Mendelian Genetics Coin Toss Lab

PRE-LAB DISCUSSION:
In heredity, we are concerned with the occurrence, every time an egg is fertilized, of the probability that a particular gene or chromosome will be passed on through the egg, or through the sperm, to the offspring. As you know, genes and chromosomes are present in pairs in each individual, and segregate as they go into the gametes (egg and sperm). There are two possible genes that the egg or sperm might obtain from each pair, but it actually receives only one of them. If the probability of getting either one is equal, this probability can be expressed as 1/2, like the probability of getting heads or tails when you flip a penny. But one cannot examine the genes in a sperm or egg. One must wait until fertilization has occurred and a new individual has been produced, and some characteristic controlled by the genes has had time to develop. Thus, we are faced with the probability that it will go into the sperm, together with the probability that these will combine at fertilization. The following model will help you to see this.
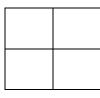
PURPOSE:
- What is probability?
- What does random mean and how does it apply to genetics?
- How does probability relate to the Punnett Square and the offspring that are shown?

PART A:
PROCEDURE:
1. Use 2 pennies. One penny represents a pair of genes in a parent. The other penny represents the same pair of genes on the other parent.
   P= head = dominant gene (purple)
   p = tail = recessive gene (white)
2. Both parents are heterozygous (Pp)
   1. Pp= the pair of genes in one parent
   2. Pp= the other pair of genes in other parent.
3. Record the resulting offspring from a Punnett Square under the expected probability on your data chart.
4. Toss the coins together. They can only turn up-PP, Pp, pp
5. Remember: each coin represents each parent and each toss can only turn up one way, therefore, a parent can give only one gene of a pair.
6. Toss the coins 50 times and record under "tally" on the data chart.
7. Determine the percentage and record under experimental probability on your data chart.
8. Record the results on your data chart.

Punnett Square

Data Table

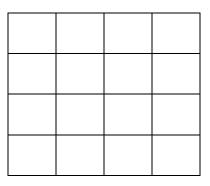|	**Expected Probability**	**Tally**	**Actual Probability**
(HH) PP			
(HT) Pp			
(TT) pp			

QUESTIONS FOR DISCUSSION:
1. How close did your actual results come to your expected results? What caused the difference?
2. What fraction of actual PP, Pp, pp did you record? How close is it to the ration Mendel predicted?

PART B:
PROCEDURE:
1. Use 2 pennies, 2 nickels
2. 1 penny and 1 nickel represent 2 pair of genes in a parent. The other penny and nickel represent the same pair of genes in the other parent.
3. Y = head on the penny (yellow), y = tail on the penny (white)
   R = head on the nickel (rough), r = tail on the nickel (smooth)
4. Both parents are heterozygous for both traits.
   YyRr x YyRr
5. Record the resulting offspring from a Punnett square under the expected probability on your data chart.
6. Toss all four coins (at the same time) 50 times and record results on your data chart.
7. Determine the percentage and record under experimental probability on your data chart.

DATA:
1. Use a Punnett square to determine the expected probability.
2. Use the data table to tally your coin tosses.

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DATA TABLE:

	Penny	Nickel	Tally	Experimental	Expected
1st Dominant and 2nd Dominant	HH (YY) HH(YY) HT(Yy) HT(Yy)	HH(RR) HT(Rr) HH(RR) HT(Rr)			
1st Dominant and 2nd Recessive	HH(YY) HT(Yy)	TT(rr) TT(rr)			
1st Recessive and 2nd Dominant	TT(yy) TT(yy)	HH(RR) HT(Rr)			
1st Recessive and 2nd Recessive	TT(yy)	TT(rr)			

QUESTIONS FOR DISCUSSION:
1. How close did your actual results come to your expected results?
2. What fraction of actual phenotypes did you record, i.e. how many yellow and rough, white and smooth, etc? How close is it to the expected ration Mendel predicted?

CONCLUSION: Answer the three purpose questions.