Section 4.1 - Intro to Probability
MDM4U
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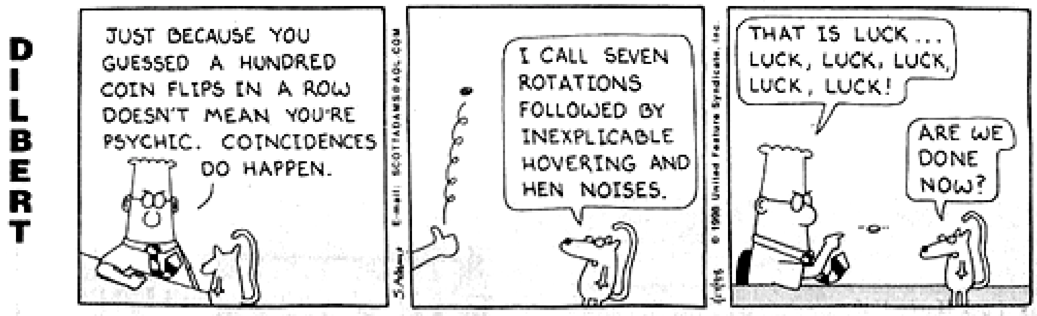

Activity #1: Monty Hall – Let's Make a Deal

Game description: This game is based on the old television show "Let's Make a Deal" hosted by Monty Hall. At the end of each show, the contestant who had won the most money was invited to choose from among 3 doors: Door #1, Door #2, and Door #3. Behind one of the three doors was a very nice prize, let's say a car. Behind the other 2 doors there was a goat. The contestant selected a door. Monty then revealed what was behind one of the OTHER doors (always a goat). The contestant was then offered a choice: stick with his current door, or switch to the remaining un-revealed door. He won what was behind his final choice of door.

Part I: SIMULATION
Instructions: Students pair up. Each pair of students should have 3 cards – a face card/ace (car) and 2 numbered cards (goats). Have one of the partners arrange the cards and act as Monty Hall and the other as the contestant. The contestant picks a door (card). Without showing the original pick, the show host shows one of the other cards (it must always be a goat). The contestant must now decide to switch or stick. The card is shown. Do this 10 times and record the results in the table below.

Trial	Stick/Switch?	Win/lose?
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Finally, exchange roles. Repeat the simulation. Ultimately, each pair of students should have 20 observations between them. (For a "modern version" of the simulation, visit:
http://istics.net/monty/#

Combine your data with your partner's data.

# of trials switched	_________	# of cars won (after switching)	_________
# of trials "stuck"	_________	# of cars won (after "sticking")	_________
total # of trials	_________	# of cars won (grand total)	_________

Now pool the class results. Don't double-count your data and your partner's!

# of trials switched	_________	# of cars won (after switching)	_________
# of trials "stuck"	_________	# of cars won (after "sticking")	_________
total # of trials	_________	# of cars won (grand total)	_________

Part II: MATHEMATICAL PROBABILITY

1) What was the *experimental* probability of winning when you "stuck"

2) What was the *experimental* probability of winning when you "switched"

3) What strategy is best? Back up your answer with the *theoretical* probability of winning for each strategy.

Watch this video for an explanation of the probabilities: http://www.youtube.com/watch?v=mhlc7peGlGg

<u>Activity #2: The Last Banana</u>

Instructions: You will roll two dice, if the biggest number showing is a 1, 2, 3, or 4, PLAYER 1 wins. If the biggest number showing is a 5 or 6, PLAYER 2 wins. Decide with your partner who is going to be player 1 and who is going to be player two. Conduct 20 trials and see who wins each trial.

Trial	Highest Number	Winning Player
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Simulations:

# of trials highest # is 1-4 _________

# of trials highest # is 5 or 6 _________

Combining Class Data:

# of trials highest # is 1-4 _________

# of trials highest # is 5 or 6 _________

Experimental Probability:

$P(1-4\ is\ highest\ number) =$

$P(5\ or\ 6\ is\ highest\ number) =$

Theoretical Probability:

$P(1-4\ is\ highest\ number) =$

$P(6\ is\ highest\ number) =$

https://www.youtube.com/watch?v=Kgudt4PXs28

Activity #3: Skunk

Game Description: The object of SKUNK is to accumulate points by rolling dice. Points are accumulated by making several "good" rolls in a row but choosing to stop before a "bad" roll comes and wipes out all the points. **Each letter of SKUNK represents a different round of the game**; play begins with the “S” column and continues through the "K" column. The object of SKUNK is to accumulate the greatest possible point total over five rounds. The rules for play are the same for each of the five rounds. (letters)

- At the beginning of each round, every player stands. Then, the teacher rolls a pair of dice and records the total on an overhead or at the board.
- Players record the total of the dice in their column, unless a "one" comes up.
- If a "one" comes up, play is over for that round only and all the player's points in that column are wiped out.
- If "double ones" come up, you get -10 for that round.
- If a "one" doesn't occur, players may choose either to try for more points on the next roll (by continuing to stand) or to stop and keep what he or she has accumulated (by sitting down). Once a player sits during a round they may not stand again until the beginning of the next round.
- A round is over when all the students are seated or a one or double ones show.

Here is your game board:

S	K	U	N	K

S	K	U	N	K

Probability questions:

1) What is the probability of a one showing on any given roll?

2) What is the probability of rolling double ones on any given roll?

3) What was your strategy during the game? Why?

<u>Activity #4: Coin Flip Conundrum</u>

If you were to flip two coins simultaneously, what would be the theoretical probability of each occurring?

a) $P(H,H) =$

b) $P(H,T) =$

Instructions: You and your opponent will take turns repeatedly flipping a coin. Player 1 wins if 2 heads are flipped in a row. Player 2 wins if a flip of heads is immediately followed by a flip of tails. Decide with your partner which Player you will be, then conduct 10 trials and record the results.

Trial	Winning Combination	Winning Player
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Simulations:

\# of trials HH wins ________

\# of trials HT wins ________

Combining Class Data:

\# of trials HH wins ________

\# of trials HT wins ________

Experimental Probability:

$P(HH\ wins) =$

$P(HT\ wins) =$

What do you think these *experimental* probabilities tell us about the *theoretical* probability of flipping HH or HT. Why do you think this is?