Lucky Sums?

Reporting Category Probability and Statistics

Topic Predicting the likelihood of outcomes

Primary SOL 4.13 The student will
a) predict the likelihood of an outcome of a simple event; and
b) represent probability as a number between 0 and 1, inclusive.

Materials

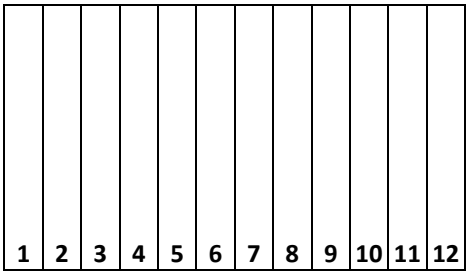
- Crayons
- Number cubes with numbers 1–6

Vocabulary

possible outcome, event, predict, probability, impossible, unlikely, equally likely, likely, certain, fraction, least likely, most likely

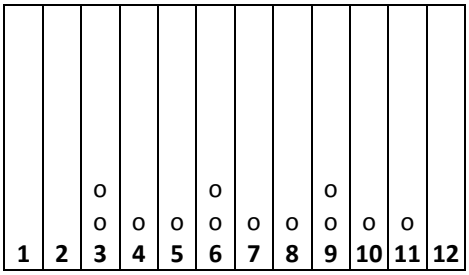
Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

1. Group students into teams of two students, and give each student one sheet of paper and a crayon. Have students fold their papers into twelfths as follows: holding the paper horizontally, fold it in half, like a greeting card. Then, fold it in half again. Finally, fold it into equal thirds with two more folds, like a letter. This will result in 12 equal sections, as shown at right. Have the students number the sections 1 through 12 at the bottom of each section.



   (Note: You may choose to use this folding process to review rectangles and fractional parts. Point out that students began with a rectangle (review definition) and that they still have a rectangle after each fold even though the width becomes smaller and smaller. Also, point out that with the first fold, they are making halves; the second fold results in fourths; and the third and fourth folds yield twelfths. Students can make predictions about what they think is happening with each fold and then check their predictions.)

2. Distribute two number cubes to each team of students. Have each student predict the *sum* of the two numbers that will be rolled for *each* of 12 rolls of the two cubes. Direct each student to use the crayon to record his/her predictions by drawing a small circle for each predicted sum above the corresponding number (see example at right). Do not give students any hints or suggestions.



3. Have team members take turns rolling both cubes at once, adding the two numbers rolled, and then x-ing out a circle above that sum number on the chart. If a circle was not placed above that number during the prediction step, or if no circle is left to x-out, have each

student place a tally above the number to have a record of the sum that was rolled. The first player in the team to x-out all of his/her circles is the winner.

4. When teams are finished playing, have all students analyze why they won or lost the game. Have them devise strategies they would like to try. As a class, document on the board the probability of rolling each sum, as shown below:

Sum	Possible sum combinations	**Probability** The number of sum combinations/all possible number combinations
1	Impossible to roll a 1 with two number cubes	0 / 36
2	1 + 1 (unlikely or little chance)	1 / 36
3	1 + 2, 2 + 1 (unlikely or little chance)	2 / 36
4	1 + 3, 2 + 2, 3 + 1	3 / 36
5	1 + 4, 2 + 3, 3 + 2, 4 + 1	4 / 36
6	1 + 5, 2 + 4, 3 + 3, 4 + 2, 5 + 1 (likely or good chance)	5 / 36
7	1 + 6, 2 + 5, 3 + 4, 4 + 3, 5 + 2, 6 + 1 (likely or good chance)	6 / 36
8	2 + 6, 3 + 5, 4 + 4, 5 + 3, 6 + 2 (likely or good chance)	5 / 36
9	3 + 6, 4 + 5, 5 + 4, 6 + 3	4 / 36
10	4 + 6, 5 + 5, 6 + 4	3 / 36
11	5 + 6, 6 + 5 (unlikely or little chance)	2 / 36
12	6 + 6 (unlikely or little chance)	1 / 36

Show students how you find the possible number combinations for each sum (0, 1, 2, 3, 4, 5, and 6) and the number of all possible number combination (36). Discuss patterns in interpreting the probability or likelihood that something is going to happen. Without naming it, discuss the reason the commutative property (e.g., 3 + 4 = 4 + 3) is not used when figuring out the probability of rolling each sum.

5. Have students discuss and analyze the data. Then, have them make a new chart to play the game again at school and/or at home, using their new knowledge.

Assessment

- **Questions**
  - Was your actual outcome close to your prediction?
  - Now that you have played the game and see how it works, would you make the same predictions or different predictions? Why?
- **Journal/Writing Prompts**
  - Explain how you plan to beat your opponent when playing this game again. Explain your strategy and why you believe it will help you win.
  - Describe another game you have played that is similar to this one. Describe how you will play it differently next time with a strategy based on what you have learned about probability.
- **Other assessments**
  - During the game, circulate and observe students' strategies, rationale for placement of circles, and discoveries. Note how quickly the students apply their

new knowledge from the first game experience and the probability chart on the board to their second game predictions.

Extensions and Connections (for all students)

- Have students create their own challenges, using number cubes.
- Have students predict how their strategies for the placement of the circles would change depending on the number of number cubes used.
- Have students predict how their strategies would change if they were subtracting the two numbers rolled instead of adding them. Have them explain this by using a chart. They could then do an experiment and analyze to see if their predictions were accurate.

Strategies for Differentiation

- In step one, provide sheets of paper already divided into 12 columns so that folding is not necessary.