Algorithms

FOURTH EDITION

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2.4 HEAPSORT DEMO

Heapsort demo

Heap construction. Build max heap using bottom-up method.

array in arbitrary order

S	O	R	T	E	X	A	M	P	L	E
1	2	3	4	5	6	7	8	9	10	11

Heapsort demo

Heap construction. Build max heap using bottom-up method.

1-node heaps

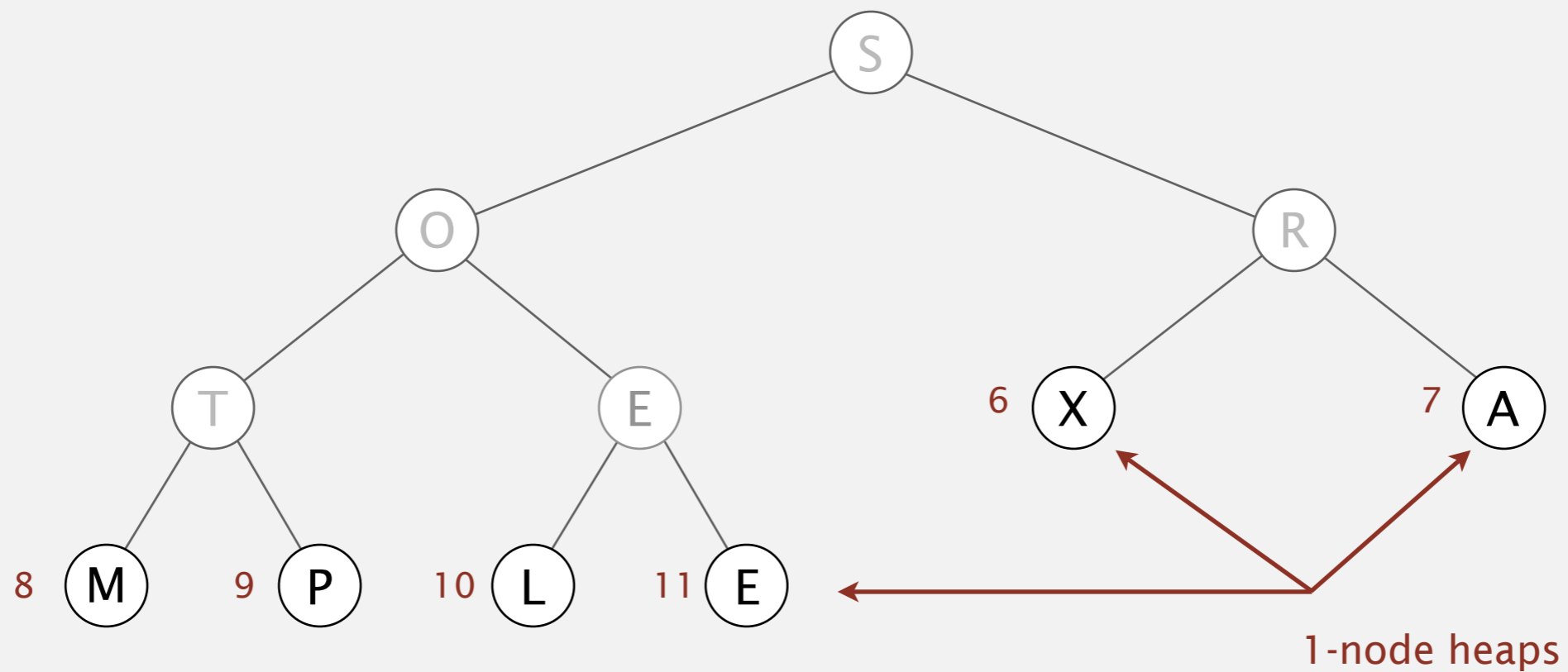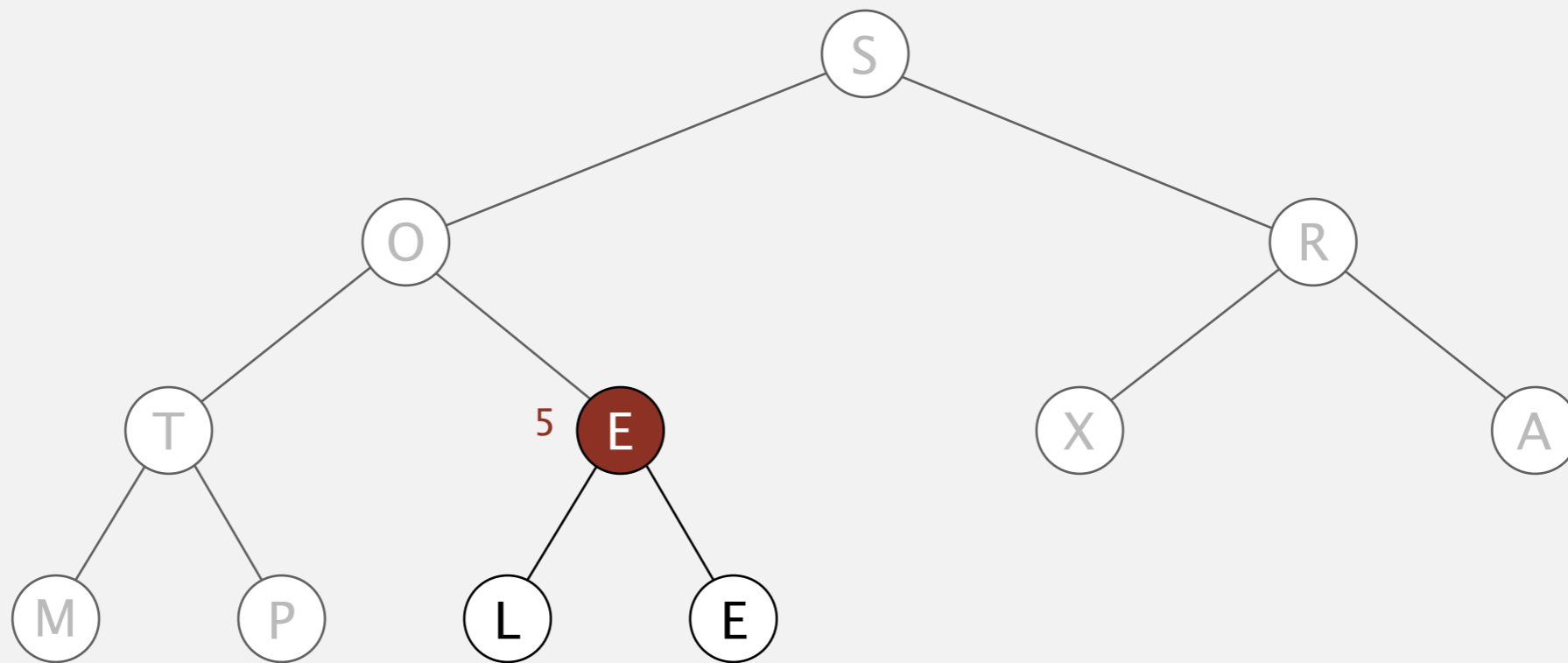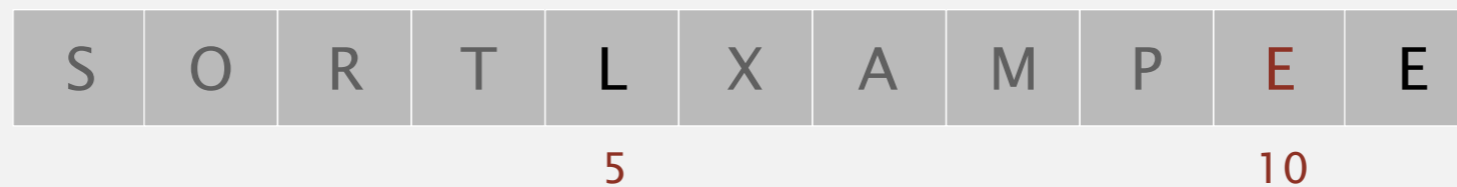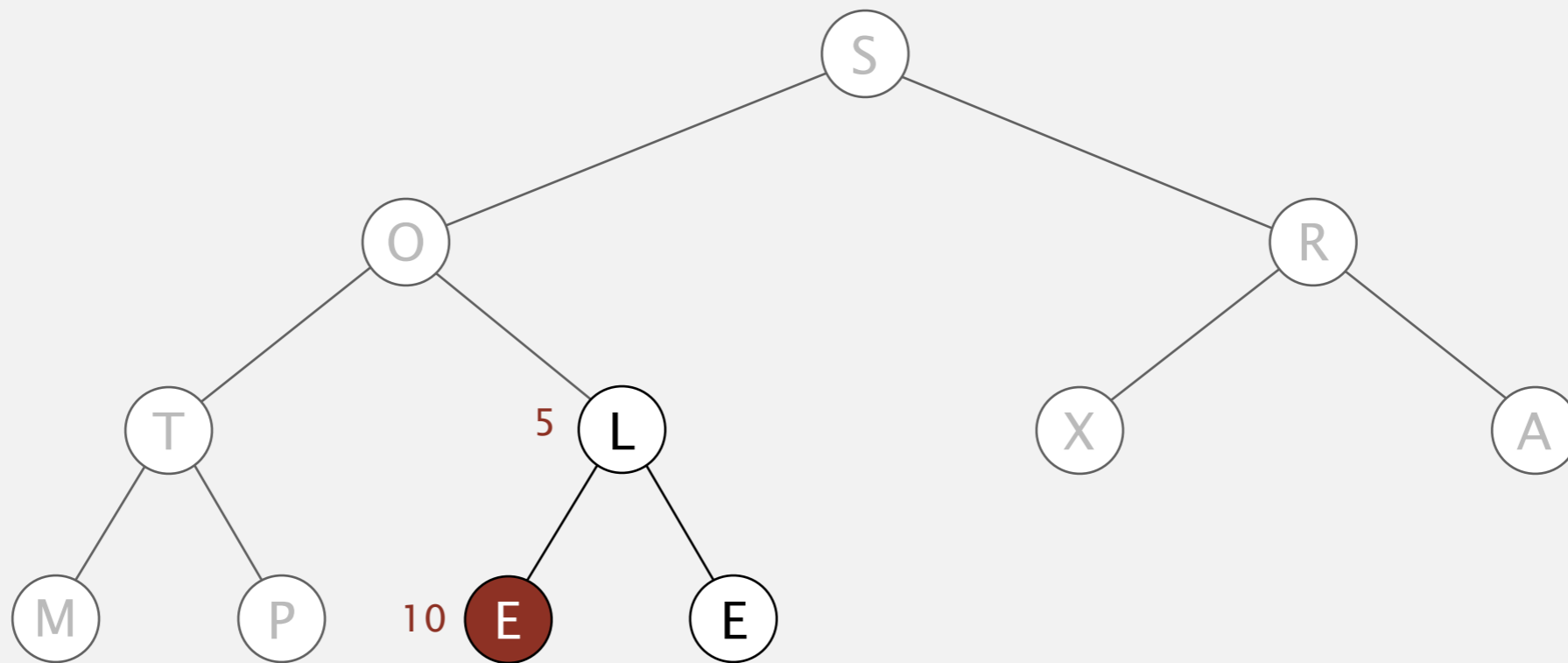| S	O	R	T	E	X	A	M	P	L	E
					6	7	8	9	10	11

Heapsort demo

Heap construction. Build max heap using bottom-up method.

sink 5

Heapsort demo

Heap construction. Build max heap using bottom-up method.

sink 5
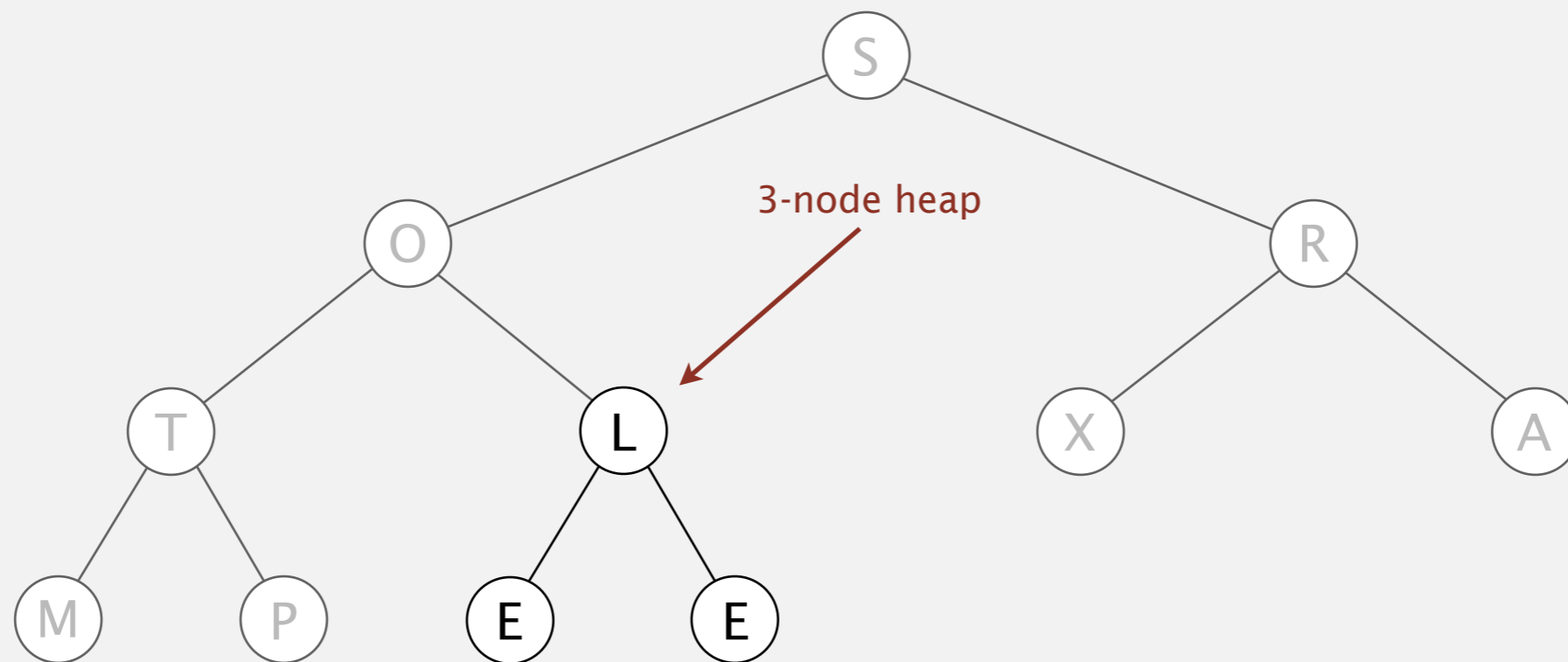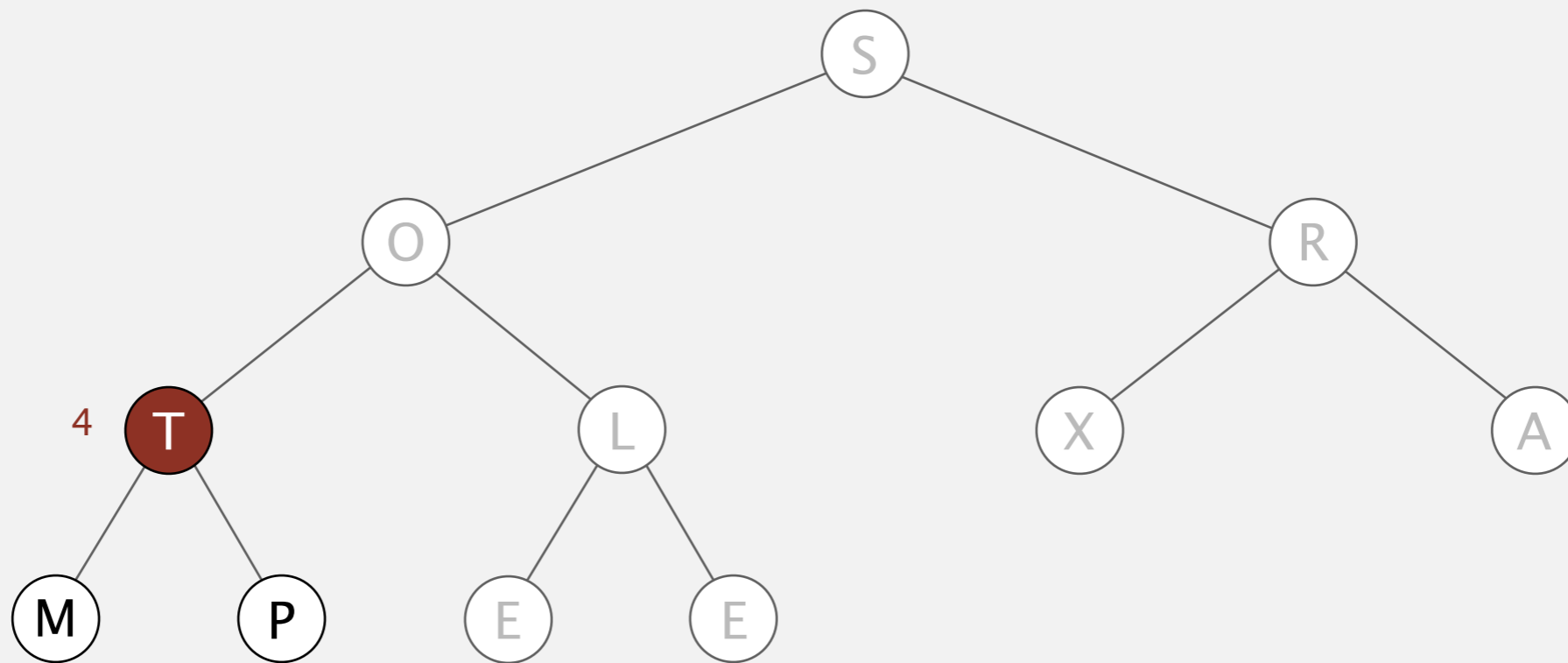

S	O	R	T	L	X	A	M	P	E	E

Heapsort demo

Heap construction. Build max heap using bottom-up method.

sink 5

3-node heap

| S | O | R | T | L | X | A | M | P | E | E |

Heapsort demo

Heap construction. Build max heap using bottom-up method.

sink 4

S	O	R	T	L	X	A	M	P	E	E

4

Heapsort demo

Heap construction. Build max heap using bottom-up method.

