Name _____   Date _____

TWO-STAGE EXPERIMENTS: Match

In this game for two players, tiles or cubes of two different colors are placed in a bag. Before playing, one player is selected to be Match and the other is Not Match.

Each player reaches into the bag and draws out one tile. If the two players' tiles match in color, Match scores a point. If they are different colors, Not Match scores a point. The tiles are then returned to the bag for the next turn. The player with the most points after 12 turns wins.

Match should be played often with different combinations of tiles. Begin with 2 tiles of 2 colors (e.g., 2 red and 2 yellow). Then try other combinations of two colors, but use no more than 6 total chips.

Directions: As you play each game, keep score below.

Combination of tiles (e.g., 2 red and 2 yellow): _____

Match: _____

Not Match: _____

Combination of tiles (e.g., 2 red and 2 yellow): _____

Match: _____

Not Match: _____

Combination of tiles (e.g., 2 red and 2 yellow): _____

Match: _____

Not Match: _____

Combination of tiles (e.g., 2 red and 2 yellow): _____

Match: _____

Not Match: _____

Combination of tiles (e.g., 2 red and 2 yellow): _____

Match: _____

Not Match: _____

Adapted from *Teaching Student-Centered Mathematics: Grades 3-5* (p. 348)

Directions: After you have had several chances to play, answer the following questions.

1. Overall is this game fair? Does each player have the same chance of winning? Why or why not?

_____

_____

_____

_____

_____

2. Select the tile combination from one of your games, and use the space below to determine its sample space (all possible outcomes). Then, answer whether or not the game was fair. Explain why or why not.

_____

_____

_____

_____

Adapted from *Teaching Student-Centered Mathematics: Grades 3-5* (p. 348)

THEORETICAL PROBABILITIES: Word Problems

1. A bag contains 10 tiles: 1 red, 2 yellow, 3 green, and 4 blue. The experiment involves drawing a single tile and rolling a standard number cube. What is the probability of drawing a yellow tile and rolling a number greater than 2? Do your work on a separate piece of paper. Below, provide your answer and explain your strategy for finding it.

_____

_____

_____

_____

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_____

2. You are a prisoner in a faraway land. The king has decided to give you a chance to escape. He shows you the featured maze. At the start of each fork in the path, you must spin the spinner and follow the path that it point to. You may request that the key to freedom be placed in one of the two rooms. In which room should you place the key in order to have the better chance of freedom? Do your work on a separate piece of paper. Below, provide your answer and explain your strategy for finding it.

_____

_____

_____

_____

_____

_____

_____

Adapted from *Teaching Student-Centered Mathematics: Grades 3-5* (p. 350)
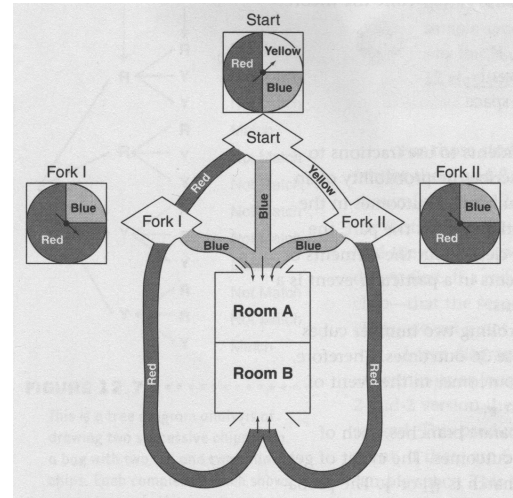
COMPARING RESULTS AS NUMBERS INCREASE: Checking the Theory

The teacher will display the Blackline Master, "What Are the Chances?"

The teacher will provide pairs of students with a spinner face that is half red and half blue. Students should agree that the chance of blue is one-half. The teacher will mark the 1/2 point on the Impossible-Certain continuum and draw a vertical line down through all of the lines below this point.

