Name:_____

How to Solve a Dihybrid Cross

Step 1: Identify Parental Genotypes

Determine the genotype of the parental organisms for the two traits you're studying. For example, if you're examining seed color (Y for yellow, y for green) and seed shape (R for round, r for wrinkled) in pea plants, you might start with parents of genotypes YYRR (pure-breeding for yellow round seeds) and yyrr (pure-breeding for green wrinkled seeds).

Create a "key" for the possible phenotypes

YY = Yellow
Yy = Yellow
yy = green

RR = round
Rr = round
rr = wrinkled

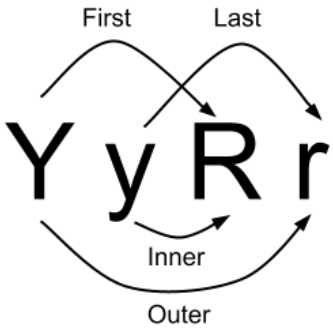
Step 2: Determine Possible Gametes

Identify the possible gametes each parent can produce through the process of Mendelian segregation. Each parent will produce haploid gametes containing one allele for each trait.

For the parents **YyRr and YyRr**:

- Parent 1 gametes: YR, Yr, yR, yr
- Parent 2 gametes: YR, Yr, yR, yr

Use the "FOIL" method to determine the gametes - first, outer, inner, last



Step 3: Set Up a Punnett Square

Construct a Punnett square to visualize the potential genotypes of offspring resulting from the cross between the parental organisms. Label the rows and columns with the possible gametes from each parent.

Name:_____

Step 4: Analyze Offspring Genotypes

Fill in the Punnett square by combining the gametes from each parent. This will give you the genotype combinations of the offspring. There are 16 possible combinations of genotypes.

	YR	Yr	yR	yr
YR	YYRR	YYRr	YyRR	YyRr
Yr	YYRr	YYrr	YyRr	Yyrr
yR	YyRR	YyRr	yyRR	yyRr
yr	YyRr	Yyrr	yyRr	yyrr

Step 5: Determine Phenotypes

Once you have the genotypes of the offspring, determine the phenotypes associated with each genotype based on the expression of the traits being studied. Refer to your "key" to help your determine the phenotypes. It may also be helpful to colorcode the squares to help you count.

	YR	Yr	yR	yr
YR	YYRR	YYRr	YyRR	YyRr
Yr	YYRr	YYrr	YyRr	Yyrr
yR	YyRR	YyRr	yyRR	yyRr
yr	YyRr	Yyrr	yyRr	yyrr

Step 6: Calculate Phenotypic and Genotypic Ratios

Count the number of each phenotype and genotype in the offspring to determine the phenotypic and genotypic ratios.

Yellow, Round = **9/16**
Yellow, Wrinkled= **3/16**
Green, Round = **3/16**
Green, Wrinkled = **1/6**

9:3:3:1

Name:_____

How to set up dihybrid crosses

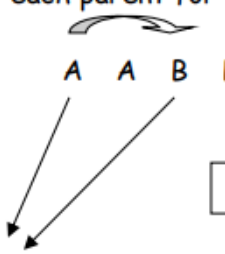
A) Figure out the genotypes of both traits for both parents.

B) Write out the parents' genotypes together ex. AABB X aabb

C) Use the F i r s t O u t s i d e I n s i d e L a s t method to set up the test cross

1) Draw the arrows for each parent for the FOIL method. An example is given below.

Parent 1 A A B B X Parent 2 a a b b



2) Set up the cross for both sides.

Parent 1

AB

Parent 2

3) Practice filling in the probable offspring below.

