Homework 1

Math 262

Write your solutions to the following problems and turn them in to the homework mailbox (RMS level 3, near the fireplace) by 5:00pm on Friday, February 10.

Warm-Up

Read "The Secret to Raising Smart Kids" (*Scientific American*, January 2015, `http://bit.ly/dweck-mindset`) and answer the following questions: *What are three ways that students with a growth mind-set approach challenges differently than students with a fixed mind-set? How might a growth mind-set be valuable in this course?*

Book Problems

- Section 1.1 #1, 2, 6, 11 (pages 6–9)
- Section 1.2 #19 (page 19) *(Assume that events A and B are disjoint.)*

Additional Problems

Tom and Helga play a simple coin-flipping game for a big prize. Each round consists of a single flip of a "fair" coin. Tom wins the round if the coin lands heads; otherwise Helga wins that round. Tom and Helga take turns flipping the coin; Tom goes first. The first player to win 10 rounds wins a $1000 prize.

1. Is the game fair to both players, in the sense that either player is equally likely to win? Why or why not?

Unfortunately, the coin falls down a sewer and Tom and Helga need to abandon their game before it's over. When they stop, the score is Tom 6 and Helga 7. How should the prize be divided "fairly"? Here are some possibilities:

I. Around 1494, Luca Pacioli proposed that if Tom's score is A and Helga's is B, the prize be divided in the proportion $A : B$. In the situation above, Tom gets 6/13 (or about $462) and Helga gets 7/13 (about $538).

II. Around 1550, Niccolo Tartaglia disliked Pacioli's method. (What happens if the game ends after just one round?) Tartaglia suggested that since Helga leads by 1 in a 10-round game, she should get 10% more ($550) of the prize than Tom ($450).

III. Around 1654, Blaise Pascal (along with other luminaries, like Fermat) disliked Tartaglia's method. He proposed that the prize be divided based on the probability that the interrupted game would have ended with Tom or Helga winning. Since Helga leads 7 to 6, presumably she should get more.

2. Tom and Helga's game, if started up again, would have to end in no more than 6 more throws. Why? Why not 7?

3. Explain why Pascal's method gives Tom 22/64 of the prize (about $344) and Helga 42/64 (about $656).

   Hint: There are $2^6 = 64$ possible sequences of heads and tails that result from six coin flips. How many of these would cause Tom to win?

4. Which of these methods seems "fairest" to you? Why?