sink 4

3-node heap
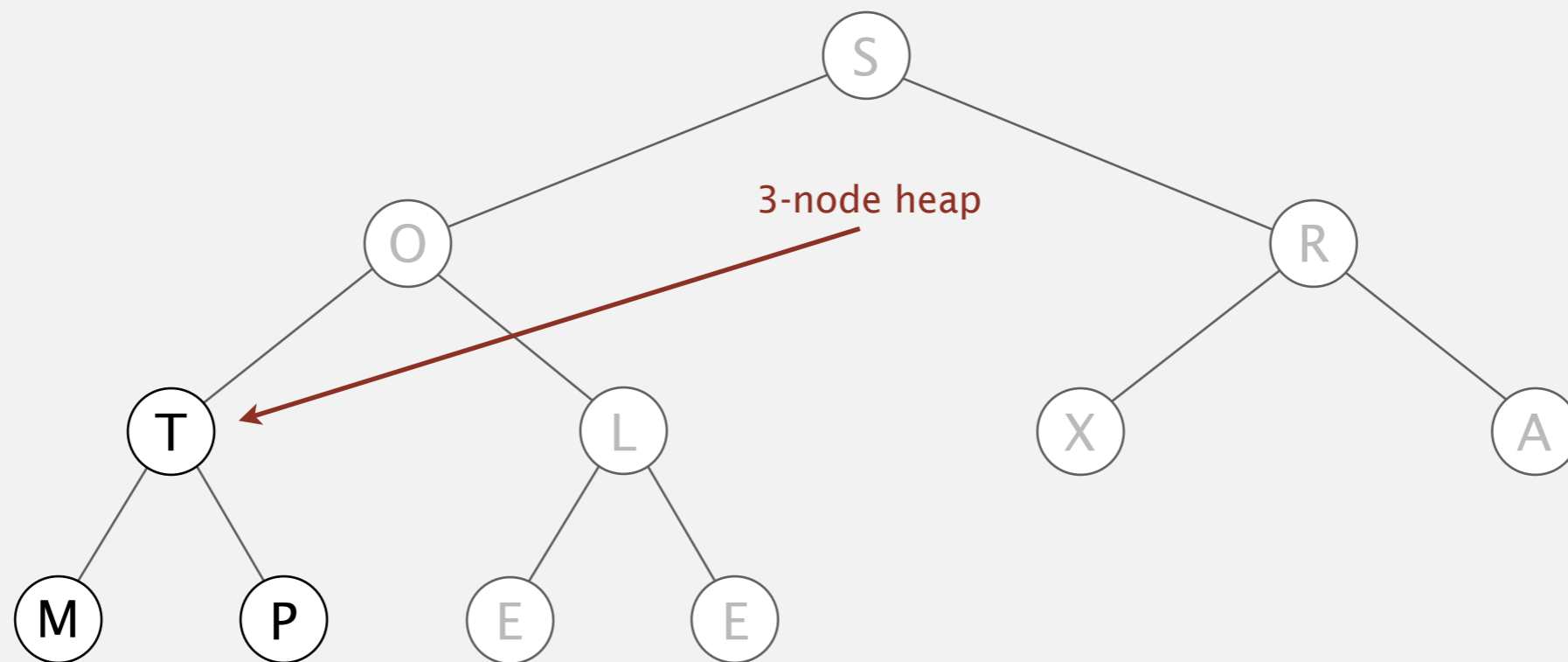
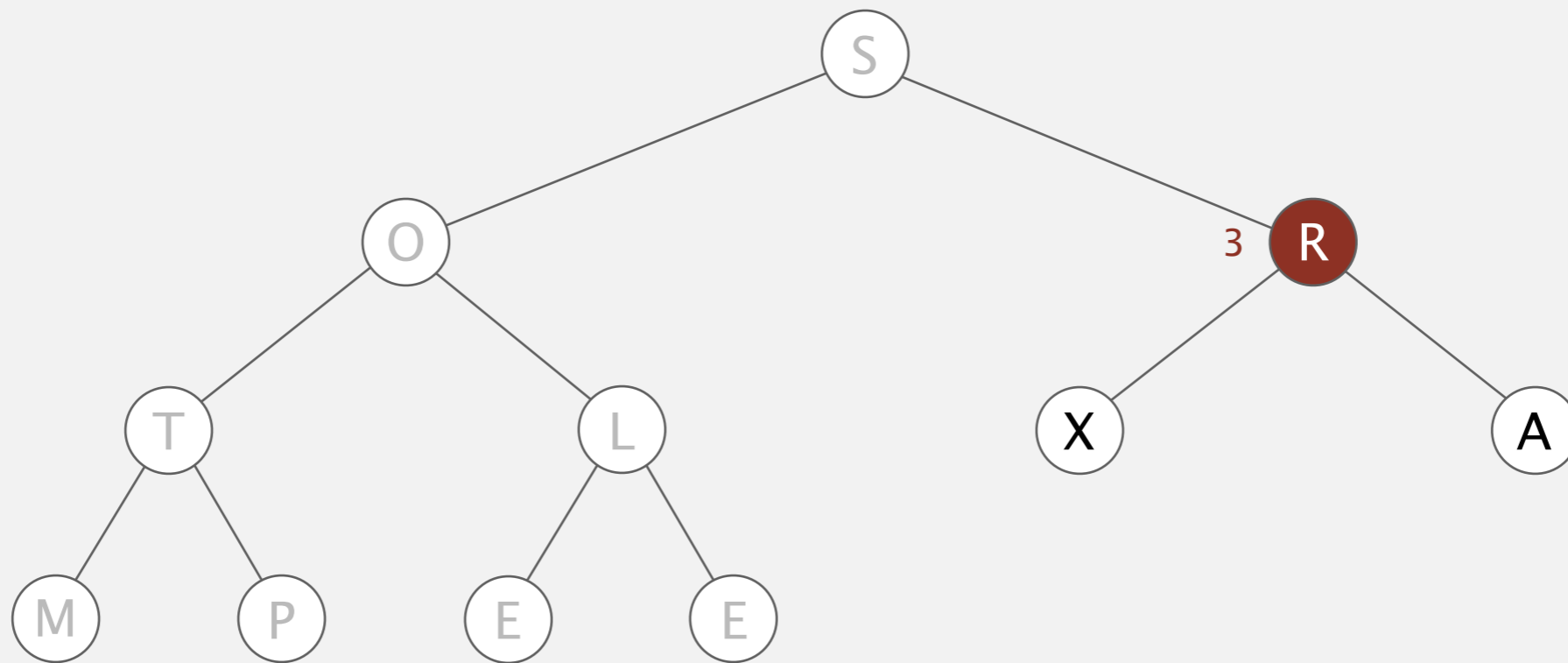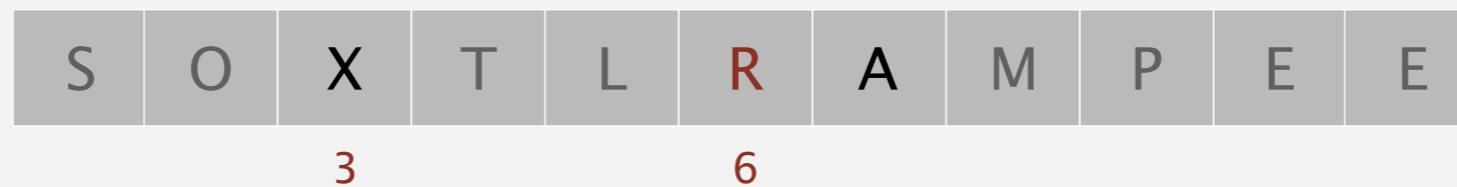| S	O	R	T	L	X	A	M	P	E	E

Heapsort demo

Heap construction. Build max heap using bottom-up method.

sink 3

Heapsort demo

Heap construction. Build max heap using bottom-up method.

sink 3

S	O	X	T	L	R	A	M	P	E	E

3   6

Heapsort demo

Heap construction. Build max heap using bottom-up method.

sink 3

3-node heap

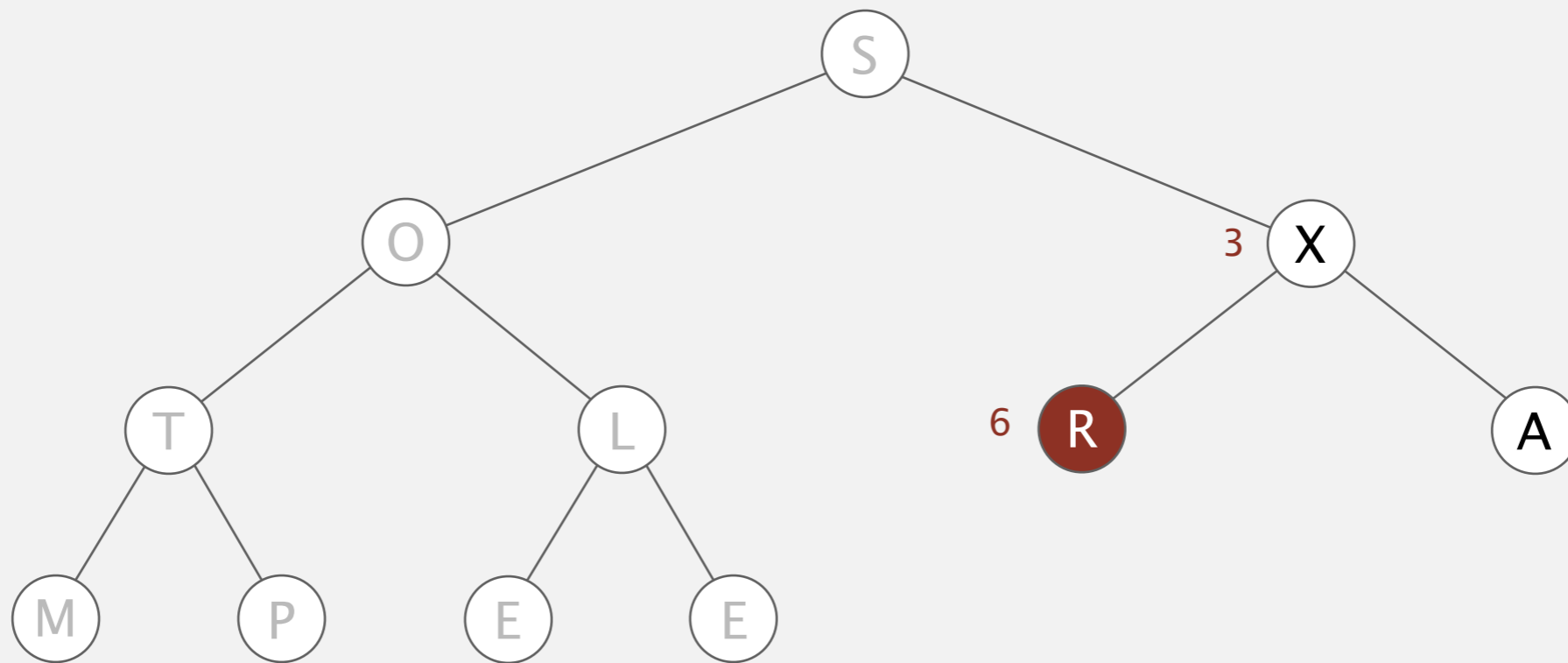| S	O	X	T	L	A	A	M	P	E	E

Heapsort demo

Heap construction. Build max heap using bottom-up method.

sink 2

Heapsort demo

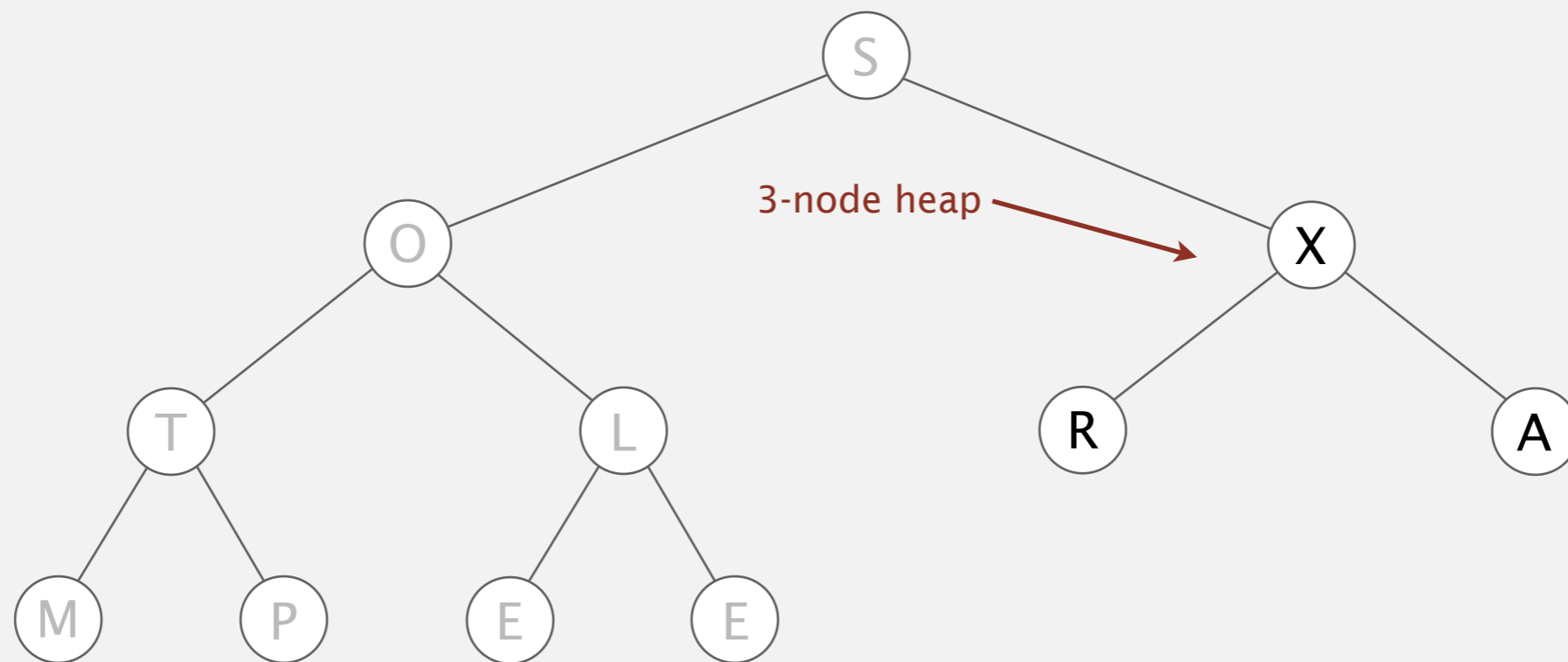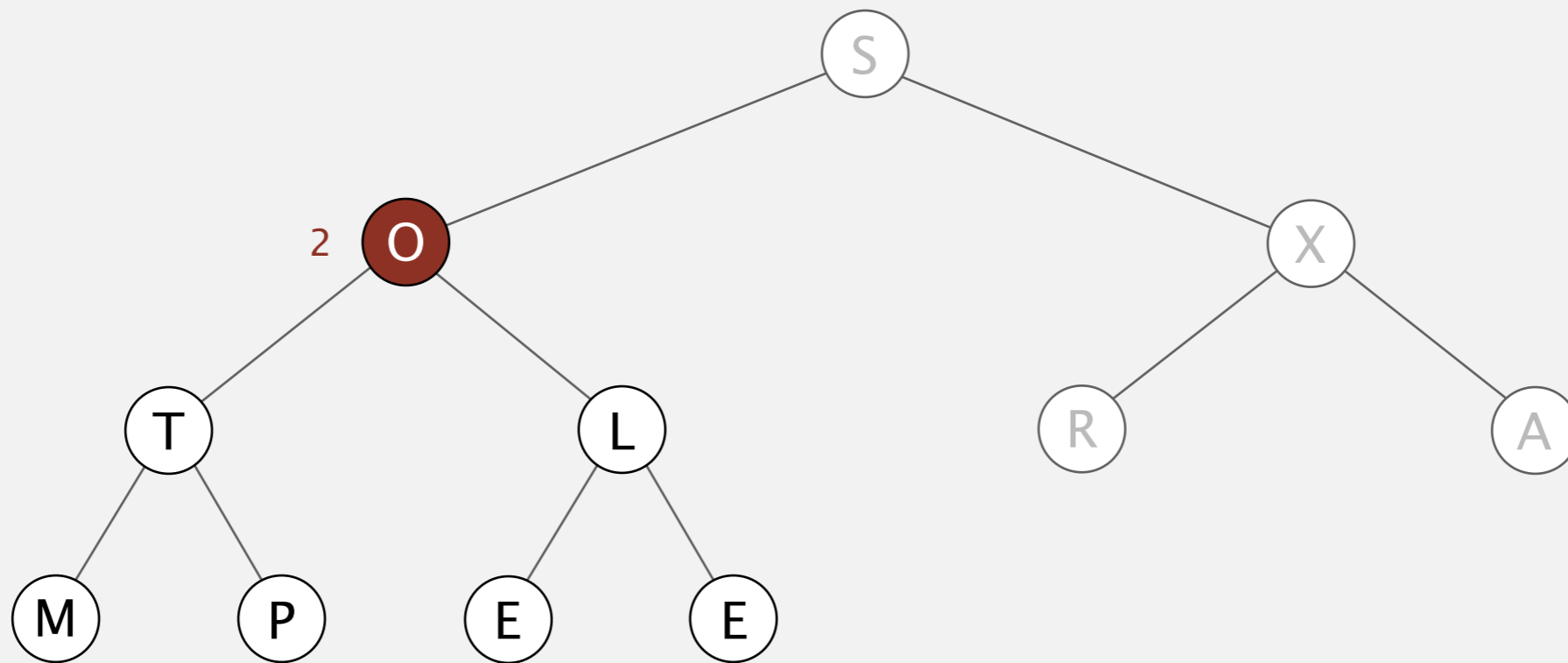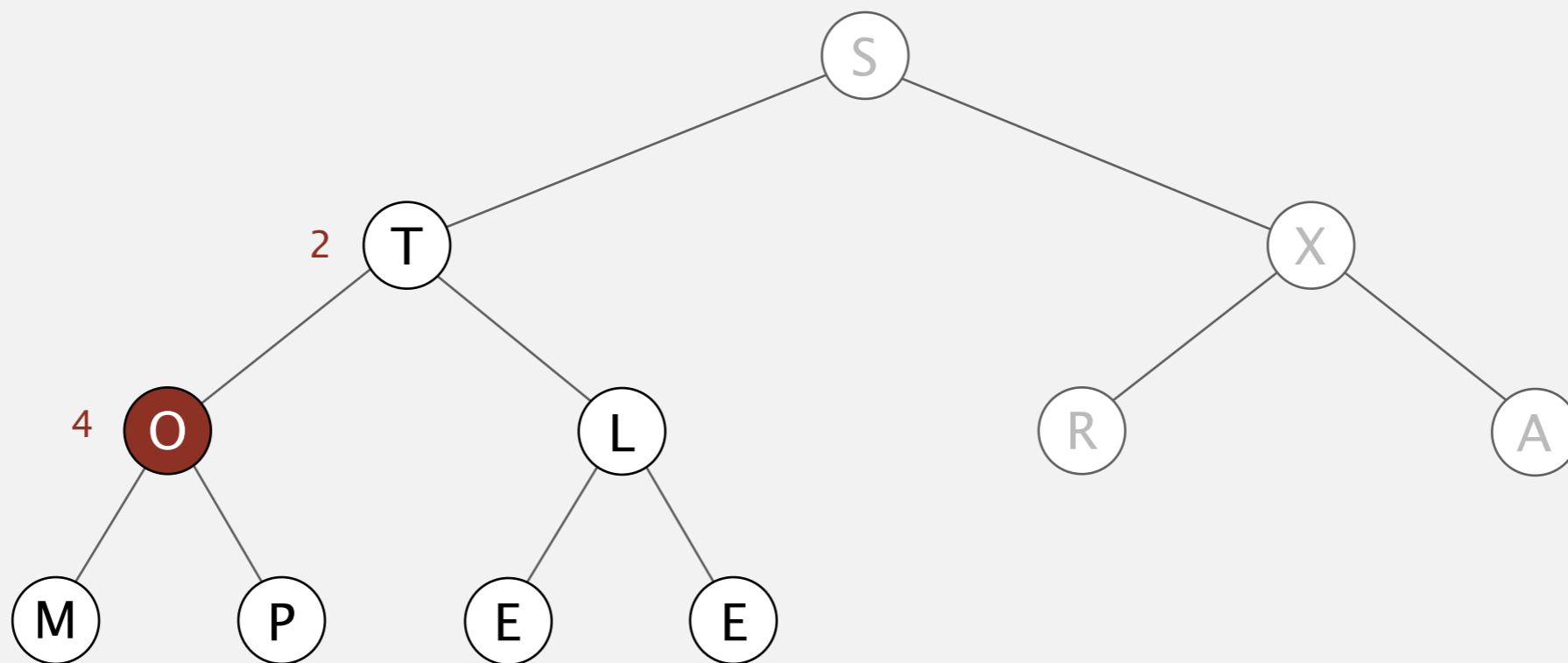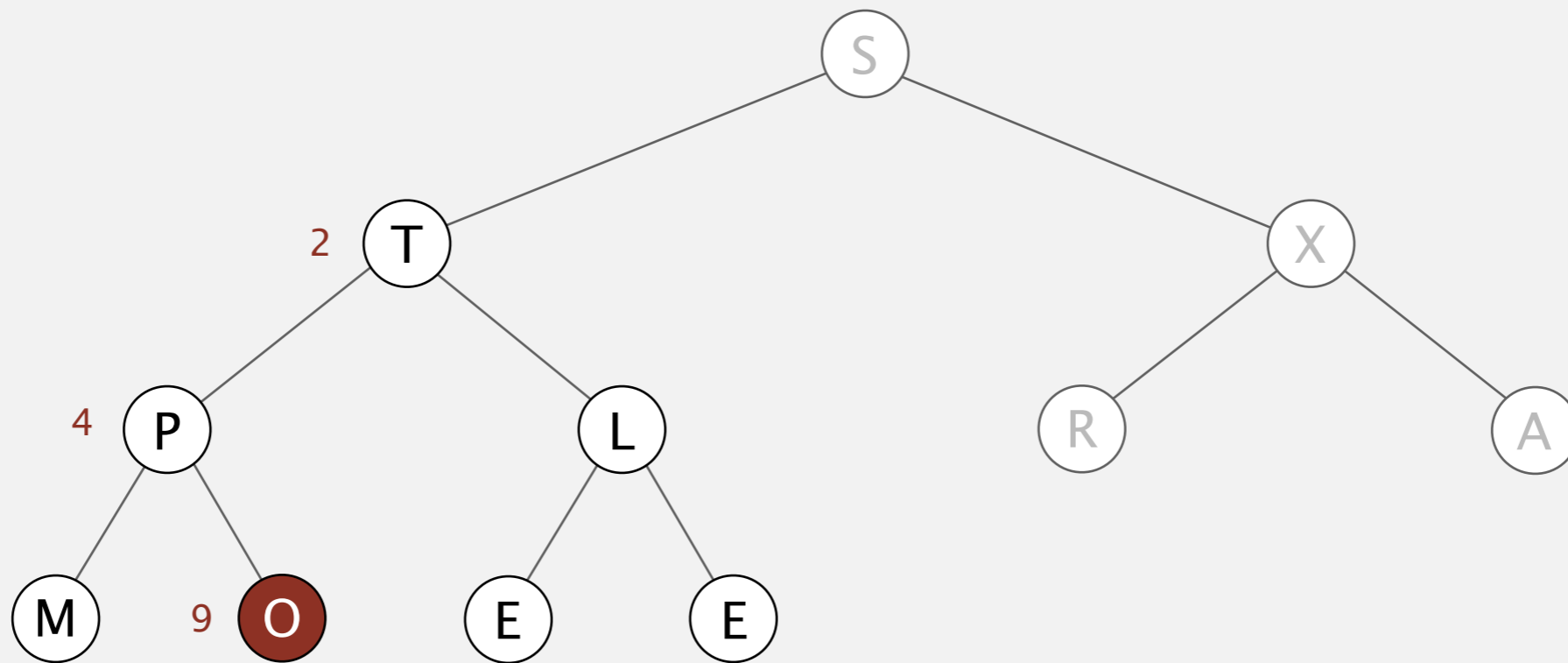Heap construction. Build max heap using bottom-up method.

