```
/*********************************************************************
****
 * AUTHORS   : Dan Karlsson
 * CLASS     : CS1D
 * DATE      : 04-03-16
 * Extra Credit : Red-Black Tree Dictionary

*********************************************************************
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Inserting the key [ 18 ] with the value : Laguna Niguel
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```
  18
 /  \
-1  -1
```
---------------------------------------------------------------------
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Inserting the key [ 41 ] with the value : Mission Viejo
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```
    __18__
   /      \
  -1       41
          /  \
        -1   -1
```
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--------
Inserting the key [ 22 ] with the value : Lake Forest
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Rotate right around the subtree : 41
----------------------------------------------------------------------
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--------
Rotate left around the subtree : 18
----------------------------------------------------------------------
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     __22__
    /      \
   18       41
  / \      / \
 -1  -1  -1  -1
----------------------------------------------------------------------
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Inserting the key [ 44 ] with the value : Irvine
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          _____22_____
         /              \
      __18__          __41__
     /      \        /      \
    -1      -1      -1       44
                           / \
                          -1  -1

          _____22_____
         /              \
      __18__          __41__
     /      \        /      \
    -1      -1      -1       44
```
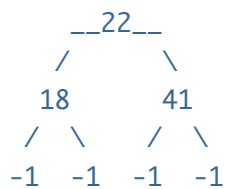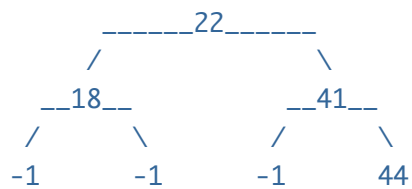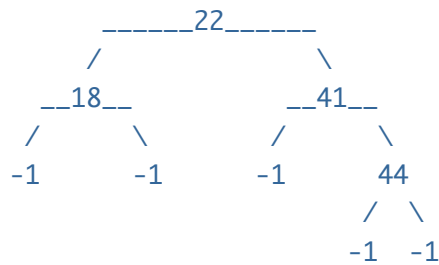
```
                    / \
                  -1   -1
```
------------------------------------------------------------------------
------------------------------------------------------------------------
--------
Rotate left around the subtree : 22
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------------------------------------------------------------------------
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```
      __41__
     /      \
    22       44
   / \      / \
 -1   -1  -1   -1
```

```
      __41__
     /      \
    22       44
   / \      / \
 -1   -1  -1   -1
```
------------------------------------------------------------------------
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--------
Inserting the key [ 59 ] with the value : San Clemente
------------------------------------------------------------------------
------------------------------------------------------------------------
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```
          _____41_____
         /              \
      __22__           __44__
     /      \         /      \
   -1        -1     -1        59
                             / \
                           -1   -1
```
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--------
Inserting the key [ 32 ] with the value : San Diego
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------------------------------------------------------------------------
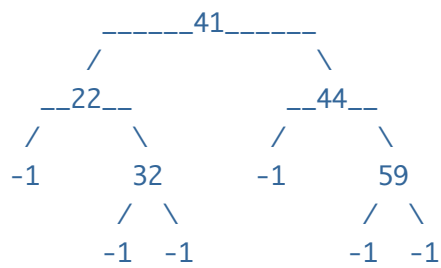
```
--------

          _____41_____
        /               \
     __22__           __44__
     /      \         /      \
   -1       32      -1       59
           /  \             /  \
         -1   -1          -1   -1
------------------------------------------------------------------------
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--------
