



NUMBER :	NAME :	EXAM GRADE	
Rules to be Obeyed During the Exam		[.....]
SIGNATURE:			

1. Cell phones are not allowed to be used as a calculator or a watch. They must be switched off and placed in the pocket.
 2. Brief information about the exam will be given at the beginning, then no one is not allowed to ask a question during the exam.
 3. Do not to forget to sign this paper after writing your number and name.

<pre> void right(int i, int p, int n, int k, int s) { s += i; if(n == k) { cout << s << endl; return; } else right(i+p, p, n+1, k, s); } void down(int i, int p, int n, int k) { if(n == k) cout << i << endl; else right(i, p, 1, k, 0); if(i == 1) return; else down(i/2, p/2, 1, k*2); } void main() { down(8, 16, 1, 1); } </pre>	Output
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1. What is the output of the program above? (25P)

1 2 3 4 5 6 7

2. Insert the elements above into a Heap according to the code below.
 Hint → root is max element instead of min. (25P)

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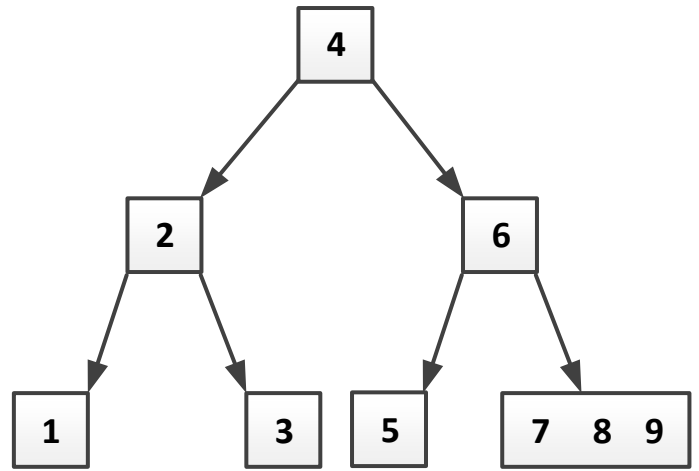
bool isLess(const int& e, const int& f)
{
    if(e<f) return true; else return false;
}

void insert(const int& e)
{
    T.addLast(e);
    Position v = T.last();
    while (!T.isRoot(v))
    {
        Position u = T.parent(v);
        if (isLess(*v, *u)) break;
        T.swap(v, u);
        v = u;
    }
}

```

2 4 6 1 3 5

3. Insert elements above into a Splay Tree. (25P)



4. Remove 5 from the 2-3-4 Tree above. (25P)