EECS 560: Homework 3
Due: Monday, October 19, 2015 (At the beginning of lecture)

Note: You must show all of your work to obtain credit for a problem. Partial credit will be given when meaningful answers were given.

Questions:

1. (15 points) Given a set $S$ of 11 records with priorities $\{34, 68, 1, 2, 88, 56, 94, 72, 45, 39, 75\}$. Construct a 2-3 tree for $S$ by inserting the elements in $S$, in the given order, into an initially empty 2-3 tree. When done, delete 68, 39, and then 94. **You must illustrate all your 2-3 trees clearly for credit.**

2. (30 points; 15 points each) Given a set $S$ of 15 records with priorities $\{64, 20, 21, 61, 45, 17, 12, 92, 55, 83, 47, 63, 37, 73, 25\}$.
   
   (a) Build a min 2-heap for $S$ by inserting the records, in the order given, into an initially empty heap. When done, delete min twice.
   
   (b) Build a max 2-heap for $S$ by using the bottom-up approach. When done, delete max twice.

   **You must illustrate all of your trees clearly for credit.**

3. (30 points; 15 points each) Given a set $S$ of 15 records with priorities $\{64, 20, 21, 61, 45, 17, 12, 92, 55, 83, 47, 63, 37, 73, 25\}$.
   
   (a) Build a minmax heap for $S$ by inserting the records, in the order given, into an initially empty heap. When done, perform deleteMin and then deleteMax once.
   
   (b) Build a maxmin heap for $S$ using the bottom-up approach. When done, perform deleteMax and then deleteMin once.

   **You must illustrate all of your trees clearly for credit.**

4. (25 points) Emergency Room Patient Processing
   
   (a) (5 points) Describe how a priority queue could be used to determine which patient should be seen in which order by a single emergency room doctor, assuming priorities can be assigned to each type of concern, e.g., heart attack, broken leg, gun shot wound, etcetera. Assume that a priority of 1 is the top priority.
   
   (b) (10 points) Suppose that, in addition to knowing each patient’s concern, his/her general condition is also known, e.g., middle-aged runner with a broken leg, ninety-five year-old male who experienced a heart attack, etc. How does your answer to (a) change?
   
   (c) (10 points) Assume that for each patient, his/her concern and general condition is known. In addition, suppose that there are three emergency room (ER) doctors working tonight. One of the ER doctors working at the hospital tonight specializes in cardiovascular ER cases; a second one working tonight at the hospital specializes in pediatric ER cases. The third doctor, who specializes in farm accident ER cases, is on call, which means she is able to stay at home until she is called in to treat a case. It takes her 20 minutes to reach the hospital. How can a priority queue(s) be used to determine which patient is seen by which doctor and in what order each doctor’s patients are seen?