Calculating gametes and their probabilities for two linked loci.
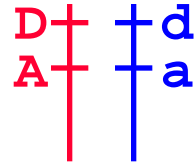
Step 1: Draw a picture of the chromosomes using the haplotype information. It is helpful to draw the chromosomes in different colors. For example, if the haplotype for a person is DA/da, then the chromosomes may be drawn as:

Step 2: Label the two rows of a Punnett square by the alleles at the top of the chromosome. (You can use the alleles toward the bottom and get the same result). In this example, the D locus is at the top so the row labels will be D and d. The beginning of the Punnett square is:

Gametes and their probabilities for two linked loci.			
Allele:	Probability:		
D			
d			

Step 3: Enter the probabilities for the two row alleles. Because the probability for this locus follows Mendel's law of segregation, the probabilities for each allele will be 1/2. The Punnett square now looks like this:

Gametes and their probabilities for two linked loci.			
Allele:	Probability:		
D	.5		
d	.5		

Step 4: Label the columns and the column probabilities in the following way:

Gametes and their probabilities for two linked loci.			
		Recombination?	
		No	Yes
Allele:	Probability:	(1 –)	
D	.5		
d	.5		

Step 5: Multiply the row probability by the column probability for each of the four cells. Forget about entering the genotypes—that will be done in the next step. The Punnett square now becomes.

Gametes and their probabilities for two linked loci.			
		Recombination?	
		No	Yes
Allele:	Probability:	(1 –)	
D	.5	.5(1 –)	.5
d	.5	.5(1 –)	.5

Step 6: Go back to the chromosomes drawn in Step 1 and enter the genotypes into the cells of the Punnett square. For example, if gamete contains allele D and there is no recombination, then the gamete will be DA. This genotype will be entered into the upper left cell of the Punnett square:

Gametes and their probabilities for two linked loci.			
		Recombination?	
		No	Yes
Allele:	Probability:	(1 –)	
D	.5	DA .5(1 –)	.5
d	.5	.5(1 –)	.5

Similarly, if the gamete contains allele D but there is a crossover between the D and the A locus, then the gamete will be Da. This will be the entry into the upper right-hand cell:

Gametes and their probabilities for two linked loci.					
		Recombination?			
		No		Yes	
Allele:	Probability:	(1 –)			
D	.5	DA	.5(1 –)	Da	.5
d	.5		.5(1 –)		.5

Performing the same operations for allele d gives the following Punnett square:

Gametes and their probabilities for two linked loci.					
		Recombination?			
		No		Yes	
Allele:	Probability:	(1 –)			
D	.5	DA	.5(1 –)	Da	.5
d	.5	da	.5(1 –)	dA	.5

Step 7: Enter substitute the numerical value for . For example, if   = .10, then the Punnett square will look like this:

Gametes and their probabilities for two linked loci.					
		Recombination?			
		No		Yes	
Allele:	Probability:	(1 – .1) = .9		.1	
D	.5	DA	.5(.9) = .45	Da	.5(.1) = .05
d	.5	da	.5(.9) = .45	dA	.5(.1) = .05

The resulting gametes and their probabilities are:

Gamete:	Probability:
DA	.45
Da	.05
da	.45
dA	.05