sink 2

S	T	X	O	L	R	A	M	P	E	E

2   4

Heapsort demo

Heap construction. Build max heap using bottom-up method.

sink 2

S	T	X	P	L	R	A	M	O	E	E
	2		4					9		

Heapsort demo

Heap construction. Build max heap using bottom-up method.

sink 2

7-node heap
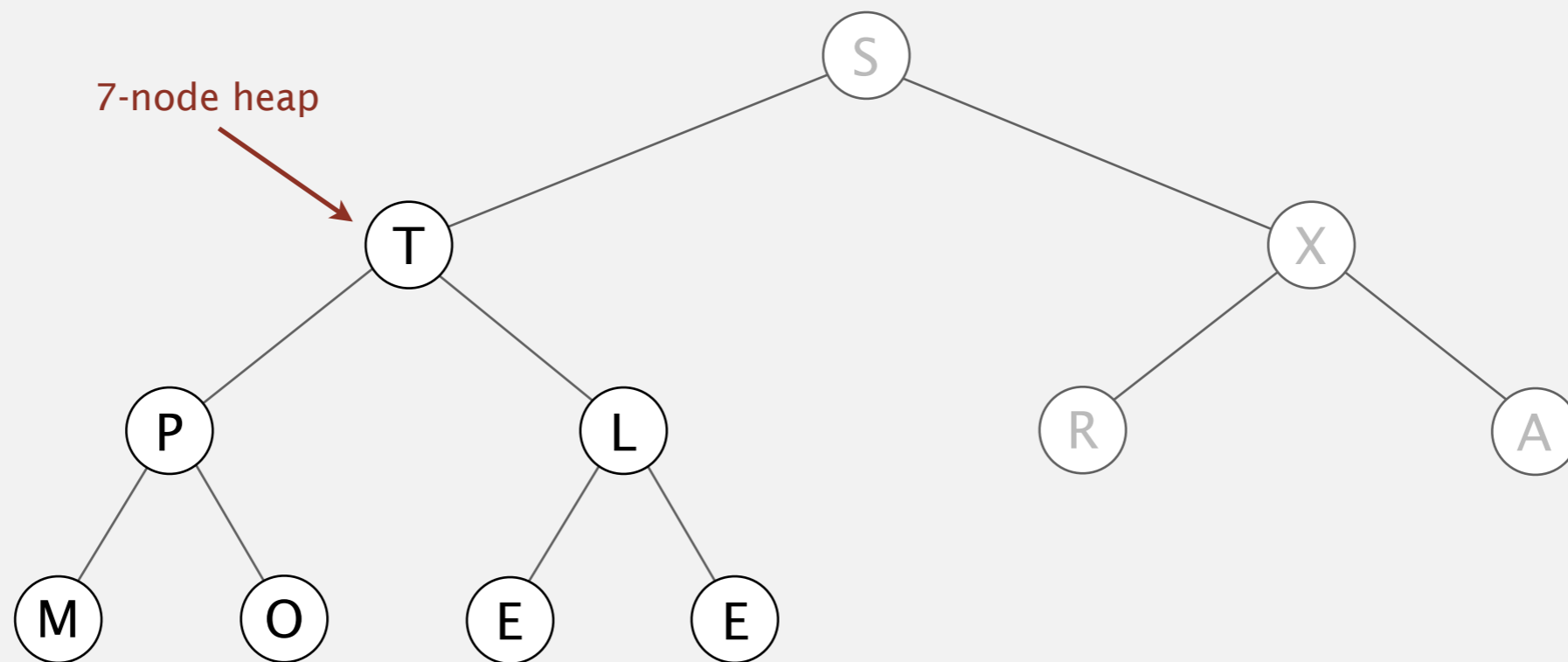
S	T	X	P	L	R	A	M	O	E	E

Heapsort demo

Build max heap using bottom-up method.

sink 1

S	T	X	P	L	R	A	M	O	E	E

1

Heapsort demo

Heap construction. Build max heap using bottom-up method.

sink 1

X	T	S	P	L	R	A	M	O	E	E
1		3								

Heapsort demo

Heap construction. Build max heap using bottom-up method.

Heapsort demo

Sortdown. Repeatedly delete the largest remaining item.

exchange 1 and 11

X	T	S	P	L	R	A	M	O	E	E

Sortdown. Repeatedly delete the largest remaining item.

exchange 1 and 11

E	T	S	P	L	R	A	M	O	E	X

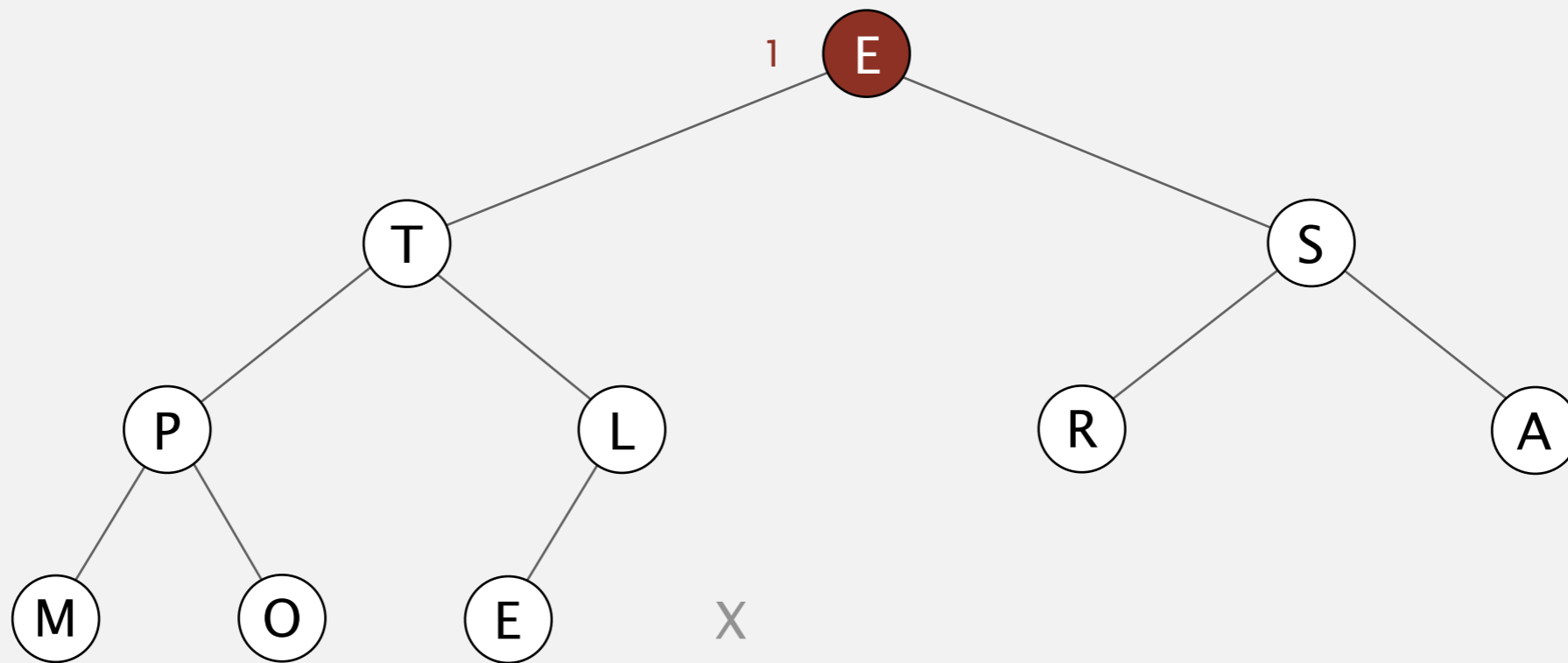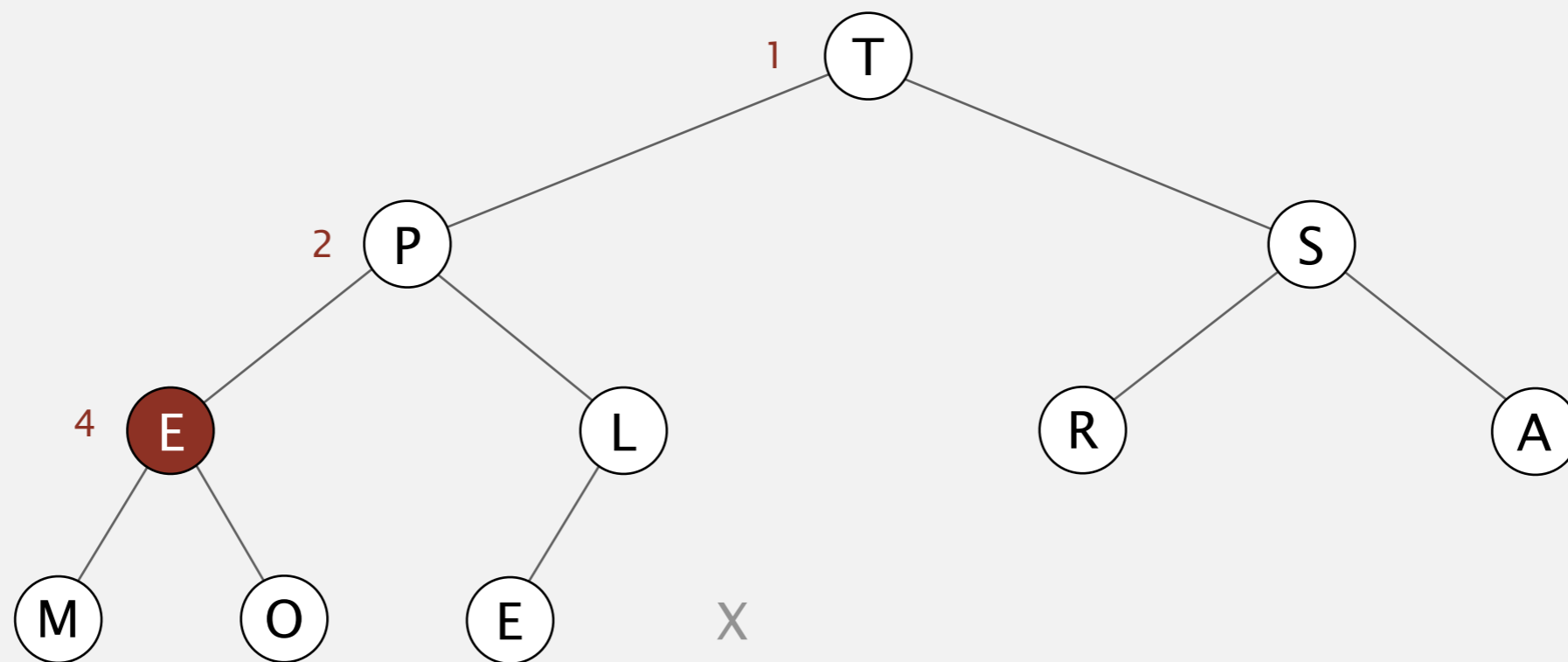1   11

Heapsort demo

Repeatedly delete the largest remaining item.

sink 1

Heapsort demo

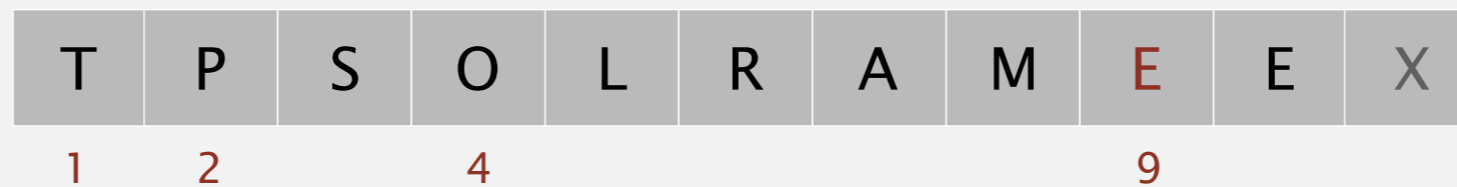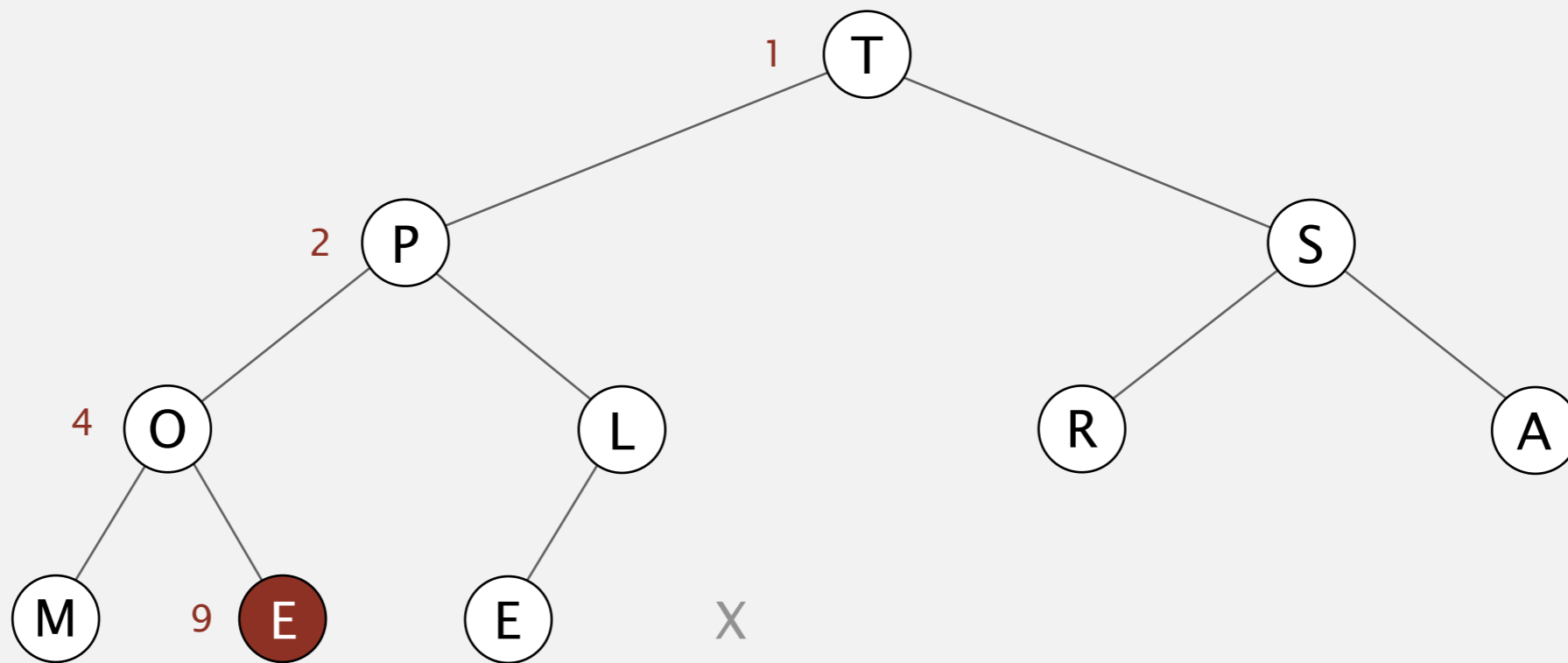Sortdown. Repeatedly delete the largest remaining item.

