

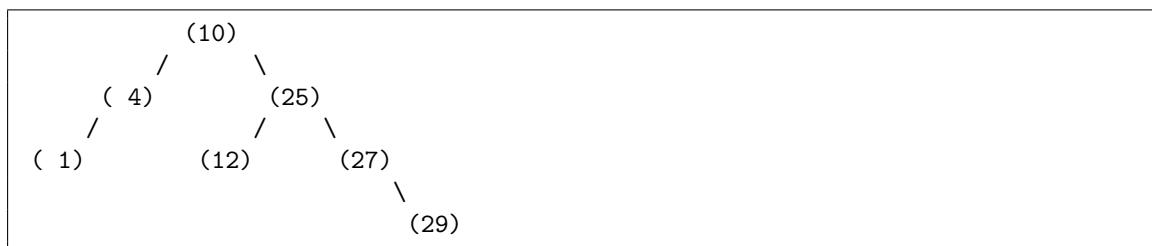
CISS350: Data Structures and Advanced Algorithms
Quiz q10707

Name: YOUR EMAILScore:

Here's the BTreeNode class:

```
class BTreeNode
{
public:
    int key_;
    BTreeNode * parent_;
    BTreeNode * left_, * right_;
};
```

For the following questions, here's an example on how to describe a binary tree in text. For this tree



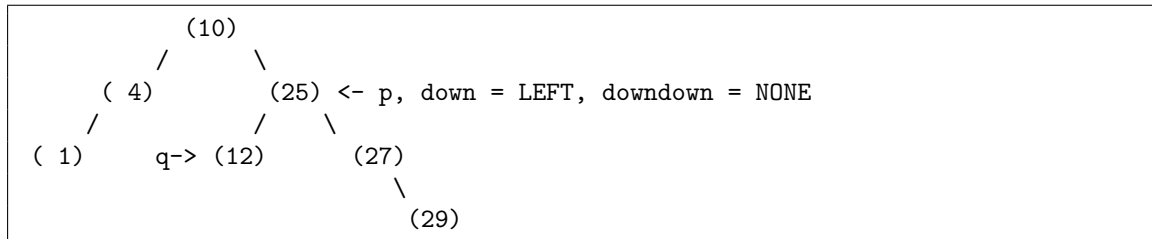
you write

```
[10, [4, 25]]
[4, [1, None]]
[25, [12, 27]]
[1, [None, None]]
[12, [None, None]]
[27, [None, 29]]
[29, [None, None]]
```

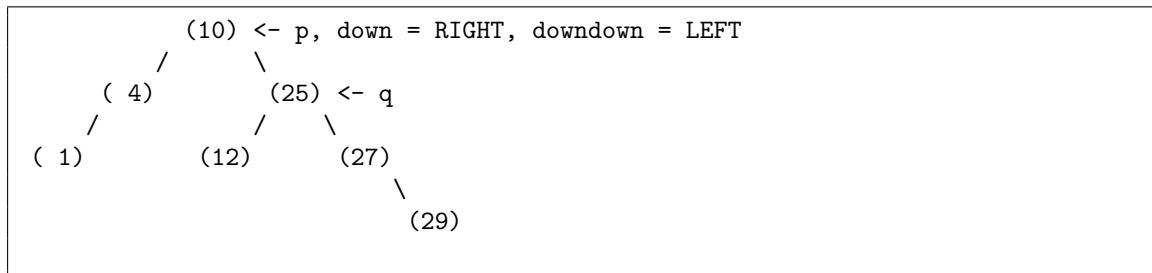
Q1. In moving a pointer **p** up one node at a time during balancing, you need to keep track on the pointer that is “behind” **p** and you also need to remember the path backward by two steps, whether the 2-step path downward is a LEFT-LEFT or LEFT-RIGHT or RIGHT-LEFT or RIGHT-RIGHT. For instance if **p** is here:



and if it climbs up by one step, you have



and if it climbs one step up, you have



The constants `LEFT`, `RIGHT`, `NONE` are defined in the code fragment below. If `p` is the root node, after calling `climbup`, you do the obvious – for instance `p` becomes `NULL`, `q` points to the root node, `down` is `NONE`, and `downdown` is the previous value of `down`.
ANSWER:

```
const int NONE = -1;
const int LEFT = 0;
const int RIGHT = 1;
void climbup(BTNode *& p, BTNode *& q, int & down, int & downdown)
{
}
}
```

