

## Genetics Worksheet

### Part 1 Introduction:

- Describe the genotypes given (use your notes). The first two are already done.
 

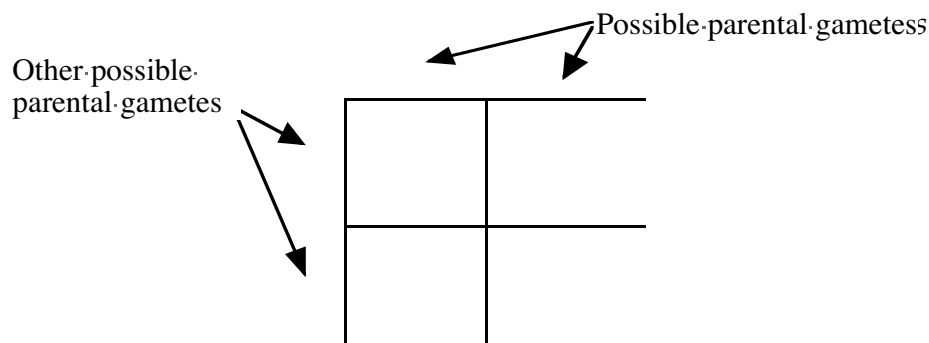
A. DD <u>homozygous, dominant</u>	D. ss _____
B. Dd <u>heterozygous</u>	E. Yy _____
C. dd _____	F. WW _____
  
- In humans, brown eye color (B), is dominant over blue eye color (b). What are the **phenotypes** of the following genotypes? In other words, what color eyes will they have?
 

A. BB _____
B. bb _____
C. Bb _____

### The Five (5) Steps Associated With Solving a Genetics Problem:

*If you take the time to follow the directions below, you will be able to solve most genetics problems.*

- Determine** the **genotypes** of the parents or whatever is given in problem.
- Set up your **Punnett square** as follows: \*# sq. based on possible gametes that can be formed.



- Fill in** the squares. This represents the possible combinations that could occur during fertilization.
- Write out** the possible **genotypic ratio** of the offspring.
- Using** the **genotypic** ratio determine the phenotypic ratio for the offspring.

### Part 2: Sample Problem (Just read this over, it is a practice problem)

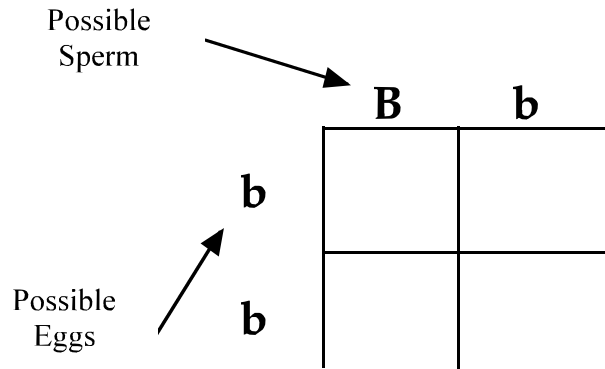
*A heterozygous male, black eyed mouse is crossed with a red eyed, female mouse. Predict the possible offspring!*

**Step 1: Determine the genotype of the parents.** The male parent is **heterozygous** which means he has one allele for black eyes and one allele for red eyes. Since his eyes are black, this means that black allele must be dominant over the red allele. So the male parents genotype is “**Bb**” (B = allele for black eye, b = allele for red eye).  
 The female parent has red eyes, there is only one way to have this recessive phenotype, so she must to be homozygous recessive. Homozygous recessive means that her genotype must be “**bb**”. Therefore, genotype of the parents is **Bb x bb**.

**Step 2:**

During meiosis (the formation of sex cells) one member (allele) of each gene pair separate. The male mouse (Bb) produces some sperm containing “B” (the allele for black eye) and some sperm containing “b” (the allele for red eyes).

