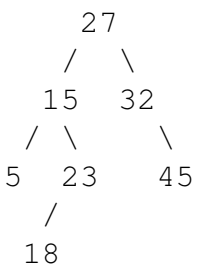
Midterm 2 Review

These questions are designed to help you think about course material. The exam will be mostly short answer or coding.

Research shows that the best way to study for an exam is with other people. In group study, the people who start knowing more learn more (think about why), so don't think that it is only valuable to study with people who know more than you do.

1 Trees

1. Draw the AVL balanced binary tree that results from each sequence of inserts.
   - 10, 12, 4, 3, 5, 7, 15
   - 1, 4, 8, 9, 10, 11
   - 10, 9, 8, 7, 12, 14, 16
2. Given the following AVL tree, show the steps required to insert(19).



2 Sorting Algorithms

3. Review Homework 4 and be able to answer similar questions.
4. Identify the following mystery sorting algorithm:

```
void mysterySort(int * values, int length) {
  for (int i = 0; i < length; i++) {
    int x = i;
    for (int j = i+1; j < length; j++) {
      if (values[j] < values[x]) {
        x = j;
      }
    }
    int y = values[i];
    values[i] = values[x];
```

```
    values[x] = y;
  }
}
```

5. What is the exact running time, T(n), of the mysterySort?
6. What is the big-O notation for the running time of mysterySort?
7. Identify the following mystery sorting algorithm:

```
void mysterySort2(int * values, int begin, int end) {
  int s = end - begin;
  int h = s/2;
  if (h > 0) {
    mysterySort2(values, begin, h+begin);
    mysterySort2(values, h+begin, end);
  }
  int x = 0;
  int y = 0;
  int * t = new int[s];
  for (int z = 0; z < s; z++) {
    if (y == s-h ||
        (x != h && (values[x+begin] < values[y+begin+h]))) {
      t[z] = values[x+begin];
      x++;
    }
    else {
      t[z] = values[y+begin+h];
      y++;
    }
  }
  for (int z = 0; z < s; z++) {
    values[begin+z] = t[z];
  }
  delete [] t;
}
```

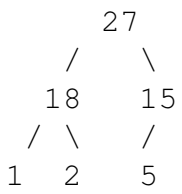
8. What is the exact running time, T(n), of the mysterySort2?
9. What is the big-O notation for the running time of mysterySort2?

3 Heaps

10. Describe the implementation and running time of the following operations on a Binary Max Heap:

- getMax
- deleteMax
- insert
- increaseKey

11. Given the following max binary heap, show the steps required to execute deleteMax.



12. Given the following max binary heap, show the steps required to insert(35).