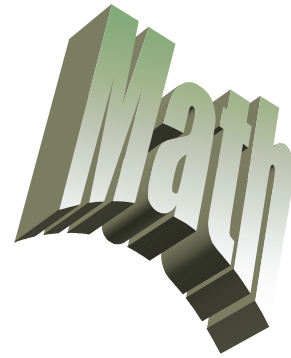


Algebra/Geometry Institute Summer 2005



Probability

Faculty Name: Donna Thompson

School: Solomon Middle School

Grade Level: 5th - 8th

1 Teaching objective(s)
Students will calculate and apply basic probability.

2 Instructional Activities

First, students will complete a bell ringer (3-5 minutes). These are the bell ringer

problems to place on the board. 1. $\frac{(6+10+8)}{30} = \underline{\hspace{2cm}}$ 2. $\frac{(12+10+6)}{43} = \underline{\hspace{2cm}}$

3. $\frac{26+14}{40} = \underline{\hspace{2cm}}$ 4. What does the word probability mean to you? $\underline{\hspace{2cm}}$

After discussing the bell ringer, #4 will lead us into the definition and formula for probability. Place this on the board.

Probability of an event = $\frac{\text{amt. favorable}}{\text{total}}$. Explain to the students that amount

favorable means the # of that item you have. Total means to count up all the items you have. For example: X O X O X O O. If these symbols were in a bag, find the probability of picking an X. $P(X) = 3/7$ because the total number of items is 7 so that is the denominator and you are looking for X's so count how many of that item you have, which is 3. Three is the numerator because that is the number of favorable items you have.

Activity one

Students will play the childhood game of Paper, Rock, and Scissors (adapted from Delta RSI 2001 summer institute) to determine the probability of an event.

Review that paper covers rock, rock crushes scissors, and scissors cut paper. Remind the students that rock is a closed fist; paper is an outstretched hand, and scissors are a fist with 2 fingers pointing out. To play count to 3 with your partner and at the same time hit your own fist together, but on the count of 3 you will need to change your fist to paper, rock or scissors. Tell the students to pair up. They are to play 20 times and record the winner and what they won with (paper, rock, or scissors) in t-tables to keep a tally. One t-table will have the 2 players' names as headings and the other t-table will have Paper, Rock and Scissors as headings. The teacher should show one example before they start their trials. Let's say I played a student and I won with rock. Under my name I would put one tally mark because I won the round and under rock in the other table I would place one tally because I won with rock. Now let the students

perform their 20 trials. After they play have them add up all the tally marks in each column and place that sum over 20 (because they played 20 times). Their answer will be the experimental probability of that event. Have some of the students give their answers and see how close they are to the theoretic probability of the event. Paper, rock and scissors should each be pretty close to $\frac{1}{3}$ because you had 3 ways to win. Each player's probability should be close to $\frac{1}{2}$ because you had 2 people playing. Lastly, ask the students what we could do to get our experimental probability closer to the theoretic probability.

Activity Two

Distribute worksheet (adapted from Addison-Wesley's Probability: Middle Grades Mathematics Project, 1986) and state that we are going to use probability to see if Prince Trek can make it through the canal system to save Princess Leona. Once the papers are distributed, have a student read the set up. Give each student a die and explain that they are working as a group to see if the path will be open or not for Prince Trek. There are 5 gates so each person will roll 5 times for each trial. If the die comes up even then the gate is open. If the die comes up odd, then the gate is closed. Once a student has rolled 5 times and marked their outcomes, look at the diagram and see if those results will lead to an open path. If so write yes, if not write no. After the 20 trials, determine the probability at the bottom of the worksheet to see if he will save Princess Leona or not.

Sample trial: A student rolls 5 times on trial 1. They get a 3, 5, 6, 4, and 2. So this means gate 1 is closed, gate 2 is closed, gate 3 is open because it was even, gate 4 is open because it was even, and gate 5 is open because it was even. Now look at the diagram at the open gates 3, 4, and 5. Decide if Prince Trek has an open path if those 3 are open. The answer is yes so you write yes in the last column. Let the students complete the worksheet. When students have finished, we will discuss the theoretic probability of saving Princess Leona which is .59. We will determine ways to improve our experiment to get closer to the theoretic probability.