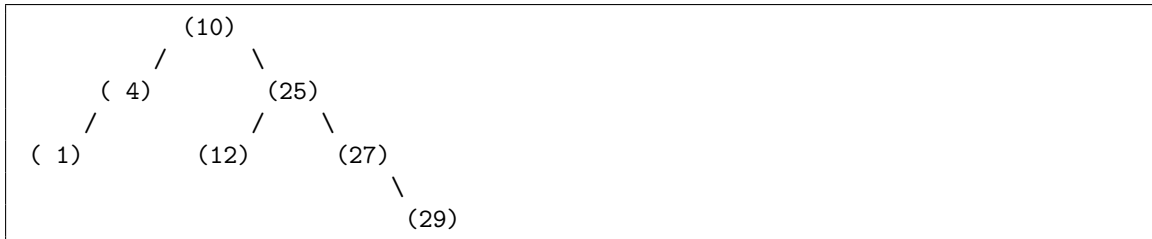
Q2. For this tree:



What is the tree after performing a right rotation at the node with key value of 10?

ANSWER:

Q3. For this BST:



insert 30 and then balance it (if necessary). Write the resulting tree in text below.

ANSWER:

Q4. For this BST:



insert 2 and then balance it (if necessary). Write the resulting tree in text below.

ANSWER:

INSTRUCTIONS

In the file `thispreamble.tex` look for

```
\renewcommand\AUTHOR{}
```

and enter your email address:

```
\renewcommand\AUTHOR{jdoe5@cougars.ccis.edu}
```

(This is not really necessary since alex will change that for you when you execute `make`.) In your bash shell, execute “`make`” to recompile `main.pdf`. Execute “`make v`” to view `main.pdf`.

Enter your answers in `main.tex`. In the bash shell, execute “`make`” to recompile `main.pdf`. Execute “`make v`” to view `main.pdf`.

For each question, you’ll see boxes for you to fill. For small boxes, if you see

```
1 + 1 = \answerbox{}
```

you do this:

```
1 + 1 = \answerbox{2}
```

`answerbox` will also appear in “true/false” and “multiple-choice” questions.

For longer answers that need typewriter font, if you see

```
Write a C++ statement that declares an integer variable name x.
\begin{answercode}
\end{answercode}
```

you do this:

```
Write a C++ statement that declares an integer variable name x.
\begin{answercode}
int x;
\end{answercode}
```

`answercode` will appear in questions asking for code, algorithm, and program output. In this case, indentation and spacing is significant. For program output, I do look at spaces and newlines.

For long answers (not in typewriter font) if you see

```
What is the color of the sky?
\begin{answerlong}
\end{answerlong}
```

you can write

```
What is the color of the sky?  
\begin{answerlong}  
The color of the sky is blue.  
\end{answerlong}
```

A question that begins with “T or F or M” requires you to identify whether it is true or false, or meaningless. “Meaningless” means something’s wrong with the question and it is not well-defined. Something like “ $1 + 2 = 4$ ” is either true or false (of course it’s false). Something like “ $1+2 = 4?$ ” does not make sense.

When writing results of computations, make sure it’s simplified. For instance write 2 instead of $1 + 1$.

HIGHER LEVEL CLASSES.

For students beyond 245: You can put L^AT_EX commands in `answerlong`.

More examples of meaningless statements: Questions such as “Is $42 = 1+2$ true or false?” or “Is $42 = \{2\}^{\{3\}}$ true or false?” does not make sense. “Is $P(42) = \{42\}$ true or false?” is meaningless because $P(X)$ is only defined if X is a set. For “Is $1 + 2 + 3$ true or false?”, “ $1 + 2 + 3$ ” is well-defined but as a “numerical expression”, not as a “proposition”, i.e., it cannot be true or false. Therefore “Is $1 + 2 + 3$ true or false?” is also not a well-defined question.

More examples of simplification: When you write down sets, if the answer is $\{1\}$, do not write $\{1, 1\}$. And when the values can be ordered, write the elements of the set in ascending order. When writing polynomials, begin with the highest degree term.

When writing a counterexample, always write the simplest.