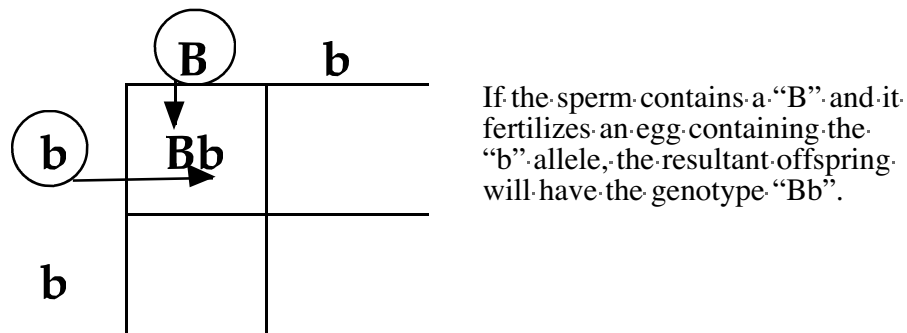
On one axis of the Punnett square you put the two possible gametes for the male.



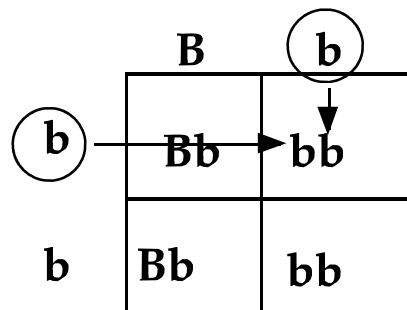
Repeat this for the other axis for the possible female gametes. Since she is “bb” you must put “b” and “b”.

**Step 3:**

During fertilization sperm meets the egg. The Punnett square show us the various **possibilities** during fertilization. The offspring must be one of these genotypes listed in the squares.



Repeating the process we can see all of the possible genotypes.



**Step 4:**

The genotypic ratio is determined by counting each possible genotype. You’ll note there are two “Bb” for every two “bb”. Therefore, we write the ratio as

$$\begin{array}{l} 2 : 2 \\ \mathbf{Bb : bb} \end{array}$$

Normally we reduce to the lowest terms:  $1 : 1$   
 $Bb : bb$

**Step 5:**

The Bb will produce a black eyed mouse (phenotype) and the bb will produce a red eyed mouse (phenotype). The phenotypic ratio is written as

$1 : 1$   
**black eye : red eye**

*Ratios tell you there is an **even chance** of having offspring with black eyes as there is for having offspring with red eyes. That would be the same as a 50% probability of having red eyes, or a 50% probability of having black eyes.*

**\*\*On the following pages are several problems. With each new problem, one sample is illustrated, make sure you look over the sample. In your spiral notebook you must copy the first problem from each section along with its solution. This means you should have a total of eight problems written out and solved: monohybrid cross, working backwards, test (back) cross, dihybrid cross, incomplete dominance, multiple alleles, sex-linked cross and pedigree analysis.**

**Part 3 Monohybrid Cross**

When we study the inheritance of a single gene it is called a monohybrid cross. **\*\*On the following pages are several problems.**

**1. A heterozygous, smooth pea pod, plant is crossed with a wrinkled pea pod plant. There are two alleles for pea pod, smooth and wrinkled. Predict the offspring from this cross.**

- a. What is the the genotype of the parents? \_\_\_\_\_
- b. Set up a Punnett square with possible gametes.


- c. Fill in the Punnett square for the resultant offspring.
- d. What is the predicted genotypic ratio for the offspring ? \_\_\_\_\_
- e. What is the predicted phenotypic ratio for the offspring ? \_\_\_\_\_
- f. If this cross produced 50 seeds how many would you predict to have a wrinkled pod?

**2. In humans, acondroplasia “dwarfism” (D) is dominant over normal (d). A homozygous dominant (DD) person dies before the age of one. A heterozygous (Dd) person is dwarfed. A homozygous recessive individual is normal. A heterozygous dwarf man marries a dwarf heterozygous woman.....**


- a. What is the probability of having a normal child? \_\_\_\_\_
- b. What is the probability that the next child will **also** be normal? \_\_\_\_\_
- b. What is the probability of having a child that is a dwarf? \_\_\_\_\_
- b. What is the probability of having a child that dies at one from this disorder? \_\_\_\_\_

**3. In humans, free earlobes (F) is dominant over attached earlobes (f). If one parent is homozygous dominant for free earlobes, while the other has attached earlobes can they produce any children with attached earlobes?**


**4. In humans widow's peak (W) is dominant over straight hairline (w). A heterozygous man for this trait marries a woman who is also heterozygous.**


- a. List possible genotypes of their offspring.
- a. List the phenotypic ratio for their children.

**Part 4: Working Backwards**

*Some times we only know about the offspring and we want to learn about the parents. If you have been paying attention, you should have started to notice a pattern. For example, when both*