

## WHAT ARE THE CHANCES?

### Performance Standard 10C.H

Understand the difference between the outcome of the experiment, and the outcome that they expected:

- *Mathematical knowledge*: analyze outcome of probability experiment and compare theoretic and empirical results.
- *Strategic knowledge*: solve problem using systematic process.
- *Explanation*: explain completely what was done and why it was done.

### Procedures

1. ***In order to determine, describe and apply probabilities of events (10C)***, provide students with sufficient learning opportunities to develop the following:
  - Discuss the difference in empirical and theoretical probability.An understanding of genetics and their impact on reproduction are skills often encountered in veterinary related occupations as well as other health fields. The ability to use analytical skills to solve problems in the health care setting as outlined by the National Health Care Standards is important.
2. Provide students with the “What Are the Chances?” task worksheet. Have students work individually.

Brooke works as an assistant in a veterinarian’s office over the summer. One of her jobs is to care for the animals boarding at the office. While cleaning the dog cages, she notices that the Collie in Kennel #3 is blind. Upon questioning the veterinarian, she learns that the dog has Collie Eye Anomaly. This blindness occurs when trying to breed a Collie with desired purebred features. The anomaly is inherited as a simple autosomal recessive trait. Brooke has been thinking about purchasing a Collie for breeding purposes. She wants to know what her chances are of buying a desirable dog (Collie without the recessive trait for Collie Eye Anomaly). How would you show and explain to Brooke the theoretical probabilities of having a desirable dog versus the empirical probabilities of purchasing a desirable dog?
3. Use the standard scoring rubric. Give each student a score in each of the three categories. A score of 4 should indicate complete description of the differences in empirical and experimental probability using correct terminology. A 3 should represent nearly complete discussion that demonstrates the correct ideas, but they may not have communicated them clearly. A 2 should indicate that students have some idea about how to answer the question but miss important points that affect their answers. A 1 generally shows little understanding in their discussion but at least shows some understanding of probability. A score of 0 generally reflects no understanding of probability.
4. Computation is not really a component of this task.
5. Solution should demonstrate clear understanding of theoretical and empirical probability results. Students will use Punnett squares to clarify their explanation.

### Examples of Student Work

- [Meets](#)
- [Exceeds](#)

### Time Requirements

- One class period

### Resources

- Copies of the “What Are the Chances?” task sheet
- Writing utensil
- Mathematics Rubric

NAME \_\_\_\_\_ DATE \_\_\_\_\_

### **WHAT ARE THE CHANCES?**

#### Student Task Sheet

Brooke works as an assistant in a veterinarian's office over the summer. One of her jobs is to care for the animals boarding at the office. While cleaning the dog cages, she notices that the Collie in Kennel #3 is blind. Upon questioning the veterinarian, she learns that the dog has Collie Eye Anomaly. This blindness occurs when trying to breed a Collie with desired purebred features. The anomaly is inherited as a simple autosomal recessive trait. Brooke has been thinking about purchasing a Collie for breeding purposes. She wants to know what her chances are of buying a desirable dog (Collie without the recessive trait for Collie Eye Anomaly).

How would you show and explain to Brooke the theoretical probabilities of having a desirable dog versus the empirical probabilities of purchasing a desirable dog?

## MATHEMATICS RUBRIC

NAME \_\_\_\_\_ DATE \_\_\_\_\_

- Exceeds standard (must receive a 4 in each area)
- Meets standard (must receive all 3's or a combination of 3's and 4's)
- Approaches standard (must receive all 2's or any combination which may include a 3 or a 4)
- Begins standard (has no 3's or 4's but not all 1's)
- Absent (has all 1's and 0's)

|              | <b>Mathematical Knowledge</b>  | <b>Strategic Knowledge</b>   | <b>Explanation</b>   |
|--------------|--|--|--|
| <b>4</b>     | <ul style="list-style-type: none"> <li>• Wrote the right answer.</li> <li>• Used math words correctly to show understanding of how math works.</li> <li>• Worked it out with no mistakes.</li> <li>• Used the right math words and labeled the answers.</li> </ul> | <ul style="list-style-type: none"> <li>• Identified all the important parts of the problem, and knew how they went together.</li> <li>• Showed all the steps used to solve the problem.</li> </ul> | <ul style="list-style-type: none"> <li>• Wrote what was done and why it was done.</li> <li>• If a drawing was used, all of it was explained in writing.</li> </ul>   |
| <b>3</b>     | <ul style="list-style-type: none"> <li>• Knew how to do the problem, but made small mistakes.</li> </ul>   | <ul style="list-style-type: none"> <li>• Identified most of the important parts of the problem.</li> <li>• Showed most of the steps used to solve the problem.</li> </ul>                          | <ul style="list-style-type: none"> <li>• Wrote mostly about what was done.</li> <li>• Wrote a little about why it was done.</li> <li>• If a drawing was used most of it was explained in writing.</li> </ul> |
| <b>2</b>     | <ul style="list-style-type: none"> <li>• Understood a little, but made a lot of big mistakes.</li> </ul>   | <ul style="list-style-type: none"> <li>• Identified some of the important parts of the problem.</li> <li>• Showed some of the steps used to solve the problem.</li> </ul>                          | <ul style="list-style-type: none"> <li>• Wrote some about what was done or why it was done but not both.</li> <li>• If a drawing was used, some of it was explained in writing.</li> </ul>                   |
| <b>1</b>     | <ul style="list-style-type: none"> <li>• Tried to do the problem, but didn't understand it.</li> </ul>   | <ul style="list-style-type: none"> <li>• Identified almost no important parts of the problem.</li> <li>• Showed almost none of the steps used to solve the problem.</li> </ul>                     | <ul style="list-style-type: none"> <li>• Wrote or drew something that didn't go with the answer.</li> <li>• Wrote an answer that was not clear.</li> </ul>   |
| <b>0</b>     | <ul style="list-style-type: none"> <li>• No answer attempted.</li> </ul>   | <ul style="list-style-type: none"> <li>• No strategy shown.</li> </ul>   | <ul style="list-style-type: none"> <li>• No written explanation.</li> </ul>  |
| <b>Score</b> |  |  |  |