Inserting the key [ 49 ] with the value : Anaheim
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--------
Rotate right around the subtree : 59
------------------------------------------------------------------------
------------------------------------------------------------------------
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------------------------------------------------------------------------
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--------
Rotate left around the subtree : 44
------------------------------------------------------------------------
------------------------------------------------------------------------
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          _____41_____
        /               \
     __22__           __49__
     /      \         /      \
   -1       32      44       59
           /  \     /  \     /  \
         -1   -1  -1   -1  -1   -1

          _____41_____
        /               \
     __22__           __49__
```
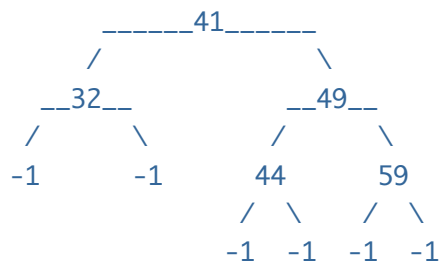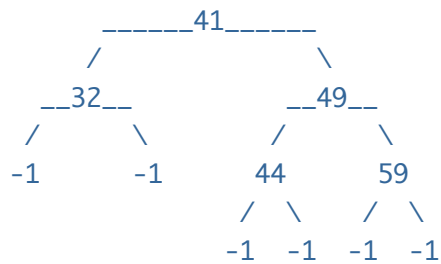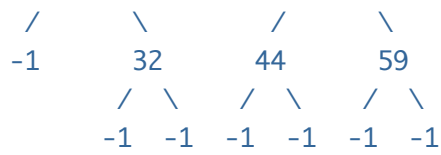
```
        /        \         /        \
      -1        32        44        59
              /  \      /  \      /  \
            -1   -1   -1   -1   -1   -1


            _____41_____
           /              \
        __32__          __49__
       /      \        /      \
     -1        -1     44        59
                    /  \      /  \
                  -1   -1   -1   -1


            _____41_____
           /              \
        __32__          __49__
       /      \        /      \
     -1        -1     44        59
                    /  \      /  \
                  -1   -1   -1   -1
```
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--------
Inserting the key [ 73 ] with the value : Los Angeles
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```
              _____41_____
             /                              \
      _____32_____                  _____49_____
     /              \                 /              \
   -1                -1            __44__          __59__
                                 /      \        /      \
                               -1        -1    -1        73
                                                        /  \
                                                      -1   -1
```
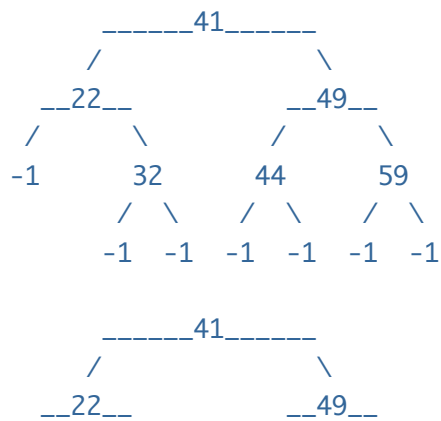------------------------------------------------------------------------
------------------------------------------------------------------------
--------
Inserting the key [ 44 ] with the value : Laguna Niguel
------------------------------------------------------------------------
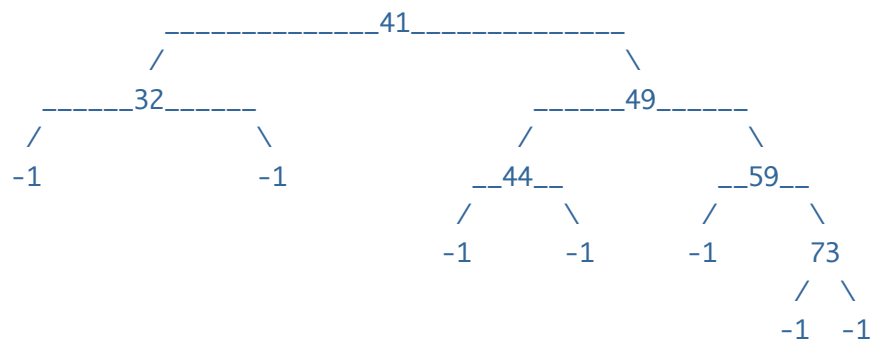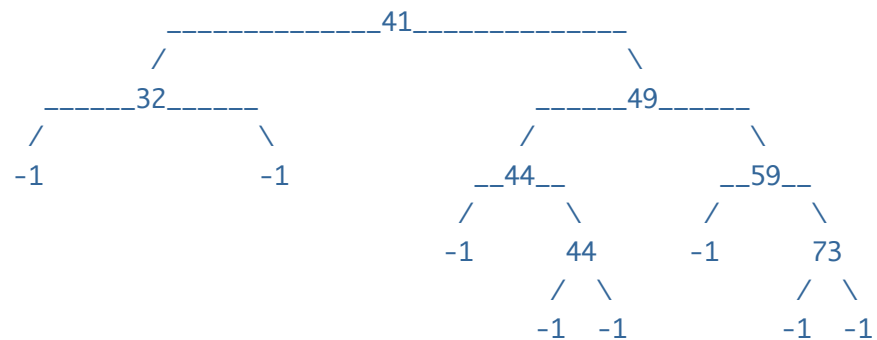
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                              _____41_____
                             /                            \
              _____32_____                      _____49_____
             /              \                     /              \
           -1               -1                __44__            __59__
                                             /      \          /      \
                                           -1       44       -1       73
                                                   /  \              /  \
                                                 -1   -1           -1   -1
--------------------------------------------------------------------------
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-------
Inserting the key [ 17 ] with the value : Orange
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                            _____41_____
                           /                            \
            _____32_____                      _____49_____
           /              \                     /              \