sink 1

T	E	S	P	L	R	A	M	O	E	X
1	2									

Heapsort demo

Repeatedly delete the largest remaining item.

sink 1

T	P	S	E	L	R	A	M	O	E	X

1   2   4

Heapsort demo

Sortdown. Repeatedly delete the largest remaining item.

sink 1

T	P	S	O	L	R	A	M	E	E	X
1	2		4					9		

Heapsort demo

Repeatedly delete the largest remaining item.

| T | P | S | O | L | R | A | M | E | E | X |

Heapsort demo

Sortdown. Repeatedly delete the largest remaining item.
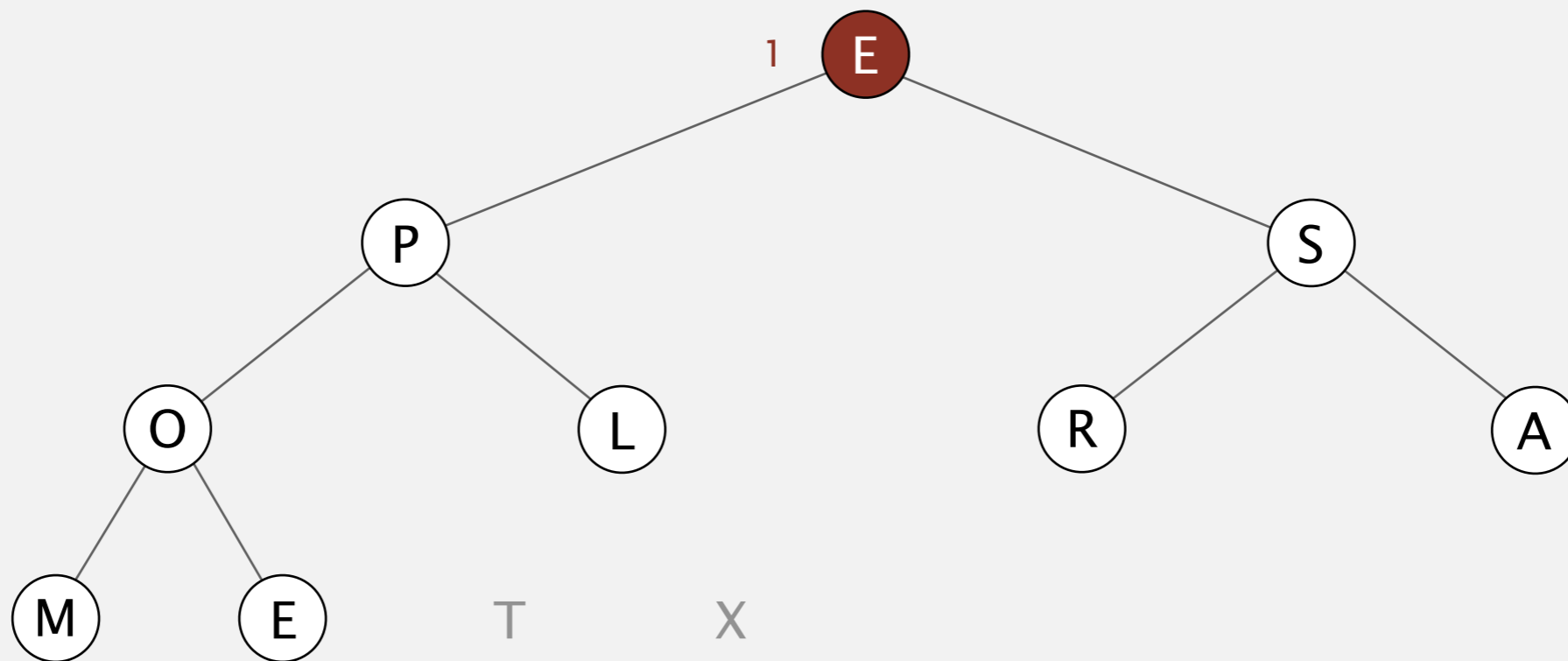
exchange 1 and 10

T	P	S	O	L	R	A	M	E	E	X

1   10

Heapsort demo

Repeatedly delete the largest remaining item.

exchange 1 and 10

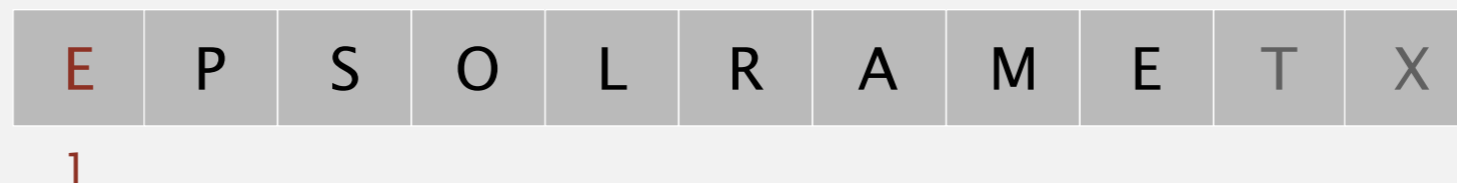| E	P	S	O	L	R	A	M	E	T	X

1   10

Heapsort demo

Sortdown. Repeatedly delete the largest remaining item.

sink 1

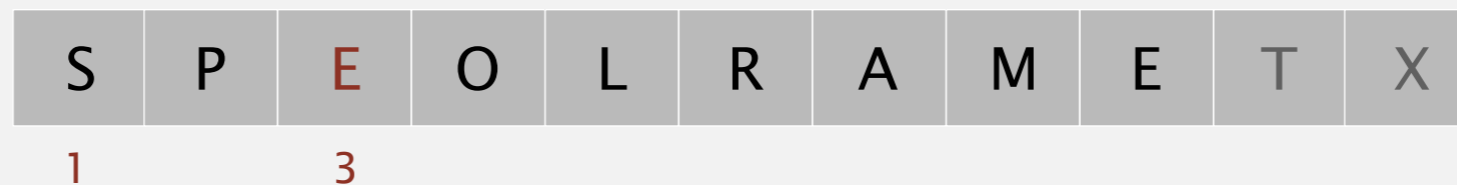| E	P	S	O	L	R	A	M	E	T	X

1
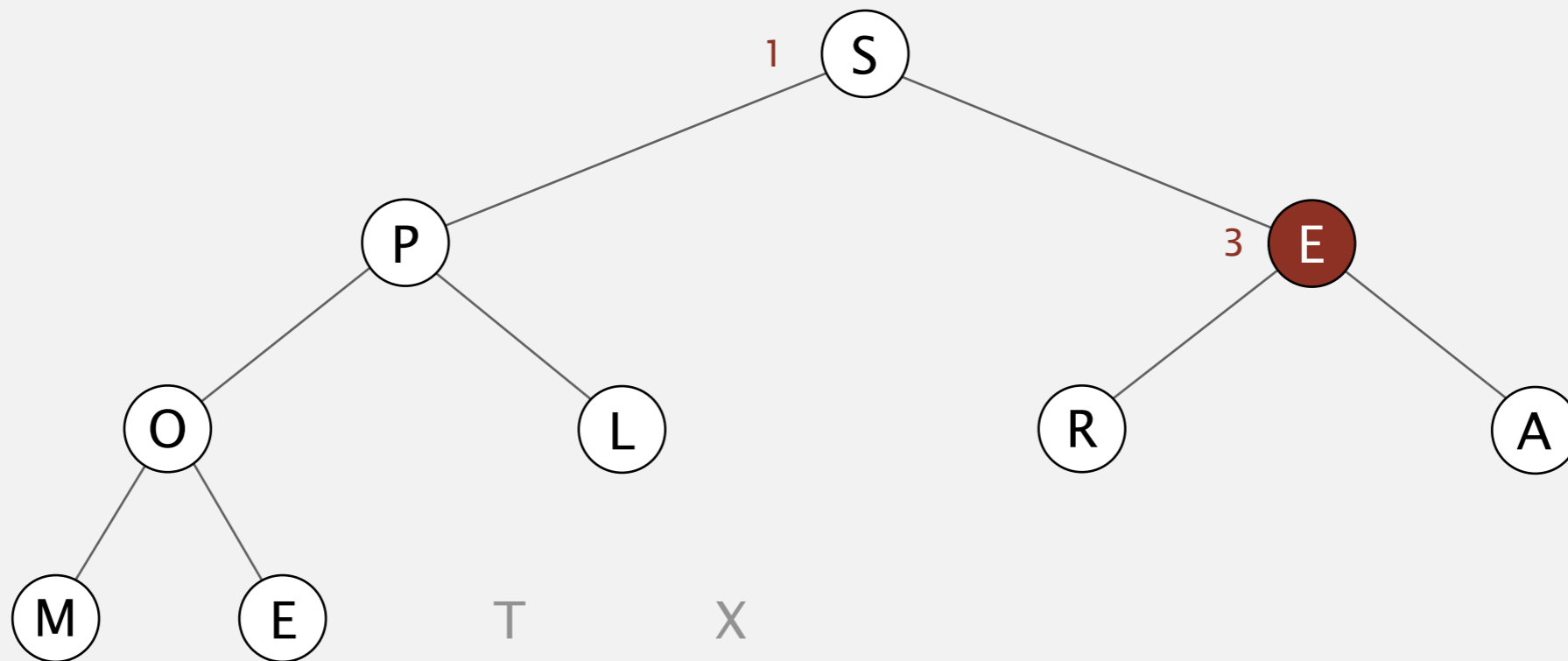
Heapsort demo

Sortdown. Repeatedly delete the largest remaining item.

sink 1

Heapsort demo

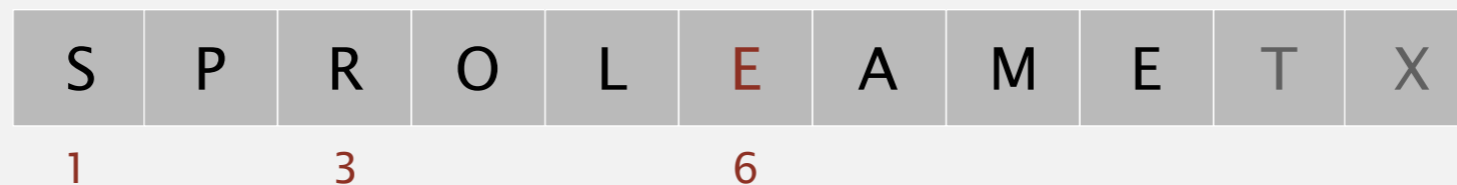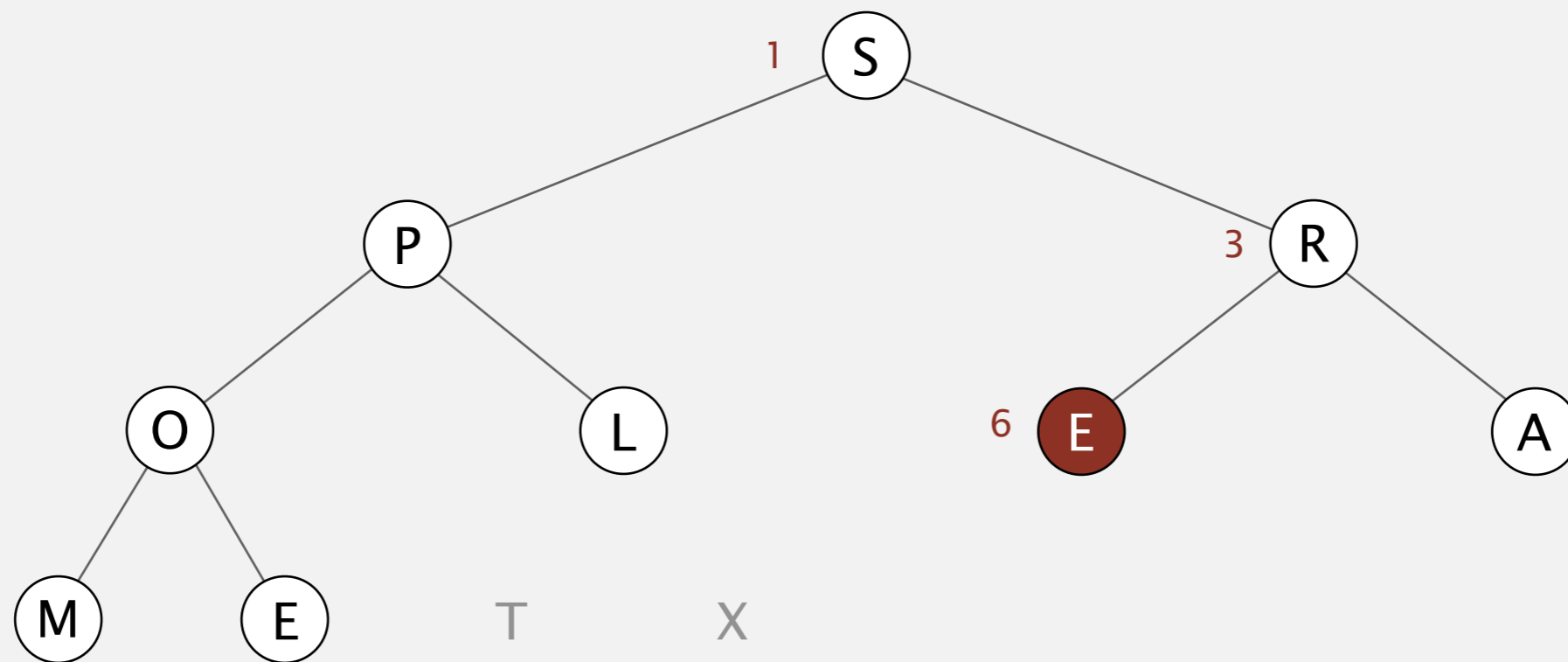Sortdown. Repeatedly delete the largest remaining item.

sink 1

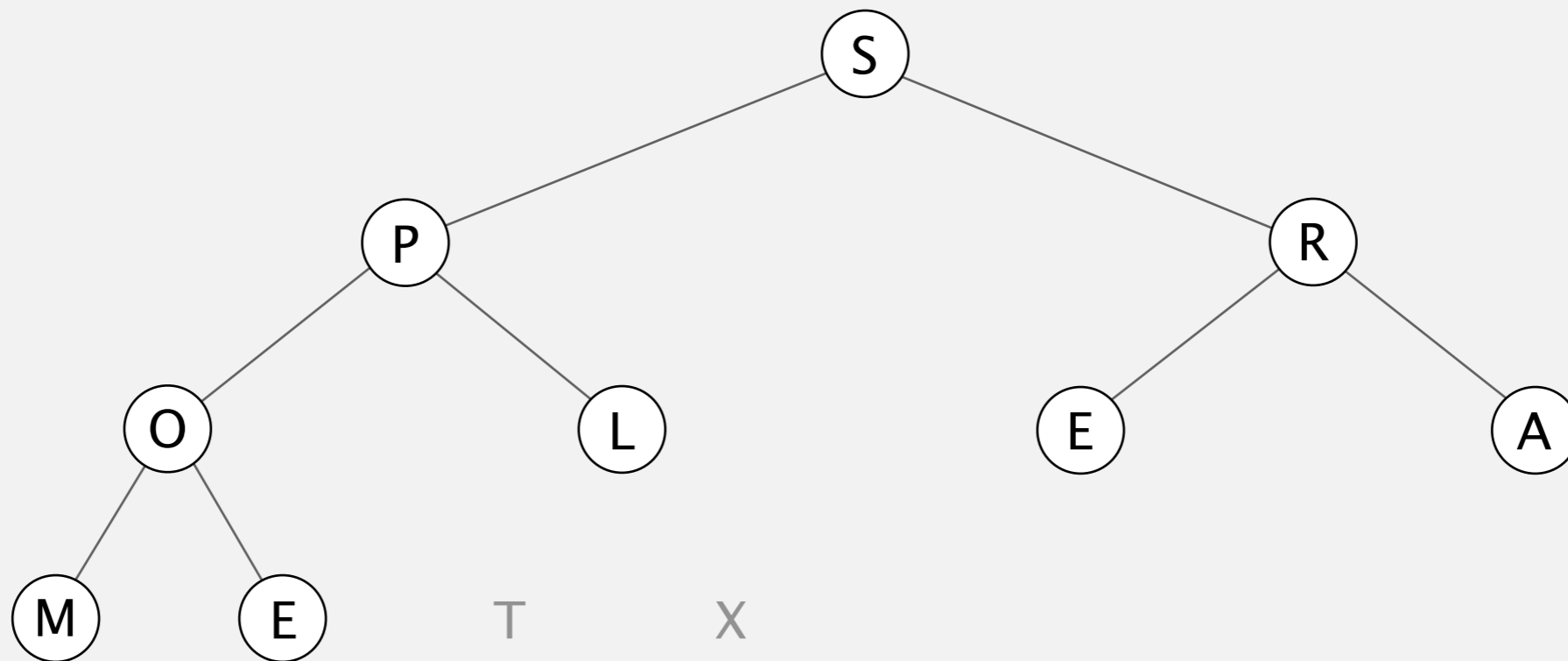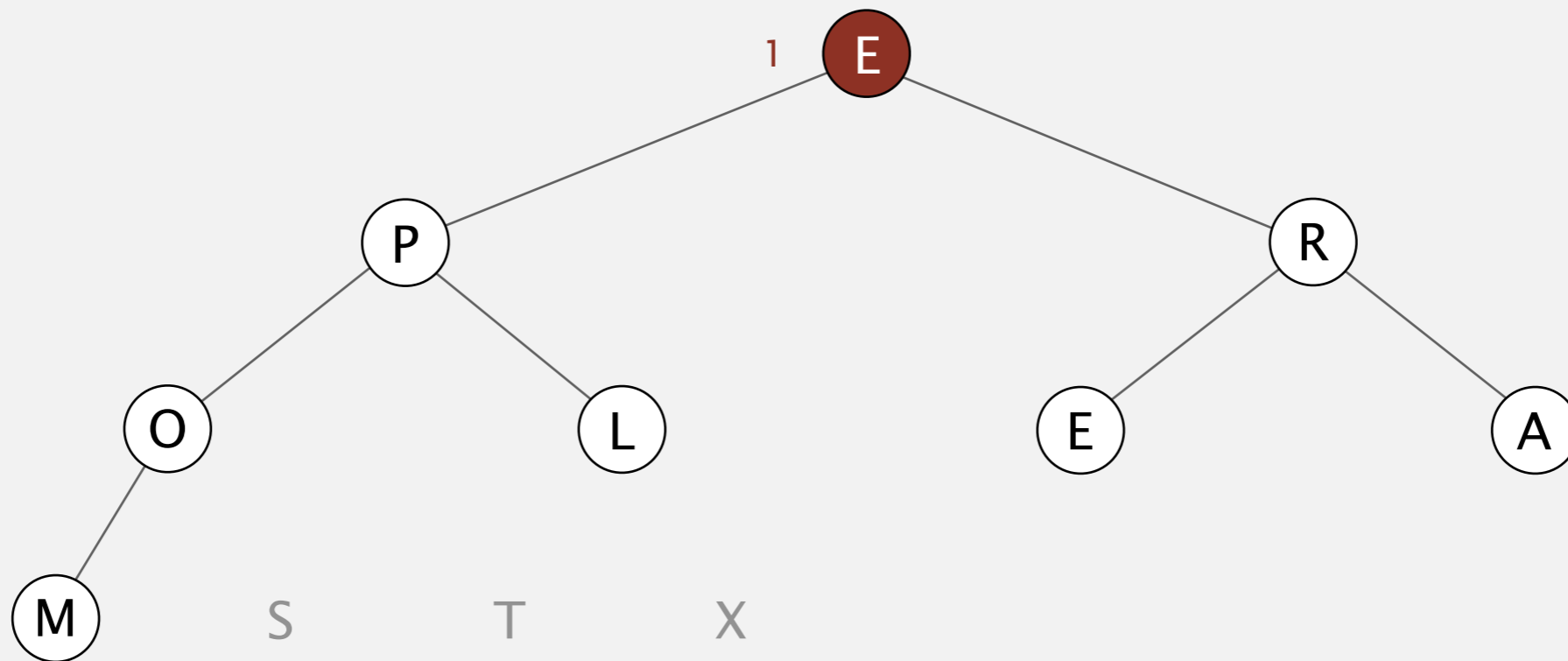
	S	P	R	O	L	E	A	M	E	T	X
	1		3			6					

