Assignment #4

Due Dates: Saturday, October 7 at 11:59pm

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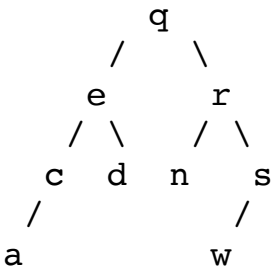Late Policy: -10 points per hour late

Instructions: This is an individual assignment. Answers should be your own work.

Chapter 4

6 points
1.   Tree traversals.

     Give the sequence of letters for each traversal of this binary tree:

```
                 q
               /   \
             e       r
            / \     / \
           c   d   n   s
          /           /
         a           w
```


     a.   (2 pts) an inorder traversal
     b.   (2 pts) a preorder traversal
     c.   (2 pts) a postorder traversal
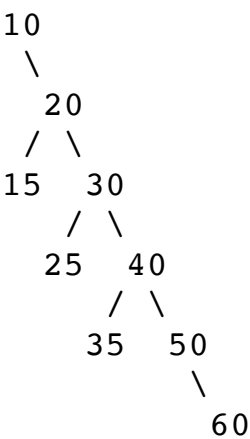

10 points
2.   Draw an AVL tree for the following values inserted in this order.   Illustrate
     each rotation that occurs:
           65 13 16 52 28 11 20 14 87 50 26

10 points
3.   Draw an AVL tree for the following values inserted in this order.   Illustrate
     each rotation that occurs:
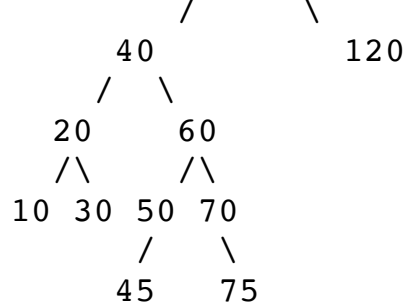   83 12 68 55 32 6 46 57 62

10 points
4. For the splay tree shown below, show how an access of node 60 is performed. Illustrate
each operation that occurs:


```
        10
          \
           20
          /  \
        15   30
            /  \
          25   40
              /  \
            35   50
                   \
                    60
```
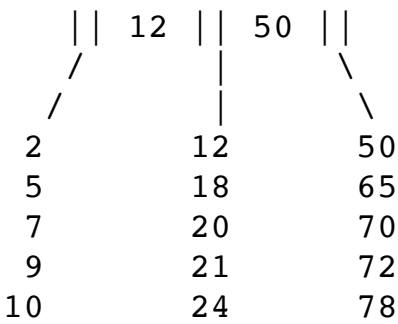

10 points
5. For the splay tree shown below, show how an access of node 75 is performed. Illustrate
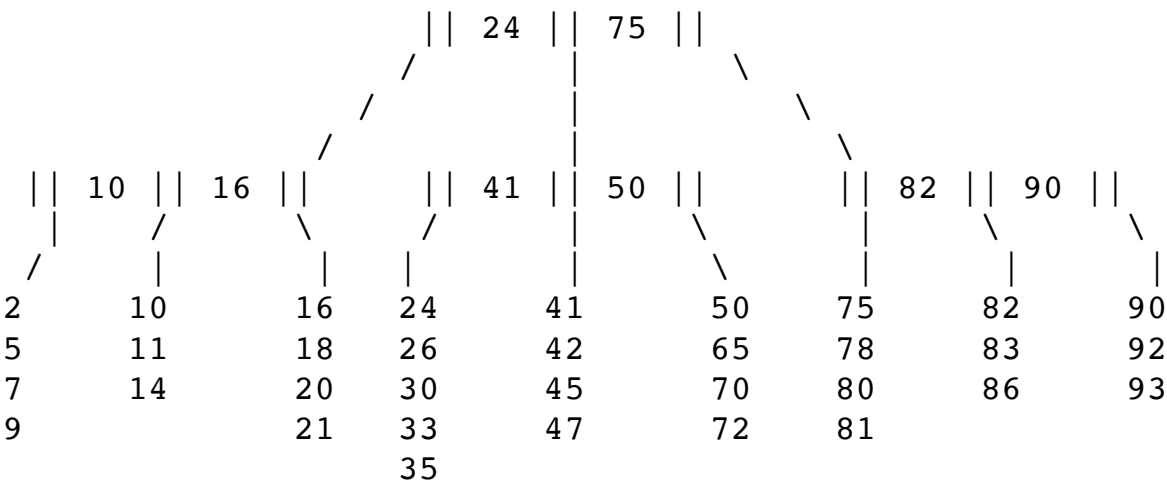each operation that occurs:

```
            80
```

```
                /       \
          40              120
         /  \
      20      60
      /\      /\
    10 30  50  70
            /    \
          45      75
```


10 points
6. For the B+-tree where M=3 and L=5 shown below, show how an insert of value 80 is handled.


```
      || 12 || 50 ||
      /      |      \
     /       |       \
    2        12       50
    5        18       65
    7        20       70
    9        21       72
    10       24       78
```


10 points
7. For the B+-tree where M=3 and L=5 shown below, show how an insert of value 28 is handled.


```
                   || 24 || 75 ||
                  /       |       \
                /         |         \
              /           |           \
      || 10 || 16 ||      || 41 || 50 ||      || 82 || 90 ||
       |   /       \       /    |     \        |     \      \
      /   |         |     |     |      \       |      |      |
     2    10        16    24    41      50     75     82     90
     5    11        18    26    42      65     78     83     92
     7    14        20    30    45      70     80     86     93
     9              21    33    47      72     81
                          35
```

10 points
8. A B+-tree is to be stored on disk whose block size is 3096 bytes. The data records
      to be stored are 36 bytes, and their key is 4 bytes. Determine the values for
      M and L for the B+-tree. Assume pointers are 4 bytes each.

8 points
9. For the problem above, how many levels are needed to store 8,600,000 records?

8 points
10. If a binary tree has N nodes, how many null child pointers will it have? Explain your
reasoning.

8 points
11. In a perfect binary tree (one filled at every level), what does adding another level do
to the number of nodes in the tree?

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