        __17__            -1                __44__            __59__
       /      \                            /      \          /      \
     -1       -1                         -1       44       -1       73
                                                 /  \              /  \
                                               -1   -1           -1   -1
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--------------------------------------------------------------------------
-------
Inserting the key [ 77 ] with the value : Palms Springs
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Rotate left around the subtree : 59
--------------------------------------------------------------------------
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```
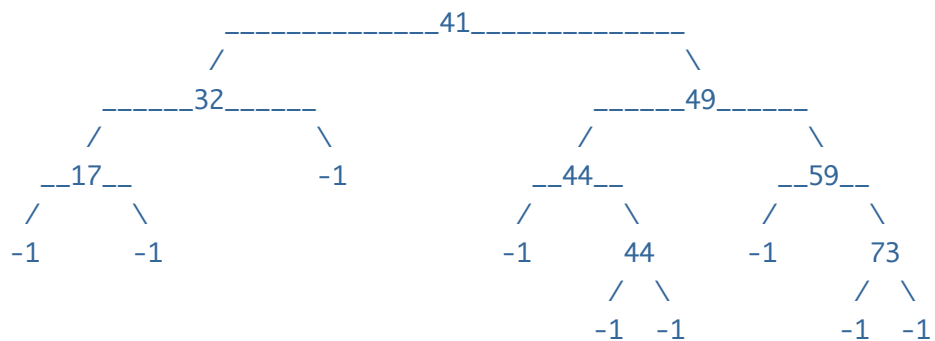
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                            _____41_____
                           /                            \
              _____32_____                      _____49_____
             /              \                     /              \
          __17__            -1                 __44__            __73__
         /      \                             /      \          /      \
       -1        -1                         -1        44       59       77
                                                     / \      / \      / \
                                                   -1  -1   -1  -1   -1  -1
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--------
Inserting the key [ 26 ] with the value : Riverside
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
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--------
Rotate left around the subtree : 17
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
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-------------------------------------------------------------------------------
--------
Rotate right around the subtree : 32
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                           _____41_____
                          /                            \
              _____26_____                      _____49_____
             /              \                     /              \
          __17__            __32__             __44__            __73__
         /      \          /      \           /      \          /      \
       -1        -1      -1        -1        -1        44       59       77
                                                     / \      / \      / \
                                                   -1  -1   -1  -1   -1  -1
```
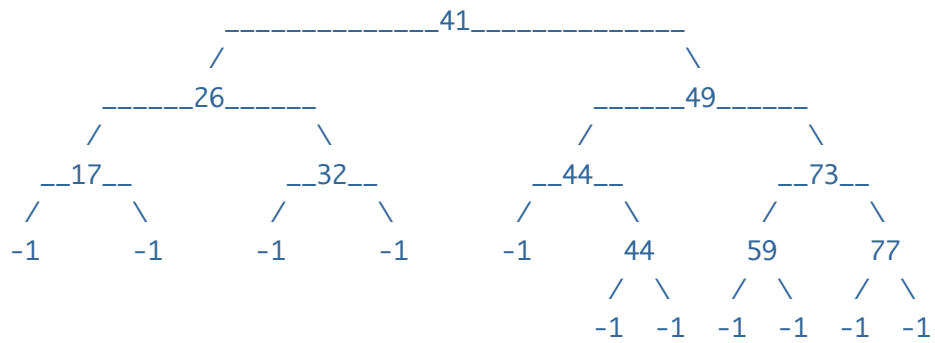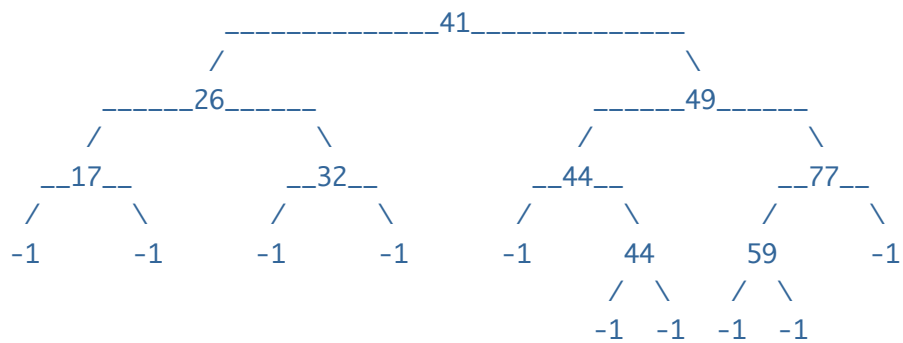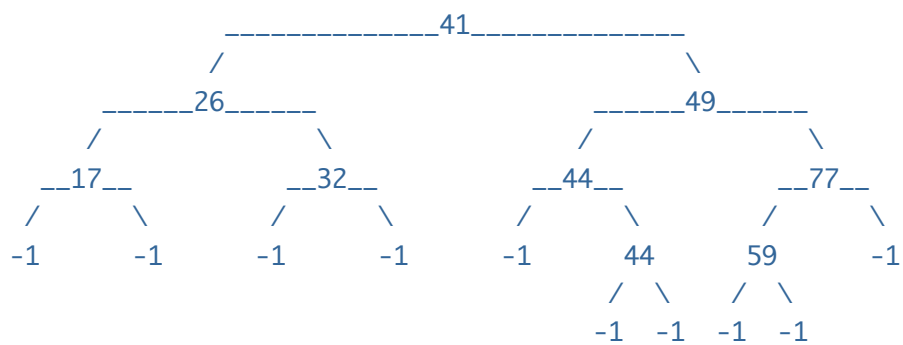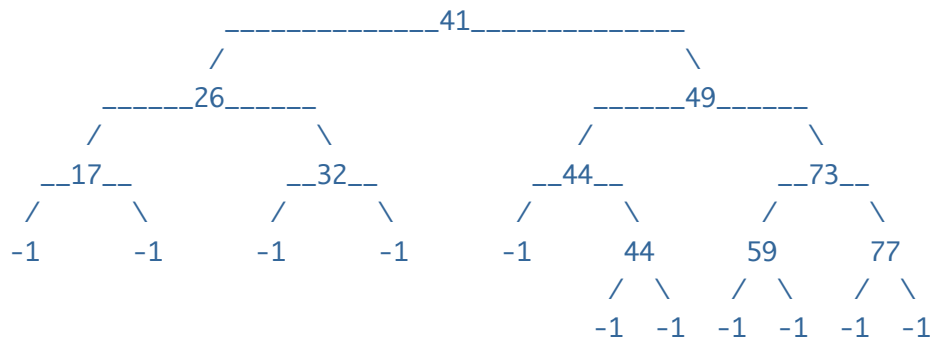
```
                    _____41_____
                   /                              \
            _____26_____                  _____49_____
           /              \                 /              \
        __17__          __32__           __44__          __73__
       /      \        /      \         /      \        /      \
     -1        -1    -1        -1      -1        44     59        77
                                                / \    / \      / \
                                              -1  -1  -1  -1   -1  -1


                    _____41_____
                   /                              \
            _____26_____                  _____49_____
           /              \                 /              \
        __17__          __32__           __44__          __77__
       /      \        /      \         /      \        /      \
     -1        -1    -1        -1      -1        44     59        -1
                                                / \    / \
                                              -1  -1  -1  -1


                    _____41_____