Heapsort demo

Sortdown. Repeatedly delete the largest remaining item.

| S | P | R | O | L | E | A | M | E | T | X |

Heapsort demo

Sortdown. Repeatedly delete the largest remaining item.

exchange 1 and 9

S	P	R	O	L	E	A	M	E	T	X

1   9

Heapsort demo

Sortdown. Repeatedly delete the largest remaining item.

exchange 1 and 9

E	P	R	O	L	E	A	M	S	T	X

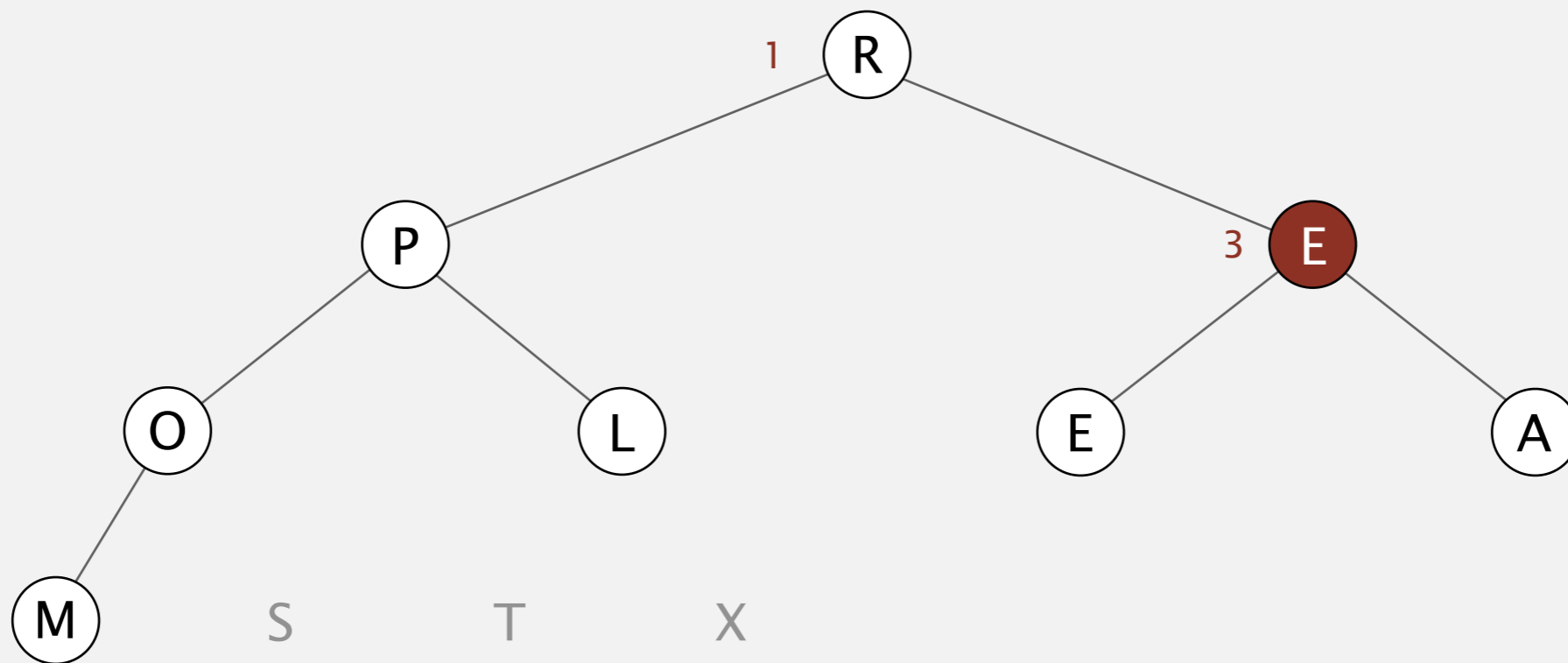1   9

Heapsort demo

Sortdown. Repeatedly delete the largest remaining item.

sink 1

Heapsort demo

Sortdown. Repeatedly delete the largest remaining item.

sink 1

Heapsort demo
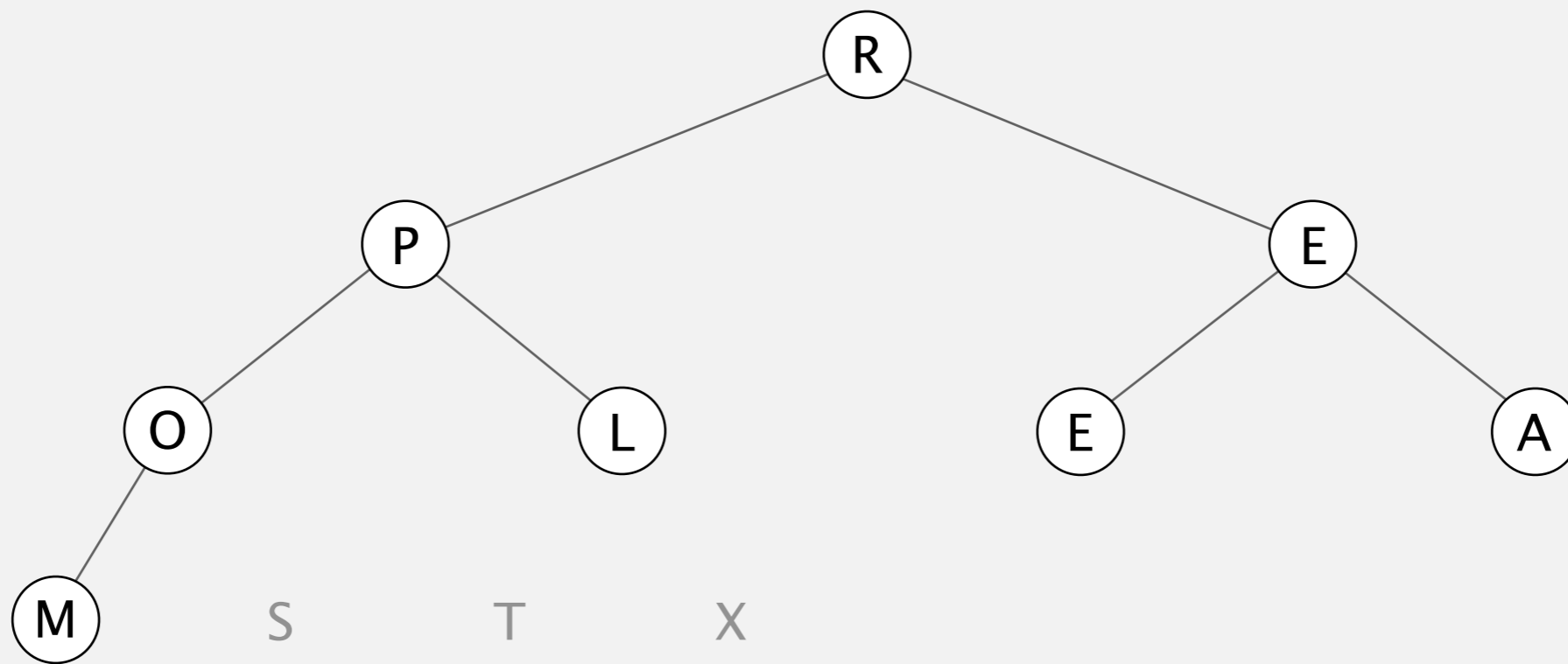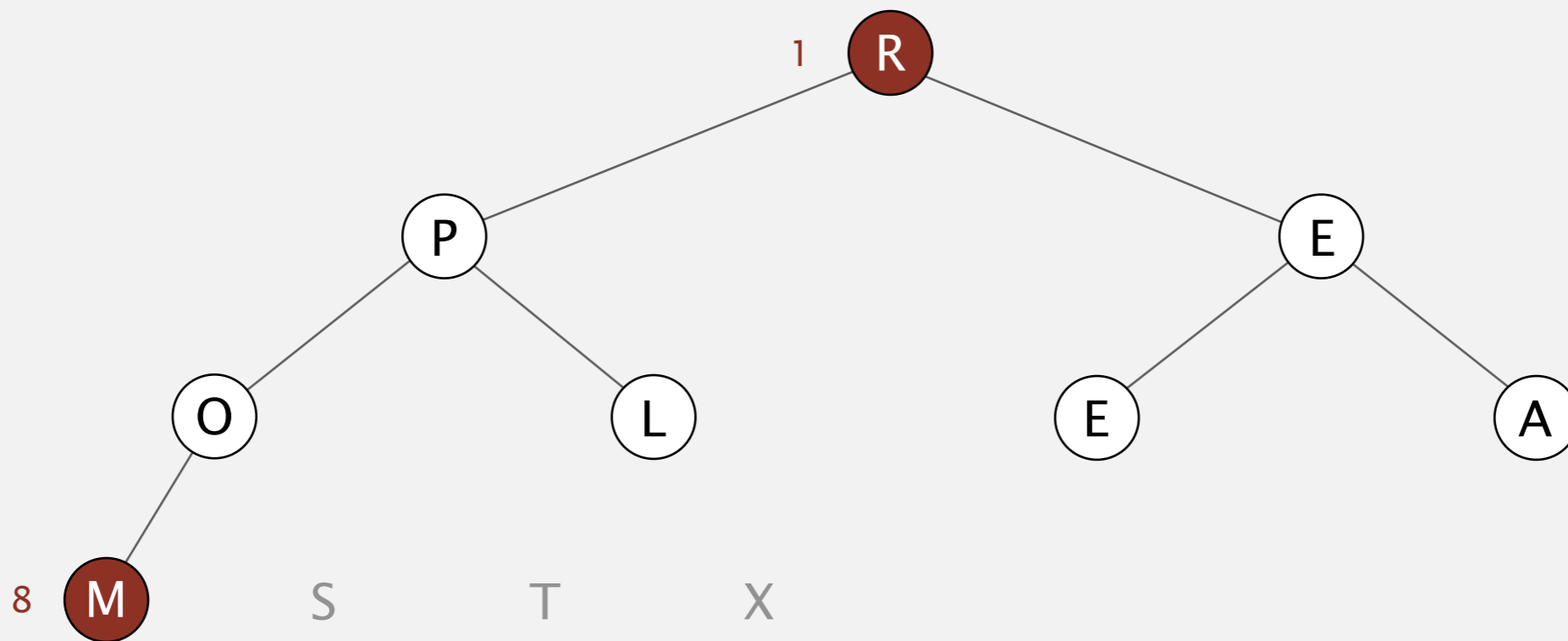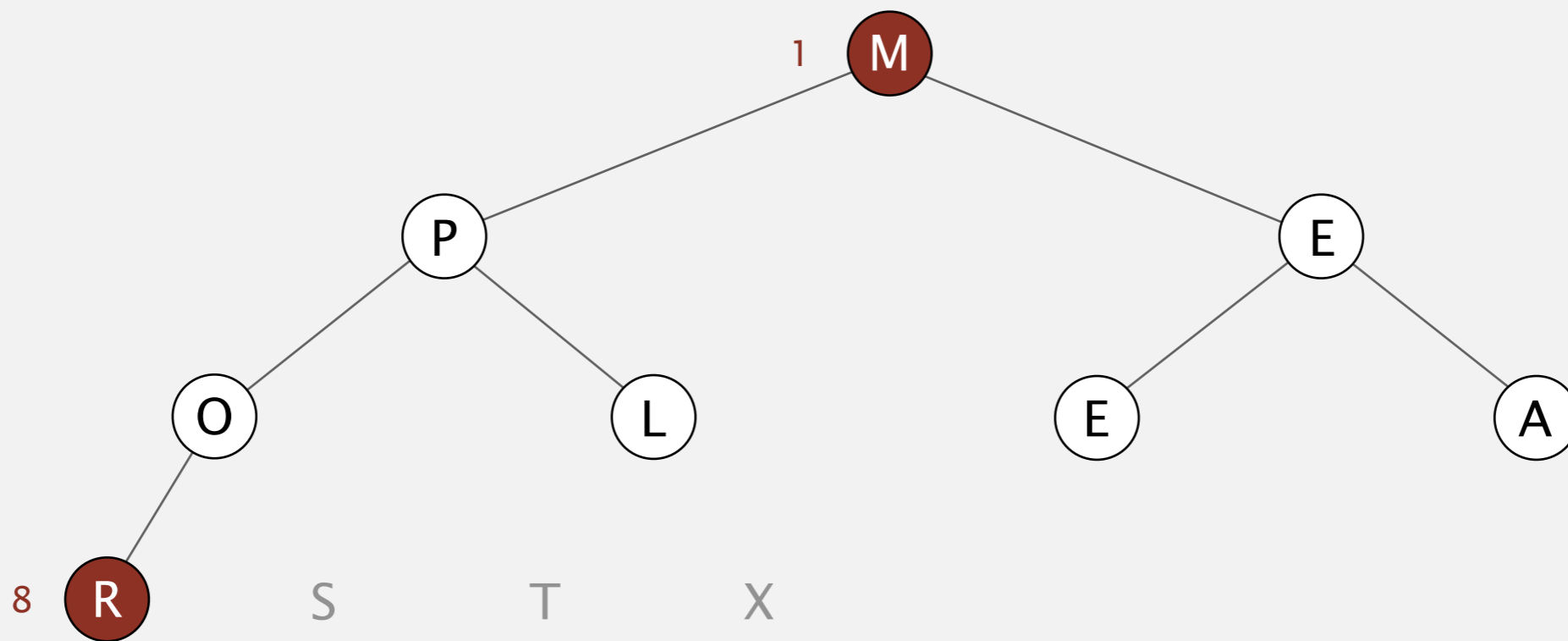
Sortdown. Repeatedly delete the largest remaining item.

R	P	E	O	L	E	A	M	S	T	X

Heapsort demo

Sortdown. Repeatedly delete the largest remaining item.

exchange 1 and 8

R	P	E	O	L	E	A	M	S	T	X

Heapsort demo

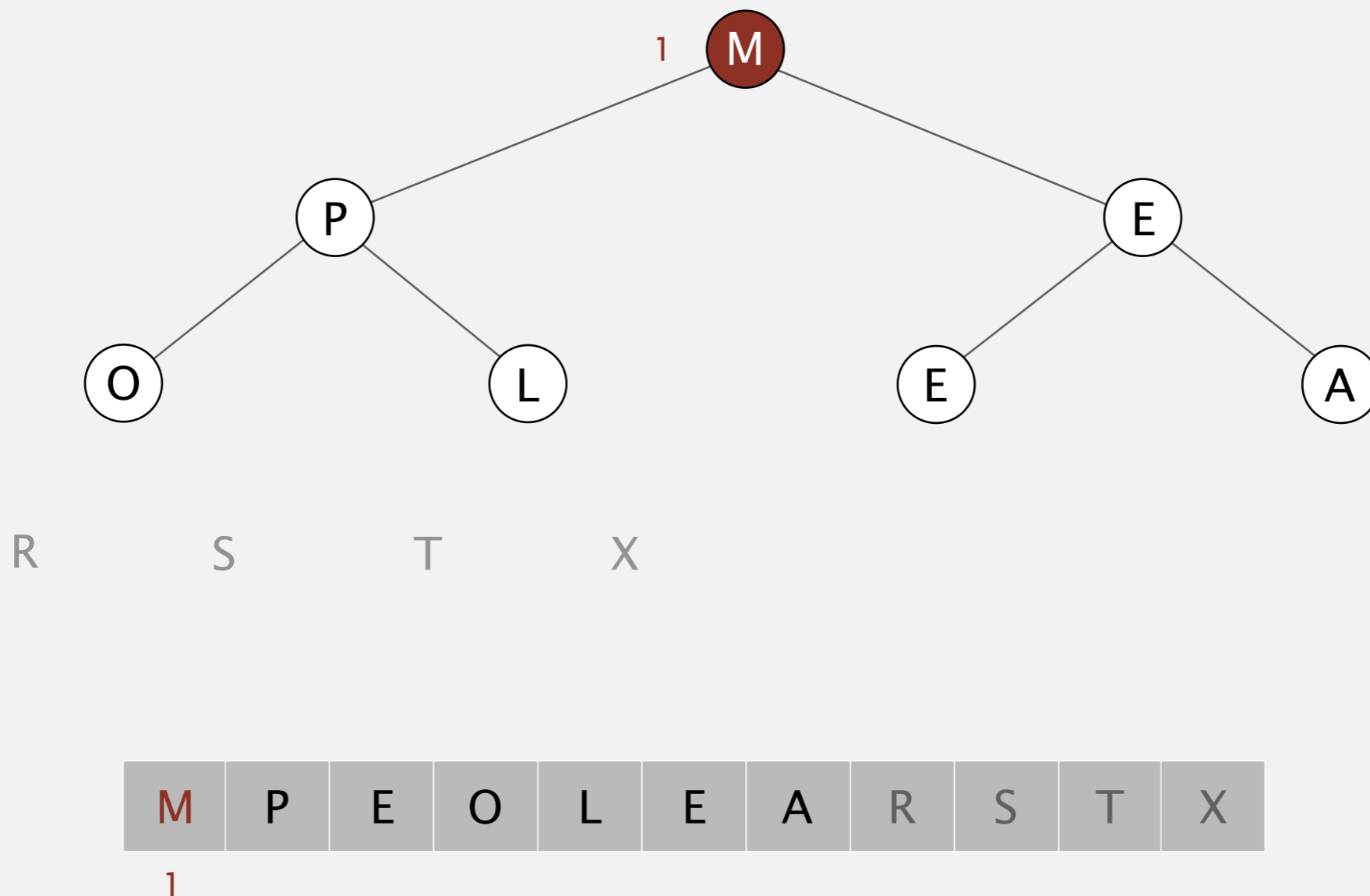Sortdown. Repeatedly delete the largest remaining item.

