Benzekri Omar
300262795
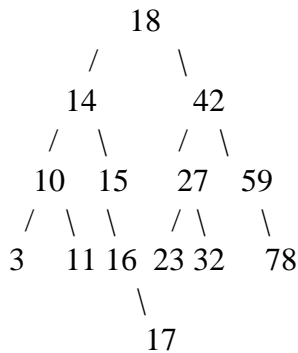
uOttawa

L'Université canadienne
Canada's university
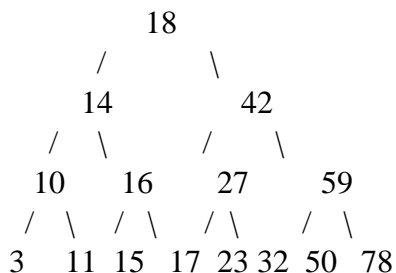
Devoir 6 (2.5% - 10 points)
CSI2110/CSI2510 (Automne 2022)

Question 1.

Key 17:

```
                18
              /      \
          14          42
        /    \       /  \
      10    15     27   59
     /  \   \     /  \     \
    3   11 16 23 32     78
                  \
                  17
```

After balancing:

```
                18
              /        \
          14            42
        /    \         /   \
      10      16     27    59
     /  \    /  \    /  \      \
    3   11 15  17 23 32  78
```
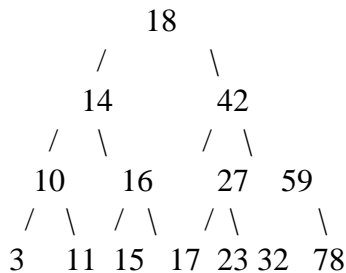
Key 50 (no balancing required) :

```
                18
              /          \
          14              42
        /    \          /     \
      10      16     27       59
     /  \    /  \    /  \     /   \
    3   11 15  17 23 32 50   78
```

Key 45 (no balancing required) :

```
                18
          /            \
        14              42
      /    \          /     \
    10     16      27       59
   / \    / \     / \      /   \
  3   11 15 17  23 32    50   78
                         /
                        45
```

Key 43 :

```
              18
          /         \
        14           42
      /    \        /     \
    10      16    27       59
   / \     / \    / \     /   \
  3   11  15  17 23 32 50   78
                       /
                      45
                     /
                    43
```

After balancing:

```
              18
          /         \
        14           42
      /    \        /     \
    10      16    27       59
   / \     / \    / \     /   \
  3   11  15  17 23 32 45   78
                       /  \
                     43    50
```

Key 44 :

```
                18
              /      \
           14           42
          /  \         /    \
        10    16     27      59
       / \   / \    / \     /  \
      3  11 15 17 23 32 45   78
                          / \
                        43   50
                           \
                           44
```

After balancing:

```
                18
              /      \
           14           42
          /  \         /    \
        10    16     27      45
       / \   / \    / \     /    \
      3  11 15 17 23 32 43      59
                          \    / \
                         44  50  78
```

