###### :::penny.jpg:::penny.jpgName\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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***Penny Genetics***

**How Well Does a Punnet Square Predict the Actual Ratios?**

In this lab you will make predictions using Punnet Squares. You will then use pennies to simulate the crosses and 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 |
| **T T** |  |
| **T t** |  |
| **t t** |  |

### Part I: 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 |  | 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.** |
| **t** |  |  |

**Part 2: ACTUAL RATIO**

Now you will determine the actual ratios by using pennies to represent the crosses. You have two pennies. On 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 big toe?) \_\_\_\_\_\_\_\_

**Procedure:**

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** |  |  |

These two charts show your ACTUAL Ratios.

|  |  |
| --- | --- |
| **Phenotypes** | Total |
| **Short toe**  **(add all Tt & Tt)** |  |
| **Long toe (tt)** |  |



##### **Part 3: Comparing Actual to Predicted Ratios**

Compare your Predicted Ratios (from a Punnet square) to your Actual Ratios (from the coin toss)

|  |  |  |
| --- | --- | --- |
|  | **Predicted Ratios (from square)** | **Actual Ratios (from flips)** |
| **TT** |  |  |
| **Tt** |  |  |
| **tt** |  |  |
| **Short Toe** |  |  |
| **Long Toe** |  |  |

**Would you consider the actual and predicted ratios the (circle one)**

SAME CLOSE TO THE SAME NOT CLOSE AT ALL

**Part IV: 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**

Please draw it in the space below:

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 on the next page in the chart.**

What percentage are short toes?

What percentage are long toes?

|  |  |  |
| --- | --- | --- |
|  | **Tally** | **Total** |
| **Tt** |  |  |
| **tt** |  |  |

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 punnet square above? Why or why not?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. What do the pennies represent in the simulation?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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