Question 1

Sunday, January 20, 2019 12:44 AM

(a)

```
void Hanoi(int n) {
    if(!s->v->isEmpty() && n >= 1) {
        Hanoi(n-1);
        moveNext(s, a2);
        H1(n-1, a3, a2, a1);
        moveNext(a2,a3);
        if(!s->v->isEmpty())
            H2(n-1, a1, a2, a3);
        else
            Hanoi(n-1);
    } else if(s->v->isEmpty()) {
        if(n == 0)
            moveNext(a3,d);
        else if(n >= 1) {
            moveNext(a3, d);
            H2(n-1, a1, a2, a3);
            moveNext(a1, a2);
            H1(n-1, a3, a2, a1);
            moveNext(a2, a3);
            Hanoi(n-1);
        }
    }
    recursiveCalls++;
}
```

```
void H2(int n, Node * begin, Node * aux, Node * end) {
    if(n == 1)
        moveNext(begin, end);
    else if(n >= 2) {
        H2(n-1, begin, aux, end);
        moveNext(begin, aux);
        H1(n-1, end, aux, begin);
        moveNext(aux, end);
        H2(n-1, begin, aux, end);
    } recursiveCalls++;
}

void H1(int n, Node * begin, Node * aux, Node * end) {
    if(n == 1)
        moveNext(begin, end);
    else if(n >= 2) {
        H2(n-1, begin, end, aux);
        moveNext(begin, end);
        H2(n-1, aux, begin, end);
    } recursiveCalls++;
}
```

Time Complexity

Where $Hanoi(n)$ is $T(n)$,

$Hanoi(n) = 3 \cdot Hanoi(n-1) + 2 \cdot Hop(n-1) + f(n) \Rightarrow O(3^n)$

Explanation

$3 \cdot Hanoi(n-1)$ line 1, 3, and 20 of $Hanoi$ function

$\Rightarrow O\left(3^{\frac{n}{1}}\right) \Rightarrow O(3^n)$

$2 \cdot Hop(n-1)$ $H1$ and $H2$ call from both $stack\ is\ empty$ & $stack\ is\ not\ empty$

$\Rightarrow O\left(2^{\frac{n}{1}}\right) \Rightarrow O(2^n)$

$f(n)$ = can either be 2 or 3-4 moves

where it's 2 moves, stack is not emtpy (line 4 and 6 show this)

where it's 3-4 moves, stack is empty (line 13, 15, 17, and 19)

$\Rightarrow O(1)$

$3 \cdot Hanoi(n-1)$ in this case has the largest long-term growth

$\therefore Hanoi(n) = O(3^n)$

Space Complexity

Where $stack\ size$ is the number of disks n

$\#\ of\ array\ stacks \cdot stack\ size + atomic\ moves\ per\ recursive\ call \cdot recursive\ calls$

$= 5 \cdot n + \underbrace{2 \cdot [3(n-1)]}_{stack\ is\ not\ empty} + \underbrace{4 \cdot [3(n-1)]}_{stack\ is\ empty}$

$= O(n)$ linear growth

(b) On next page

$n = 1$
Start -> 1 -> Aux1
Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Dest

$n = 2$
Start -> 1 -> Aux1
Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3
Start -> 2 -> Aux1
Aux1 -> 2 -> Aux2
Aux3 -> 1 -> Aux1
Aux2 -> 2 -> Aux3
Aux3 -> 2 -> Dest
Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Dest

$n = 3$
Start -> 1 -> Aux1
Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3
Start -> 2 -> Aux1
Aux1 -> 2 -> Aux2
Aux3 -> 1 -> Aux1
Aux2 -> 2 -> Aux3
Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3
Start -> 3 -> Aux1
Aux1 -> 3 -> Aux2
Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2
Aux3 -> 2 -> Aux1
Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1
Aux2 -> 3 -> Aux3
Aux3 -> 3 -> Dest
Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3
Aux1 -> 2 -> Aux2
Aux3 -> 1 -> Aux1
Aux2 -> 2 -> Aux3
Aux3 -> 2 -> Dest
Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Dest