exchange 1 and 8

Heapsort demo

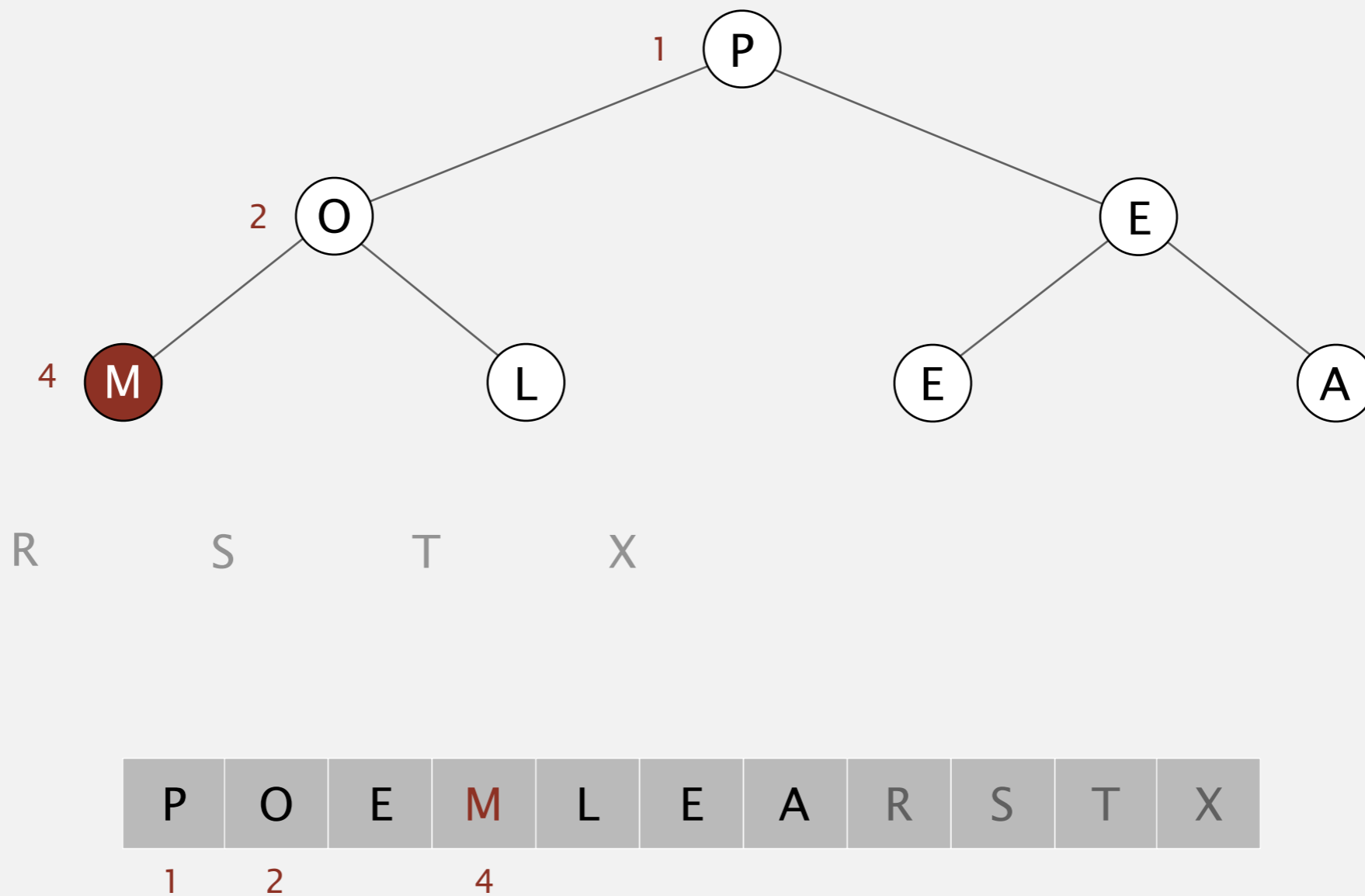Sortdown. Repeatedly delete the largest remaining item.

sink 1

Heapsort demo

Sortdown. Repeatedly delete the largest remaining item.

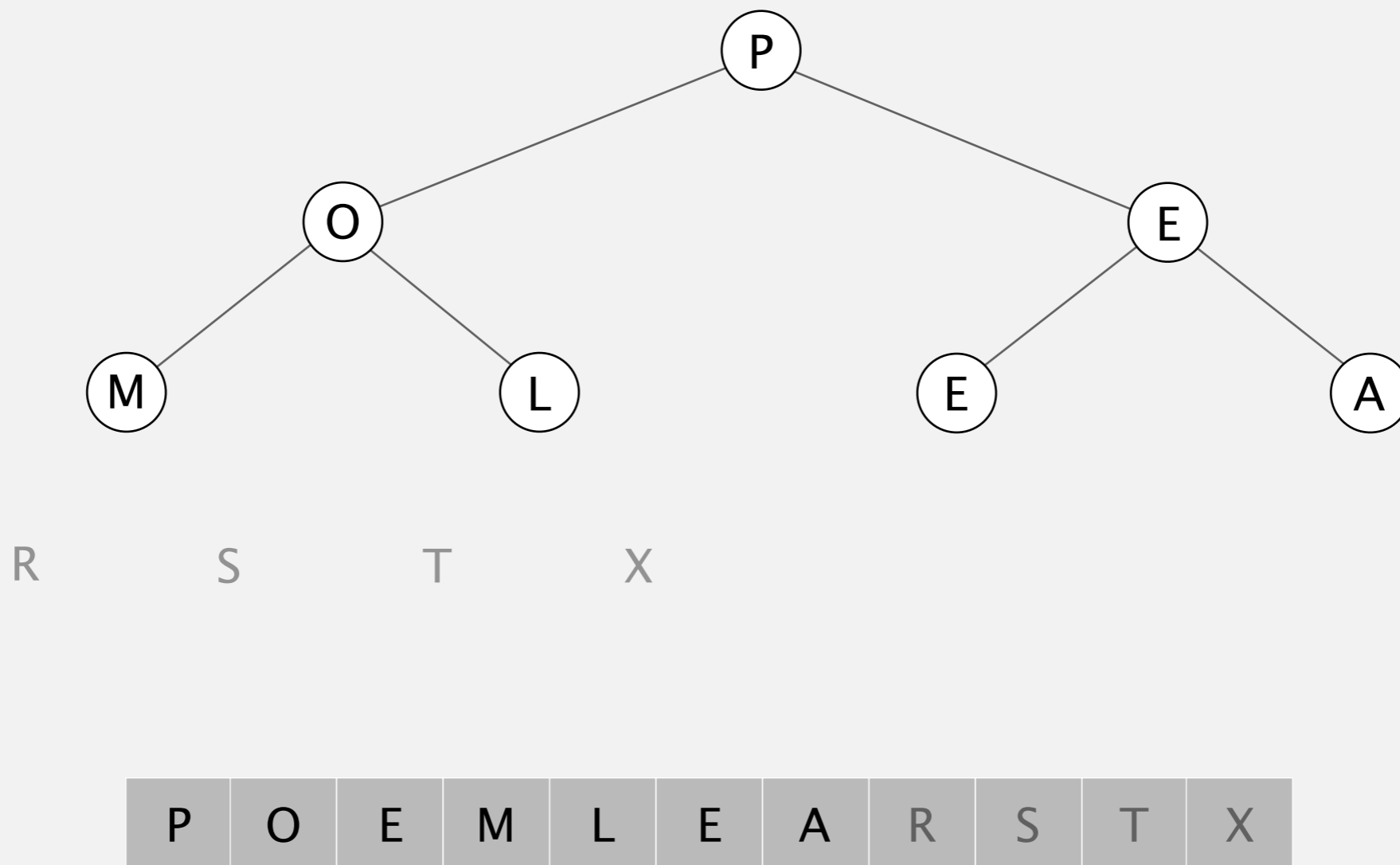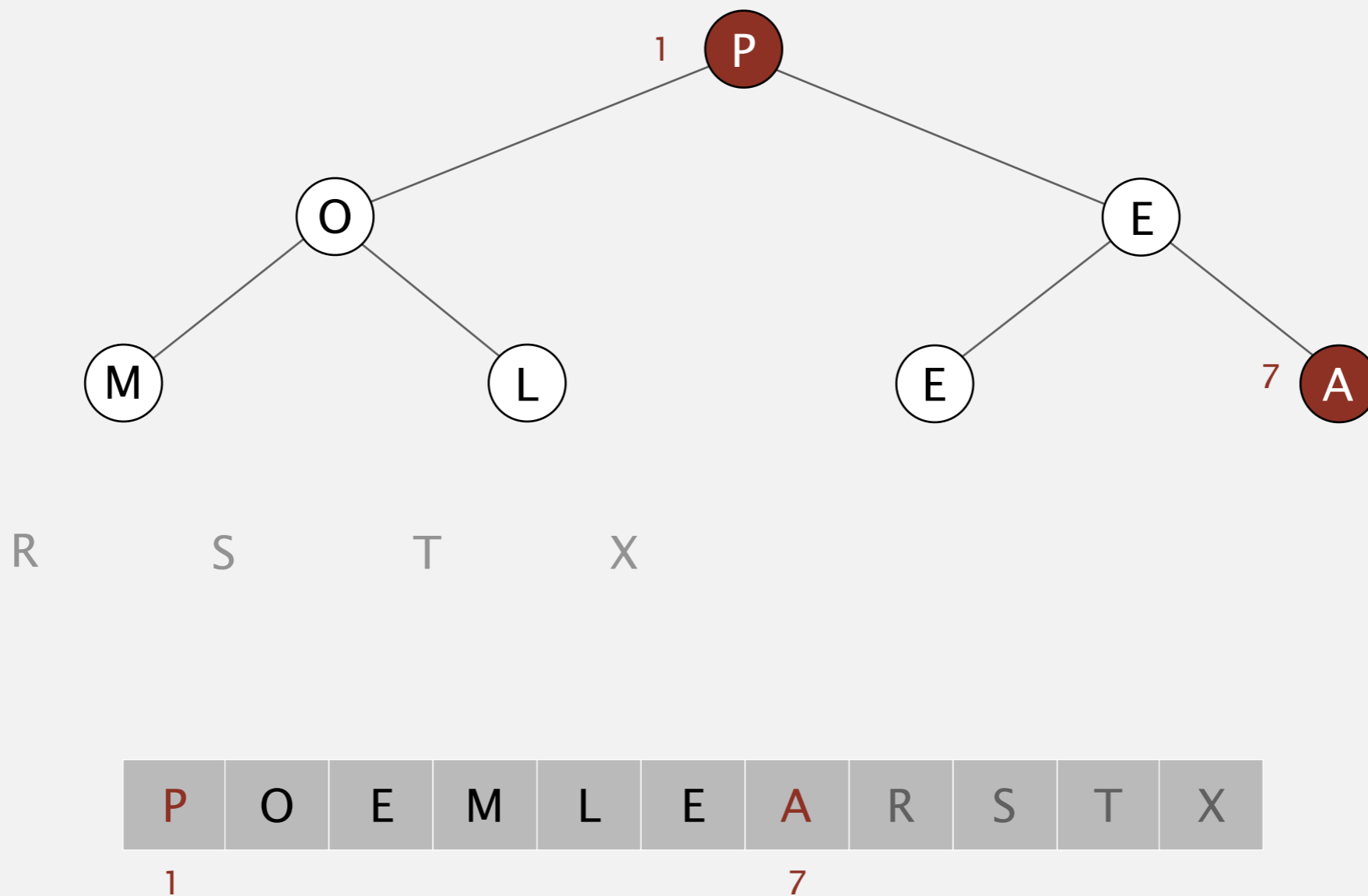# Heapsort demo

Sortdown. Repeatedly delete the largest remaining item.

sink 1

P	O	E	M	L	E	A	R	S	T	X

1   2   4

Heapsort demo

Sortdown. Repeatedly delete the largest remaining item.

Heapsort demo

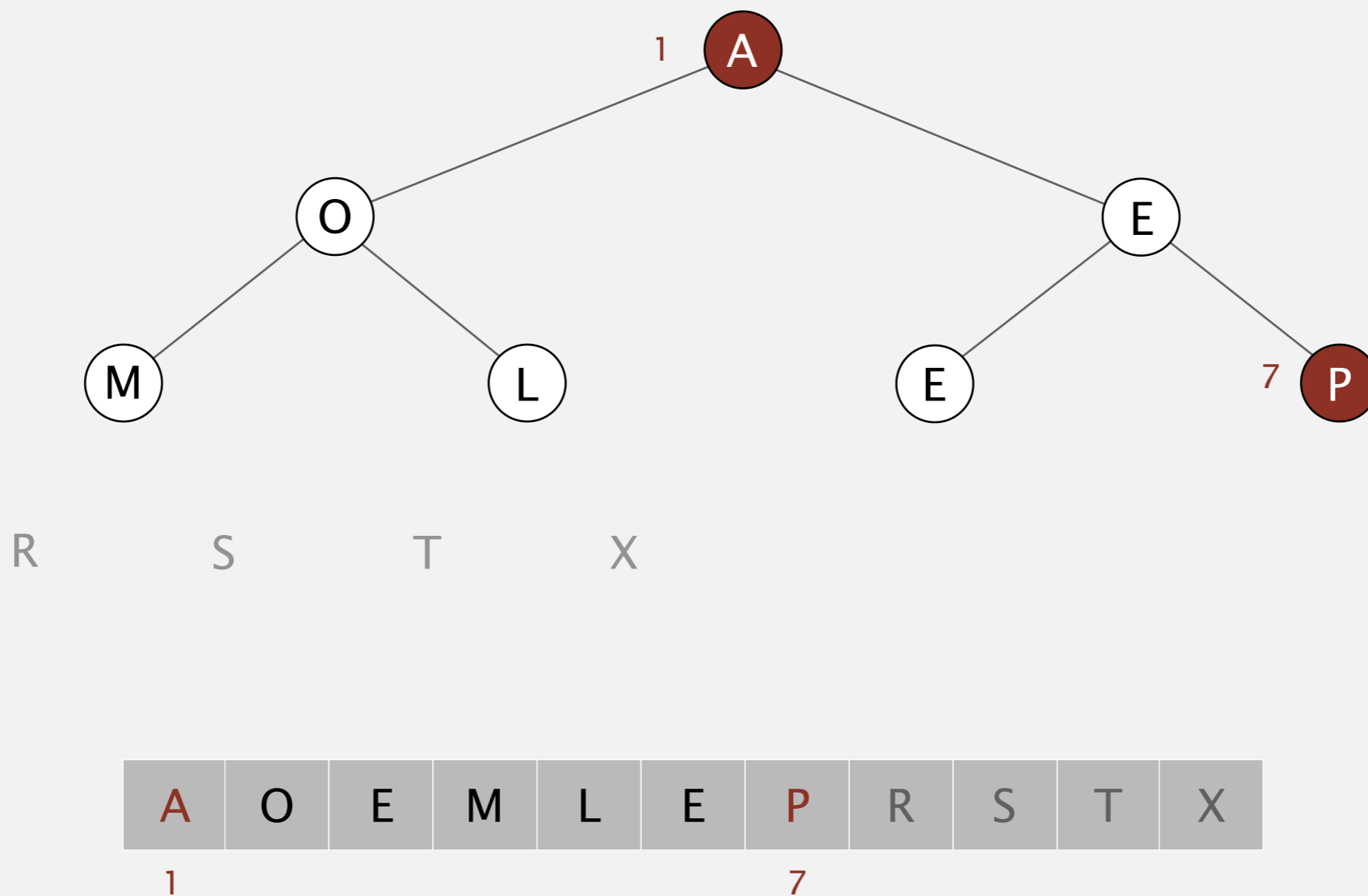Sortdown. Repeatedly delete the largest remaining item.

exchange 1 and 7

Heapsort demo
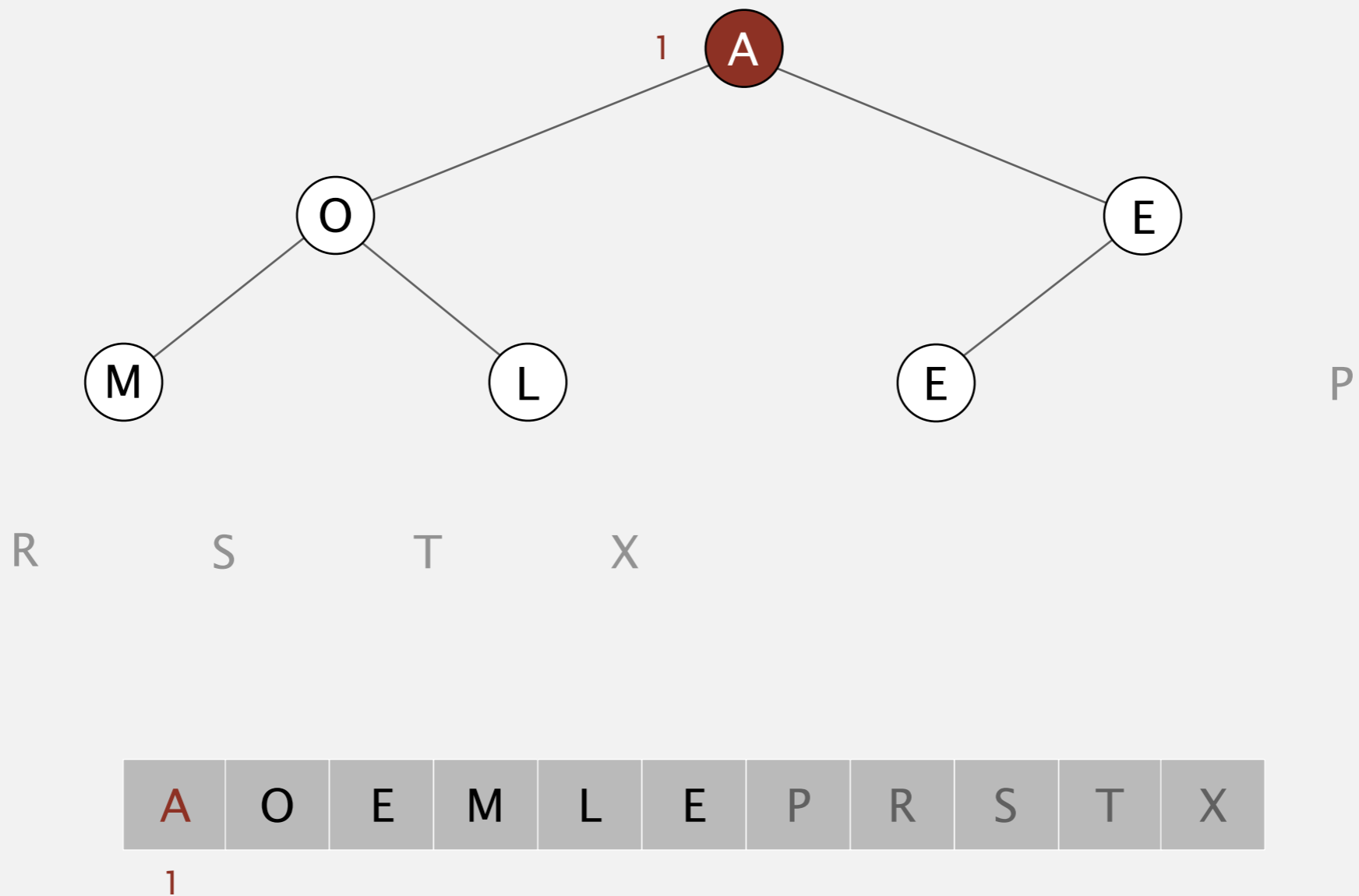
Repeatedly delete the largest remaining item.

