Review Problems From The Book

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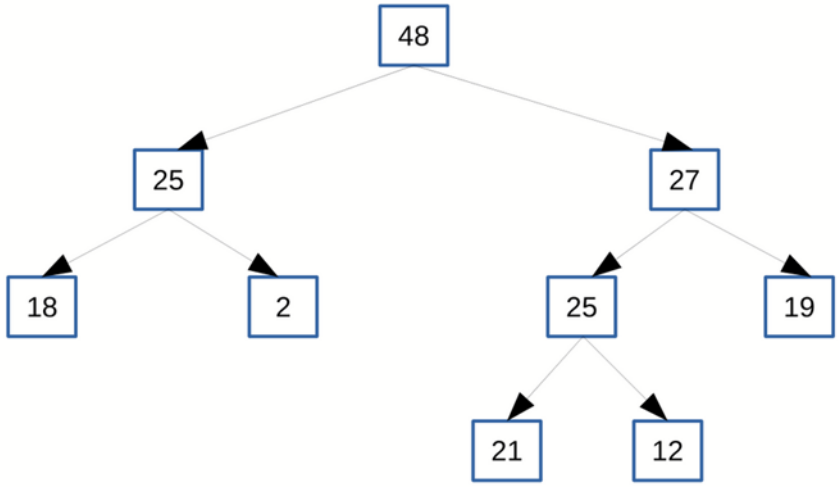
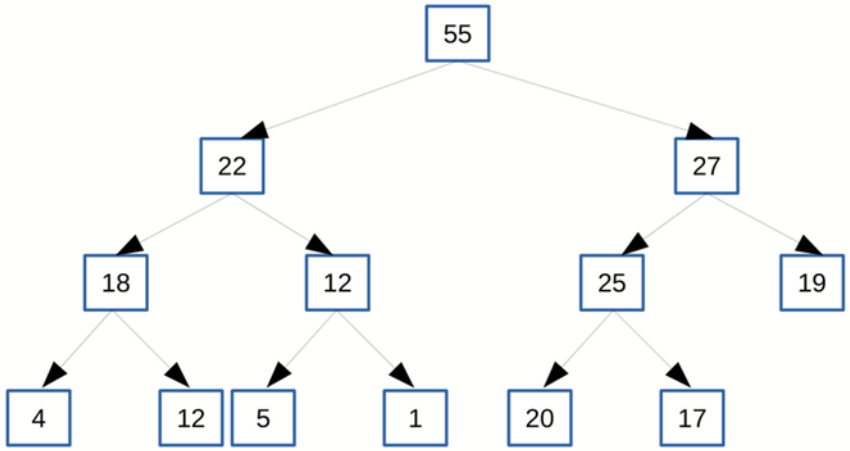
Review Problems for Final Exam

Consider the following binary tree. Is it a *heap*? (Yes / No)



4. Consider the following *heap*.



Write its underlying array representation (as we have it in the Heap class implementation):

1. What, if anything, is wrong with the following C++ code fragment?

```
int x,*t;
t = &x;
delete t;
```

3. Write a C++ function that determines if the first `int` parameter it is passed is a square of the second `int` parameter. It should return `true` if it is so, and `false` otherwise.

```
bool determine(int x, int y){
```

4. I have a bunch of syntax errors in the following C++ program. Find them and correct them.

```
#include<iostream>

using namespace

double function(int a, int b, c) :

     if (a>b)
          cout << "a>b" << endl;
          return a*c

     else :
          cout << "a <= b" << endl;
          return b*a;
}

int main(){

     int x = 10, y = 2, z = 5.5

     cout <<  function(x,y,z) << endl;

}
```

4. What is the output of the following C++ program?

```
double f(int a, int b){
     return (a*a) / double(b);
}

int main(){
     int x = 10, y = 2;
     cout <<  x <<  "/" << y << "=" << f(x,y) << endl;
}
```

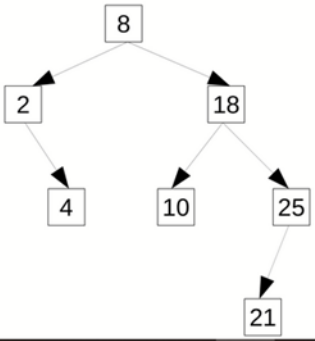
1. The worst-case search time for a *binary search tree* (*BST*) is Θ(n). **True or False?**

2. A full binary tree is not necessarily a complete binary tree. **True or False?**

3. Which of the following orders will produce a *binary search tree (BST)* with the best search times?

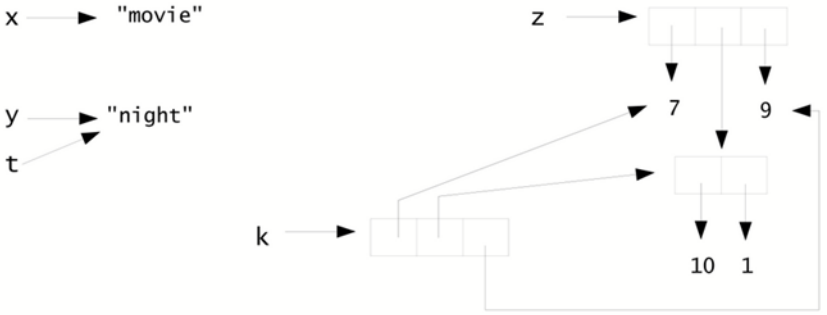
(a) inserting the items in random order
(b) inserting the items in reverse order
(c) inserting the items in order
(d) all will result in the same search times

4. Using the `BST` class, write the code that would produce the following binary search tree:



```
x = “movie”
y = “night”
z = [7, [10, 1], 9]

t = y
k = copy(z)
```

Here is the pictorial representation of the memory after the code above executes:



Use this pictorial representation of the memory to show what will happen if the following code is added:

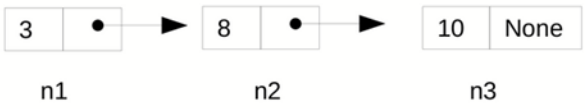
```
x = x + ' ' + y

k.append(27)

K[1][1] = 6

k.remove(7)
```

2. Which of the following is <u>not true</u> of Python list?

(a) The are implemented underneath as a contiguous arrays.
(b) All of the items in the list must be of the same type.
(c) They can grow and shrink dynamically.
(d) They allow for efficient random access.

3. I'm using ListNode class we defined in class.

Here is what I have so far:



I want to insert a new node with value 12 between 8 and 10. Here is what I am doing:

```
n4 = ListNode(12,n1.link)
```

My code is incomplete and has an error. Correct the error and complete the code!

2. Give a theta analysis of the time efficiency of the following code fragments:

(a)

```
n = int(input("Enter a positive integer:"))
i = 0
while i < n:
  i += 2
```

T(n) =

(b)

```
n = int(input("Enter a positive integer:"))
total = 2
for i in range(100):
  for j in range(2*n):
    total += 3
```