

```

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3	13	5	0	7	11	4	9	14	2	10	1	12	8	6
---	----	---	---	---	----	---	---	----	---	----	---	----	---	---

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
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}

```

3	6	5	0	7	8	4	1	2	9	10	14	12	11	13
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2	10	14
1	9	9
0	0	8

top

```

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---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
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0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
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4		
3		
2	14	
1	9	9
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top

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0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
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top

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```

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---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
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```

3	6	5	0	7	8	4	1	2	9	10	11	12	14	13
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

14		
13		
12		
11		
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3	6	5	0	7	8	4	1	2	9	10	11	12	14	13
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
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0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
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0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
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14		
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0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
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---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
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8		
7		
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4		
3		
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1	9	9
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3	6	5	0	7	8	4	1	2	9	10	11	12	14	13
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
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4		
3		
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0	0	8

top

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3	6	5	0	7	8	4	1	2	9	10	11	12	13	14
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2	10	12
1	9	9
0	0	8

top

a, p b


```

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```

3	6	5	0	7	8	4	1	2	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

a, p b

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3	13	
2	10	12
1	9	9
0	0	8

top

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```

3	6	5	0	7	8	4	1	2	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

a, p b

14		
13		
12		
11		
10		
9		
8		
7		
6		
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```

3	6	5	0	7	8	4	1	2	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

a,p b

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4	14	
3	13	13
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1	9	9
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top

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3	6	5	0	7	8	4	1	2	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

a,p b

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4	14	14
3	13	13
2	10	12
1	9	9
0	0	8

top

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```

3	6	5	0	7	8	4	1	2	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14			top
13			
12			
11			
10			
9			
8			
7			
6			
5			
4	14	14	
3	13	13	
2	10	12	
1	9	9	
0	0	8	

a, p b

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3	6	5	0	7	8	4	1	2	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4	14	
3	13	13
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1	9	9
0	0	8

top

p a,b

```

void sort (Tab t) {
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```

3	6	5	0	7	8	4	1	2	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
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top

p a,b

```

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3	6	5	0	7	8	4	1	2	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14			top
13			
12			
11			
10			
9			
8			
7			
6			
5			
4			
3	13	13	
2	10	12	
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p a,b


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3	6	5	0	7	8	4	1	2	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14			top
13			
12			
11			
10			
9			
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7			
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p a,b

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3	6	5	0	7	8	4	1	2	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3	13	
2	10	12
1	9	9
0	0	8

top

a, p b

```

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a,b,p

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top

p a,b


```

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a,p b

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            stackPush(&first, p+1);
            stackPush(&last, b);
        }
    }
}

```

3	6	5	0	7	8	4	1	2	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

a,p b

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3	11	11
2	10	10
1	9	9
0	0	8

top

```

void sort (Tab t) {
    uint p, a, b;
    Stack first = stackNew(t.len);
    Stack last = stackNew(t.len);
    stackPush(&first, 0);
    stackPush(&last, t.len-1);
    while (!stackEmpty(first)) {
        a = stackPop(&first);
        b = stackPop(&last);
        if (a < b) {
            p = a + partition(slice(t, a, b));
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```

3	6	5	0	7	8	4	1	2	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
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0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
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10		
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8		
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top

p a,b

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0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
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top

p a,b

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top

p a,b

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top

p a,b

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top

a,p b


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```

a,b,p

3	6	5	0	7	8	4	1	2	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

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a,b,p

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a,b,p

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14		
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14		
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top


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```

	a							b		p							
	3	6	5	0	7	8	4	1	2	9	10	11	12	13	14		

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
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4		
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2		
1		
0		top

```

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```

a					b				p					
3	6	5	0	7	8	4	1	2	9	10	11	12	13	14

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
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1		
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top

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a						p		b								
3	6	5	0	2	1	4	8	7	9	10	11	12	13	14		

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top

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13		
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	3	6	5	0	2	1	4	8	7	9	10	11	12	13	14		

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14			
13			
12			
11			
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9			
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7			
6			
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4			
3			
2			
1			
0	0	6	top

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```

a					p					b				
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            stackPush(&first, p+1);
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        }
    }
}

```

3	6	5	0	2	1	4	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2		
1	7	7
0	0	6

top

```

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3	6	5	0	2	1	4	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
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top

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---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

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0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
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0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
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}

```

a,b,p

3	6	5	0	2	1	4	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
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9		
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5		
4		
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1		
0	0	6

top

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```

a,b,p

3	6	5	0	2	1	4	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
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0	0	6

top


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```

a,b,p

3	6	5	0	2	1	4	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

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14		
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top

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0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
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top