Each pair of students spins their spinner once. The teacher will make a tally chart for Red and Blue results and tally these first spins. He will collect the results of additional spins until there is a total of 20 spins. The results of the 20 spins will be marked on the second line. For example, if there are 13 Blue and 7 Red, he will place a mark at about 13 on the 0-to-20 number line. If the result of these 20 spins is not exactly 10 and 10, discuss possible reasons why this may be so.

Student pairs each spin their spinners 10 more times. The teacher will collect the results and add them to the tallies for the first 20 spins. The total should be a multiple of 10. The teacher will mark the total in the right-hand box of the third line and indicate the number of Blue spins on the line as before. This will be repeated at least two more times, continuing to add the results of new spins to the previous results. Each time, the teacher will enter the total in the right-hand box to create a new number line but with the same length as before. If possible, try to get the total number of spins to be at least 1,000.

Directions: For each number line, calculate the number of times the class spun each color, by fraction, decimal, and percent.

1. Blue: Fraction: _____   Decimal: _____   Percent: _____

    Red: Fraction: _____   Decimal: _____   Percent: _____

2. Blue: Fraction: _____   Decimal: _____   Percent: _____

    Red: Fraction: _____   Decimal: _____   Percent: _____

3. Blue: Fraction: _____   Decimal: _____   Percent: _____

    Red: Fraction: _____   Decimal: _____   Percent: _____

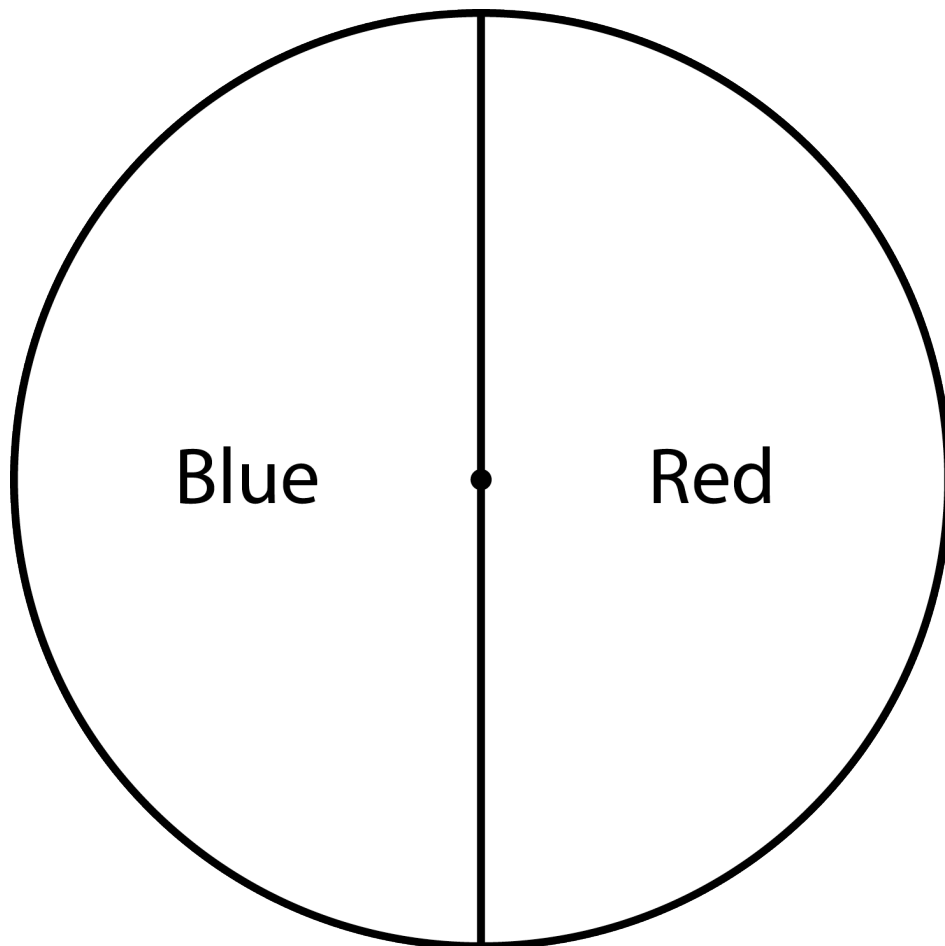4. Blue: Fraction: _____   Decimal: _____   Percent: _____

