

Recombination frequency practice problems

1. You are examining recombination between two linked genes, E and F. Each gene has two alleles:

For E, the two alleles are E1 and E2

For F, the two alleles are F5 and F6

A. You cross an individual homozygous for E1 and F5 to an individual homozygous for E2 and F6. Draw the phase of the F1 offspring from this cross.

B. A female from the F1 generation is crossed to a male homozygous for E2 and F5. Which of the following offspring are recombinant? (there may be multiple responses)

Hint: Ignore the contributions from the homozygous male in order to infer the recombination that happened in the female.

i. E1E2 F5F5

ii. E1E2 F5F6

iii. E2E2 F5F5

iv. E2E2 F5F6

2. In a plant, red petals are dominant over pink, and feathered leaves are dominant over simple. You cross an individual with red petals and feathered leaves that you know is heterozygous at both loci with a pink, simple individual. You observe the following in the progeny:

Red, Feathered 174

Red, Simple 165

Pink, Feathered 181

Pink, Simple 170

Can you say anything with confidence about whether these genes are on the same chromosome?

3. You cross a fly that is heterozygous for mutations at two genes with a fly that is a double-recessive at those genes. You observe the following genotypes in the progeny:

PpRr: 98

Pprr: 32

ppRr: 28

pprr: 105

- A. Draw the heterozygous parent's genotype in phase.

- B. Can you say anything with confidence about whether these genes are on the same chromosome?

- C. What is the distance between these genes in cM?

4. Working with fish, you cross a double-heterozygote with large fins and a bony tail (FfBb) with a double-recessive that has small fins and a regular tail (ffbb). In the offspring, you observe:

Large, Bony: 16

Large, Regular: 139

Small, Bony: 126

Small, Regular: 19

- A. Draw the heterozygous parent's genotype in phase.

- B. What is the distance between these genes in cM?

5. You're looking at a cross between a female with the genotype (A B C)//(a b c) and a male with the genotype (a b c)//(a b c). You get count the following genotypes in the progeny:

ABC // abc	233
AbC//abc	238
abc//abc	237
aBc//abc	228
aBC//abc	8
Abc//abc	20
ABc//abc	21
abC//abc	15

Which of the following can you say with certainty? (multiple responses may be correct)

- A. A and B are on the same chromosome
- B. A and B are NOT on the same chromosome
- C. B and C are on the same chromosome
- D. B and C are NOT on the same chromosome
- E. A and C are on the same chromosome
- F. A and C are NOT on the same chromosome
- G.

6. You perform a three-point cross between a triple-heterozygote and a triple-recessive. In the offspring, you observe the following genotypes:

hint: genes are not necessarily written in the order that they occur along the chromosome.

BbDdFf:	9
BbDdff:	27
BbddFf:	114
Bbddff:	333
bbDdFf:	349
bbDdff:	125
bbddFf:	32
bbddff:	11

- A. Draw the parental phases.
- B. Without calculating recombination frequencies, what is the order of the genes on the chromosome? *Hint: look for the double recombinants*
- C. Calculate the distance between each pair of genes in cM.