                   /                              \
            _____26_____                  _____49_____
           /              \                 /              \
        __17__          __32__           __44__          __77__
       /      \        /      \         /      \        /      \
     -1        -1    -1        -1      -1        44     59        -1
                                                / \    / \
                                              -1  -1  -1  -1
```
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--------
Inserting the key [ 19 ] with the value : Brea
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--------------------------------------------------------------------------
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```
                    _____41_____
                   /                              \
            _____26_____                  _____49_____
           /              \                 /              \
```
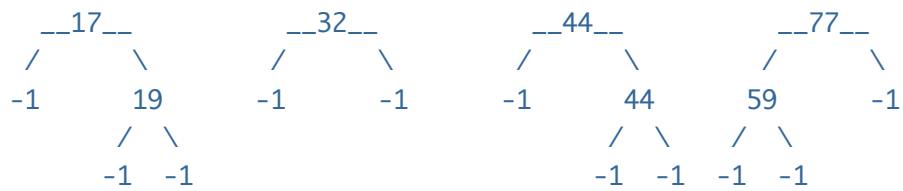
```
   __17__            __32__            __44__            __77__
  /      \          /      \          /      \          /      \
-1       19       -1       -1       -1       44       59       -1
        /  \                                 / \      / \
      -1   -1                              -1  -1   -1  -1
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Inserting the key [ 60 ] with the value : Santa Ana
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Rotate left around the subtree : 59
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--------
Rotate right around the subtree : 77
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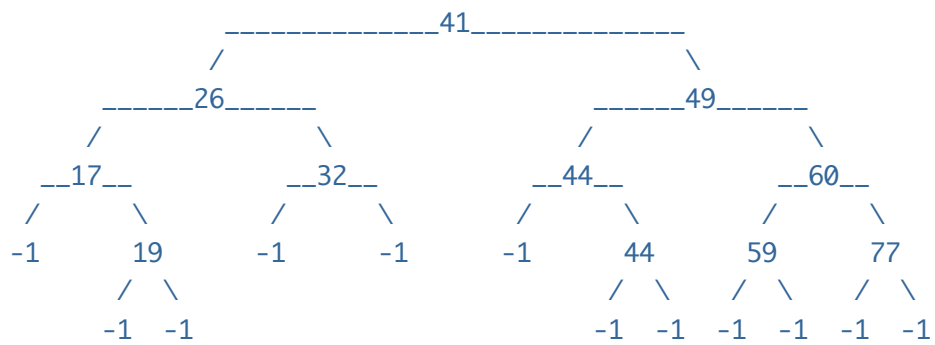
```
                _____41_____
               /                                 \
        _____26_____                    _____49_____
       /              \                   /              \
   __17__            __32__            __44__            __60__
  /      \          /      \          /      \          /      \
-1       19       -1       -1       -1       44       59       77
        /  \                                 / \      / \      / \
      -1   -1                              -1  -1   -1  -1   -1  -1
```
--------------------------------------------------------------------------
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--------
Inserting the key [ 35 ] with the value : Tustin
--------------------------------------------------------------------------
--------------------------------------------------------------------------
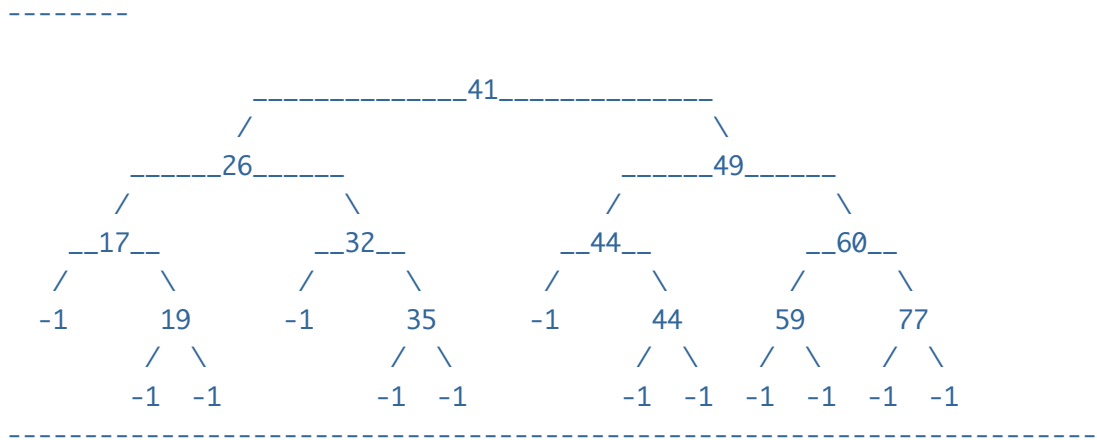
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                    _____41_____
               /                               \
         _____26_____                  _____49_____
        /              \                /              \
     __17__          __32__          __44__          __60__
    /      \        /      \        /      \        /      \
  -1        19    -1        35    -1        44    59        77
          /  \            /  \            /  \    /  \    /  \
        -1   -1         -1   -1         -1  -1  -1  -1  -1  -1
-------------------------------------------------------------------
-------------------------------------------------------------------
--------
Inserting the key [ 52 ] with the value : Oceanside
-------------------------------------------------------------------
-------------------------------------------------------------------
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_____41_____
                                 /
\
                    _____26_____
_____49_____
                 /                               \
/
         _____17_____                  _____32_____
_____44_____
        /              \                /              \
/