$n = 4$
Start -> 1 -> Aux1
Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3
Start -> 2 -> Aux1
Aux1 -> 2 -> Aux2
Aux3 -> 1 -> Aux1
Aux2 -> 2 -> Aux3
Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3
Start -> 3 -> Aux1
Aux1 -> 3 -> Aux2
Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2
Aux3 -> 2 -> Aux1
Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1
Aux2 -> 3 -> Aux3
Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3
Aux1 -> 2 -> Aux2
Aux3 -> 1 -> Aux1
Aux2 -> 2 -> Aux3
Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3
Start -> 4 -> Aux1
Aux1 -> 4 -> Aux2
Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2
Aux3 -> 2 -> Aux1
Aux2 -> 1 -> Aux3
Aux1 -> 2 -> Aux2
Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2
Aux3 -> 3 -> Aux1
Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1
Aux2 -> 2 -> Aux3
Aux1 -> 1 -> Aux2
Aux3 -> 2 -> Aux1
Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1
Aux2 -> 4 -> Aux3
Aux3 -> 4 -> Dest
Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3
Aux1 -> 2 -> Aux2
Aux3 -> 1 -> Aux1
Aux2 -> 2 -> Aux3
Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3
Aux1 -> 3 -> Aux2
Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2
Aux3 -> 2 -> Aux1
Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1
Aux2 -> 3 -> Aux3
Aux3 -> 3 -> Dest
Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3
Aux1 -> 2 -> Aux2
Aux3 -> 1 -> Aux1
Aux2 -> 2 -> Aux3
Aux3 -> 2 -> Dest
Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Dest

$n = 5$

First 100 moves	Remaining moves
Start -> 1 -> Aux1	Aux3 -> 3 -> Aux1
Aux1 -> 1 -> Aux2	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux3 -> 1 -> Aux1
Start -> 2 -> Aux1	Aux2 -> 2 -> Aux3
Aux1 -> 2 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 2 -> Aux1
Aux2 -> 2 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 1 -> Aux2	Aux3 -> 1 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 5 -> Aux3
Start -> 3 -> Aux1	Aux3 -> 5 -> Dest
Aux1 -> 3 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 1 -> Aux1	Aux2 -> 1 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 2 -> Aux2
Aux3 -> 2 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 2 -> Aux3
Aux3 -> 1 -> Aux1	Aux1 -> 1 -> Aux2
Aux2 -> 3 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 3 -> Aux2
Aux2 -> 1 -> Aux3	Aux3 -> 1 -> Aux1
Aux1 -> 2 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 2 -> Aux1
Aux2 -> 2 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 1 -> Aux2	Aux3 -> 1 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 3 -> Aux3
Start -> 4 -> Aux1	Aux1 -> 1 -> Aux2
Aux1 -> 4 -> Aux2	Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1	Aux1 -> 2 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 1 -> Aux1
Aux3 -> 2 -> Aux1	Aux2 -> 2 -> Aux3
Aux2 -> 1 -> Aux3	Aux1 -> 1 -> Aux2
Aux1 -> 2 -> Aux2	Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1	Aux1 -> 4 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 1 -> Aux1
Aux3 -> 3 -> Aux1	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux3 -> 2 -> Aux1
Aux3 -> 1 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 2 -> Aux3	Aux1 -> 2 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 1 -> Aux1
Aux3 -> 2 -> Aux1	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux3 -> 3 -> Aux1
Aux3 -> 1 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 4 -> Aux3	Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2	Aux2 -> 2 -> Aux3
Aux2 -> 1 -> Aux3	Aux1 -> 1 -> Aux2
Aux1 -> 2 -> Aux2	Aux3 -> 2 -> Aux1
Aux3 -> 1 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 2 -> Aux3	Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2	Aux2 -> 4 -> Aux3
Aux2 -> 1 -> Aux3	Aux3 -> 4 -> Dest
Aux1 -> 3 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 1 -> Aux1	Aux2 -> 1 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 2 -> Aux2
Aux3 -> 2 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 2 -> Aux3
Aux3 -> 1 -> Aux1	Aux1 -> 1 -> Aux2
Aux2 -> 3 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 3 -> Aux2
Aux2 -> 1 -> Aux3	Aux3 -> 1 -> Aux1
Aux1 -> 2 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 2 -> Aux1
Aux2 -> 2 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 1 -> Aux2	Aux3 -> 1 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 3 -> Aux3
Start -> 5 -> Aux1	Aux3 -> 3 -> Dest
Aux1 -> 5 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 1 -> Aux1	Aux2 -> 1 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 2 -> Aux2
Aux3 -> 2 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 2 -> Aux3
Aux1 -> 2 -> Aux2	Aux3 -> 2 -> Dest
Aux3 -> 1 -> Aux1	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux2 -> 1 -> Aux3
Aux3 -> 3 -> Aux1	Aux3 -> 1 -> Dest
Aux2 -> 1 -> Aux3	
Aux3 -> 1 -> Aux1	
Aux2 -> 2 -> Aux3	
Aux1 -> 1 -> Aux2	
Aux2 -> 1 -> Aux3	
Aux1 -> 3 -> Aux2	
Aux3 -> 1 -> Aux1	
Aux1 -> 1 -> Aux2	
Aux3 -> 2 -> Aux1	
Aux2 -> 1 -> Aux3	
Aux1 -> 2 -> Aux2	
Aux3 -> 1 -> Aux1	
Aux1 -> 1 -> Aux2	
Aux3 -> 4 -> Aux1	
Aux2 -> 1 -> Aux3	
Aux3 -> 1 -> Aux1	
Aux2 -> 2 -> Aux3	
Aux1 -> 1 -> Aux2	
Aux3 -> 2 -> Aux1	
Aux2 -> 1 -> Aux3	
Aux3 -> 1 -> Aux1	
Aux2 -> 3 -> Aux3	
Aux1 -> 1 -> Aux2	
Aux2 -> 1 -> Aux3	
Aux1 -> 2 -> Aux2	
Aux3 -> 1 -> Aux1	
Aux1 -> 1 -> Aux2	

