Fatih Budak
150130006

Analysis of Algorithms 1
Project Report 5

1. Firstly, output of my program :

```
[budakf@ssh algo-5]$ g++  Source.cpp
[budakf@ssh algo-5]$ ./a.out input.txt
(B) Glen F 29
-(B) Dane F 14
--(B) Blair F 11
---(R) Alex M 13
---(R) Casey F 35
--(B) Evan M 18
---(R) Fran M 30
-(R) Leah F 23
--(B) Izzy M 27
---(B) Hayden M 28
---(B) Jude F 26
----(R) Kelly F 24
--(B) Naomi F 21
---(B) Morgan M 22
---(R) Ryan F 17
----(B) Parker M 19
-----(R) Ogden M 20
-----(R) Quinn M 18
----(B) Taylor F 14
-----(R) Shane M 16

5th Adult: Hayden
3rd Non-Adult: Dane
```

2. **Briefly explain what you would do to correctly update the name of a person as a node in the Red–Black Tree.**

In our red black tree, we have used name of person as key value. Therefore, if we want to update the name of any person, we find the wanted person and update person's name, but person's new name, also key value, may be bigger than its parent or may be smaller than its child. In short, rest of our red black tree have an error, after update operation. Also, this error cannot be fixed with fixup function. Because of these reasons, if we want to update the name of any person, we can follow a path like this: Firstly, we create a new node having same values with the person whose name will be updated except its name. After that, we delete this person and call delete fixup function. Finally, we insert new node.

3. **Briefly explain what you would do to correctly increment (by 1) the ages of all people in the Red–Black Tree.**

We traverse all red black tree and increment by one ages of all people.However, age is related to adult or non-adult attributes. Because of relationship between age and adult, non-adult attributes, we must call count_both function. So that num_adult and num_non_adult numbers are updated.