     -1                __19__          -1                __35__
-1                __44__          __59__                __77__
                   /      \        /      \             /      \
/       \         /      \        /      \             /      \
                 -1       -1                             -1        -1
-1        -1    52       -1    -1        -1

/  \

-1   -1
-------------------------------------------------------------------
```
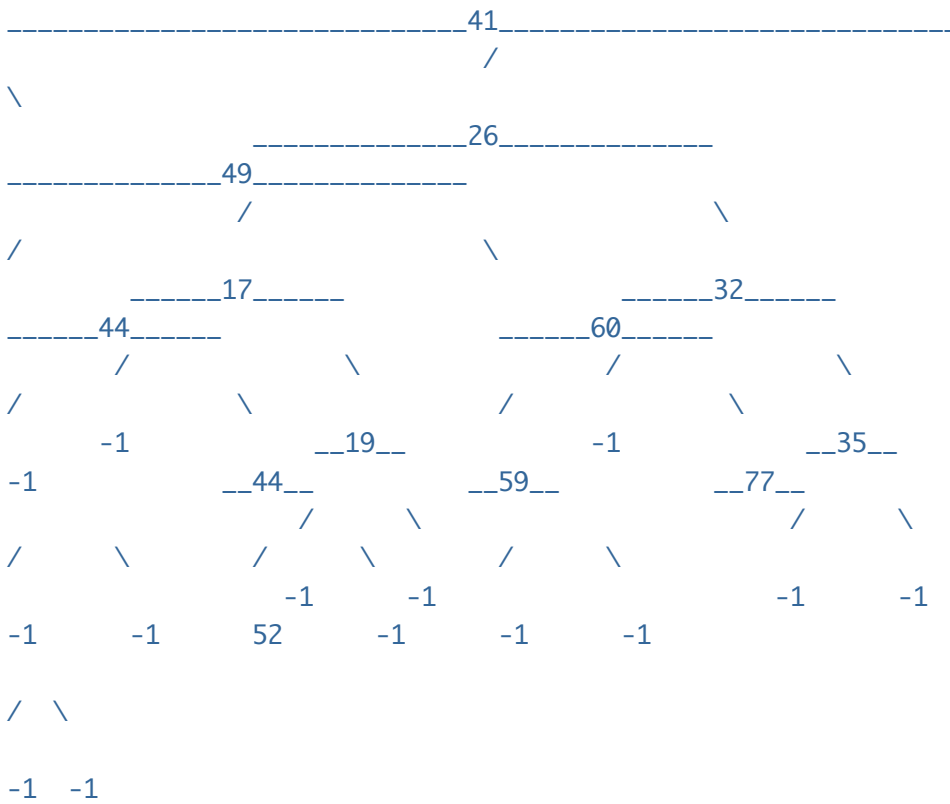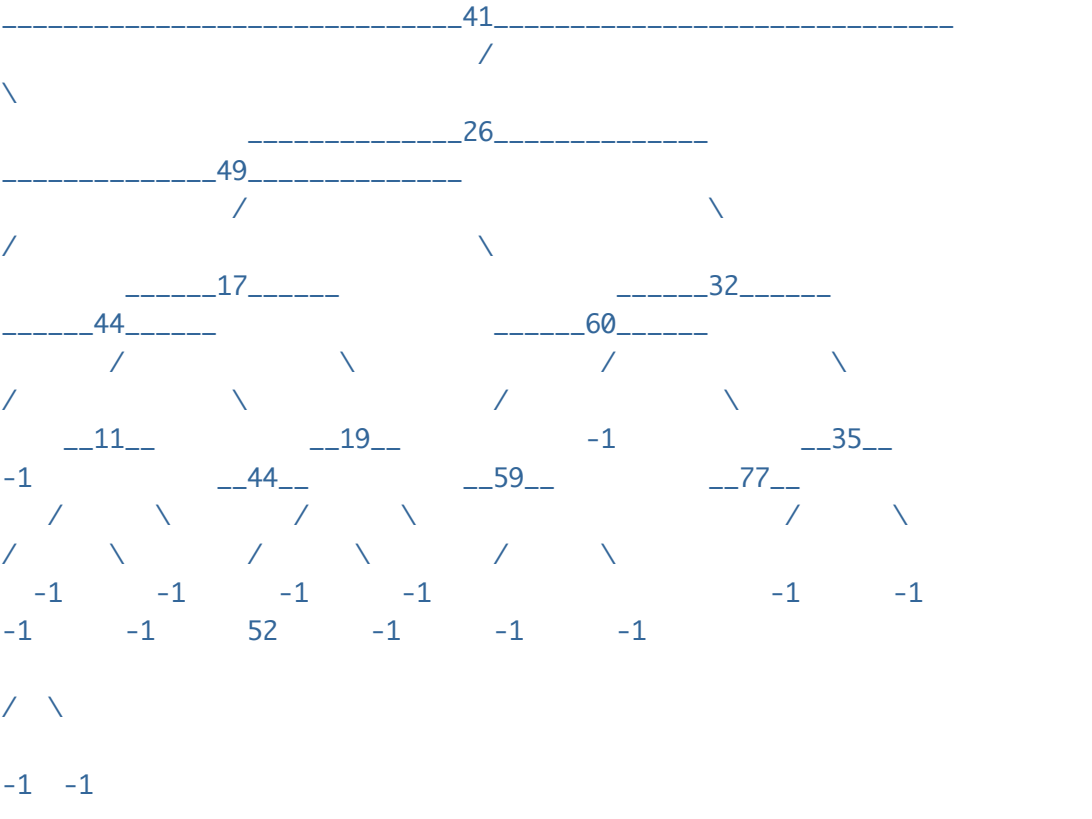
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Inserting the key [ 11 ] with the value : La Jolla
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_____41_____
                             /
\
                      _____26_____
_____49_____
             /                              \
/                            \
      _____17_____                    _____32_____
_____44_____                    _____60_____
      /         \                  /             \
/           \              /           \
    __11__          __19__          -1            __35__
-1            __44__          __59__          __77__
   /    \        /    \        /    \          /    \
  /    \        /    \        /    \          /    \
   -1      -1      -1      -1                    -1      -1
-1      -1      52      -1      -1      -1

/ \

-1  -1
------------------------------------------------------------------------
------------------------------------------------------------------------
--------
Inserting the key [ 18 ] with the value : Del Mar
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_____41_____
                             /
\
                      _____26_____
```
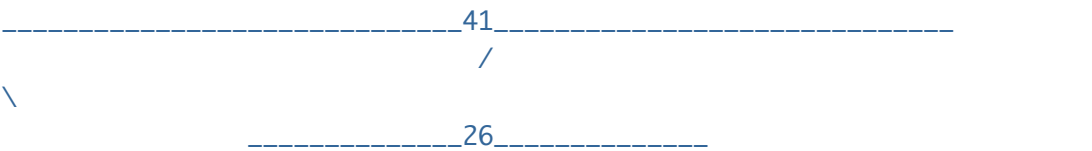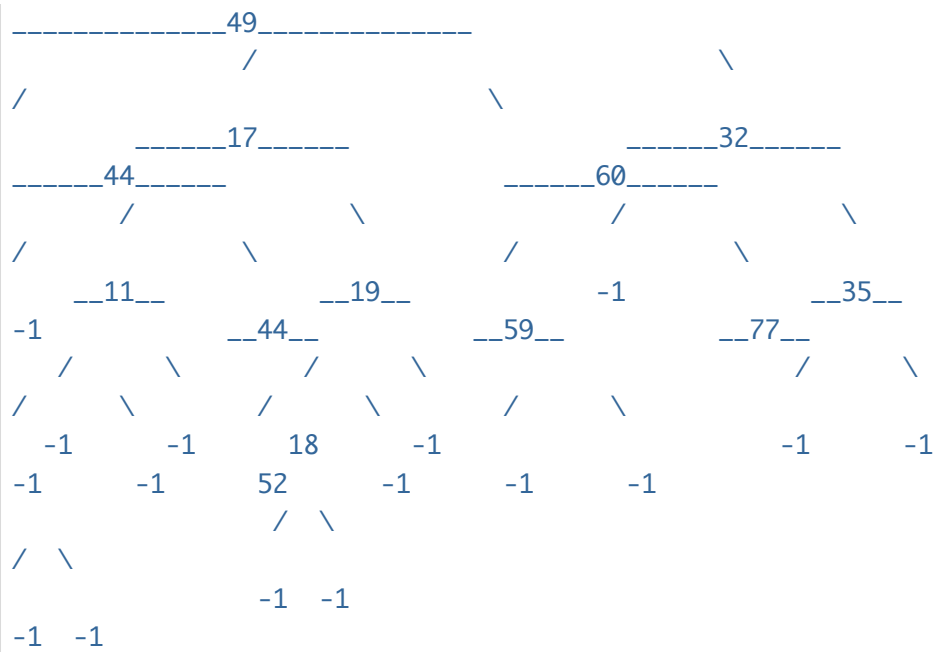
```
_____49_____
             /                              \
/                         \
        _____17_____              _____32_____
_____44_____              _____60_____
      /          \          /          \
/          \        /          \
    __11__        __19__        -1              __35__
-1            __44__        __59__              __77__
    /    \        /    \        /    \          /    \
/    \      /      \      /      \
    -1      -1        18      -1                  -1      -1
-1      -1        52          -1        -1      -1
                      /  \
/ \
                    -1  -1
-1  -1
----------------------------------------------------------------------
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--------
Inserting the key [ 22 ] with the value : Aliso Viejo
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_____41_____
                                    /
\
                      _____26_____
_____49_____
                     /                              \
/                         \
        _____17_____              _____32_____
_____44_____              _____60_____
      /          \          /          \
/          \        /          \
    __11__        __19__        -1              __35__
-1            __44__        __59__              __77__
    /    \        /    \        /    \          /    \
/    \      /      \      /      \
    -1      -1        18      22                  -1      -1
```
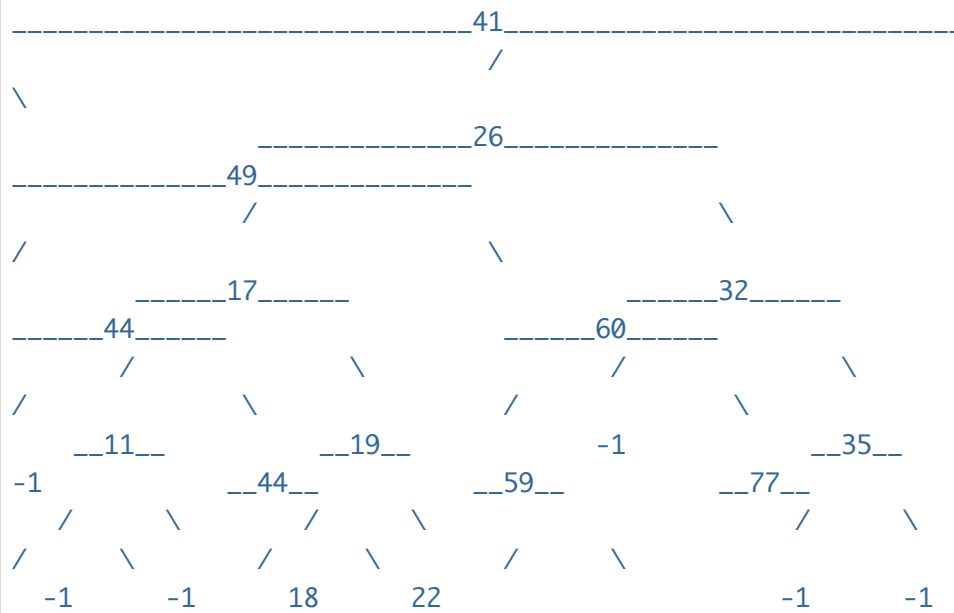
```
-1        -1        52        -1        -1        -1
                   / \       / \
 /  \
                  -1  -1  -1  -1
-1  -1
--------------------------------------------------------------------------
--------------------------------------------------------------------------
--------
Inserting the key [ 49 ] with the value : Laguna Beach
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--------------------------------------------------------------------------
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--------------------------------------------------------------------------