$n = 6$

First 100 moves	Last 100 moves
Start -> 1 -> Aux1	Aux2 -> 1 -> Aux3
Aux1 -> 1 -> Aux2	Aux3 -> 1 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 2 -> Aux3
Start -> 2 -> Aux1	Aux1 -> 1 -> Aux2
Aux1 -> 2 -> Aux2	Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1	Aux1 -> 3 -> Aux2
Aux2 -> 2 -> Aux3	Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux3 -> 2 -> Aux1
Start -> 3 -> Aux1	Aux2 -> 1 -> Aux3
Aux1 -> 3 -> Aux2	Aux1 -> 2 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 2 -> Aux1	Aux3 -> 4 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 3 -> Aux3	Aux2 -> 2 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux3 -> 2 -> Aux1
Aux1 -> 2 -> Aux2	Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 2 -> Aux3	Aux2 -> 3 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Start -> 4 -> Aux1	Aux1 -> 2 -> Aux2
Aux1 -> 4 -> Aux2	Aux3 -> 1 -> Aux1
Aux3 -> 1 -> Aux1	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 3 -> Aux1
Aux3 -> 2 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux3 -> 1 -> Aux1
Aux1 -> 2 -> Aux2	Aux2 -> 2 -> Aux3
Aux3 -> 1 -> Aux1	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 2 -> Aux1
Aux3 -> 3 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux3 -> 1 -> Aux1
Aux3 -> 1 -> Aux1	Aux2 -> 5 -> Aux3
Aux2 -> 2 -> Aux3	Aux3 -> 5 -> Dest
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 2 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux1 -> 2 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 4 -> Aux3	Aux2 -> 2 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 2 -> Aux2	Aux1 -> 3 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 2 -> Aux3	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 2 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 3 -> Aux2	Aux3 -> 1 -> Aux1
Aux3 -> 1 -> Aux1	Aux2 -> 3 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 2 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux1 -> 2 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 3 -> Aux3	Aux2 -> 2 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 2 -> Aux2	Aux1 -> 4 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 2 -> Aux3	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 2 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Start -> 5 -> Aux1	Aux1 -> 2 -> Aux2
Aux1 -> 5 -> Aux2	Aux3 -> 1 -> Aux1
Aux3 -> 1 -> Aux1	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 3 -> Aux1
Aux3 -> 2 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux3 -> 1 -> Aux1
Aux1 -> 2 -> Aux2	Aux2 -> 2 -> Aux3
Aux3 -> 1 -> Aux1	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 2 -> Aux1
Aux3 -> 3 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux3 -> 1 -> Aux1
Aux3 -> 1 -> Aux1	Aux2 -> 4 -> Aux3
Aux2 -> 2 -> Aux3	Aux3 -> 4 -> Dest
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 3 -> Aux2	Aux1 -> 2 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2	Aux2 -> 2 -> Aux3
Aux3 -> 2 -> Aux1	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 2 -> Aux2	Aux1 -> 3 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 4 -> Aux1	Aux3 -> 2 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 2 -> Aux3	Aux2 -> 3 -> Aux3
Aux1 -> 1 -> Aux2	Aux3 -> 3 -> Dest
Aux3 -> 2 -> Aux1	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1	Aux1 -> 2 -> Aux2
Aux2 -> 3 -> Aux3	Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2	Aux2 -> 2 -> Aux3
Aux2 -> 1 -> Aux3	Aux3 -> 2 -> Dest
Aux1 -> 2 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 1 -> Aux1	Aux2 -> 1 -> Aux3
Aux1 -> 1 -> Aux2	Aux3 -> 1 -> Dest

