Algebra/Geometry Institute Summer 2006
Faculty Name: Archie Mitchell
School: Walter C. Robinson Achievement Center (Cleveland, Ms)
Grade Level: 8th Grade

What's the Deal with Probability?

1) **Teaching objective(s)**
   A) The student(s) will calculate and apply basic probability.
   B) The Student(s) will calculate different ways to express probability numerically: as a rate, decimal, and a percent.

2) Instructional Activities
   A) Begin the lesson by asking students to define probability (the likelihood or chance that a given event will occur). Probability is usually expressed as a ratio of the number of likely outcomes compared with the total number of outcomes possible. Ask students if they can give an example of probability
   B) To help students understand probability, work on the following problem as a class: Imagine that you have boarded an airplane. The rows are numbered from 1 to 30, and there are six seats per row, three on each side of the isle. Seats in each row are labeled A through F. Using that information, work together as a class to solve the problems listed below.

- **How many seats are in the airplane?** *180 seats*
- **What are your chances of sitting in row number 7?** *6/180, or 1/30*
- **What are your chances of sitting in a window seat?** *There are two window seats per aisle, for a total of 60 window seats. Your chances of seating at a window would be 60/180, or 1/3.*
- **What are your chances of sitting in an "A" seat?** *There are 30 A seats, so your chances are 30/180, or 1/6.*
- **What are your chances of sitting in an even-numbered row?** *Of the 30 rows, 15 are even-numbered, so your chances are 15/30, or 1/2.*
- **What are your chances of sitting in a seat that is not a widow seat or a aisle seat?** *There are two window seats and two aisle seat and 30 rows, so there total is 60 + 60 = 120. The answer is 180 – 120 = 60; therefore, it is 60/180 or 1/3*
- **What are your chances of seating a seat mark A, B, C, or D?** *There are 30 of each seat, which equals to 120. Therefore your answer would be 120/180 or 2/3*
- **What are your chances of seat in a seat on row 15?** *6 seat on row 15; therefore the answer is 6/180 or 1/30*

   C) To figure out each problem, students must set up a ratio between the total number of outcomes—in these problems either the total number of seats or rows—and the specific question asked. Tell students that they will write their answer as a fraction, decimal, and percentage. Example: The chance of sitting in seat 7A is 1/180, .00555, or .555 percent. The ratio presented

as a percentage helps make it clear if the probability of an event is great or small.

D) Distribute the Classroom Activity Sheet and tell students that they are going to work on several probability problems in class, expressing the answer as a fraction, decimal, and percentage. Students may work individually or with partners. The problems and the answers are listed below.

- Your sock drawer is a mess. Twelve black socks and six red socks are mixed together. What are the chances that, without looking, you pick out a red sock? What are the chances of picking a black sock? *The total is 18 socks, and one-third of them are red (6/18, or 1/3, or .333, or 33.3 percent). The probability of picking a red sock is 1/3, or 33.3 percent. Because two-thirds of the socks are black (12/18, or 2/3, or—rounding up—66.7 percent), the probability of picking a black one is higher—2/3, or 66.7 percent, compared with 1/3, or 33.3 percent.*
- You are rolling a regular die. What is the probability of rolling a 3? *Of the total of six outcomes, 3 is one outcome. The probability is the ratio 1/6, .1666, or 16.66 percent.*
- If you are rolling a regular die, what is the probability of rolling an even number? *Of the six possible outcomes, half, or three outcomes, are an even number. The probability is 3/6, 1/2, .5, or 50 percent.*
- You are randomly choosing a card from a deck of 52 cards. What is the probability that the card you pick will be a king? *Of the 52 possible outcomes, four outcomes are kings. The probability is 4/52, 1/13, .076, or 7.6 percent.*
- You are visiting a kennel that has three German shepherds, four Labrador retrievers, two Chihuahuas, three poodles, and five West Highland terriers. When you arrive, the dogs are taking a walk. What is the probability of seeing a German shepherd first? *Out of a total of 17 dogs, 3 are German shepherds. The probability of seeing a German shepherd is 3/17, .176, or 17.6 percent.*
- Two out of three students in Mr. Allen's class prefer buying lunch to bringing it. Twenty students prefer buying lunch. How many students are in Mr. Allen's class? *Students can set up the following problem: 20/30, or 2/3, of the total number of students (X) buy lunch (20). To express that mathematically, 2/3 (X) = 20. Solve for X, which equals 30, so there are 30 students in Mr. Allen's class.*
- **Materials and resources**
  - Copies of Classroom Activity sheet: Probability Problem Solving (These sheet will be graded)
  - Numbered Dice
  - Decks of Cards (Used to demonstrate probability problem)
  - http://school.discovery.com/lessonplans/programs/probability/

