Note: These problems are designed for practice during a 50 minute recitation.

1. **Easy** problems: expected to be solved in *5 min*.
2. **Medium** problems: expected to be solved in *30 min*.
3. **Hard** problems: expected to be solved in *15 min*.

During the recitation, you may discuss the problems with your peers and the TA. Please control your volume and don’t annoy others. An electronic copy of these problems and solutions will be posted on the following URL: <http://cs.utsa.edu/~btang/pages/teaching.html>.

**Questions**:

1. (Easy, 2 min) Suppose that E and F are events in a sample space and p(E) = 1/3,p(F) = 1/2,and p(E I F) = 2/5. Find p(F I E). (Textbook [KR] Page 424: 1)
2. (Easy, 3 minSuppose that Frida selects a ball by first picking one of two boxes at random and then selecting a ball from this box at random. The first box contains two white balls and three blue balls, and the second box contains four white balls and one blue ball. What is the probability that Frida picked a ball from the first box if she has selected a blue ball? (Textbook [KR] Page 424: 3)
3. (Medium, 15min) Suppose that a test for opium use has a 2% false positive rate and a 5% false negative rate. That is, 2% of people who do not use opium test positive for opium, and 5% of opium users test negative for opium. Furthermore, suppose that 1 % of people actually use opium.
   1. Find the probability that someone who tests negative for opium use does not use opium.
   2. Find the probability that someone who tests positive for opium use actually uses opium. (Textbook [KR] Page 424: 7)
4. (Medium, 15 min) Suppose that 8% of the patients tested in a clinic are infected with HI­ Furthermore, suppose that when a blood test for HIV is given, 98% of the patients infected with HIV test positive and that 3 % of the patients not infected with HIV test positive. What is the probability that
   1. a patient testing positive for HIV with this test is infected with it?
   2. a patient testing positive for HIV with this test is not infected with it?
   3. a patient testing negative for HIV with this test is infected with it?
   4. a patient testing negative for HIV with this test is not infected with it? (Textbook [KR] Page 424: 9)
5. (Hard, 15 min) Suppose that a Bayesian spam filter is trained on a set of 1000 spam messages and 400 messages that are not spam. The word "opportunity" appears in 175 spam messages and 20 messages that are not spam. Would an incoming message be rejected as spam if it contains the word "opportunity" and the threshold for rejecting a message is 0.9? (Textbook [KR] Page 425: 19)