hair, yellow hair) in the male offspring of this cross? Suppose we observe 50% bald, 42% yellow hair, and 8% red hair. What is the recombination fraction between the bald and red/yellow loci?

4 (1 point): Three linked loci, $A - B - C$ (linked in this order) show the following recombination frequencies: $A - B$ 8%, $B - C$ 25%, $A - C$ 30%. 1000 individuals are measured and 5 double-recombinants are observed. What is the coefficient of coincidence for $A - C$? What is the interference?

5 (1 point): Gametes from an ABC/abc triple heterozygous parent (note that ABC is not necessarily the gene order). What is the gene order:

- (a): When rarest gamete classes are ABc and abC ?
- (b): When no aBC and Abc gametes are seen in a large sample?

6 (3 points): An ABC/abc individual (ABC is not necessarily the gene order) is crossed to an abc/abc individual and gametes are scored. Out of a total of 1000 gametes from the ABC/abc , we observe

ABC	382	ABc	8
abc	395	abC	9
Abc	98	AbC	2
aBC	105	aBc	1

Using this data, compute the recombination frequencies for all pairs of loci, the correct map order, the coefficient of coincidence, and the interference.