- **Assessment**
  - Teacher Observation
    The teacher will use an assessment rubric which total three points assess the performance of the students.

- **Three points:** demonstrates a strong understanding of probability based on their participation in class, their ability to complete the Classroom Activity Sheet, and their ability to complete the Take-Home Activity Sheet.
- **Two points:** demonstrates a moderate understanding of probability based on their participation in class, their ability to complete the Classroom Activity Sheet, and their ability to complete the Take-Home Activity Sheet.
- **One point:** demonstrates a weak understanding of probability based on their participation in class, their ability to complete the Classroom Activity Sheet, and their ability to complete the Take-Home Activity.

Name _____ Date _____

Find the probability. Write your answer as a decimal rounded to the nearest hundredth.

1. A jar contains 13 purple and 11 violet marbles. A marble is drawn at random. P(purple).	2. A jar contains 13 pink, 9 blue, and 16 navy marbles. A marble is drawn at random. P(blue or navy).
3. You roll a number cube numbered from 1 to 6. P(not a 2).	4. You roll a number cube numbered from 1 to 6. P(a number greater than 4).
5. You roll a number cube numbered from 1 to 6. P(a composite number).	6. A number from 20 to 26 is drawn at random. P(23, 22, 21, or 24).
7. A number from 13 to 19 is drawn at random. P(a number greater than 19).	8. A jar contains 14 black, 7 gray, and 16 green marbles. A marble is drawn at random. P(not black).
9. A number from 9 to 21 is drawn at random. P(14).	10. A jar contains 21 navy, 12 blue, 8 pink, and 5 green marbles. A marble is drawn at random. P(pink or green).
11. A number from 21 to 29 is drawn at random. P(not a 21).	12. You roll a number cube numbered from 1 to 6. P(a number divisible by 2).
13. A jar contains 21 black, 7 white, and 20 blue marbles. A marble is drawn at random. P(blue).	14. A jar contains 11 navy and 8 violet marbles. A marble is drawn at random. P(not navy).
15. You roll a number cube numbered from 1 to 6. P(an even number).	16. You roll a number cube numbered from 1 to 6. P(a prime number).
17. A jar contains 8 gray, 19 yellow, 15 white, and 11 pink marbles. A marble is drawn at random. P(yellow).	18. A number from 13 to 20 is drawn at random. P(an even number).

Name: _____ Date: _____

Activity Sheet

1. Your sock drawer is a mess. Twelve black socks and six red socks are mixed together. What are the chances that, without looking, you pick out a red sock? What are the chances of picking a black sock?

2. You are rolling a regular die. What is the probability of rolling a 3?

3. If you are rolling a regular die, what is the probability of rolling an even number?

4. You are randomly choosing a card from a deck of 52 cards. What is the probability that the card you pick will be a king?

5. You are visiting a kennel that has three German shepherds, four Labrador retrievers, two Chihuahuas, three poodles, and five West Highland terriers. When you arrive, the dogs are taking a walk. What is the probability of seeing a German shepherd first?

6. Two out of three students in Mr. Allen's class prefer buying lunch to bringing it. Twenty students prefer buying lunch. How many students are in Mr. Allen's class?