Lottery Activity: The Multiplication Rule   Name:

1. Choose any 3 digits from 0 – 9 and write them down in the space below (digits can repeat).

2. Go into the apps button on the calculator and start up the probability simulator. You will be running the last program (random numbers). Press enter when you get to this program. Write the numbers that come up in the first column.

3. Fill in the table using the numbers you chose and the numbers on the calculator

EX 1:   **3 Chosen Digits: _____ _____ _____**

Lottery #s from calculator	How many numbers matched yours?	How many of the matching numbers are in the correct place?
Calculate your successes	Total ÷ 30 = _____ %	Total ÷ 30 = _____ %

Ex 2: Now, choose 5 numbers between 0 and 9 and fill in the table below with your results (digits can repeat).

         5 Chosen Digits: _____ _____ _____ _____ _____

Lottery #s from calculator	How many numbers matched yours?	How many of the matching numbers are in the correct place?
Calculate your successes	Total ÷ 50 = _____ %	Total ÷ 50 = _____ %

Ex 3: Choose 5 numbers between 0 and 50 and fill in the table below with your results (digits can repeat).

5 Chosen Numbers: _____ _____ _____ _____ _____

Lottery #s from calculator	How many numbers matched yours?	How many of the matching numbers are in the correct place?
Calculate your successes	Total ÷ 50 = _____ %	Total ÷ 50 = _____ %

Examine the results...

How did the percentages of the numbers matched (column 2) compare to the percentages for the numbers matched AND in the correct place (column 3)?

Describe the differences in the percentages calculated as the total amount of numbers from which to choose increased.

The multiplication rule states that total amount of possible outcomes to a <u>sequence</u> of *n* events, is given by multiplying the total number of possibilities, *k*, in each event. That is, $k_1 \cdot k_2 \cdot k_3 \cdot \ ... \ \cdot k_n$.

<u>3-digit lottery, from ex 1:</u>

When drawing a 3-digit lottery number what is the sequence of events? How many events are there?

How many possibilities are there in each event?

How many total outcomes are there?

What would be the percentage for choosing a winning a 3-digit lottery ticket in this scenario?

5-digit lottery, from ex 2:

When drawing a 5-digit lottery number, what is the sequence of events? How many events are there?

How many possibilities are there in each event?

How many total outcomes are there?

What would be the percentage for choosing a winning 5-digit lottery ticket in this scenario?

5-digit lottery, from ex 3:

When drawing a 5-digit lottery number, what is the sequence of events? How many events are there?

How many possibilities are there in each event?

How many total outcomes are there?

What would be the percentage for choosing a winning 5-digit lottery ticket in this scenario?

Based on this information, would you play one of these lottery games, if it costs $2 a ticket? Why or why not?

Take a look back:

A new restaurant has opened offering lunch combos for $5. With the combo, you get one sandwich, one combo, and one drink. The choices are…

  Sandwiches – chicken salad, turkey, grilled   cheese

  Sides – chips, french fries, fruit cup

  Drinks – soda, water

  How many combos are possible? Make a tree diagram to generate the list.

Combinatorics – the study of ways to count possible outcomes

Multiplication Rule - The multiplication rule states that total amount of possible outcomes to a <u>sequence</u> of *n* events, is given by multiplying the total number of possibilities, *k*, in each event. That is, $k_1 \cdot k_2 \cdot k_3 \cdot \ \ldots \ \cdot k_n$.

Now use the multiplication rule to find the total number of combos for lunch.

Let's try these using the combination rule.
Ex 1: You throw two 10 sided dice. How many possible combinations can you roll?

Ex 2: You throw 1 six-sided die and 1 eight-sided die. How many possible combinations can you roll?

Ex 3: You draw three cards from a standard deck **without replacement**. How many possible card combinations can you get?

Ex 4: In the morning you have a choice of 5 shirts, 3 pairs of pants, and 2 pairs of shoes to wear. How many possible outfits can you make?

Ex 5: A multiple choice test has 50 questions each with four possible choices. How many different answer keys could be made?

Practice Problems
Find the total number of possible outcomes using the multiplication rule.

1. Three six-sided dice or rolled.

2. Five cards are removed, without replacement, from a standard deck.

3. A novelty candy item comes in twelve different flavors and eight different shapes.

4. A new computer comes with a choice of three different monitors, four different printer models, three different software packages, and two different colors.

5. Three twelve-sided dice are rolled.

6. Flip a coin ten consecutive times.

7. A quiz has ten multiple-choice questions each with four possible responses.

8. To travel to a friends house, you have a choice of two roads for the first leg, three roads for the second leg, and two roads for the final leg.

9. A shirt manufacturer makes shirts in five different styles, nine different colors, and six different sizes.

10. A new refrigerator comes in three different models, two different sizes, and five different colors.

11. A true-false test has 50 questions.

12. Five marbles are drawn, without replacement, from a bag containing fifteen marbles.