Basic Probability Ideas

Experiment - a situation involving chance or probability that leads to results called outcomes.

Random Experiment – the process of observing the outcome of a chance event

Simulation – the use of random numbers, spinners, or some other device to model an experiment or a real-world activity

Sample – a subset of the total population

Probability –the probability of an event P(A) =
(Number of favorable outcomes)**/**(Number of possible outcomes)

Experimental Probability – a number that indicates the likelihood that an event will occur based upon the results of an experiment

Theoretical Probability – the probability values assigned to events based on mathematical theory rather than on trials of an experiment

The Law of Large Numbers - if someone observes a random variable X very many times., in the long run, the proportion of outcomes taking any value gets close to the probability of that value. The **Law of Large Numbers** says that the average of the observed values gets close to the mean X.

Two-Dice Games

Game 1

Materials: Two Dice

Rules: Roll both dice. Add the two numbers.

Score: Player I scores a point if the sum is even.

Player II scores a point the sum is odd.

Play and record the actual sums in a table such as the one pictured on the next page..

http://www.activityvillage.co.uk/dice-games

Sum	2	3	4	5	6	7	8	9	10	11	12
Total # of times sum occurred											

Based on your results:

Number of even sums rolled = ____________________

Number of odd sums rolled = ______________________

Total number of trials = ___________________

P (odd sum) = ________________

P (even sum) = _______________

Game 2

Materials: Two Dice

Rules: Roll both dice. Multiply the two numbers.

Score: Player I scores a point if the product is even.

Player II scores a point the product is odd.

Play and record the actual products in a table similar to the one pictured below.

Sum	2	3	4	5	6	7	8	9	10	11	12
Total # of times sum occurred											

Based on your results:

Number of even products rolled = ________________

Number of odd products rolled = ___________________

Total number of trials = ________________

P (odd product) = ______________

P (even product) = _____________

Analyzing Two-Dice Games

Game 1

Sum	1	2	3	4	5	6
1						
2						
3						
4						
5						
6						

Total sums = ____________________

Total number of even sums = ______________

Total number of odd sums = ______________

P (even sum) = ______________

P (odd sum) = ______________

Game 2

Product	1	2	3	4	5	6
1						
2						
3						
4						
5						
6						

Total products = ____________________

Total number of even products = __________________

Total number of odd products = __________________

P (even products) = ______________

P (odd products) = ______________

Adapted from Middle Grades Mathematics Project Probability.

Teacher Pages

Activity: Two Dice Games

Purpose: To calculate probabilities in a game involving the toss of two dice.

Mathematics: Determining the probability of each result in the sample space generated by tossing two dice, and calculating the possible sums and product, and if these results are even or odd. Using this information to determine the likelihood of winning a game involving even and odd sums, and another game involving even and odd products.

Gaise Framework

I. Formulate Questions

a. If we play a game involving tossing two dice and expecting even or odd sums, which type of sum is more likely to occur?

b. If we play a game involving tossing two dice and expecting even or odd products, which type of product is more likely to occur?

I. Collect Data

Play the game 10 times and determine how many even and how many odd results are obtained.

II. Analyze Data

What do the results tell us about the likelihood of even and odd sums and products?

III. Interpret Results

How can we determine theoretical results for this experiment.

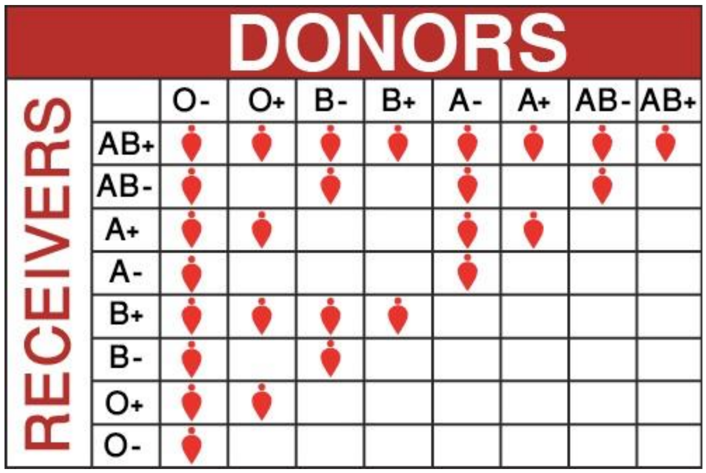
Discussing and Debriefing the Activity

Questions listed at the end of the lesson should be used. In addition, you might want to ask the following:

c. What would happen if there were 3 dice? 4?

What other questions could we ask about this experiment?

Blood Type Simulation



40% of blood donors have type A blood. What is the probability that it will take at least 4 donors to find one with type A blood?

We will simulate this experiment with a toss of a die. We are concerned with results of which 40% represent type A blood.

A die has 6 sides, each of which are equally likely to come up when the die is tossed.

How can this situation be simulated using a die?

To simulate this, one method is as follows:

A toss of 1 or 2 represents type A blood

A toss of 3, 4, or 5 represents not type A blood.

A toss of 6 is discarded as if it did not happen.

Toss a die until you get a 1 or 2, repeat this 19 more times, discarding all results of a "6."

Example of a trial: 4, 5, 3, 6, 1.

For this trial, we did not get a 1 or a 2 within 4 rolls., so this is not a successful trial.

Example of a trial: 5, 2,. For this trial we got a 2 within 4 rolls, so this is a successful trial.

Trial #	Results	Trial #	Results
1		11	
2		12	
3		13	
4		14	
5		15	
6		16	
7		17	
8		18	
9		19	
10		20	

In how many of your 20 trials, did you successfully roll a 1 or a 2 within 3 rolls?

What is the probability that it will take at least 4 donors to find one with type A blood?

How would the results change if 60% of the population had type A blood? 20%?

Imagine you are a doctor, what steps would you take to ensure you had a type A donor for a patient?

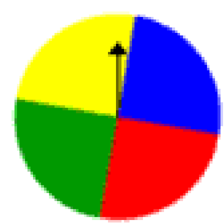
Idea Wave: Probability

Write 2 more sentences for each situation. I have provided you with one sentence about each

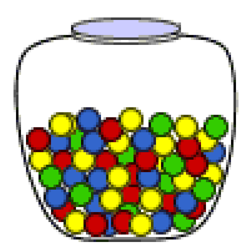
1. The probability of rolling an even number on 1 die is 3/6.

2. The probability of choosing a red card from a standard deck of cards is 26/52.

3. The probability of the spinner landing on the color red or yellow is 2/4.



4. A glass jar contains 6 red, 5 green, 8 blue and 3 yellow marbles. The probability of choosing a green marble from the jar is 5/22.



Idea Wave: Probability

Finish the following sentences. Be able to justify your ideas.

1. The probability of an event occurring is…
2. Experimental probability is...
3. Theoretical probability tells me...
4. As the number of experimental trials increases…
5. The probability of an event not occurring is …
6. Mutually exclusive events have …

Discussion:
Find a peer, read their sentences and let them read yours. Repeat this two or three more times.

In the space below, write two sentences you heard that impressed you, along with the name of their writers.

Person	Sentence