Names ________________________________ Block ______ Date ________________

Mendelian Genetics Lab Simulation

BACKGROUND

The rock pocket mouse is a small rodent found in the southwestern United States. Rock pocket mice that live in areas with a light-colored ground usually have light fur color. Most rock pocket mice that live in areas covered by dark-colored rocks, however, are dark.

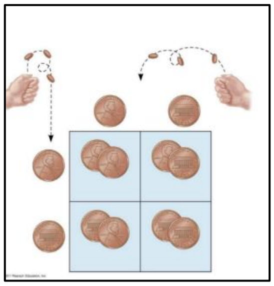
Purpose

- Use coins to simulate random allele segregation and random fertilization of sexually reproducing rock pocket mice with respect to a particular phenotype: fur color.
    - Dark fur color (D) is dominant to light fur color (d) in this species of mice, so:
        - "DD" and "Dd" produce ______________________ fur ________
        - "dd" produces ______________________ fur ________
- Key questions:
    - How do random events affect patterns of heredity?
    - Are these patterns predictable, even though they produced by random events?
    - How does probability relate to the results of a Punnett Square?

Procedure

1. Use 2 pennies.
    - Each penny represents ________________________________
    - Each side of a penny represents ________________________________
    - Heads = ____________________ = ____________________
    - Tails = ____________________ = ____________________
    - Each penny has a head and a tail, so each parent is ________________________________
2. Flip each penny to simulate ________________________________
    - What are the chances a parent passes on the dark (D) allele? ____________________
    - What are the chances a parent passes on the light (d) allele? ____________________
3. Predict the expected offspring from a crossing of these two pennies (parents) using a Punnett Square (**complete at right**).

4. Record the expected percentages of each genotype in the offspring in the "Expected Probability" column of **Data Table 1** based on your Punnett Square.
5. Toss both coins together to simulate gamete formation (meiosis) and fertilization.
    - The offspring's genotype is the combination of the 2 sides that land facing up (e.g. if you get 2 tails facing up, the genotype would be "dd.")



6. Tally the genotype results in **Data Table 1** in the "Observed Tally" column. Toss the coins together 25 times (for a total of 25 offspring)
7. Determine the observed percentage of each genotype and record under "actual probability" column in **Data Table 1**.
    - Actual Probability = Observed Tally ÷ Total x 100 (e.g. 12/25 * 100 = 48%)

DATA TABLE 1

Offspring Genotype (heads/ tails combination)	Expected Probability (%)	Observed Tally	Actual Probability (%)
DD (Heads-Heads)			
Dd (Heads-Tails)			
dd (Tails-Tails)			

Check Yourself: Do the percentages in a single column add up to 100%? Do the tally boxes add up to 25?

ANALYSIS QUESTIONS

1. How well did the Punnett Square predict the actual results of "breeding" two heterozygous mice? Describe any differences you saw between the expected (Punnett Square) and actual results.

2. Explain why differences exist (or could exist) between the actual results and the results predicted by the Punnett Square. (Hint: Punnett Squares tell us the chances of certain breeding outcomes.)

3. If you repeated this simulation, would you get exactly the same actual results again? Why or why not?

4. The phenotype of a parent is controlled by 2 alleles (its genotype), but a parent only passes 1 allele to offspring (the other allele comes from the other parent). Explain why we tossed a coin to simulate allele segregation (gamete formation) and fertilization?

5. If this pair of mice had a 26th baby, what are the chances that it would have the "Dd" genotype? Should the genotypes of the first 25 babies matter to your prediction?

6. How would you expect your results to change if one of the pennies had "heads" on both sides (so a "DD" genotype)? Explain your answer, and include a new Punnett below.