    Red: Fraction: _____   Decimal: _____   Percent: _____

5. Blue: Fraction: _____   Decimal: _____   Percent: _____

    Red: Fraction: _____   Decimal: _____   Percent: _____

Adapted from *Teaching Student-Centered Mathematics: Grades 3-5* (p. 352)

6. What happens as the total number of spins becomes greater? Why do you think this is?

_____

_____

_____

_____

_____

7. How might have your spinner caused human error in this experiment?

_____

_____

_____

_____

_____

Blue   •   Red

Adapted from *Teaching Student-Centered Mathematics: Grades 3-5* (p. 352)

What Are the Chances?

Impossible   **Certain**

0   **20**

0

0

0

0

Name _____ Date _____

COMPARING RESULTS AS NUMBERS INCREASE: Experimental Probability

You will gather data on how often you can expect a dropped thumbtack to land with the point straight up. Each pair of students will need five thumbtacks and a small box with a cover or lid. All of the tacks in the room must be the same.

Using a probability line, the teacher will demonstrate the two possibilities for a tack to land on a flat surface. After exploring your own tacks briefly, decide about where on the top probability line you think the probability of point up should fall.

Next, four students shake their boxes of tacks and report the number of point-up results. The teacher will tally these (as in the previous activity) and mark the corresponding point on the 0-to-20 line. Next, students get their data from 10 more tacks – two tosses of five tacks. The teacher will tally and record on the third number line. Continue to gather data on more and more tacks, recording accumulated data on successive lines. It should not take too long to get 1,000 total tosses and it is not unreasonable to continue to 1,500 or even 2,000 tosses.

1. Once the class has reached 1,000 total tosses, where do you think the correct probability mark on the top line should be and why?

   _____

   _____

   _____

2. Once the class has reached 1,500 total tosses, where do you think the correct probability mark on the top line should be and why?

   _____

   _____

   _____

3. Once the class has reached 2,000 total tosses, where do you think the correct probability mark on the top line should be and why?

   _____

   _____

   _____

4. What happens as the total number of drops becomes greater? Why do you think this is?

   _____

   _____

   _____

   _____

Adapted from *Teaching Student-Centered Mathematics: Grades 3-5* (pp. 353-354)

What Are the Chances?

Impossible   **Certain**

**0**   **20**

COMPARING RESULTS AS NUMBERS INCREASE: Word Problems

1. Margaret spun the spinner 10 times. Blue turned up on three spins. Red turned up on seven spins. Margaret says that there is a 3-in-10 chance of spinning blue. Carla then spun the same spinner 100 times. Carla recorded 53 spins of blue and 47 spins of red. Carla says that the chance of spinning blue on this spinner is about even.

Who do you think is more likely to be correct: Margaret or Carla? Explain. Also, draw a spinner that you think they may have been using.

_____

_____

_____

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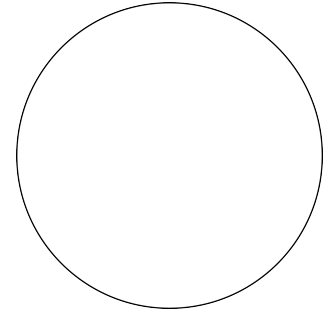
2. Duane has a lucky coin that has been tossed many, many times. He is sure that it is a fair coin – that there is an even chance of heads or tails. Duane tosses his coin six times and heads come up six times in a row. Duane is sure that the next toss will be tails because he has never been able to toss heads seven times in a row. What do you think the chances are of Duane tossing heads on the next toss? Explain your answer.

_____

_____

_____

_____

_____

_____

Adapted from *Teaching Student-Centered Mathematics: Grades 3-5* (p. 354)