Tuesday, January 9

Today's Readings

- From the *DCM Reader*:
  - Chapter 2 Introduction
  - Atkins, *The Limitless Power of Science*
  - Gould, *Non-Overlapping Magisteria*
  - Fang Li Zhi, *Note on the Interface Between Science and Religion*
  - MacKay, *A Scientist in God’s World*

- Collins, *The Language of God*, excerpts
- Levinson, *Chance, Luck and Statistics*, Chapters 1 and 2

Class

- Devotions
- More Probability
  - conditional probability
  - generalized probability rules
  - expected value
- Quiz and Discussion of Science and Faith

Preparing for Tomorrow

Probability Problems

Do problems 6–9.

Coming Events

Reading for Thursday

- *Evangelical Climate Initiative*
- Film: *An Inconvenient Truth*
- Salsbury, *The Lady Tasting Tea*, Preface and Chapter 1
- Carlson, *The Truth, But not the Whole Truth*

Films

We will be watching films each of the next three days.
Probability Problems

6. Two games with dice.
   a) Here is an interesting game. Alice rolls a single six-sided die four times. If she gets at least one 6, she wins. If she gets no 6’s, Bob wins. What is the probability that Alice wins?
   b) Would it matter if Alice rolled 4 dice at once rather than one die four times?
   c) Here is another interesting game. Alice rolls two six-sided dice 24 times. If she gets at least one double-6, she wins. Otherwise Bob wins. What is the probability that Alice wins this game?
   d) Would it matter if Alice rolled 48 dice at once rather than two dice 24 times?

These games were actually played (for money) by the French nobleman Antoine Gombauld in the 17th century. He figured that since rolling double sixes was six times as hard as rolling a single six, the probabilities of winning each game should be the same. When he started losing money at the second game, however, he wrote a letter to the French mathematician Blaise Pascal. Together with Pierre de Fermat, Pascal went on to develop the mathematics of probability, focussing primarily on “games of chance”.

7. The table below shows the probabilities for a random variable $X$.

<table>
<thead>
<tr>
<th>$X$</th>
<th>probabaility</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>.5</td>
</tr>
<tr>
<td>1</td>
<td>.3</td>
</tr>
<tr>
<td>5</td>
<td>.1</td>
</tr>
<tr>
<td>10</td>
<td>.1</td>
</tr>
</tbody>
</table>

   What is $E(X)$ (the expected value of $X$)?

8. Suppose you roll 5 fair 6-sided dice, what is the probability that at least two of them match?

9. The Daily 4 game works just like the Daily 3 game, except four numbers are selected. If you “play it straight”, you win if your four numbers match the ones drawn at the lottery (in the exact order). The prize is $5000.
   a) What is the probability of winning the $5000 prize?
   b) What is the expected value of such a lottery ticket?

If you “play it boxed”, you only have to match the numbers, but not necessarily the order. So for example, 1234 matches 3421.
   c) If you have a ticket with the number 1123, what is the probability of winning “playing it boxed”?
   d) What prize value should be assigned to this ticket so that it has the same expected value as the “play it straight” ticket?

10. If you roll a four-sided die (sides labeled 1, 2, 3, and 4) and a six-sided die (with standard labeling), what is the probability of rolling doubles? What is the probability that the four-sided die has a larger number than the six-sided die?