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0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
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2		
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0		top

```

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```

3	6	5	0	2	1	4	7	8	9	10	11	12	13	14
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0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2		
1		
0		

top

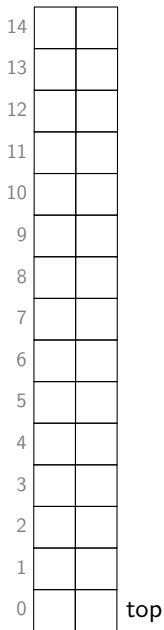
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0 1 2 3 4 5 6 7 8 9 10 11 12 13 14



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0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
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2		
1		
0	0	top

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0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
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0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
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top


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0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

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```

0	6	5	3	2	1	4	7	8	9	10	11	12	13	14
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0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

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0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

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0	6	5	3	2	1	4	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

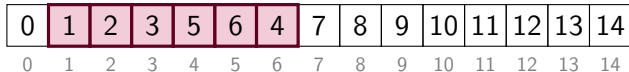
14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2		
1		
0	0	0

top

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            p = a + partition(slice(t, a, b));
            stackPush(&first, a);
            stackPush(&last, p);
            stackPush(&first, p+1);
            stackPush(&last, b);
        }
    }
}

```



14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2		
1		
0	0	0

top


```

void sort (Tab t) {
    uint p, a, b;
    Stack first = stackNew(t.len);
    Stack last = stackNew(t.len);
    stackPush(&first, 0);
    stackPush(&last, t.len-1);
    while (!stackEmpty(first)) {
        a = stackPop(&first);
        b = stackPop(&last);
        if (a < b) {
            p = a + partition(slice(t, a, b));
            stackPush(&first, a);
            stackPush(&last, p);
            stackPush(&first, p+1);
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        }
    }
}

```

	a		p			b													
0	1	2	3	5	6	4	7	8	9	10	11	12	13	14					

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2		
1	1	3
0	0	0

top


```

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        }
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}

```

0	1	2	3	5	6	4	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2	4	6
1	1	3
0	0	0

top

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```

0	1	2	3	5	6	4	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2	4	6
1	1	3
0	0	0

top

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```

0	1	2	3	5	6	4	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2	6	
1	1	3
0	0	0

top

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```

0	1	2	3	5	6	4	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2		
1	1	3
0	0	0

top

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```

0	1	2	3	5	6	4	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2		
1	1	3
0	0	0

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        }
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}

```

				a	p	b										
0	1	2	3	5	4	6	7	8	9	10	11	12	13	14		

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2		
1	1	3
0	0	0

top

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```

0	1	2	3	5	4	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2	4	
1	1	3
0	0	0

top


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```

0	1	2	3	5	4	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2	4	5
1	1	3
0	0	0

top

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```

0	1	2	3	5	4	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
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5		
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3	6	
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1	1	3
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top

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```

0	1	2	3	5	4	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
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8		
7		
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5		
4		
3	6	6
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1	1	3
0	0	0

top

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```

0	1	2	3	5	4	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
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3	6	6
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1	1	3
0	0	0

top

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            stackPush(&last, p);
            stackPush(&first, p+1);
            stackPush(&last, b);
        }
    }
}

```

p a,b

0	1	2	3	5	4	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3	6	
2	4	5
1	1	3
0	0	0

top

```

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            stackPush(&last, p);
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```

0	1	2	3	5	4	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2	4	5
1	1	3
0	0	0

top

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            stackPush(&last, p);
            stackPush(&first, p+1);
            stackPush(&last, b);
        }
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}

```

0	1	2	3	5	4	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14			top
13			
12			
11			
10			
9			
8			
7			
6			
5			
4			
3			
2	4	5	
1	1	3	
0	0	0	

```

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}

```

0	1	2	3	5	4	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2	4	5
1	1	3
0	0	0

top


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```

0	1	2	3	5	4	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2	5	
1	1	3
0	0	0

top

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        }
    }
}

```

a b,p

0	1	2	3	5	4	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2		
1	1	3
0	0	0

top

```

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            stackPush(&first, a);
            stackPush(&last, p);
            stackPush(&first, p+1);
            stackPush(&last, b);
        }
    }
}

```

a b,p

0	1	2	3	5	4	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2		
1	1	3
0	0	0

top

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```

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
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9		
8		
7		
6		
5		
4		
3		
2		
1	1	3
0	0	0

top

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```

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2	4	
1	1	3
0	0	0

top

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```

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2	4	4
1	1	3
0	0	0

top

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```

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
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8		
7		
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5		
4		
3	5	
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0	0	0

top

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```

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
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8		
7		
6		
5		
4		
3	5	5
2	4	4
1	1	3
0	0	0

top


