Laws of Probability: Coin Toss Lab

Modified from http://sites.eastnoble.net/science/bio1/activities/Coin%20Toss%20Lab%20-%20Laws%20of%20Probability1.doc

**I. Deviation and Chance**

How to compute % deviation: % deviation= Sum of differences from expected X 100

 Total occurrences

# Example: A coin is tossed 10 times producing 7 heads and 3 tails. The deviation is computed as follows

 Observed Expected Difference from expected

## Heads 7 5 2

Total 10 10 2

Occurrences

Deviation 2 = .2 X 100 = 20%

 10

### Chart 1: Tossing One Coin

 **Complete the following chart:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number**  |  | **Heads** |   | **% Deviation** |
| **of tosses** | Expected | Observed | Difference |   |
| **10** |  |   |   |   |
| **50** |  |   |   |   |
| **Class 10** |   |   |   |   |
| **Class 50** |  |  |  |  |

#### II. Independent Events Occurring Simultaneously

How does chance operate with two independent events occurring simultaneously, such as two coins being flipped at once? Will the chance of flipping two heads at once be greater or less than ½ (50-50)?

1. Complete the EXPECTED results of Chart 2.
The expected results can be generalized in the following manner
	1. The probability of two independent events occurring at the same time is the product of their individual probabilities.
2. **Flip two coins 40 times**, recording the results under OBSERVED in the table below. Write your results on the board. ALSO record class results, once they have been totaled.

#### Chart 2: Tossing Two Coins

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Tosses** | **Individual** | **Results** | **% Deviation** | **Class** | **Results** |   |
|  | Observed | Expected |  | Observed | Expected | % Deviation |
| **Heads-Heads** |   |   |  |   |  |   |
| **Heads-Tails** |   |   |  |   |  |   |
| **Tails-Tails** |   |   |  |   |  |   |
| **Total Tosses** |   |   |  |   |  |   |

**Probability and Genetics**:

1. *Fill out the Punnett squares below to see the similarity between the results of the coin flips and the results of the monohybrid cross. What fraction of the offspring should receive the alleles aa?*

|  |  |  |
| --- | --- | --- |
|  | *1/2 A* | *1/2 a* |
| *1/2 A* |  |  |
| *1/2 a* |  |  |

|  |  |  |
| --- | --- | --- |
|  | *Heads (H)* | *Tails (T)* |
| *Heads (H)* |  |  |
| *Tails (T)* |  |  |

1. *It there is only one offspring, what are its chances of receiving the alleles Aa?*
2. *Which comes closer to the expected- the class or the individual results?*
3. *If the probability of flipping a head or tail on a coin is ½, why did approximately ½, rather than ¼, of the tosses result in a heads-tails combination?*

#### *Analysis*

*1. Do the Punnett squares in genetics problems tell you what must happen or what might happen? Explain*

*2. Why was it important to calculate the class data in a coin toss experiment?*

*3. Would a small deviation in an experiment mean that something was wrong with the experiment? Explain.*

*4. If three coins are flipped simultaneously, what is the probability that all three will be heads? Show your work.*

*5. A man and a woman have five children, all girls. Is it correct to assume that, if they have another child, probability would favors it being a boy? Explain.*

*6. A penny tossed 120 times results in 62 heads and 58 tails. In the space below, calculate the expected number of heads and tails and determine the percent deviation.*