--------------------------------------------------------------------------
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Rotate right around the subtree : 59
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_____41_____
                                       /
\
                          _____26_____
_____49_____
               /                                        \
 /                                 \
       _____17_____                         _____32_____
_____44_____                         _____60_____
       /              \                        /              \
 /              \                      /              \
   __11__          __19__                  -1              __35__
-1              __44__                  __52__              __77__
   /      \       /      \                                 /      \
 /      \       /      \                 /      \         /      \
   -1      -1      18      22                            -1      -1
-1      -1      49      59      -1      -1
                   / \     / \
 / \     / \
                  -1  -1  -1  -1
-1  -1  -1  -1
```

```
_____41_____
                               /
\
                      _____26_____
_____49_____
               /                              \
/                              \
        _____17_____                         _____32_____
_____44_____                         _____60_____
       /              \                        /              \
/              \                        /              \
     __11__          __19__              -1               __35__
-1               __44__              __52__               __77__
    /      \        /      \         /      \            /      \
/      \        /      \         /      \            /      \
  -1        -1      18        22                       -1        -1
-1        -1      49        59       -1        -1
                 / \     / \
/ \     / \
                -1   -1  -1   -1
-1   -1  -1   -1


_____49_____
                               /
\
                      _____26_____
_____60_____
               /                              \
/                              \
        _____17_____                         _____32_____
_____52_____                         _____77_____
       /              \                        /              \
/              \                        /              \
     __11__          __19__              -1               __35__
__49__          __59__              -1               -1
    /      \        /      \                            /      \        /
\          /      \
  -1        -1      18        22                       -1        -1       -1
-1        -1      -1
```

```
                    / \     / \
                  -1   -1  -1   -1


_____49_____
                               /
\
                    _____26_____
_____60_____
                /                              \
/                              \
        _____17_____                  _____32_____
_____52_____                  _____77_____
        /          \              /          \
/              \              /              \
    __11__          __19__          -1              __35__
__49__          __59__          -1              -1
    /    \        /    \                      /    \        /
\        /      \                                  /      \      /
    -1      -1      18      22                    -1      -1      -1
-1      -1      -1
                  / \     / \
                -1   -1  -1   -1
--------------------------------------------------------------------
--------------------------------------------------------------------
--------
Inserting the key [ 11 ] with the value : Laguna Beach
--------------------------------------------------------------------
