Fun with Double Dice

Overview

This lesson will focus on first introducing the double dice as a new, fun resource with many applications, and showing some of those applications to various grade levels. From simple number recognition, to multiple event probability, the double dice are a fun, simple tool for students which will help them receive much needed practice with mathematical operations.

Benchmarks

3-4th Grade

Number, Number Sense, and Operations

- B. Recognize and generate equivalent representations for whole numbers, fractions and decimals.
- C. Represent commonly used fractions and mixed numbers using words and physical models.
- G. Model and use commutative and associative properties for addition and multiplication.
- I. Demonstrate fluency in multiplication facts with factors through 10 and corresponding divisions.

Data Analysis and Probability

- E. Describe data using mean, mode, median and range.

5-7th Grade

Number, Number Sense, and Operations

- B. Compare, order and convert among fractions, decimals and percents.
- G. Apply and explain the use of prime factorizations, common factors, and common multiples.

Data Analysis and Probability

- A. Read, create and use line graphs, histograms, circle graphs, box-and-whisker plots, stem-and-leaf plots, and other representations when appropriate.
- B. Interpret data by looking for patterns and relationships, draw and justify conclusions, and answer related questions.
- J. Compare experimental and theoretical results for a variety of simple experiments.

8-10th Grade

Data Analysis and Probability

- E. Evaluate the validity of claims and predictions that are based on data by examining the appropriateness of the data collection and analysis.
- F. Construct convincing arguments based on analysis of data and interpretation of graphs.
- G. Describe sampling methods and analyze the effects of method chosen on how

well the resulting sample represents the population.

J. Compute probabilities of compound events, independent events, and simple dependent events.

K. Make predictions based on theoretical probabilities and experimental results.

Time Dependent on which lesson and applications you are using (avg. 30-50 min).

Materials

Students will need the following: One double dice, and a copy of one of the sheets dependent on which grade level and concept you are dealing with.

Procedures

1. Each student should receive a double dice AFTER you go over rules and expectations for using the dice.

Some which I have addressed include (and some I wish I would have said):

- The dice is not to be rolled when I am talking and/or giving whole group instruction.
- The dice is to be rolled in the middle of the table/desk to avoid dropping the dice on the floor.
- The dice is not to be excessively shaken before tossing (3 times is good)
- The dice is not to be dropped from high altitudes ☺
- Do NOT forcefully drop or attempt to bounce the dice

You may simply want to model the proper technique instead of going over each individual bullet.

2. Distribute the double dice to students and have them each properly roll the dice 1-2 times.

3. Go over the specific procedures and expectations to the worksheet/aspect of this overall lesson which is appropriate to your grade level/needs.

Extension Activities

Again, this is highly dependent on the grade level and concept which you are teaching. We will have time on the end to discuss individual extension activities, and I will also include some ideas in each of the lesson worksheets on the proceeding pages.

Assessments

1. Students may be informally assessed as the teacher walks around the room to monitor students understanding while working on the lab sheet/worksheet.
2. Students may be formally assessed with the use of the lab sheet/worksheet.

Name: _____

Big die roll	Little die roll	Big X Little =	Little x Big=
1			
2			
3			
4			
5			

1. Does your answer change when we switch the order of our numbers? How do you know?

_____

_____

Double Dice - Instructions

1. The outer dice value will be your numerator.

2. The smaller inner dice will be your denominator.

3. Roll the dice, and record the fraction in the appropriate table.

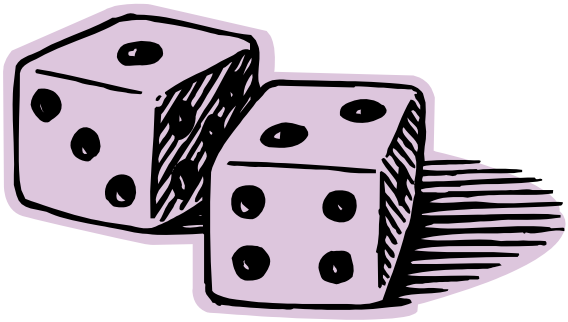
4. If the result of the roll was a proper fraction, record it, and indicate the simplest form of the fraction.

5. If the result of the roll was an improper fraction, record it, and indicate the mixed number equivalent of the fraction.

6. Be sure to show your work!

7. You may use a separate sheet of paper if needed for your work.

8. If you complete your sheet before the class has ended, bring your sheet to me and I shall give you another practice sheet.



Improper Fractions	Mixed Number Equivalent	Work

Proper Fractions	Simplest Form	Work

Mean, Median, Mode, and Range

Use the double dice to create a two digit number as shown here.

On the big outer die, I rolled a 2. (this will go in the tens place)
On the small inner die, I rolled a 5. (this will go in the ones place)

So, the number resulting from my roll would be 25.

Using the method described above, roll your die 10 times, and record your resulting number each time.

Roll number:

1. _____ 2. _____ 3. _____ 4._____ 5._____

6. _____ 7. _____ 8._____ 9._____ 10. _____

Now, use your data to answer the following questions.

1. Create a stem and leaf plot of your collected data.

Mean, Median, Mode, and Range

2. What is the range of your data? What does the range indicate about your collected data?

_____

_____

_____

3. What is the mean of your data? What does the mean indicate about your collected data?

_____

_____

_____

4. What is the mode of your data? What does the mode indicate about your collected data?

_____

_____

_____

5. What is the median of your data? What does the median indicate about your collected data?

_____

_____

_____

Mean, Median, Mode, and Range

How to extend this activity:

1. One could extend this activity by having students look not only at their own data, but have them also record the data of a classmate, and see how this adjusts their original results.
2. Instead of simply making a stem and leaf plot, one could have students create line graphs, histograms, circle graphs, box-and-whisker plots, or any other type of visual representation pertaining to the data collected.
3. You could ask higher level thinking questions such as:
    - Could we ever have roll of 10? Why or why not? What effect does this have on the data we will collect?
    - Will our results be the same every time we perform this experiment? Why or why not?
    - What type of graphical representation would be best to show our data?

