Understand Experimental Probability and Theoretical Probability – Spinners and Race Cars (5 activities)

· **Understanding Experimental Probability** - Choose a spinner to use, click the 'SPIN' and check the results. You can choose from different spinners as well as a number cube to roll.
· **Racing Game With One Die** – This is a simulated racing game where a car moves depending on which number is rolled on the dice. Every option can be adjusted in this simulation. Make sure you explore thoroughly.
· **Racing Game With Two Dice** – You can choose a 'lucky player' to move one more step than everyone else during the race. You can choose the number of players and the length of the race.
· **Experimental and Theoretical Probability** – You will be able to set up your own spinner and also choose how many spins you want to use. You should look at the results and compare between experimental and theoretical probabilities. You can change the size of the spinner and the number of spins.
· **Adjustable Spinner Experiment** - You can change the size of the sections within the spinner, and this will change the theoretical probability. You can also adjust the number of sections on the spinner as well as the number of spins.
Questions specifically related to understanding experimental probability and theoretical probability:
1. What happens when the arrangement of the spaces on the spinners are changed?
2. What happens when the number of spins change?
3. What happens when the race segments are dropped to two?
4. How does changing the field of which car moves affect the outcomes?
5. What happens when the number of runs is increased?
6. Compare and contrast the experimental and theoretical probabilities when the different fields are changed in different ways.

Understand Independent and Dependent Events – The Monty Hall Paradox

"Would you make a deal to trade up to five hundred dollars in cash for one of these three doors, knowing behind one of them is $3,254 in cash or valuable merchandise? Several people may have to make that decision during the next few minutes as we bring you the Marketplace of America.... Let's Make a Deal! And now, here's America's top trader, TV's Big Dealer, Monty Hall! - Opening Spiel 1963-1969

The well-known Monty Hall probability problem is based on a television show of the 1960's and 1970's called Let's Make a Deal. Show host, Monty Hall would ask a contestant to pick one of three doors. Behind one of the three doors was a large prize. Behind the other two doors were lesser prizes, sometimes a group of goats grazing on fresh hay. Once the contestant picked a door, Monty would open one of the remaining two doors that did not have a prize. Then, he would offer the contestant a chance to switch doors.
To learn about dependent and independent probability, you will work with two Monty Hall simulation games. Before playing, predict whether or not it is better to switch door selections after one is revealed. Track your results carefully so that you can discuss what happens in your journal.
· **Monty Hall Simulation (simple)** – You will choose one of three doors behind which is a prize. After you choose, you will be shown what is behind a second door. At this point you have the option to either switch your choice, or stay with your choice. The simulation will keep track of the number of times you win and

lose. You should try both switching and staying enough times to determine whether it makes any difference which strategy you choose.
· **Monty Hall Game (with explanation)** – This version of the game is similar to the first one you played. Work with it in the same way you did the first one. When you have finished, you should look at the explanation given for the outcomes.
Questions specifically related to understanding dependent and independent events in probability:
1. What happens when you stay with your original (first) choice of door?
2. What happens when you choose to switch doors?
3. Does it matter, in terms of winning, whether you stay or switch?
4. How can you explain your results in this activity?

PERMUTATIONS and COMBINATIONS WEBQUEST MAIN PAGE

Tree Diagrams Explanation

* Tree Diagram Problems

* Khan Academy Video

Math is FUN perms and combos explained

HUH? I still don't get it....Better explained

Basic Counting Principle

Permutations and Combinations CALCULATOR

* Permutation Millionaire Game

COMPLEMENTARY EVENTS

Please go to the website below. Read the examples on complements of a sample space, and then answer questions 1-3 on paper.

http://www.mathsisfun.com/data/probability-complement.html

INDEPENDENT AND DEPENDENT EVENTS

Independent Events - Math Goodies
*www.mathgoodies.com/lessons/vol6/**independent_events**.html*

KHAN ACADEMY INDEPENDENT AND DEPENDENT EVENTS
https://www.khanacademy.org/math/probability/independent-dependent-probability/dependent_probability/e/identifying-dependent-and-independent-events

http://www.wtamu.edu/academic/anns/mps/math/mathlab/col_algebra/col_alg_tut55_count.htm

Go through the tutorial and answer questions 1 a. – 1 c. on paper. (Show how you got your answer.)

1a. One quarter, one dime and one six-sided die are tossed. How many results are possible?

1b. Next semester you are going to take one science class, one math class, one history class and one english class. According to the schedule you have 4 different science classes, 3 different math classes, 2 different history classes, and 3 different English classes to choose from. Assuming no scheduling conflicts, how many different four-course selections can you make?

1c. Six students in a speech class all have to give there speech on the same day. One of the students insists on being first. If this student's request is granted, how many different ways are there to schedule the speeches?

Answer the five questions on paper.

1. A student at SCDS has 3 uniform shirts, 4 pairs of pants, and 2 Country Day sweatshirts. How many different outfits can he make if each outfit consists of shirt, pants and sweatshirt?

2. A combination lock has a 5 digit combination. How many different answers are possible if

a) any digits are allowed in any spot?

b) the first digit must be a 1?

c) the digits must all be odd numbers?

3. A licence plate consists of three letters followed by 3 numbers. What is the total number of possible licence plates if

a) we are allowed to have repeated letters and numbers?

b) we are not allowed to repeat letters or numbers?

4. At a homestyle restaurant the blue plate special allows you to order a meat, a vegetable, a potato, and a dessert for only $3.59. The meats this week are ham, meat loaf, or chicken. The vegetables are green beans, lima beans, spinach, or corn. The potato choices are mashed, baked, or fried. The desserts are apple pie, ice cream, apple pie with ice cream, or chocolate cake.

a) List 2 different possible orders for the blue plate special.

b) Compute the total number of possible different orders.

5. A test has 15 true-false questions and 20 multiple choice questions with 5 choices each. How many possible answer sheets are there for this test?

Permutations:

http://www.wtamu.edu/academic/anns/mps/math/mathlab/col_algebra/col_alg_tut56_perm.htm

Go through the tutorial and answer questions 1a. – 1c. on paper. (Show how you got your answer.)

1a. A company issues a questionnaire whereby each employee must rank the 5 items with which he or she is most satisfied. The items are wages, work environment, vacation time, job security, supervisors, health insurance, break time, and retirement plan.

The ranking is to be indicated by the numbers 1, 2, 3, 4 and 5, where 1 indicates the item involving the greatest satisfaction and 5 the least. In how many ways can an employee answer this questionnaire?

1b. A key pad lock has 10 different digits, and a sequence of 5 different digits must be selected for the lock to open. How many key pad combinations are possible?

1c. In how many ways can 7 books be arranged on a shelf?

Combinations:

http://www.wtamu.edu/academic/anns/mps/math/mathlab/col_algebra/col_alg_tut57_comb.htm

Go through the tutorial and answer questions 1a, 1b, 2a – 2c on paper. (Show how you got your answer.)

Practice Problems 1a - 1b:

A teacher has 15 students and 5 are to be chosen to give demonstrations. How many different ways can the teacher choose the demonstrators given the following conditions.

1a. The order of the demonstrators is important?

1b. The order of the demonstrators is not important?

Practice Problems 2a - 2c:

8 students names will be drawn at random from a hat containing 14 freshmen names, 15 sophomore names, 8 junior names, and 10 senior names.

2a. How many different draws of 8 names are there overall?

2b. How many different draws of 8 names would contain only juniors?

2c. How many different draws of 8 names would contain exactly 4 juniors and 4 seniors?

On your own paper (or here) describe permutations and combinations. Compare and contrast them. Give an appropriate formula for each one.