Names_____

Penny Genetics
How Well Does a Punnett Square Predict the Actual Ratios?

In this lab you will make predictions using Punnett Squares, you will then use pennies (or chips) to simulate the crosses. Then compare the Actual Ratios with the Predicted Ratios.

The trait you are looking at is the gene that codes for a short big toe in humans.   **T** represents the dominant allele (short big toe), **t** is the recessive allele, long big toe. The following genotypes are possible. Fill in the phenotypes for them

Genotype	Phenotype (description)
T T	
T t	
t t	

Chart A

PREDICTED RATIO

Use a Punnet Square to predict the ratio of offspring in a cross where the parents are both **Tt**
 (The Square is set up for you below)

	T	t
T		
t		

What percentage of the offspring (out of 100) will be:

T T _____   Short Toe ____

T t _____

t t _____   Long Toe ____

*These are your **predicted ratios.**

ACTUAL RATIO

Now you will determine the actual ratios by using pennies (chips) to represent the crosses. You have two pennies. One side of the penny is the letter T, on the other side is the letter t. **This penny represents a parent that has the genotype T t**.   A second penny represents the other parent.   One partner is going to play the role of female, the other will play the role of male. When the coin is flipped, you are determining what sperm or what egg is being donated to the match. When you put the two flipped coins together, you are simulating fertilization.

Practice flips.   Flip the two pennies.   The results show you what your offspring will be.
        Did you get a TT, a Tt or a tt   _____

        What is the Phenotype of your offspring (tall or short?) _____

ACTUAL RATIO: To determine Actual Ratios, **you will flip your coins 100 times,** recording in the table below how often each combination came up.   (Use tally marks to record your data then summarize as a number)

Gene Combination	Tally Marks	Total
TT		
Tt		
tt		

Phenotypes	Total
Short toe (add Tt & Tt)	
Long toe (tt)	

These two charts show your ACTUAL Ratios.

Comparing Actual to Predicted Ratios

	Predicted Ratios (from chart A)	Actual Ratios (from chart B)
TT		
Tt		
tt		
Short Toe		
Long Toe		

Would you consider the actual and predicted ratios the   (circle)
        a. SAME   b. CLOSE TO THE SAME   c. NOT CLOSE AT ALL

Part II: What if the Parents are Tt x tt?

1. First make your predictions by setting up a Punnet square for the parents.
(This one is not set up for you) **Tt x tt**

How many are predicted to be:

Short Toe   _____   Long Toe   _____

**Replace one of your pennies (chips) with a t t penny.
Perform the flips with your new set of parents. Record data.

	Tally	Total
Tt		
tt		

What percentage are short toes?
What percentage are long toes?

Compare the **Predicted Ratios** of the cross to the **Actual Ratios**.

	Predicted (from square)	Actual (from flips)
Short toe		
Long toe		

Analysis

1. Use a Punnet Square to predict the phenotypic ratios in this cross: **T T   x   T t**

Short toe _____

Long toe _____

2. Would you expect the coin toss method to give a similar ratio as the punnett square above?

3. What do the pennies or chips represent in the simulation?

4. When you toss the coin to see which side lands up, you are actually simulating what part of the process of sexual reproduction?

5. When you put the two coins that are flipped together, you are simulating what part of the process of sexual reproduction?