ACTIVITY 3

Play Skunk (borrowed from NCTM's Illuminations)

Pass out paper and give each table a pair of dice.

Everyone write the word Skunk on your paper and divide it into 5 columns.

At your table take turns playing until all 5 rounds are finished. Then let me know.

First roll and record your score. You continue to roll until you want to stop or until you roll a 1. If you roll a one, your score for that column goes down to zero.

If you roll double 1's, your score in that column and all previous columns goes to zero. When all players have finished column s, go on to column k and continue the same way. At the end add all your columns together and see who has the highest score. Let the teacher know when you are finished. The object of the

game is to know when to stop rolling and pass the play to someone else. If you roll too long, you will roll a 1 or double 1's. We would discuss the probability of winning based on the combinations of rolls. We would also discuss what part of the game is chance and what part is choice.

ACTIVITY 4

Spell the word probability on your paper and answer the following.

1. $P(\text{vowel}) = \underline{\hspace{2cm}}$
2. $P(\text{b}) = \underline{\hspace{2cm}}$
3. $P(\text{e}) = \underline{\hspace{2cm}}$
4. $P(\text{letter after m in the alphabet}) = \underline{\hspace{2cm}}$
5. $P(\text{a}) = \underline{\hspace{2cm}}$
6. $P(\text{not o}) = \underline{\hspace{2cm}}$

Now assign homework. Ask students what is the probability of picking a red M&M from a bag if it contains 6 colors. They will probably say $1/6$. Have them go home and buy a bag and count the colors and see if $P(\text{red}) = 1/6$. Tell them to bring their count in along with the empty bag so you will know that they did it.

3 Materials and Resources

Paper
Pencil
Worksheet
Dice (one for each student)

4 Assessment

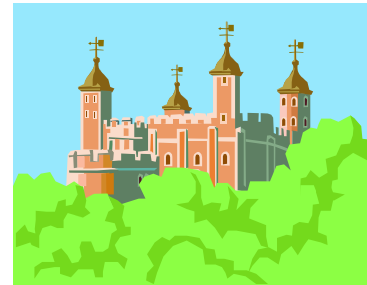
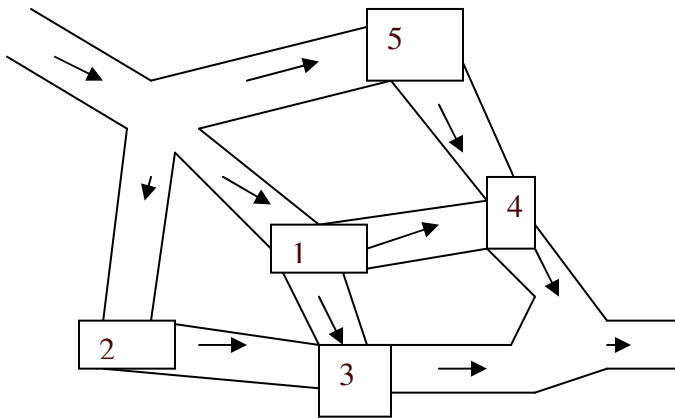
Observation
Worksheet will be graded.
Concept will be on the unit test.

Worksheet



Castle Trek

Can Princess Leona be saved?



Castle Charmin

Princess Leona is trapped at Castle Charmin. Prince Trek will try to save her by going through the canal system. Each of the 5 gatehouses is run by a troll gatekeeper who shows up half the time. So the probability of the gate open on a given day is one half. Arrows show the way the water flows through the canals. What is the probability that Prince Trek will reach Princess Leona?

Each player will roll 5 times (once for each gate). If the die shows an even #, then the gate is open. If the die shows an odd #, then the gate is closed.

Table of Results

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

1. Based on your experiment, what is the probability that he will save her?

2. Based on your experiment, what is the probability that he will not?

3. Based on your experiment, do you think he will save her?
