

Problem Set 4
Genetics 371
Winter 2010

1. A dihybrid $YyZz$ is test crossed. The following phenotypic classes are observed:

442	Yz
458	yZ
46	YZ
54	yz

- (a) What is the parental type of the heterozygous parent?
(b) Determine the map distance between Y and Z .

2. In corn...

Colored kernels (C) is dominant over colorless (c)
Plump kernels (S) is dominant over shrunken (s)
Starchy kernels (W) is dominant over waxy (w).

A trihybrid ($Cc Ss Ww$) plant is testcrossed and the following progeny are obtained:

2708 Colorless, plump, waxy
2538 Colored, shrunken, starchy
626 Colorless, plump, starchy
601 Colored, shrunken, waxy
116 Colorless, shrunken, starchy
113 Colored, plump, waxy
4 Colored, plump, starchy
2 Colorless, shrunken, waxy

Determine linkage (including map distance) for the genes, and the phase in this cross.

3. $RRSS$ is mated to $rrss$. The resulting $RrSs$ progeny are mated to each other. R and S are 35 map units apart.

- (a) Predict the frequencies of each gamete type produced from the $RrSs$ individual.
(b) Predict the frequencies of R_ss and $rrS_$ progeny classes from the $RrSs \times RrSs$ cross.

4. In a plant species, tall (**T**) is dominant over short (**t**) and red seed color (**R**) is dominant over white (**r**). The two loci are known to be linked; however, the frequency of recombinant gametes is different during production of eggs vs. production of pollen. A homozygous **TR/TR** plant is crossed to a homozygous **tr/tr** plant. The resulting heterozygote is allowed to self-fertilize. Assuming that 10% of eggs are recombinant between the **T** and **R** loci and that 8% of the pollen are recombinant, list the progeny phenotypes and proportions from this self-cross.

5. A family (mom, dad, and three kids) were genotyped at 6 different polymorphic loci on the X chromosome by allele specific (ASO) hybridization. At each locus, the four bases being tested are A, C, G, and T reading from top to bottom. Hybridization is indicated by shading and the base that actually was detected; no hybridization is indicated by blank boxes. The results for the mom and three kids are shown below.

Locus #					
1	2	3	4	5	6
A	A			A	
C			C		C
	G		G		
		T		T	T

Mom

Locus #					
1	2	3	4	5	6
A			A		A
		C	C		C
G	G				
		T		T	

Kid #1

Locus #					
1	2	3	4	5	6
	A		A		A
		C			
				G	
T					

Kid #2

Locus #					
1	2	3	4	5	6
	A		A	A	A
C		C			
G	G		G		
		T		T	T

Kid #3

(a) What is the sex of each child and how can you tell?

(b) One of the kids was adopted. Which one and how can you tell?