	AB	AB	AB	AB
ab	AaBb			
ab				
ab				
ab				

Name:_____

4) To figure the phenotypic ratio, count the number of individuals with either the dominant or recesssive phenotype for both traits! Then that ratio would be something like 4:4:4:4 or 9:3:3:1

PTC-taster- TT, Tt	Attached earlobes- EE, Ee	Can roll tongue- RR, Rr
Non-PTC taster – tt	Free earlobes – ee	Can't roll tongue - rr
Hitchhikers thumb- HH, Hh	Straight pinky- PP, Pp	
Straight thumb – hh	Bent pinky- pp	
Hair on mid-digit – MM, Mm	Widow's peak- WW, Ww	
No hair on mid-digit- mm	No widow's peak- ww	

Dihybrid Crosses. Set up the crosses using the rules and the letters from the other page.

5. If a woman who is a non-PTC taster (recessive) with heterozygous hitchhikers thumb has children with a man who is a heterozygous PTC taster with straight thumbs (recessive), what is the probability of them having each of the following types of children? (Fill in the Punnett Square and the blanks).

Parents' genotypes _____ X _____

a. How many PTC taster, Hitchhikers thumb _____

b. How many PTC taster, straight thumb _____

c. How many Non-PTC taster, Hitchhikers thumb _____

d. How many Non- PTC taster, straight thumb _____

e. What is the phenotypic ratio?_____

6.If a woman who has no hair on her mid-digit (recessive)and is homozygous attached earlobes (dominant) has children with a man who has hair on his mid-digit and has attached earlobes (heterozygous for both traits), what is the probability of them having each of the following types of children? (Fill in the Punnett Square and the blanks).

Parents' genotypes _____ X _____

a. How many hair, attached earlobes _____

b. How many hair, not attached earlobes _____

c. How many hairless, attached earlobes _____

d. How many hairless, not attached earlobes _____

e. What is the phenotypic ratio? _____

Name:_____

7. John Doe and Jane Doe want to have children and are thinking about how their childrens' hands might look. What would their children look like if they are both heterozygous for straight pinky and hitchhikers thumb? (Fill in the Punnett Square and the blanks).

Parents' genotypes _____ X _____

a.Straight pinky, hitchhikers thumb _____

b. Straight pinky, Straight thumbs _____

c. bent pinky, hitchhikers thumb _____

d. bent pinky, Straight thumbs _____

e. What is the phenotypic ratio? _____

8. Dohn Joe and Dane Joe want to have children and are thinking about how their childrens' hair line and tongues will turn out. They are both circus performers and want their children to follow in their footsteps. Their circus only accepts people with a Widow's Peak and who can roll their tongues. What would their children look like if Dohn is heterozygous for both Widow's peak and tongue rolling, and Dane is homozygous dominant for Widow's peak and heterozygous for tongue rolling? (Fill in the Punnett Square and the blanks).

Parents' genotypes _____ X _____

a.Widow's Peak, Tongue Roller _____

b. Widow's Peak, non tongue roller _____

c. Straight hairline, Tongue Roller _____

d. Straight hairline, non tongue roller _____

e. What is the phenotypic ratio? _____

f. What are the chances of their child being able to join the circus? _____

Name:_____

9. This problem will involve both a test cross and a Dihybrid Punnett Square Background information:

a. You are a pigeon breeder. In order to make the most money as a pigeon breeder, you must sell mainly checkered winged, red feather pigeons. Lucky for you checkered wings and red feathers are dominant in pigeons (plain wings and brown feathers are recessive). To breed as many checkered winged, red feather pigeons as possible, you need to breed homozygous checkered winged, red feather pigeons with each other (because all of the offspring would be checkered winged, red feather pigeons). You know you have a female homozygous checkered winged, red feathered pigeon (you bred her yourself!) She is so beautiful that she has won prizes in several pigeon beauty contests.

The Problem: You recently purchased a male pigeon that has checkered wings and red feathers from a shady pigeon dealer, who claimed it was homozygous. Before you breed this male with your prize winning female, you want to be sure that it is homozygous for both traits.

b.Describe how you will be able to tell what the genotype for both traits of your pigeon in 1 generation. (test cross here)

C. Illustrate the probable outcomes if your pigeon IS homozygous for both traits. (using a Punnett Square)