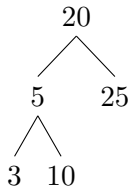
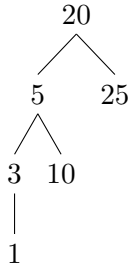
Algorithms Worksheet 5

This week there are four question worth two marks each, there are two marks for attendance.

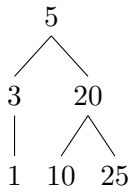
1. This is a question about AVL trees. Add '1' to this tree and balance it.



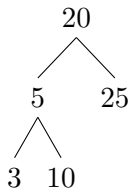
   Solution: So start with



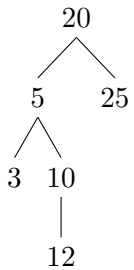
   Clearly we need to rotate so that the '5' is on top but to do this the '10' has to move to the '25':



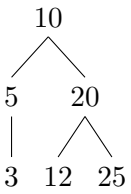
2. This is also a question about AVL trees. Add '12' to this tree and balance it.



   Solution: So start with

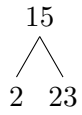


Clearly we need to rotate so that the '10' is on top but to do this the '12' has to move to the '25':

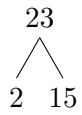


3. Heapify the list $(15, 2, 23, 19, 24, 13, 8)$.

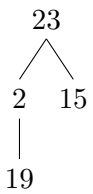
   Solution: The key point is you add each item at the next available slot in the tree and then if it violates the rule that items are smaller than their parent, you swap it upwards until it works. So



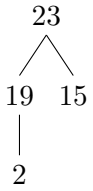
   gets changed to



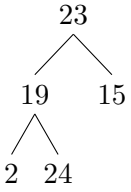
   Next adding to the next layer



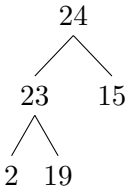
   becomes



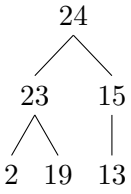
   and then



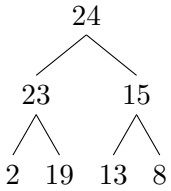
goes to



Next

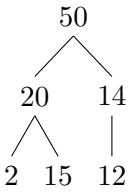


becomes



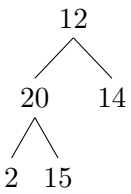
and then it finishes.

4. For the heap

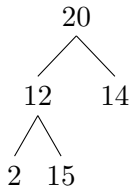


remove the top element and restore the heap property.

Solution. First you swap the last element to the top and remove the old top element:



then you push the top element down by swapping it with the larger of its children until it can't go down further:



and