Ways to adjust this activity:

1. To gear this activity more towards 3-4th grade students, one could have them create a number plot or line plot instead of a stem and leaf plot. Also, perhaps it may be best of they collect data of fewer rolls. On the worksheet, you may want to give them the formulas for finding range, median, and mode, so it is easier for them to describe their data.

2. To adjust this activity for 8-10th grade students, one could look not only at mean, median, mode, and range, but find the quartiles as well. Then, based on their data, have them create a box and whiskers plot.

It may also be helpful to have them:

- Create one or two different graphical representations of their set of data, and indicate which they feel is most appropriate to show their results.
- Compare the characteristics of the mean, median and mode for a given set of data, and explain which measure of center best represents the data.

Name: _____

Vocab

The **Least Common Multiple** (LCM) of two numbers is the smallest number (not zero) that is a multiple of both.

Multiples of 3:

0, 3, 6, 9, 12, 15, 18, 21, 24, ...

Multiples of 4:

0, 4, 8, 12, 16, 20, 24, 28 ...

The LCM of 3 and 4 is 12.

Today, we are going to be using the double dice to find the least common multiple (lcm) of two numbers.

First, you will need to roll your dice.

The big die shows the number _____

The small die shows the number _____

Find the least common multiple of these two numbers, and show your work here.

On the following page, complete the chart by rolling your dice, then finding the least common multiple (lcm) of the two numbers rolled.

Name: _____

Extensions for this activity

1. Instead of having students find only the LCM of the two numbers, one could also have them find the greatest common factor (gcf).
2. Instead of simply finding the LCM or GCF, one could have students explain the uses/applications of these values.
3. Students could work with a partner, each of them could roll their dice, then they could find the LCM/GCF of four numbers.

Big die roll	Small die roll	LCM	Work

3-4 Benchmarks addressed:
Number, Number Sense, and Operations

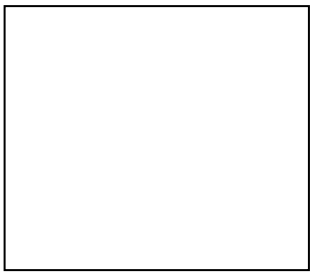
G. Model and use commutative and associative properties for addition and multiplication.

I. Demonstrate fluency in multiplication facts with factors through 10 and corresponding divisions.

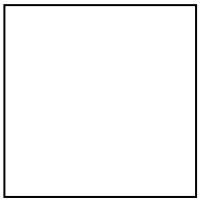
Double Dice Multiplication

1. Roll your die, and draw what you see

On the big, outer die



On the small, inner die



2. Now, lets write the number of dots we see in each of our die.

On the big die, I see _____ dots.

On the small die, I see _____ dots.

3. We are going to multiply (x) our two numbers together.

_____ x _____ = _____

4. What would happen if we changed the order of our numbers and multiplied? Lets try it!

_____ x _____ = _____

5. On the back of this sheet, I want you to continue the activity. Fill out the chart, then answer the question on the bottom.

Name: _____

Two Event Probability

(This lesson can only take place after students are familiar with one event probabilities, and know how to find all possible outcomes of simple experiments or problem situations, using methods such as lists, arrays and tree diagrams, theoretical, and experimental probability)

Question of the day: What is the probability of rolling an even number on both dice?

To answer this question, I would like you to first create a list or a tree diagram of all the possibilities. Then, count how many of those possibilities show an even number on both dice. Be sure to write your answer appropriately!

1. The probability of rolling an even number on both dice is _____.

2. Is this probability theoretical or experimental? How do you know?

_____

_____

_____

Now that we know what SHOULD happen, I would like you to find out what actually happens by following these instructions:

- Roll your dice 36 times, and record your dice rolls on the next page after each roll
- Circle and count your rolls which both numbers were even
- Answer the questions on the next page after you record your data

Name: _____

Roll Number	Result
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	
32	
33	
34	
35	
36	

Name: _____

3. What was the probability that you rolled two even numbers with your dice?

4. Is your probability considered the theoretical probability or the experimental probability? Why?

_____

_____

_____

5. Did your probability match our theoretical probability?

6. List two ways we could change this experiment in order to make our experimental probability closer to the theoretical probability.

_____

_____

_____

7. If I predicted that every 9 out of 10 times I rolled the dice, it would land on two even numbers, would this be a very accurate prediction? Why or why not?

_____

_____

_____

Name: _____

Extensions

1. One could have the students apply their knowledge of the probability of rolling two even numbers, to the probability of rolling two odd numbers, or an even and an odd number…ect.
2. One could ask more questions for which students would have to determine the experimental and theoretical probabilities.
3. One could have students combine their data to see what effect that has on the theoretical and experimental probability.
4. One could have students apply their knowledge/theoretical probability found to a larger sample. For example, say we are going to roll the dice 108 times, how many of those 108 would they expect to result in a roll of two even numbers.

Adjustments

1. To gear this activity more towards 5-7th grade learners, this activity could focus more on the listing of the possibilities, and how multiplication can be applied to two event probabilities. Also, it cannot be assumed that these learners will be as knowledgeable about theoretical and experimental probability, so this activity could serve as an introduction to those terms.