```

void sort (Tab t) {
    uint p, a, b;
    Stack first = stackNew(t.len);
    Stack last = stackNew(t.len);
    stackPush(&first, 0);
    stackPush(&last, t.len-1);
    while (!stackEmpty(first)) {
        a = stackPop(&first);
        b = stackPop(&last);
        if (a < b) {
            p = a + partition(slice(t, a, b));
            stackPush(&first, a);
            stackPush(&last, p);
            stackPush(&first, p+1);
            stackPush(&last, b);
        }
    }
}

```

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14			top
13			
12			
11			
10			
9			
8			
7			
6			
5			
4			
3	5	5	
2	4	4	
1	1	3	
0	0	0	

```

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        }
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}

```

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3	4	5
2	4	4
1	1	3
0	0	0

top

```

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            stackPush(&last, p);
            stackPush(&first, p+1);
            stackPush(&last, b);
        }
    }
}

```

p a,b

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2	4	4
1	1	3
0	0	0

top

```

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```

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2	4	4
1	1	3
0	0	0

top

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```

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2	4	4
1	1	3
0	0	0

top

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```

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2	4	
1	1	3
0	0	0

top

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            stackPush(&first, p+1);
            stackPush(&last, b);
        }
    }
}

```

a,b,p

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2		
1	1	3
0	0	0

top

```

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            stackPush(&last, b);
        }
    }
}

```

a,b,p

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2		
1	1	3
0	0	0

top


```

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        }
    }
}

```

a,b,p

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2		
1	1	3
0	0	0

top

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            stackPush(&last, p);
            stackPush(&first, p+1);
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        }
    }
}

```

a	b,p	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2		
1	3	
0	0	0

top

```
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            stackPush(&last, p);
            stackPush(&first, p+1);
            stackPush(&last, b);
        }
    }
}
```

	a	b	p												
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14


```

void sort (Tab t) {
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            stackPush(&last, p);
            stackPush(&first, p+1);
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        }
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}

```

	a	p	b													
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14		

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2		
1		
0	0	0

top

```

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            stackPush(&last, p);
            stackPush(&first, p+1);
            stackPush(&last, b);
        }
    }
}

```

a	p	b	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2		
1	1	
0	0	0

top


```

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            stackPush(&last, p);
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        }
    }
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```

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2	3	
1	1	2
0	0	0

top


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            stackPush(&first, p+1);
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        }
    }
}

```

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2	3	3
1	1	2
0	0	0

top


```

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            stackPush(&last, b);
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}

```

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2	3	
1	1	2
0	0	0

top

```

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```

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2		
1	1	2
0	0	0

top

```

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            stackPush(&first, a);
            stackPush(&last, p);
            stackPush(&first, p+1);
            stackPush(&last, b);
        }
    }
}

```

p a,b

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2		
1	1	2
0	0	0

top

```

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```

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2		
1	1	2
0	0	0

top

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```

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2		
1	1	2
0	0	0

top

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            stackPush(&first, p+1);
            stackPush(&last, b);
        }
    }
}

```

a	b,p	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14		

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2		
1		
0	0	0

top


```

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            stackPush(&last, p);
            stackPush(&first, p+1);
            stackPush(&last, b);
        }
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}

```

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2		
1		
0	0	0

top

```

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        }
    }
}

```

a, p b

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2		
1		
0	0	0

top

```

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        }
    }
}

```

a, p b

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2		
1	1	
0	0	0

top

```

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            stackPush(&last, p);
            stackPush(&first, p+1);
            stackPush(&last, b);
        }
    }
}

```

a, p b

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		
3		
2		
1	1	1
0	0	0

top

```

void sort (Tab t) {
    uint p, a, b;
    Stack first = stackNew(t.len);
    Stack last = stackNew(t.len);
    stackPush(&first, 0);
    stackPush(&last, t.len-1);
    while (!stackEmpty(first)) {
        a = stackPop(&first);
        b = stackPop(&last);
        if (a < b) {
            p = a + partition(slice(t, a, b));
            stackPush(&first, a);
            stackPush(&last, p);
            stackPush(&first, p+1);
            stackPush(&last, b);
        }
    }
}

```

a, p b

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

14		
13		
12		
11		
10		
9		
8		
7		
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5		
4		
3		
2	2	
1	1	1
0	0	0

top

```

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```

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
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14		
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top

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```

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```

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
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14		
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    }
    a,b,p
}

```

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
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```

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```

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        }
    }
    a b,p
}

```

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```

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    a,b p
}

```

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
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