

Genetics: The Science of Heredity ▪ *Skills Lab*

Make the Right Call!

Problem

How can you predict the possible results of genetic crosses?

Skills Focus

making models, interpreting data

Materials

2 small paper bags

marking pen

3 blue marbles

3 white marbles

Procedure

1. Label one bag "Bag 1, Female Parent." Label the other bag "Bag 2, Male Parent." Then read over Part 1, Part 2, and Part 3 of this lab. Write a prediction on another sheet of paper about the kinds of offspring you expect from each cross.

PART 1 Crossing Two Homozygous Parents

2. Place two blue marbles in Bag 1. This pair of marbles represents the female parent's alleles. Use the letter *B* to represent the dominant allele for blue color.
3. Place two white marbles in Bag 2. Use the letter *b* to represent the recessive allele for white color.
4. For Trial 1, remove one marble from Bag 1 without looking in the bag. Record the result in your data table. Return the marble to the bag. Again, without looking in the bag, remove one marble from Bag 2. Record the result in your data table. Return the marble to the bag.
5. In the column labeled Offspring's Alleles, write *BB* if you removed two blue marbles, *bb* if you removed two white marbles, or *Bb* if you removed one blue marble and one white marble.
6. Repeat Steps 4 and 5 nine more times.

PART 2 Crossing Homozygous and Heterozygous Parents

7. Place two blue marbles in Bag 1. Place one white marble and one blue marble in Bag 2.
8. Repeat Steps 4 and 5 ten times, and record your data in the data table for Part 2.

PART 3 Crossing Two Heterozygous Parents

9. Place one blue marble and one white marble in Bag 1. Place one blue marble and one white marble in Bag 2.
10. Repeat Steps 4 and 5 ten times, and record your data in the data table for Part 3.

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Data Table: Part 1

| <i>Trial</i> | <i>Allele From Bag 1 (Female Parent)</i> | <i>Allele From Bag 2 (Male Parent)</i> | <i>Offspring's Alleles</i> |
|--------------|--|--|----------------------------|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |
| 7 | | | |
| 8 | | | |
| 9 | | | |
| 10 | | | |

Data Table: Part 2

| <i>Trial</i> | <i>Allele From Bag 1 (Female Parent)</i> | <i>Allele From Bag 2 (Male Parent)</i> | <i>Offspring's Alleles</i> |
|--------------|--|--|----------------------------|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |
| 7 | | | |
| 8 | | | |
| 9 | | | |
| 10 | | | |

Data Table: Part 3

| <i>Trial</i> | <i>Allele From Bag 1 (Female Parent)</i> | <i>Allele From Bag 2 (Male Parent)</i> | <i>Offspring's Alleles</i> |
|--------------|--|--|----------------------------|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |
| 7 | | | |
| 8 | | | |
| 9 | | | |
| 10 | | | |

Genetics: The Science of Heredity ▪ *Skills Lab***Make the Right Call!** *(continued)***Analyze and Conclude**

Write your answers on a separate sheet of paper.

- 1. Making Models** Make a Punnett square for each of the crosses you modeled in Part 1, Part 2, and Part 3.
- 2. Interpreting Data** According to your results in Part 1, how many different kinds of offspring are possible when the homozygous parents (BB and bb) are crossed? Do the results you obtained using the marble model agree with the results shown by a Punnett square?
- 3. Predicting** According to your results in Part 2, what percentage of offspring are likely to be homozygous when a homozygous parent (BB) and a heterozygous parent (Bb) are crossed? What percentage of offspring are likely to be heterozygous (Bb)? Does the model agree with the results shown by a Punnett square?
- 4. Communicating** According to your results in Part 3, what different kinds of offspring are possible when two heterozygous parents ($Bb \times Bb$) are crossed? What percentages of each type of offspring are likely to be produced? Does the model agree with the results of a Punnett square?
- 5. Inferring** For Part 3, if you did 100 trials instead of 10 trials, would your results be closer to the results shown in a Punnett square? Explain.
- 6. Communicating** In a paragraph, explain how the marble model compares with a Punnett square. How are the two methods alike? How are they different?

More to Explore

In peas, the allele for yellow seeds (Y) is dominant over the allele for green seeds (y). What possible crosses do you think could produce a heterozygous plant with yellow seeds (Yy)? Use the marble model and Punnett squares to test your predictions.