$n = 7$

First 100 moves	Last 100 moves
Start -> 1 -> Aux1	Aux2 -> 1 -> Aux3
Aux1 -> 1 -> Aux2	Aux3 -> 1 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 2 -> Aux3
Start -> 2 -> Aux1	Aux1 -> 1 -> Aux2
Aux1 -> 2 -> Aux2	Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1	Aux1 -> 3 -> Aux2
Aux2 -> 2 -> Aux3	Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux3 -> 2 -> Aux1
Start -> 3 -> Aux1	Aux2 -> 1 -> Aux3
Aux1 -> 3 -> Aux2	Aux1 -> 2 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 2 -> Aux1	Aux3 -> 4 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 3 -> Aux3	Aux2 -> 2 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux3 -> 2 -> Aux1
Aux1 -> 2 -> Aux2	Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 2 -> Aux3	Aux2 -> 3 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Start -> 4 -> Aux1	Aux1 -> 2 -> Aux2
Aux1 -> 4 -> Aux2	Aux3 -> 1 -> Aux1
Aux3 -> 1 -> Aux1	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 3 -> Aux1
Aux3 -> 2 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux3 -> 1 -> Aux1
Aux1 -> 2 -> Aux2	Aux2 -> 2 -> Aux3
Aux3 -> 1 -> Aux1	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 2 -> Aux1
Aux3 -> 3 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux3 -> 1 -> Aux1
Aux3 -> 1 -> Aux1	Aux2 -> 5 -> Aux3
Aux2 -> 2 -> Aux3	Aux3 -> 5 -> Dest
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 2 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux1 -> 2 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 4 -> Aux3	Aux2 -> 2 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 2 -> Aux2	Aux1 -> 3 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 2 -> Aux3	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 2 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 3 -> Aux2	Aux3 -> 1 -> Aux1
Aux3 -> 1 -> Aux1	Aux2 -> 3 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 2 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux1 -> 2 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 3 -> Aux3	Aux2 -> 2 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 2 -> Aux2	Aux1 -> 4 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 2 -> Aux3	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 2 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Start -> 5 -> Aux1	Aux1 -> 2 -> Aux2
Aux1 -> 5 -> Aux2	Aux3 -> 1 -> Aux1
Aux3 -> 1 -> Aux1	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 3 -> Aux1
Aux3 -> 2 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux3 -> 1 -> Aux1
Aux1 -> 2 -> Aux2	Aux2 -> 2 -> Aux3
Aux3 -> 1 -> Aux1	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 2 -> Aux1
Aux3 -> 3 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux3 -> 1 -> Aux1
Aux3 -> 1 -> Aux1	Aux2 -> 4 -> Aux3
Aux2 -> 2 -> Aux3	Aux3 -> 4 -> Dest
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 3 -> Aux2	Aux1 -> 2 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2	Aux2 -> 2 -> Aux3
Aux3 -> 2 -> Aux1	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 2 -> Aux2	Aux1 -> 3 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 4 -> Aux1	Aux3 -> 2 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 2 -> Aux3	Aux2 -> 3 -> Aux3
Aux1 -> 1 -> Aux2	Aux3 -> 3 -> Dest
Aux3 -> 2 -> Aux1	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1	Aux1 -> 2 -> Aux2
Aux2 -> 3 -> Aux3	Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2	Aux2 -> 2 -> Aux3
Aux2 -> 1 -> Aux3	Aux3 -> 2 -> Dest
Aux1 -> 2 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 1 -> Aux1	Aux2 -> 1 -> Aux3
Aux1 -> 1 -> Aux2	Aux3 -> 1 -> Dest

