# CSE222 – Homework5 – Question3

# Report

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# Problem Solution Approach :

## * Problem Definition :

Assume you need to record the number of people in each age for a population. Extend the BinarySearchTree class of your book as **AgeSearchTree** class. You will implement **AgeData** class to handle both age and number of people at that age values. You should keep instances of AgeData in your tree. Note that AgeData should be Comparable. CompareTo method of AgeData class will be used and the comparison will be done considering the age only. For the AgeSearchTree class you will override add, remove and find methods as follows:

- While adding a node, the **add** function will first check if a node with that age exists. If it exists, the number of people field of the AgeData object in that node will be increased 1. Otherwise a new node with the AgeData object will be inserted.
- While removing a node, the **remove** function will first check if a node with that age exists. If it exists and the number of people field of this node's AgeData object is greater than 1, it will decrease the number of people field 1. If the number of people field is 1, it will remove the node.
- The **find** method will get an AgeData object of any age and find the AgeData object with the same age and return it.
- Add a **youngerThan** method which returns the number of people younger than an age.
- Add an **olderThan** method which returns the number of people older than an age. Be careful! If your youngerThan and olderThan methods always traverse all nodes that you cannot get whole credit. You should traverse only the nodes needs to be traversed.

## * Approach :

Binary tree is a useful for controlling the data which are compared with each other. Exploiting this comparability in binary tree is an efficient way according to other kinds of data structure. When the population has been thought , there are certain age and people who old a certain age. AgeData class keeps the certain age and how many people exist in that certain age.

In this assignment , the thing that provide a comparability is age. Tree can be built according to certain age of each AgeData object. compareTo method is exceedingly enough for constructing a tree. There are different types of traversing method for implementing each functionality of Tree. Those traversing methods are mentioned in Javadoc file for each function of Tree class.

# Test Cases:

## Constructors Test:

| Test ID | Scenario | Test Data | Expected Result | Actual Result | Pass | Fail |
|---|---|---|---|---|---|---|
| T01 | Create tree with constructor. | Created tree object. | Create tree successfully. | Expected result has occurred. | ✓ | |

## Methods Test:

| Test ID | Scenario | Test Data | Expected Result | Actual Result | Pass | Fail |
|---|---|---|---|---|---|---|
| T01 | - add( new AgeData(10) )<br>- add( new AgeData(20) )<br>- add( new AgeData(5) )<br>- add( new AgeData(15) )<br>- add( new AgeData(10) )<br>- add( new AgeData(9) )<br>- add( new AgeData(25) )<br>- add( new AgeData(16) )<br>- add( new AgeData(18) ) | Each of them is representing AgeData reference.<br>10 , 20 , 5, 15 , 10 ,9,25,16,18. | Construct a tree as a binary tree. | Expected result has occurred. | ✓ | |
| T02 | - find( new AgeData( 10 )).toString() | 10 , 20 , 5, 15 , 10 ,9,25,16,18 | 10 - 2 | Expected result has occurred. | ✓ | |
| T03 | - find( new AgeData( 18 )).toString() | 10 , 20 , 5, 15 , 10 ,9,25,16,18 | 18 - 1 | Expected result has occurred. | ✓ | |
| T04 | - find( new AgeData( 7 )).toString() | 10 , 20 , 5, 15 , 10 ,9,25,16,18 | Given item has not been found in tree. | Expected result has occurred. | ✓ | |
| T05 | - youngerThan( 15 ) | 10 , 20 , 5, 15 , 10 ,9,25,16,18 | 4 | Expected result has occurred. | ✓ | |
| T06 | - olderThan( 10 ) | 10 , 20 , 5, 15 , 10 ,9,25,16,18 | 5 | Expected result has occurred. | ✓ | |
| T07 | - remove( new AgeData( 9 ) ) | 10 , 20 , 5, 15 , 10 ,25,16,18 | Remove the AgeData object from the tree. | Expected result has occurred. | ✓ | |
| T08 | - remove( new AgeData( 10 ) ) | 10 , 20 , 5, 15 , 10 ,25,16,18 | Remove the AgeData object from the tree. | Expected result has occurred. | ✓ | |
| T09 | - remove( new AgeData( 7 ) ) | 10 , 20 , 5, 15 , 10 ,25,16,18 | Item cannot be found and removed. | Expected result has occurred. | ✓ | |

## Class Diagram :

*Class diagram is inserted to the homework file.*

## Running Commend and Result:

*Running command and result stage is inserted to the homework file.*