exchange 1 and 7

Heapsort demo

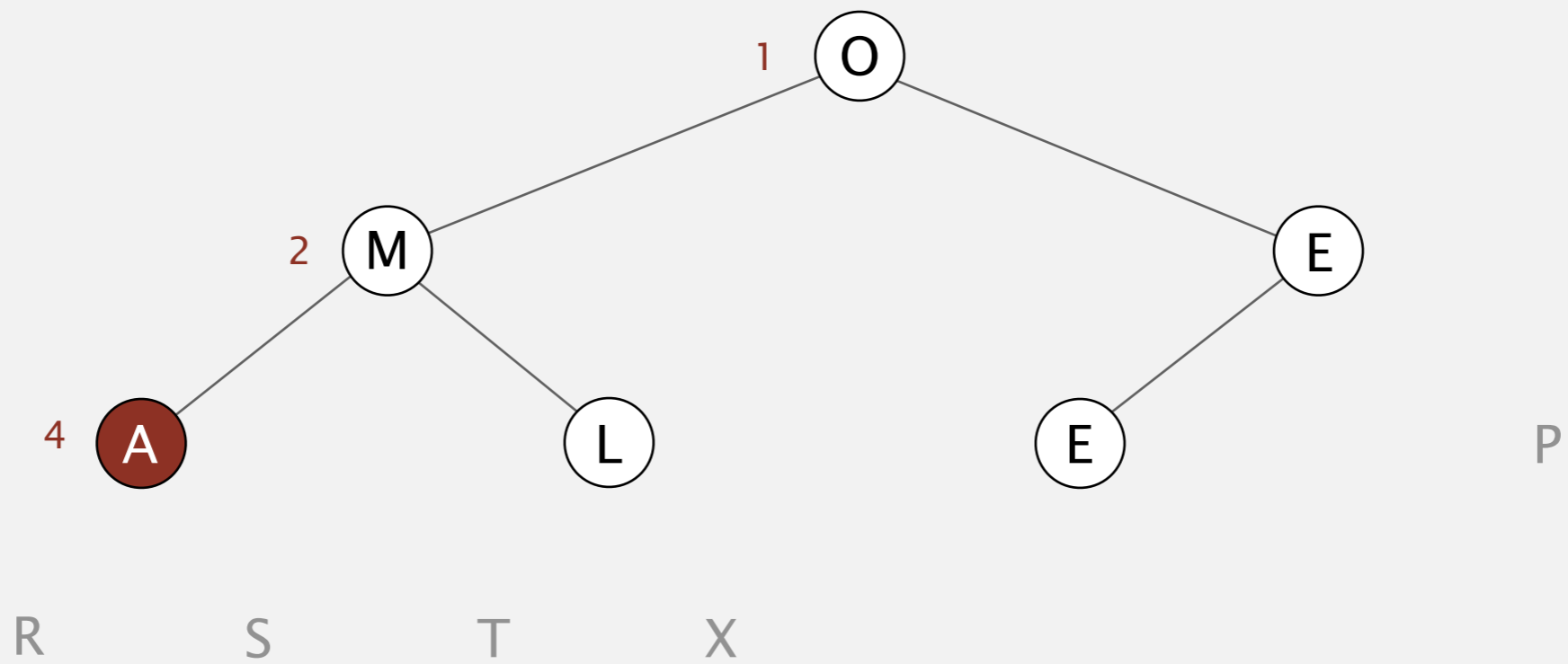Sortdown. Repeatedly delete the largest remaining item.

sink 1

Heapsort demo

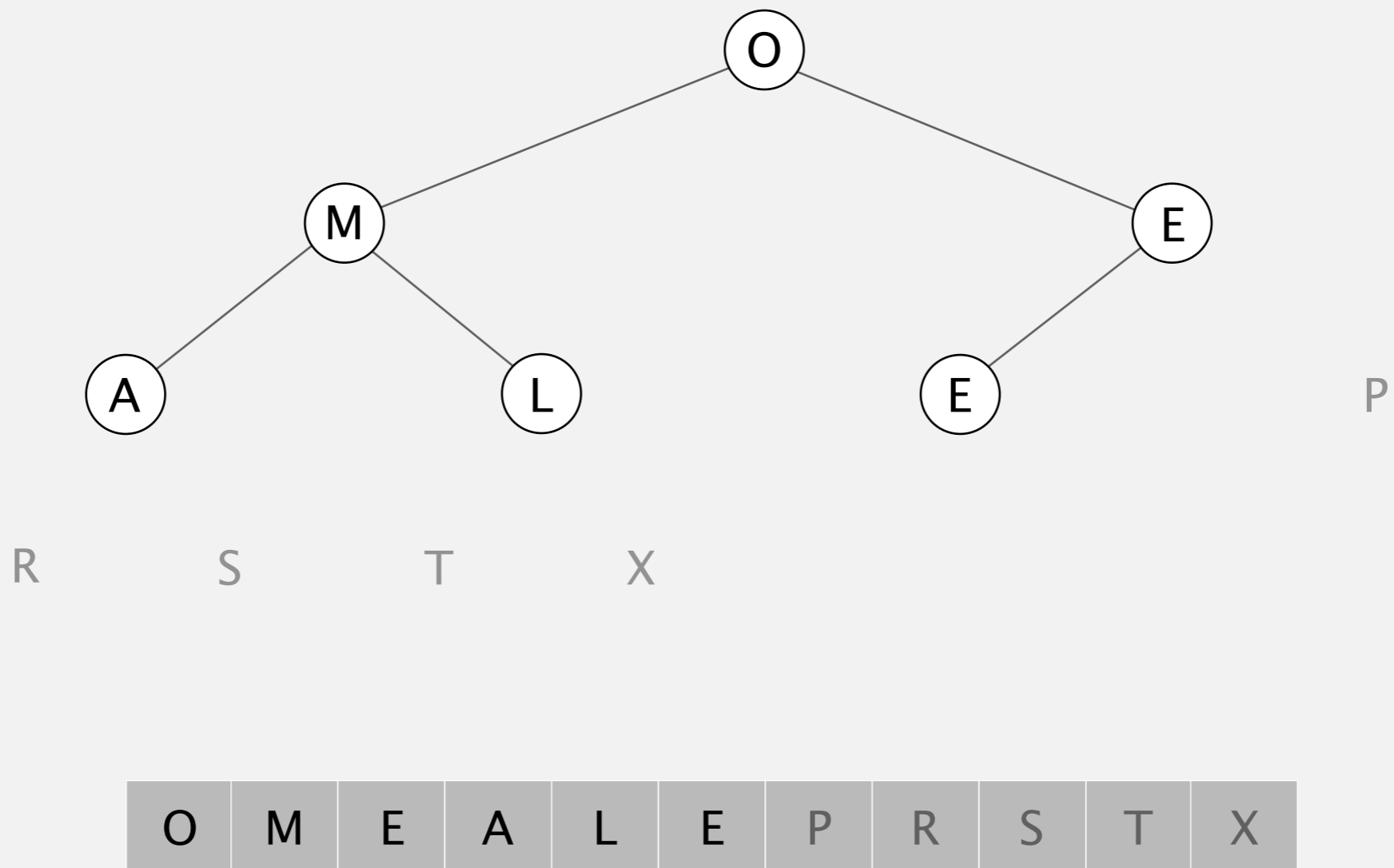Sortdown. Repeatedly delete the largest remaining item.

sink 1

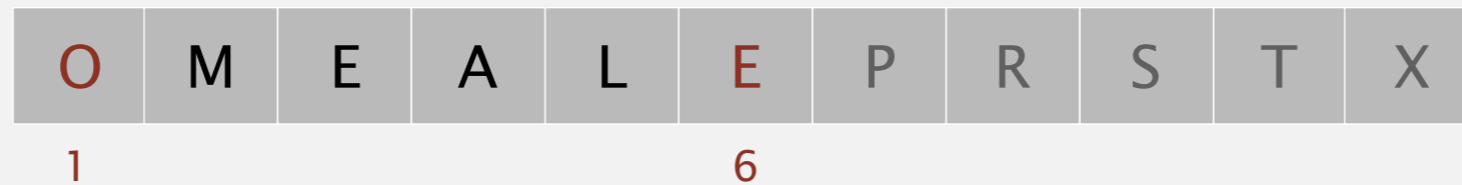Sortdown. Repeatedly delete the largest remaining item.

sink 1

O	M	E	A	L	E	P	R	S	T	X

1   2   4

Heapsort demo

Repeatedly delete the largest remaining item.

sink 1

| O | M | E | A | L | E | P | R | S | T | X |

Heapsort demo

Sortdown. Repeatedly delete the largest remaining item.

exchange 1 and 6

O	M	E	A	L	E	P	R	S	T	X

1   6

Heapsort demo

Sortdown. Repeatedly delete the largest remaining item.

exchange 1 and 6

E	M	E	A	L	O	P	R	S	T	X

1   6

Heapsort demo

Sortdown. Repeatedly delete the largest remaining item.

