24.223: Rationality, Problem Set 1 (RENUMBERED)

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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 **September 27, in class**.

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.)

I've done my best to guess at the difficulty of each problem. * = easy, ** = medium, *** = hard. (Try doing them in order, but skip around if you get stuck.)

1. Problem 2.1.* (Draw a truth-table.)
2. Problem 2.5.*
3. Problem 2.6.*** Two modifications to the textbook instructions: (1) You *can* use probability tables and Venn diagrams in your answer, if you find it easier to do so; and (2) do not do *all* of the rules. Instead, do the following (I recommend in order):

   Maximality.

   Contradiction. (Hint: every contradiction is the negation of some tautology.)

   Equivalence. (Hint: reason using probability tables or state descriptions.)

   Decomposition. (Hint: Use truth tables to show that P is equivalent to $(P\&Q) \vee (P\&\neg Q)$.)
4. Problem **2.9.****
5. Problem **2.11.****
6. Problem **3.4.**** (Hint for additivity: $(P \vee Q)\&R$ is equivalent to $(P\&R) \vee (Q\&R)$.)
7. Problem 3.5.*
8. *Here are some facts about me. When the weather's clear (C), I always bike into work (B): $cr(B|C) = 1$. When it's rainy (R), I bike in half the time: $cr(B|R) = 0.5$. When it's hailing (H), I never bike in: $cr(B|H) = 0$.

   You're 50% confident tomorrow will be clear, 40% confident it'll be rainy, and 10% confident it'll hail.

   Supposing that I bike in tomorrow, how confident should you be that it'll rain? (What is $cr(R|B)$?)
9. Problem **3.7.*, (a)–(e)**