$n = 8$

First 100 moves	Last 100 moves
Start -> 1 -> Aux1	Aux2 -> 1 -> Aux3
Aux1 -> 1 -> Aux2	Aux3 -> 1 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 2 -> Aux3
Start -> 2 -> Aux1	Aux1 -> 1 -> Aux2
Aux1 -> 2 -> Aux2	Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1	Aux1 -> 3 -> Aux2
Aux2 -> 2 -> Aux3	Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux3 -> 2 -> Aux1
Start -> 3 -> Aux1	Aux2 -> 1 -> Aux3
Aux1 -> 3 -> Aux2	Aux1 -> 2 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 2 -> Aux1	Aux3 -> 4 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 3 -> Aux3	Aux2 -> 2 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux3 -> 2 -> Aux1
Aux1 -> 2 -> Aux2	Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 2 -> Aux3	Aux2 -> 3 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Start -> 4 -> Aux1	Aux1 -> 2 -> Aux2
Aux1 -> 4 -> Aux2	Aux3 -> 1 -> Aux1
Aux3 -> 1 -> Aux1	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 3 -> Aux1
Aux3 -> 2 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux3 -> 1 -> Aux1
Aux1 -> 2 -> Aux2	Aux2 -> 2 -> Aux3
Aux3 -> 1 -> Aux1	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 2 -> Aux1
Aux3 -> 3 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux3 -> 1 -> Aux1
Aux3 -> 1 -> Aux1	Aux2 -> 5 -> Aux3
Aux2 -> 2 -> Aux3	Aux3 -> 5 -> Dest
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 2 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux1 -> 2 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 4 -> Aux3	Aux2 -> 2 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 2 -> Aux2	Aux1 -> 3 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 2 -> Aux3	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 2 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 3 -> Aux2	Aux3 -> 1 -> Aux1
Aux3 -> 1 -> Aux1	Aux2 -> 3 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 2 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux1 -> 2 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 3 -> Aux3	Aux2 -> 2 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 2 -> Aux2	Aux1 -> 4 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 2 -> Aux3	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 2 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Start -> 5 -> Aux1	Aux1 -> 2 -> Aux2
Aux1 -> 5 -> Aux2	Aux3 -> 1 -> Aux1
Aux3 -> 1 -> Aux1	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 3 -> Aux1
Aux3 -> 2 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux3 -> 1 -> Aux1
Aux1 -> 2 -> Aux2	Aux2 -> 2 -> Aux3
Aux3 -> 1 -> Aux1	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 2 -> Aux1
Aux3 -> 3 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux3 -> 1 -> Aux1
Aux3 -> 1 -> Aux1	Aux2 -> 4 -> Aux3
Aux2 -> 2 -> Aux3	Aux3 -> 4 -> Dest
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 3 -> Aux2	Aux1 -> 2 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2	Aux2 -> 2 -> Aux3
Aux3 -> 2 -> Aux1	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 2 -> Aux2	Aux1 -> 3 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 4 -> Aux1	Aux3 -> 2 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 2 -> Aux3	Aux2 -> 3 -> Aux3
Aux1 -> 1 -> Aux2	Aux3 -> 3 -> Dest
Aux3 -> 2 -> Aux1	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1	Aux1 -> 2 -> Aux2
Aux2 -> 3 -> Aux3	Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2	Aux2 -> 2 -> Aux3
Aux2 -> 1 -> Aux3	Aux3 -> 2 -> Dest
Aux1 -> 2 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 1 -> Aux1	Aux2 -> 1 -> Aux3
Aux1 -> 1 -> Aux2	Aux3 -> 1 -> Dest

