Q1:

Time required to build tree: 7698 milliseconds

Q2:

There were 72 incidents on 1/1/2003.

Time required to gather reports from tree: 181 milliseconds.

Time required to gather reports from list: 82 milliseconds.

There were 53 incidents on 3/17/2004.

Time required to gather reports from tree: 163 milliseconds.

Time required to gather reports from list: 121 milliseconds.

There were 59 incidents on 7/4/2005.

Time required to gather reports from tree: 181 milliseconds.

Time required to gather reports from list: 48 milliseconds.

There were 70 incidents on 10/31/2006.

Time required to gather reports from tree: 138 milliseconds.

Time required to gather reports from list: 46 milliseconds.

There were 44 incidents on 12/25/2007.

Time required to gather reports from tree: 138 milliseconds.

Time required to gather reports from list: 41 milliseconds.

There were 74 incidents on 6/8/2008.

Time required to gather reports from tree: 130 milliseconds.

Time required to gather reports from list: 47 milliseconds.

Q3:

Time required to build tree: 861 milliseconds

It is faster than Q1 because the tree doesn’t have duplicates and it helps to build more balanced tree (adding a duplicate to the tree is always done to the right subtree, which makes the tree more likely to be skewed to the right). The more unbalanced tree the more time it takes to add a new node while building the tree.

Q4:

Report: Incident #140574195 Date: 7/10/2014 (Thursday)

Category: LARCENY/THEFT Description: GRAND THEFT PICKPOCKET Resolution: NONE

District: TENDERLOIN Address: TAYLOR ST / OFARRELL ST

Time required to find report from tree: 0 milliseconds.

Time required to find report from list: 20 milliseconds.

Report: Incident #110592020 Date: 7/24/2011 (Sunday)

Category: LARCENY/THEFT Description: THEFT FROM MERCHANT OR LIBRARY Resolution: NONE

District: SOUTHERN Address: 800 Block of BRYANT ST

Time required to find report from tree: 0 milliseconds.

Time required to find report from list: 15 milliseconds.

Report: Incident #146106530 Date: 6/1/2014 (Sunday)

Category: LARCENY/THEFT Description: GRAND THEFT FROM LOCKED AUTO Resolution: NONE

District: NORTHERN Address: GEARY BL / WEBSTER ST

Time required to find report from tree: 0 milliseconds.

Time required to find report from list: 8 milliseconds.

Report: Incident #126105825 Date: 7/24/2012 (Tuesday)

Category: LARCENY/THEFT Description: GRAND THEFT OF PROPERTY Resolution: NONE

District: TARAVAL Address: 1700 Block of 16TH AV

Time required to find report from tree: 0 milliseconds.

Time required to find report from list: 7 milliseconds.

Report: Incident #41278838 Date: 11/8/2004 (Monday)

Category: LARCENY/THEFT Description: PETTY THEFT SHOPLIFTING Resolution: ARREST- CITED

District: SOUTHERN Address: 800 Block of MARKET ST

Time required to find report from tree: 0 milliseconds.

Time required to find report from list: 1 milliseconds.

Report: Incident #150160706 Date: 2/21/2015 (Saturday)

Category: LARCENY/THEFT Description: GRAND THEFT PICKPOCKET Resolution: NONE

District: CENTRAL Address: LEAVENWORTH ST / LOMBARD ST

Time required to find report from tree: 0 milliseconds.

Time required to find report from list: 6 milliseconds.

Report: Incident #50288466 Date: 3/14/2005 (Monday)

Category: LARCENY/THEFT Description: GRAND THEFT SHOPLIFTING Resolution: NONE

District: NORTHERN Address: 2200 Block of FILLMORE ST

Time required to find report from tree: 0 milliseconds.

Time required to find report from list: 1 milliseconds.

Report: Incident #146180813 Date: 9/4/2014 (Thursday)

Category: LARCENY/THEFT Description: GRAND THEFT FROM LOCKED AUTO Resolution: NONE

District: NORTHERN Address: 0 Block of PEACE PZ

Time required to find report from tree: 0 milliseconds.

Time required to find report from list: 6 milliseconds.

Report: Incident #70378752 Date: 4/8/2007 (Sunday)

Category: LARCENY/THEFT Description: GRAND THEFT FROM LOCKED AUTO Resolution: NONE

District: NORTHERN Address: 1000 Block of FRANKLIN ST

Time required to find report from tree: 0 milliseconds.

Time required to find report from list: 3 milliseconds.

Report: Incident #140628617 Date: 7/29/2014 (Tuesday)

Category: LARCENY/THEFT Description: GRAND THEFT FROM LOCKED AUTO Resolution: NONE

District: NORTHERN Address: VANNESS AV / HAYES ST

Time required to find report from tree: 0 milliseconds.

Time required to find report from list: 6 milliseconds.

Q5:

Time required to build tree: 673026 milliseconds.

In Q1 the comparison is based on the date and the dates are in the range between 2003 and 2015 so we have over 4000 possible values while in Q3 we compare by day of the week which is just 7 possible value. So, the likelihood of having duplicates in the tree is over 500 (4000/7) times higher for Q3. The more duplicates the more unbalanced tree is and the more time it takes to build the tree.

Q6:

There were 51196 incidents on Sunday.

Time required to gather reports from tree: 147 milliseconds.

Time required to gather reports from list: 87 milliseconds.

There were 49486 incidents on Monday.

Time required to gather reports from tree: 57 milliseconds.

Time required to gather reports from list: 84 milliseconds.

There were 51263 incidents on Tuesday.

Time required to gather reports from tree: 67 milliseconds.

Time required to gather reports from list: 24 milliseconds.

There were 52152 incidents on Wednesday.

Time required to gather reports from tree: 61 milliseconds.

Time required to gather reports from list: 19 milliseconds.

There were 52441 incidents on Thursday.

Time required to gather reports from tree: 58 milliseconds.

Time required to gather reports from list: 21 milliseconds.

There were 57693 incidents on Friday.

Time required to gather reports from tree: 70 milliseconds.

Time required to gather reports from list: 20 milliseconds.

There were 57633 incidents on Saturday.

Time required to gather reports from tree: 64 milliseconds.

Time required to gather reports from list: 19 milliseconds.

In Q2 the tree does not have duplicates and we can stop searching after finding the first match. In Q3 we must visit each node for each search criterion. That is the reason why Q3 is slower than Q2.

Q7: I got StackOverflowError. The search was trying to visit each node recursively and because the tree is very large there was not enough space on the stack to fit all recursive invocations.