24.223: Rationality, Problem Set 2

Kevin Dorst

Please turn in legible hand-written (or typed) answers to the following problems from the Titelbaum textbook. **You must show your work.**

The due date is **in class on October 11**.

Working in groups is permitted, but you must write up your answers on your own. (If you've copied your answers, I'll be able to tell—and that will be a big problem.)

1. Problem 4.1. [Galileo dropping cannon balls]

2. Problem 4.4.(For (c), 'non-extreme' means $0 < cr(E) < 1$.) [conditioning on evidence that lowers credence in a proposition, etc.]

3. Problem 4.5., (a) and (b). (Remember that at least 50% credence means at least $1 : 1$ odds—i.e. 999 : 999 odds. It may be helpful to reread section 2.3.4.) [base rate fallacy; how many tests?]

4. Problem 5.3. [Reflection principle, current credence given beliefs about future credences]
   Hint: If Y happens, what is cr_2's expectation of $cr_3(X)$? What can you infer about $cr_2(X)$? Similarly: what are these values if Z?

5. Problem 5.4. [real-world situations where Reflection fails]

6. Problem 7.1. [Playing craps in a casino]
   Hint: Each outcome of the pair of dice has $\frac{1}{36}$ probability, i.e. it's $\frac{1}{36}$ likely that the outcome will be $(1, 1)$ (the first die will land 1 and the second will land 1), $\frac{1}{36}$ likely that the outcome will be $(1, 2)$ (the first will land 1 and the second will land 2), it'e $\frac{1}{36}$ likely that the outcome will be $(2, 1)$ (the first will land 2 and the second will land 1), etc. Make sure to count *all* the ways the outcome could total to (e.g.) 7!

7. Problem 7.3. [St Petersburg]
   Hint: The probability that the first heads appears on the nth toss is $\frac{1}{2^n}$.

8. Problem 7.7. ["Suppose an agent is indifferent between two gambles..."]