$n = 9$

First 100 moves	Last 100 moves
Start -> 1 -> Aux1	Aux2 -> 1 -> Aux3
Aux1 -> 1 -> Aux2	Aux3 -> 1 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 2 -> Aux3
Start -> 2 -> Aux1	Aux1 -> 1 -> Aux2
Aux1 -> 2 -> Aux2	Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1	Aux1 -> 3 -> Aux2
Aux2 -> 2 -> Aux3	Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux3 -> 2 -> Aux1
Start -> 3 -> Aux1	Aux2 -> 1 -> Aux3
Aux1 -> 3 -> Aux2	Aux1 -> 2 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 2 -> Aux1	Aux3 -> 4 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 3 -> Aux3	Aux2 -> 2 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux3 -> 2 -> Aux1
Aux1 -> 2 -> Aux2	Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 2 -> Aux3	Aux2 -> 3 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Start -> 4 -> Aux1	Aux1 -> 2 -> Aux2
Aux1 -> 4 -> Aux2	Aux3 -> 1 -> Aux1
Aux3 -> 1 -> Aux1	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 3 -> Aux1
Aux3 -> 2 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux3 -> 1 -> Aux1
Aux1 -> 2 -> Aux2	Aux2 -> 2 -> Aux3
Aux3 -> 1 -> Aux1	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 2 -> Aux1
Aux3 -> 3 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux3 -> 1 -> Aux1
Aux3 -> 1 -> Aux1	Aux2 -> 5 -> Aux3
Aux2 -> 2 -> Aux3	Aux3 -> 5 -> Dest
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 2 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux1 -> 2 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 4 -> Aux3	Aux2 -> 2 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 2 -> Aux2	Aux1 -> 3 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 2 -> Aux3	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 2 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 3 -> Aux2	Aux3 -> 1 -> Aux1
Aux3 -> 1 -> Aux1	Aux2 -> 3 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 2 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux1 -> 2 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 3 -> Aux3	Aux2 -> 2 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 2 -> Aux2	Aux1 -> 4 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 2 -> Aux3	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 2 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Start -> 5 -> Aux1	Aux1 -> 2 -> Aux2
Aux1 -> 5 -> Aux2	Aux3 -> 1 -> Aux1
Aux3 -> 1 -> Aux1	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 3 -> Aux1
Aux3 -> 2 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux3 -> 1 -> Aux1
Aux1 -> 2 -> Aux2	Aux2 -> 2 -> Aux3
Aux3 -> 1 -> Aux1	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 2 -> Aux1
Aux3 -> 3 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux3 -> 1 -> Aux1
Aux3 -> 1 -> Aux1	Aux2 -> 4 -> Aux3
Aux2 -> 2 -> Aux3	Aux3 -> 4 -> Dest
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 3 -> Aux2	Aux1 -> 2 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2	Aux2 -> 2 -> Aux3
Aux3 -> 2 -> Aux1	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 2 -> Aux2	Aux1 -> 3 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 4 -> Aux1	Aux3 -> 2 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 2 -> Aux3	Aux2 -> 3 -> Aux3
Aux1 -> 1 -> Aux2	Aux3 -> 3 -> Dest
Aux3 -> 2 -> Aux1	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1	Aux1 -> 2 -> Aux2
Aux2 -> 3 -> Aux3	Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2	Aux2 -> 2 -> Aux3
Aux2 -> 1 -> Aux3	Aux3 -> 2 -> Dest
Aux1 -> 2 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 1 -> Aux1	Aux2 -> 1 -> Aux3
Aux1 -> 1 -> Aux2	Aux3 -> 1 -> Dest

