Names:_____

Week 6: Cartoon Guide Questions

Please read pages 27–39 of the Cartoon Guide with your group. The reading is a bit denser this time, and some of the concepts will be new to you, so do not rush through it; spend a substantial amount of time reading the book together with your groupmates, then answer the following questions.

Question 1. In your own words, explain: who were the primary influences in the development of the field of probability, and what were their contributions?

Question 2. On p. 30, the basic definitions of "random experiment", "elementary outcomes", and "sample space" are given. To which words or phrases in our notes and textbook do these terms correspond?

Question 3. On p. 31, you are shown the sample spaces corresponding to the events of tossing a single die, a pair of dice, and three dice. How many outcomes are in the sample space corresponding to the event of tossing four dice? [Use the generalized rule of counting, if you need to.]

Question 4. When tossing four dice, what is the probability of them all coming up 1's?

Question 5. State (either in words or with formulas) the two characteristic properties of probability.

Question 6. On p. 33, why do the remaining probabilities need to sum to 0.75?

Question 7. Write a set containing the elementary outcomes corresponding to the event of drawing a spade from a standard deck of cards.

Question 8. On p. 32, the author states, "If you rolled [two] dice a very large number of times, in the long run, (5,2) would occur 1/36 of the time." This is an illustration of the **law of large numbers**:

> If a situation, trial, or experiment is repeated again and again, the proportion of successes will tend to approach the probability that any one outcome will be a success.

Together with your groupmates, flip a coin 10 times and record the results in a list here:

Flip the coin ten additional times, and record the results here:

What is the proportion of heads in the first ten flips? What is the proportion of heads in the first twenty flips? Do your results agree with the law of large numbers? What would you expect to happen if you flipped the coin 1,000 times?

Question 9. For each of the following probabilities, determine whether the classical, relative frequency, or personal (sometimes called "subjective") definitions of probability were used.

(a) When rolling one particular die, the probability of getting a "4" is 1/3.

(b) A political analyst told us that the probability of Hillary Clinton's winning the state of Maine in the 2016 general election was 86%.

(c) When rolling two dice, the probability that the two numbers sum to 7 is 1/6.

(d) Based on a sample of 1,000 wells in Berkshire County, the probability that a homeowner's water contains unacceptable levels of PFOA is 37%.

Question 10. Suppose that we toss a coin two times; the sample space is therefore $\{(H, H), (H, T), (T, H), (T, T)\}$. Let E be the event of having at least one H, and let F be the event of having at least one T. Write the set containing the elementary outcomes for each of the following new events, and compute the probability that the event occurs:

(a) E and F

(b) E or F

(c) Not F

Question 11. Bonus: Claudius's book *How to Win at Dice* is said to have been "lost"; how this loss is likely to have happened?