Section Worksheet #4 Solutions

1.

1a

\[
\begin{array}{c}
7 \\
12 \\
13 \\
\end{array}
\]

Yes

1b

\[
\begin{array}{c}
5 \\
8 \\
9 \\
\end{array}
\]

No; ordering property violated

1c

\[
\begin{array}{c}
3 \\
4 \\
5 \\
\end{array}
\]

Yes

1d

\[
\begin{array}{c}
2 \\
8 \\
14 \\
\end{array}
\]

No; ordering property violated

1e. It would have a gap in the array; to be complete the array should be populated from index 1 to n, and nowhere else (except 0, which may store the size or something similar).

2. a)

\[
\begin{array}{c}
1 \\
5 \\
7 \\
\end{array}
\]

2. b)

\[
\begin{array}{c}
2 \\
5 \\
7 \\
\end{array}
\]
2.  
c)

![Diagram]

3.  
a)

![Diagram]

b) Adding a node as either a left child of node 15 or node 3 would cause a left-left imbalance

4.  
a) Each node can have at most M children, and must have a minimum of M/2 children, and each leaf can have at most L data items, and at least L/2 data items. (rounding-up)
So, a tree with M=32 and L=16 must have 16-32 children at each internal node, and must have 8-16 items at each leaf. (excepting the first 7 insertions)

4.  
b)
4. c) 

5. a) 

5. b) 

5. c) 14, 10, 17, 4, 12, 13, 24 

We can never place the 24 because the index loops between 4, 0, 5, 5, 0, 4, 3 and never hits 2.