$n = 10$

First 100 moves	Last 100 moves
Start -> 1 -> Aux1	Aux2 -> 1 -> Aux3
Aux1 -> 1 -> Aux2	Aux3 -> 1 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 2 -> Aux3
Start -> 2 -> Aux1	Aux1 -> 1 -> Aux2
Aux1 -> 2 -> Aux2	Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1	Aux1 -> 3 -> Aux2
Aux2 -> 2 -> Aux3	Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux3 -> 2 -> Aux1
Start -> 3 -> Aux1	Aux2 -> 1 -> Aux3
Aux1 -> 3 -> Aux2	Aux1 -> 2 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 2 -> Aux1	Aux3 -> 4 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 3 -> Aux3	Aux2 -> 2 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux3 -> 2 -> Aux1
Aux1 -> 2 -> Aux2	Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 2 -> Aux3	Aux2 -> 3 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Start -> 4 -> Aux1	Aux1 -> 2 -> Aux2
Aux1 -> 4 -> Aux2	Aux3 -> 1 -> Aux1
Aux3 -> 1 -> Aux1	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 3 -> Aux1
Aux3 -> 2 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux3 -> 1 -> Aux1
Aux1 -> 2 -> Aux2	Aux2 -> 2 -> Aux3
Aux3 -> 1 -> Aux1	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 2 -> Aux1
Aux3 -> 3 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux3 -> 1 -> Aux1
Aux3 -> 1 -> Aux1	Aux2 -> 5 -> Aux3
Aux2 -> 2 -> Aux3	Aux3 -> 5 -> Dest
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 2 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux1 -> 2 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 4 -> Aux3	Aux2 -> 2 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 2 -> Aux2	Aux1 -> 3 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 2 -> Aux3	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 2 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 3 -> Aux2	Aux3 -> 1 -> Aux1
Aux3 -> 1 -> Aux1	Aux2 -> 3 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 2 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux1 -> 2 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 3 -> Aux3	Aux2 -> 2 -> Aux3
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 2 -> Aux2	Aux1 -> 4 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 2 -> Aux3	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 2 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Start -> 5 -> Aux1	Aux1 -> 2 -> Aux2
Aux1 -> 5 -> Aux2	Aux3 -> 1 -> Aux1
Aux3 -> 1 -> Aux1	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 3 -> Aux1
Aux3 -> 2 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux3 -> 1 -> Aux1
Aux1 -> 2 -> Aux2	Aux2 -> 2 -> Aux3
Aux3 -> 1 -> Aux1	Aux1 -> 1 -> Aux2
Aux1 -> 1 -> Aux2	Aux3 -> 2 -> Aux1
Aux3 -> 3 -> Aux1	Aux2 -> 1 -> Aux3
Aux2 -> 1 -> Aux3	Aux3 -> 1 -> Aux1
Aux3 -> 1 -> Aux1	Aux2 -> 4 -> Aux3
Aux2 -> 2 -> Aux3	Aux3 -> 4 -> Dest
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 3 -> Aux2	Aux1 -> 2 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2	Aux2 -> 2 -> Aux3
Aux3 -> 2 -> Aux1	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux1 -> 2 -> Aux2	Aux1 -> 3 -> Aux2
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 4 -> Aux1	Aux3 -> 2 -> Aux1
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1	Aux3 -> 1 -> Aux1
Aux2 -> 2 -> Aux3	Aux2 -> 3 -> Aux3
Aux1 -> 1 -> Aux2	Aux3 -> 3 -> Dest
Aux3 -> 2 -> Aux1	Aux1 -> 1 -> Aux2
Aux2 -> 1 -> Aux3	Aux2 -> 1 -> Aux3
Aux3 -> 1 -> Aux1	Aux1 -> 2 -> Aux2
Aux2 -> 3 -> Aux3	Aux3 -> 1 -> Aux1
Aux1 -> 1 -> Aux2	Aux2 -> 2 -> Aux3
Aux2 -> 1 -> Aux3	Aux3 -> 2 -> Dest
Aux1 -> 2 -> Aux2	Aux1 -> 1 -> Aux2
Aux3 -> 1 -> Aux1	Aux2 -> 1 -> Aux3
Aux1 -> 1 -> Aux2	Aux3 -> 1 -> Dest