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--------


_____49_____
                               /
\
                    _____26_____
_____60_____
                /                              \
/                              \
        _____17_____                  _____32_____
_____52_____                  _____77_____
        /          \              /          \
```

```
    /                 \              /              \
    __11__            __19__            -1              __35__
__49__            __59__            -1              -1
    /      \          /      \                      /      \      /
\        /        \
    -1      11        18      22                          -1        -1      -1
-1        -1        -1
                / \    / \    / \
            -1  -1  -1  -1  -1  -1
--------------------------------------------------------------------------
--------------------------------------------------------------------------
--------
Inserting the key [ 42 ] with the value : Vista
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--------------------------------------------------------------------------
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--------------------------------------------------------------------------
--------------------------------------------------------------------------
--------
Rotate left around the subtree : 32
--------------------------------------------------------------------------
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_____49_____
                                /
\
                        _____26_____
_____60_____
                        /                              \
/                              \
            _____17_____                      _____35_____
_____52_____                      _____77_____
            /            \                      /              \
/            \              /              \
    __11__            __19__            __32__            __42__
__49__            __59__            -1              -1
    /      \          /      \          /      \          /      \      /
\        /        \
    -1      11        18      22        -1        -1      -1        -1      -1
-1        -1        -1
```

```
       / \   / \   / \
      -1  -1 -1  -1 -1  -1
------------------------------------------------------------------------
------------------------------------------------------------------------
--------
Inserting the key [ 49 ] with the value : San Diego
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_____49_____
                                /
\
                   _____26_____
_____60_____
              /                              \
/                              \
       _____17_____                 _____35_____
_____52_____                 _____77_____
      /          \               /          \
/          \               /          \
    __11__        __19__        __32__        __42__
__49__         __59__          -1            -1
   /    \      /    \        /    \        /    \        /
\       /    \
  -1     11    18    22      -1    -1      -1    -1      -1
49      -1          -1
         / \   / \   / \
/ \
      -1  -1 -1  -1 -1  -1
-1  -1
------------------------------------------------------------------------
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--------
Inserting the key [ 99 ] with the value : San Juan
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_____49_____
```
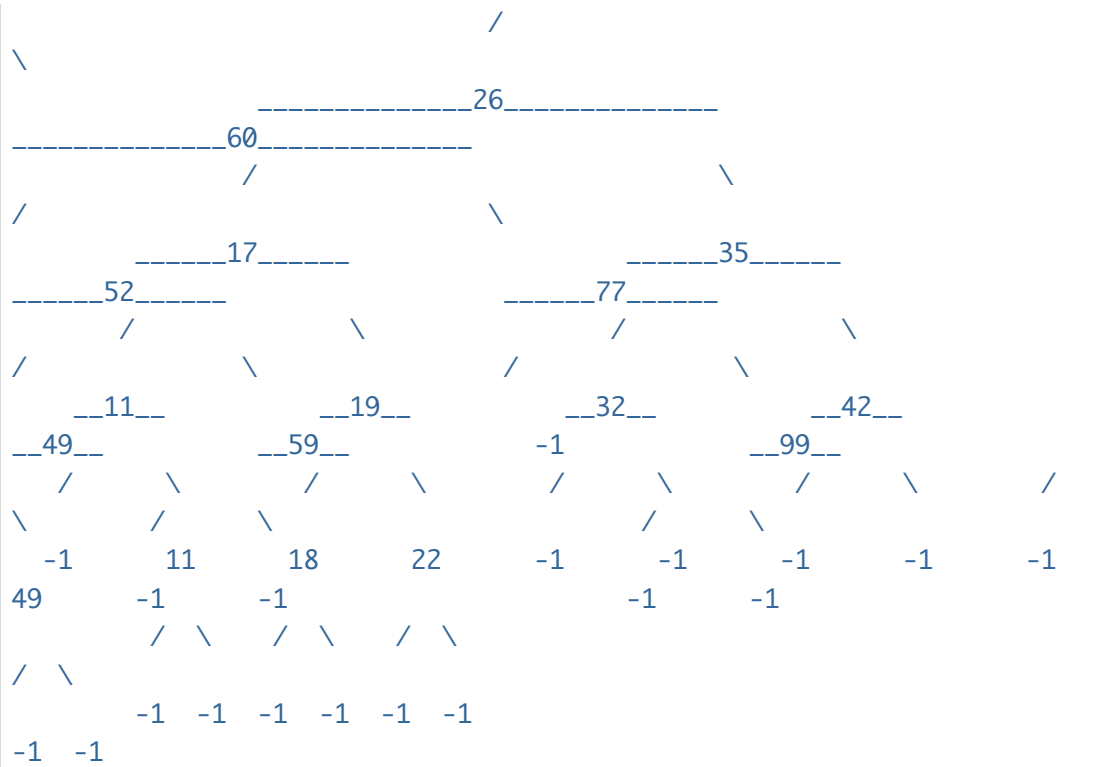
```
                                                  /
\
                       _____26_____
_____60_____
              /                              \
/                              \
          _____17_____                    _____35_____
_____52_____                    _____77_____
          /           \                /           \
/           \                /           \