Key 46 :

```
                18
              /      \
           14           42
          /  \         /    \
        10    16     27      45
       / \   / \    / \     /    \
      3  11 15 17 23 32 43      59
                          \    / \
                         44  50  78
                              /
                             46
```
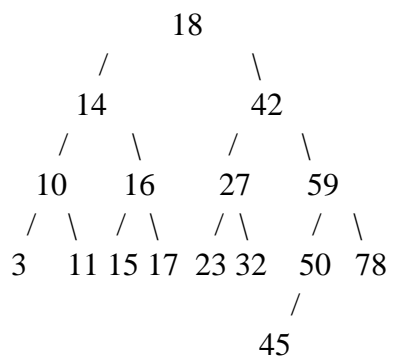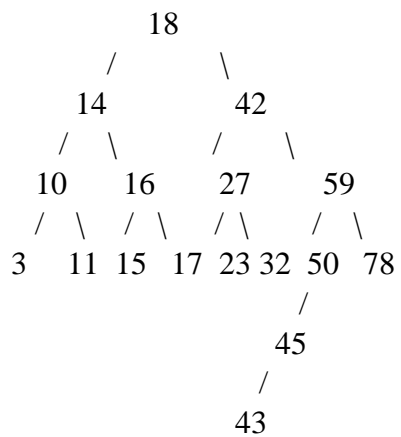
After balancing:
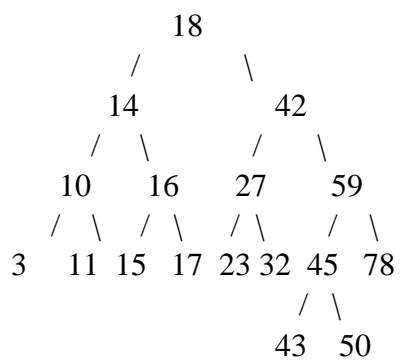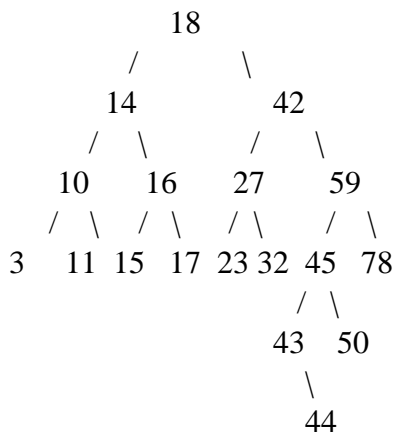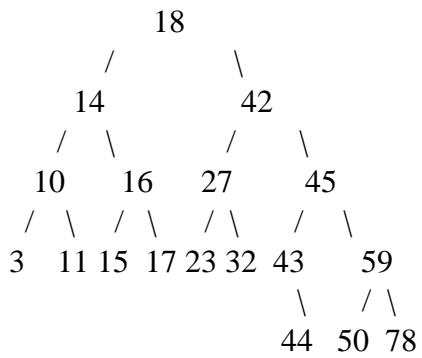
```
                18
              /      \
           14          45
          /  \        /    \
       10    16     42       59
      / \   / \    / \      /   \
     3   11 15 17 27 43    50   78
                   / \  \   /
                  23 32 44 46
```
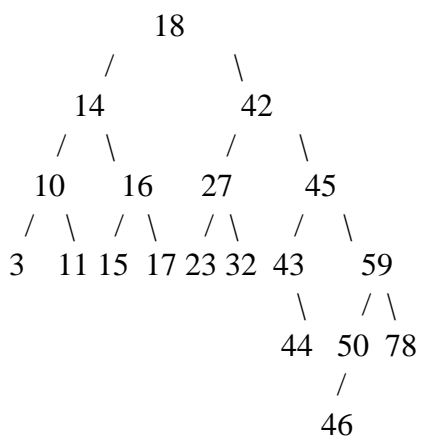
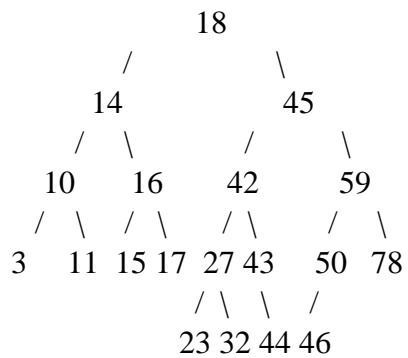## *Question 2*

After removing 40 from the AVL tree, the balance factor for the root node is 1 and so it is balanced which is no longer the case for the right subtree of node 50, the balance factor is -2 hence a rotation is performed:

```
              35
            /      \
         20          54
        /  \        /  \
     10    23     50     62
    / \    / \    / \    / \
   5   *  21 32  *   *  *   *
  / \     /\ / \
 *   *   * * 30 *
            / \
           *   *
```