Genotype and Phenotype Numbers Using One Trait

Punnett squares are used to determine the expected genotypes and genotypes of the offspring of a cross. When you examine the actual observed genotypes and phenotypes in a family, the expected and observed do not always agree. A larger number of offspring in a family usually results in a closer agreement.

In this investigation it is expected that you

a. substitute properly marked coins for gamete cells
b. toss the marked coins 100 times to present 100 offspring
c. determine the number of expected genotypes for 100 offspring and compare it with the number of observed genotypes obtained through coin tosses
d. determine the number of expected phenotypes for a genetic cross and compare it with the number of observed phenotypes obtained through coin tossing

Materials: The materials used in this experiment were:

1. 2 pennies
2. adhesive tape
3. pencil
4. scissors

Procedures: The procedures used in this experiment were:

Part A: Determining Numbers of Expected Genotypes

1. How many of each genotype combination are expected in the offspring of a cross if both parents are Rr for a trait? Use the Punnett square in Figure 1 to determine the genotypes. Record the number of each genotype in Column A of Table 1.

Figure 1

	R	r
R		
r		

2. How many of each genotype combination are expected if there are 100 offspring? Multiply each number in Column A by 25. Record this number in column B of Table 1.

Part B: Determining Numbers of Observed Genotypes

1. Cover both sides of 2 pennies with adhesive tape. Trim off any excess tape with scissors. Print and R on one side of *each* coin and an r on the other side of *each* coin.

2. Place one coin in each hand, shake, and then toss the coins onto your desk. Read and record the letter combination in column C (Toss Results) of Table 1. Make a slash (/) in the proper row of column C to indicate the letter combination.

3. Toss the coins a total of 100 times. Record the coin combinations for each toss in Table 1.

4. Record in column D the *totals* for each combination.

Part C: Determining Numbers of Expected Phenotypes

1. Assume that R represents the dominant gene for normal skin pigment. Assume that r represents a *recessive* condition called albinism [no skin pigment]. From the Punnett square [Figure 1] list in column A of Table 2 the number of offspring expected to have normal skin color and the number expected to be albinos.

2. Calculate the number expected to have each trait if there are 100 offspring. Do this by multiplying column A figures by 25. Record these numbers in column B of Table 2.

Part D: Determining Numbers of Observed Phenotypes

1. From column D of Table 1 total and record in column C of Table the number of offspring who will have normal skin pigment and those who will be albino.

Data:

Table 1: Expected and Observed Genotypes

Gene Combination	[A] Expected genotype for 4 offspring	[B] Expected genotype for 100 offspring	[C] Toss results	[D] Observed genotypes for 100 offspring
RR				
Rr or rR				
rr				

Table 2: Expected and Observed Phenotypes

Phenotype possible	[A] Expected phenotype for 4 offspring	[B] Expected phenotype for 100 offspring	[C] Observed phenotype possible for 100 offspring
Normal skin			
Albino			

Analysis:

1. What is meant by expected genotypes?

2. What is meant by observed genotypes?