      __11__          __19__          __32__          __42__
__49__          __59__          -1              __99__
      /    \      /    \        /    \        /    \        /
\        /    \        /              \        /
     -1      11      18      22      -1      -1      -1      -1      -1
49      -1      -1                              -1      -1
          /  \    /  \    /  \
/  \
          -1  -1  -1  -1  -1  -1
-1  -1
-------------------------------------------------------------------------
-------------------------------------------------------------------------
--------
Inserting the key [ 29 ] with the value : Dana Point
-------------------------------------------------------------------------
-------------------------------------------------------------------------
--------


_____49_____
                                    /
\
                       _____26_____
_____60_____
              /                              \
/                              \
          _____17_____                    _____35_____
_____52_____                    _____77_____
          /           \                /           \
/           \                /           \
      __11__          __19__          __32__          __42__
__49__          __59__          -1              __99__
```
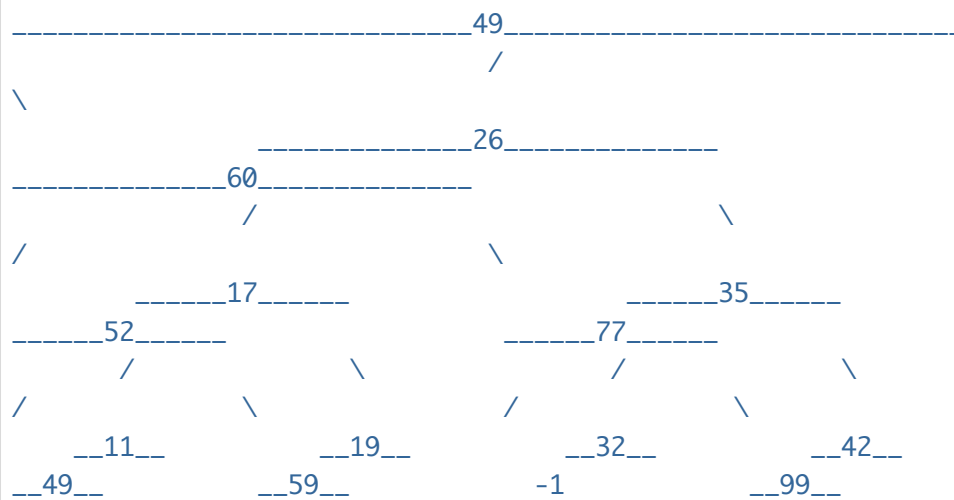
```
    /       \         /       \           /       \         /       \           /
\           /       \                               /       \
  -1        11        18        22        29         -1        -1        -1        -1
49        -1        -1                              -1        -1
        / \     / \     / \     / \
/  \
        -1  -1  -1  -1  -1  -1  -1  -1
-1  -1
--------------------------------------------------------------------------------
--------------------------------------------------------------------------------
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Inserting the key [ 32 ] with the value : Mission Viejo
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_____49_____
                                /
\

                _____26_____
_____60_____
                /                               \
/                               \

        _____17_____                         _____35_____
_____52_____                         _____77_____
        /             \                         /             \
/             \                         /             \
    __11__            __19__                __32__            __42__
__49__            __59__                  -1              __99__
    /     \         /     \             /     \         /     \         /
\         /     \                               /       \
  -1        11        18        22        29        32        -1        -1        -1
49        -1        -1                              -1        -1
        / \     / \     / \     / \     / \
/  \
        -1  -1  -1  -1  -1  -1  -1  -1  -1  -1
-1  -1


_____49_____
                                /
```

```
\
                      _____26_____
_____60_____
              /                              \
/                              \
        _____17_____                        _____35_____
_____52_____                        _____77_____
        /            \                /            \
/              \                /              \
    __11__          __19__          __32__          __42__
__49__          __59__          -1              __99__
   /      \       /      \       /      \       /      \       /
\        /      \                /      \       /      \       /
  -1      11      18      22      29      32      -1      -1      -1
49      -1      -1                      -1      -1
      /  \    /  \    /  \    /  \    /  \
/  \
      -1  -1  -1  -1  -1  -1  -1  -1  -1  -1
-1  -1

Process finished with exit code 0
```