sink 1

Heapsort demo

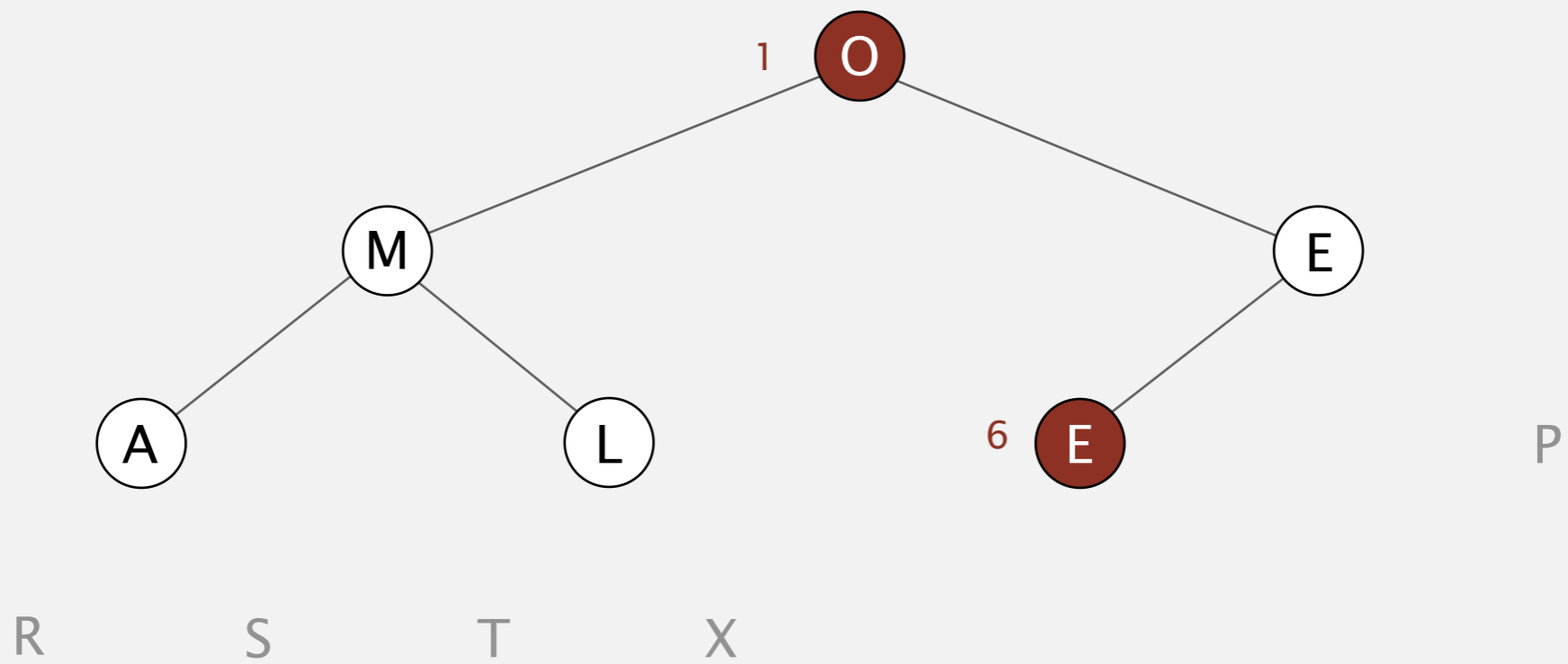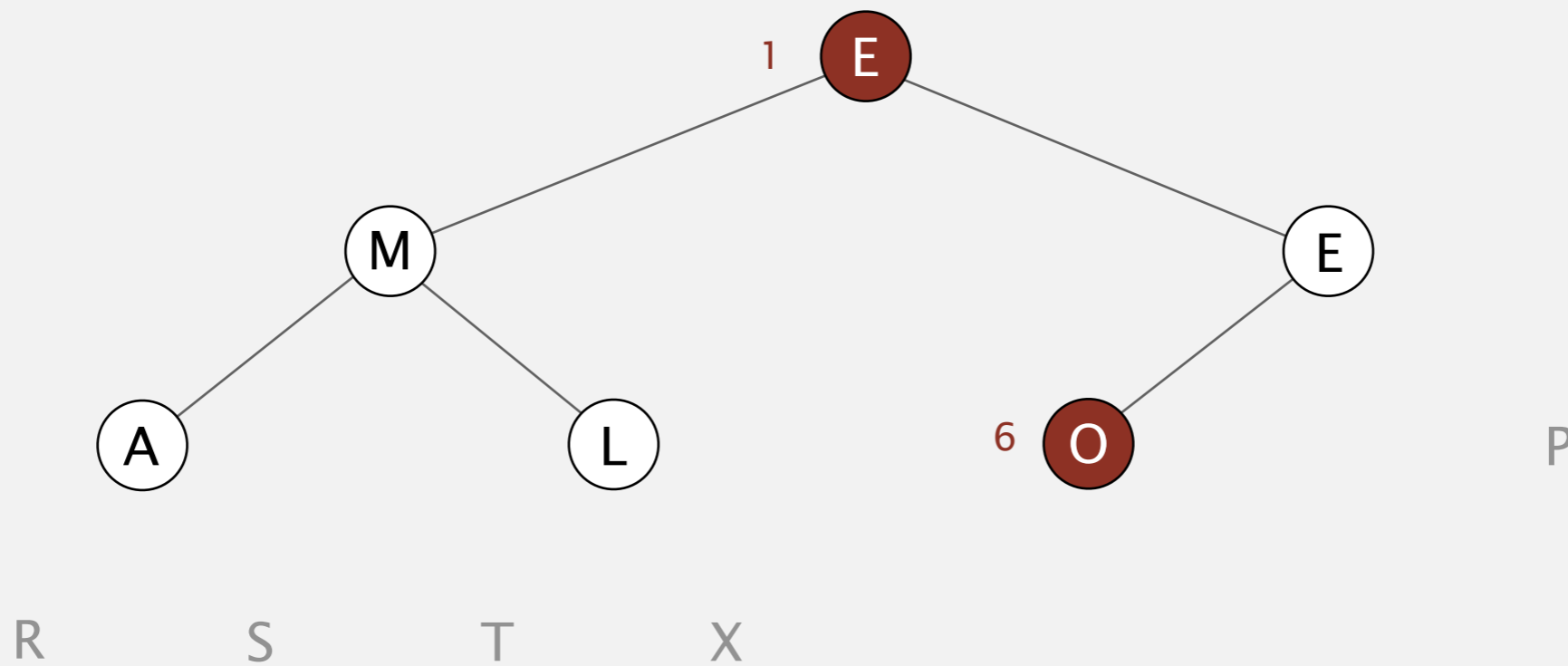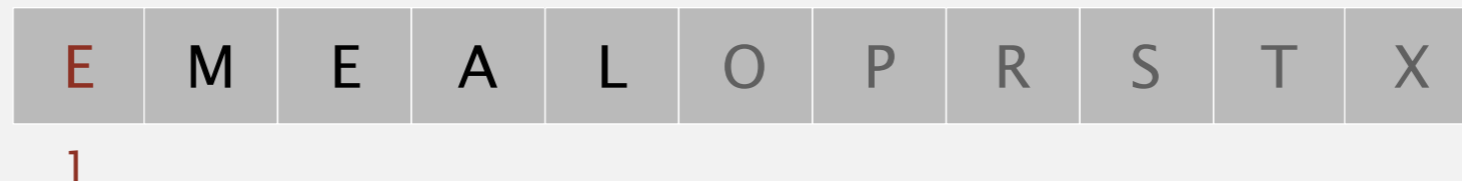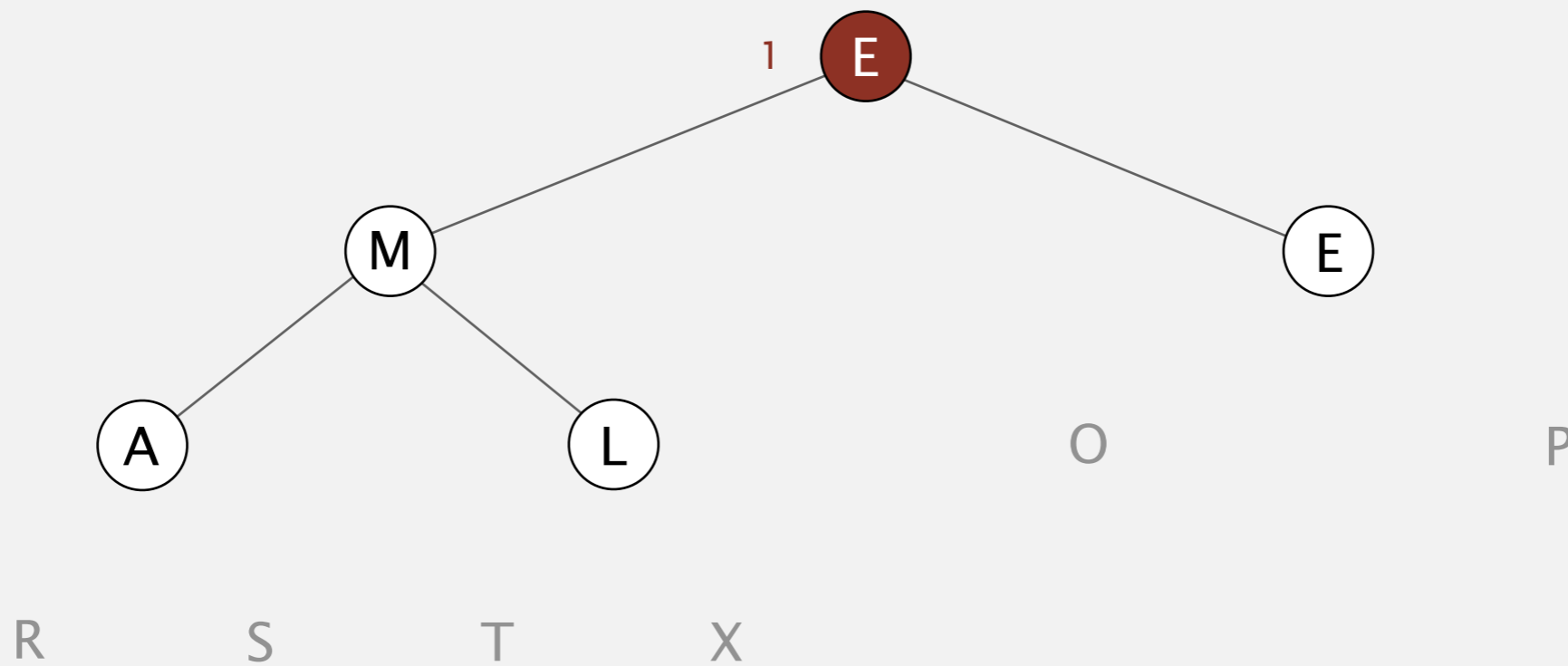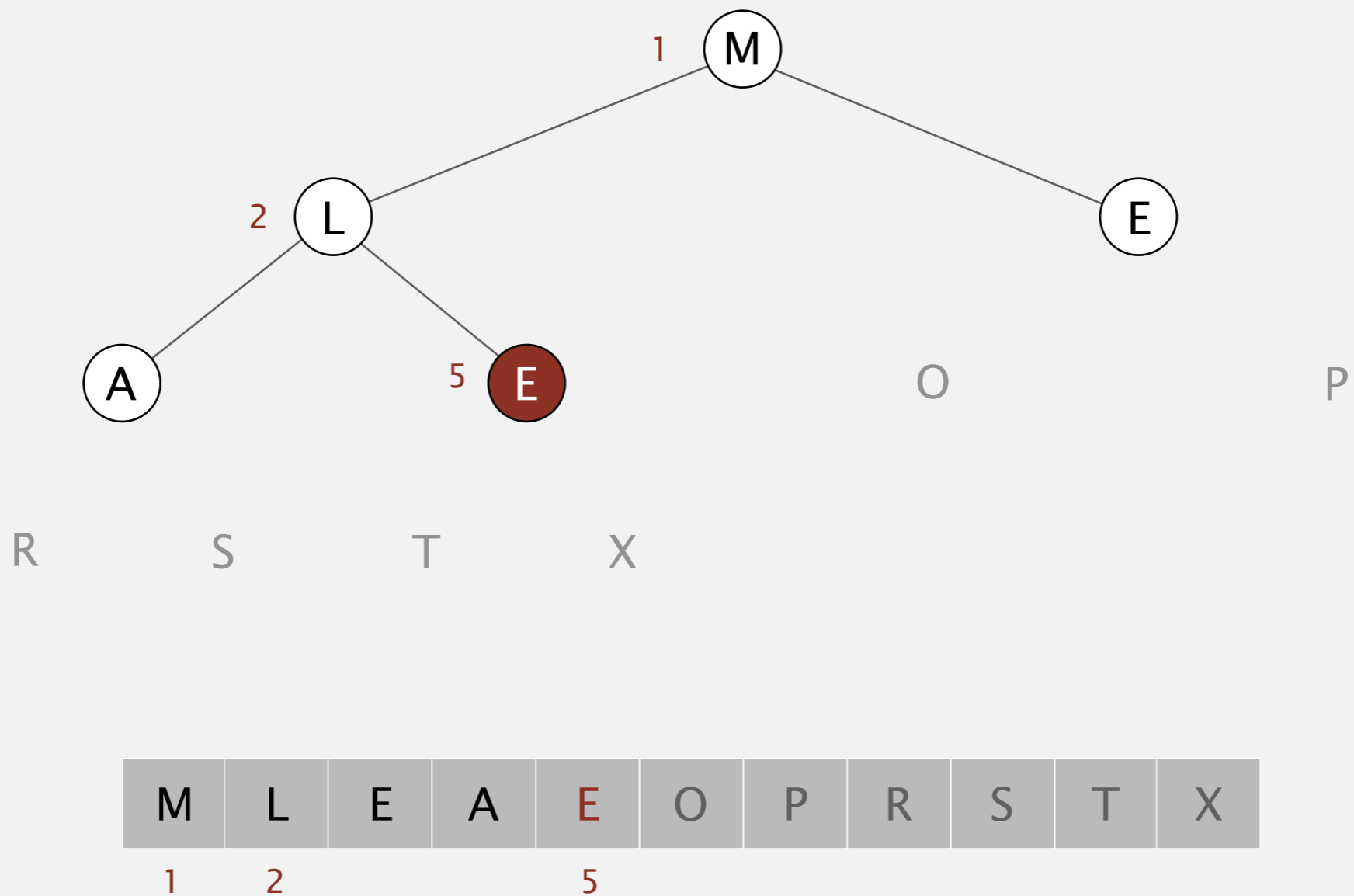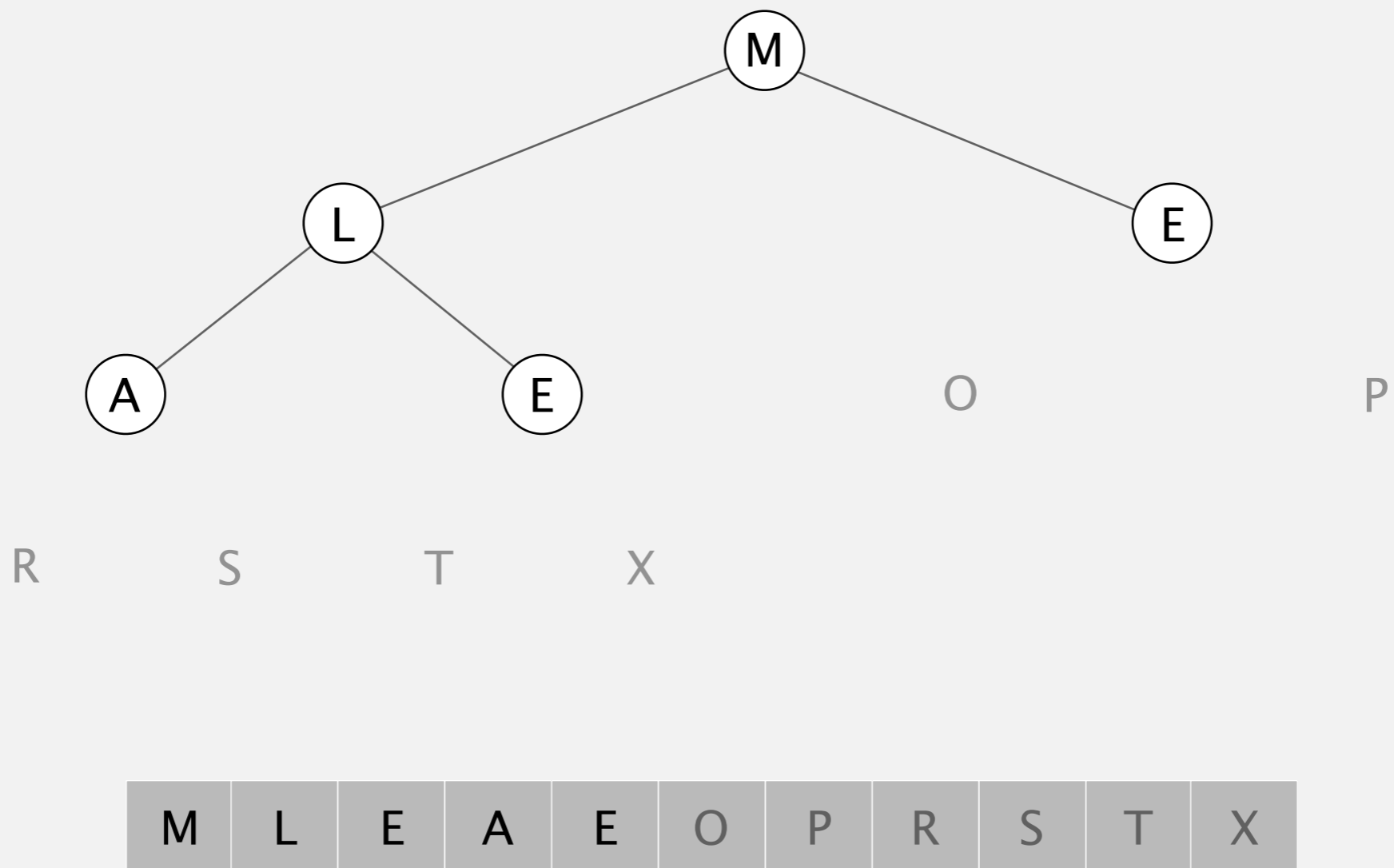Sortdown. Repeatedly delete the largest remaining item.

sink 1

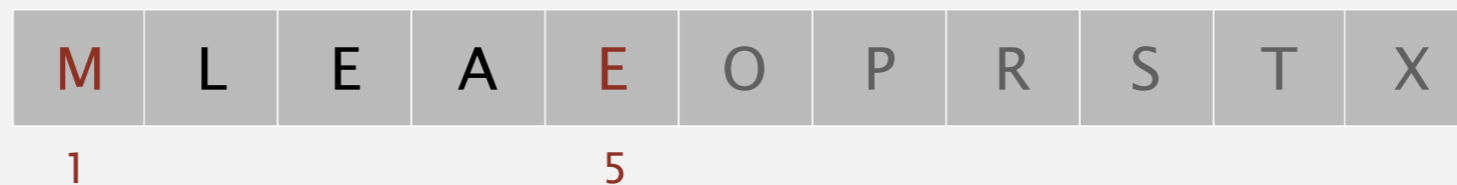# Heapsort demo

Sortdown. Repeatedly delete the largest remaining item.

sink 1

M	L	E	A	E	O	P	R	S	T	X
1	2			5						

Heapsort demo

Sortdown. Repeatedly delete the largest remaining item.

| M | L | E | A | E | O | P | R | S | T | X |

Sortdown. Repeatedly delete the largest remaining item.

exchange 1 and 5

M	L	E	A	E	O	P	R	S	T	X
1				5						

Heapsort demo

Sortdown. Repeatedly delete the largest remaining item.

exchange 1 and 5

	E									
E	L	E	A	M	O	P	R	S	T	X

1   5

Heapsort demo

Repeatedly delete the largest remaining item.

sink 1

Heapsort demo

Sortdown. Repeatedly delete the largest remaining item.

sink 1

Heapsort demo
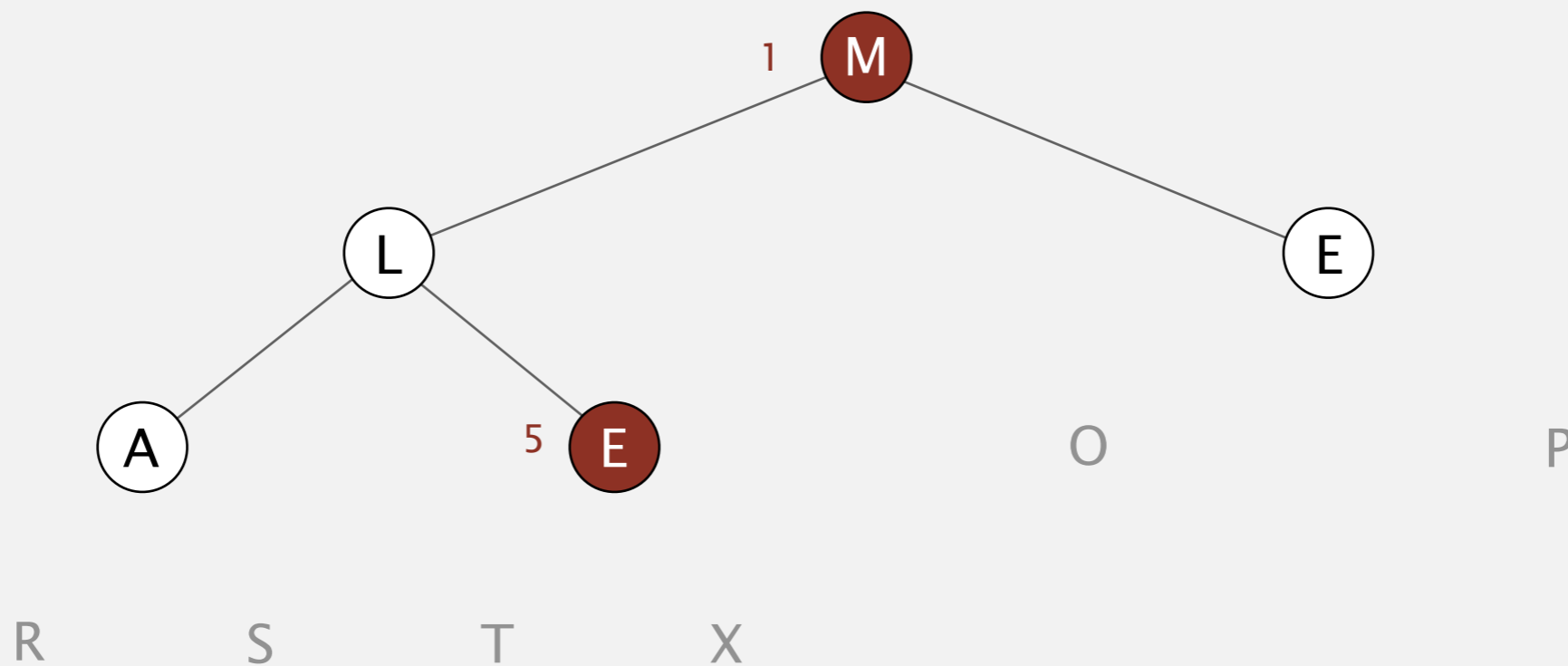
Sortdown. Repeatedly delete the largest remaining item.

Heapsort demo

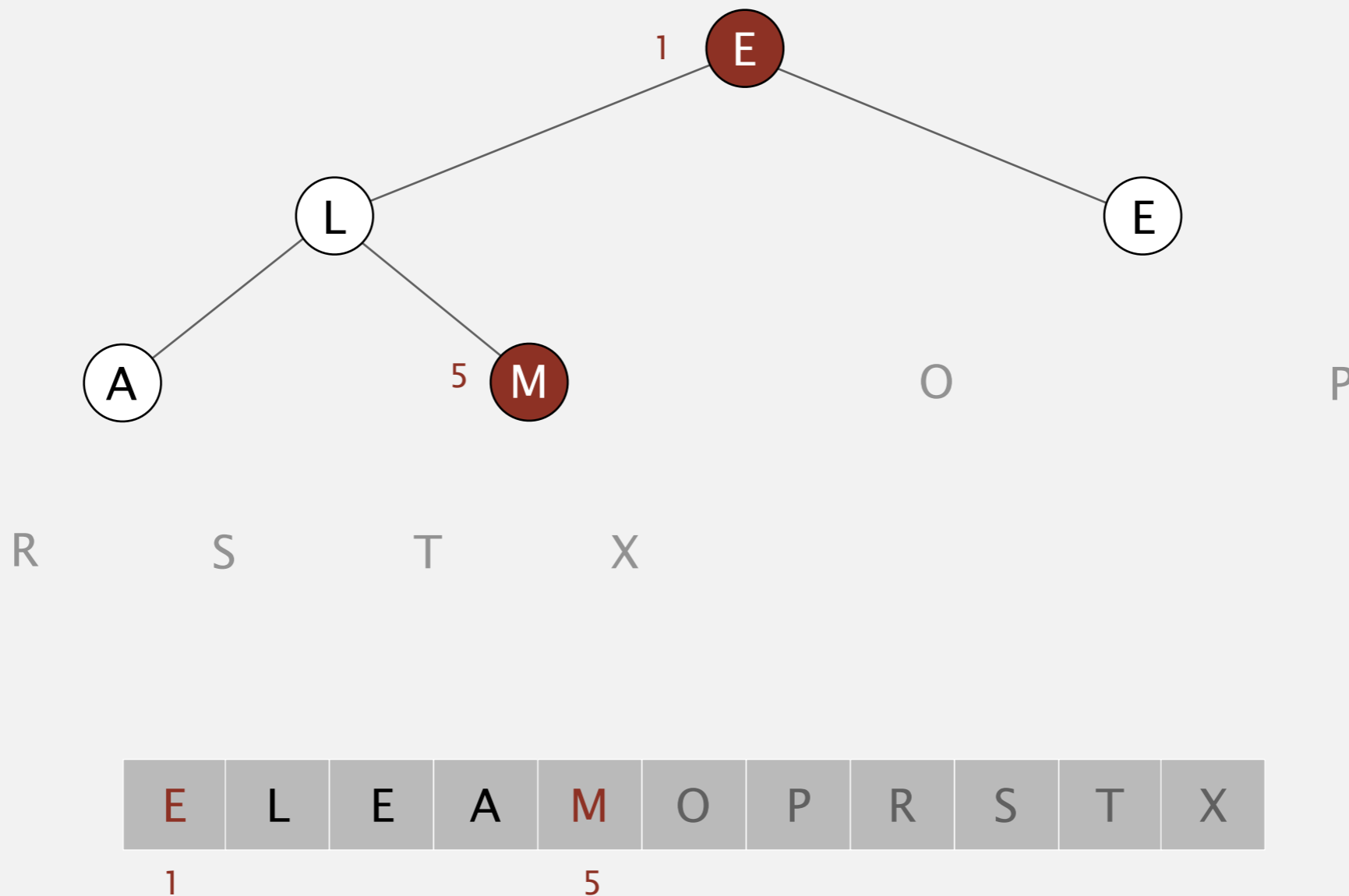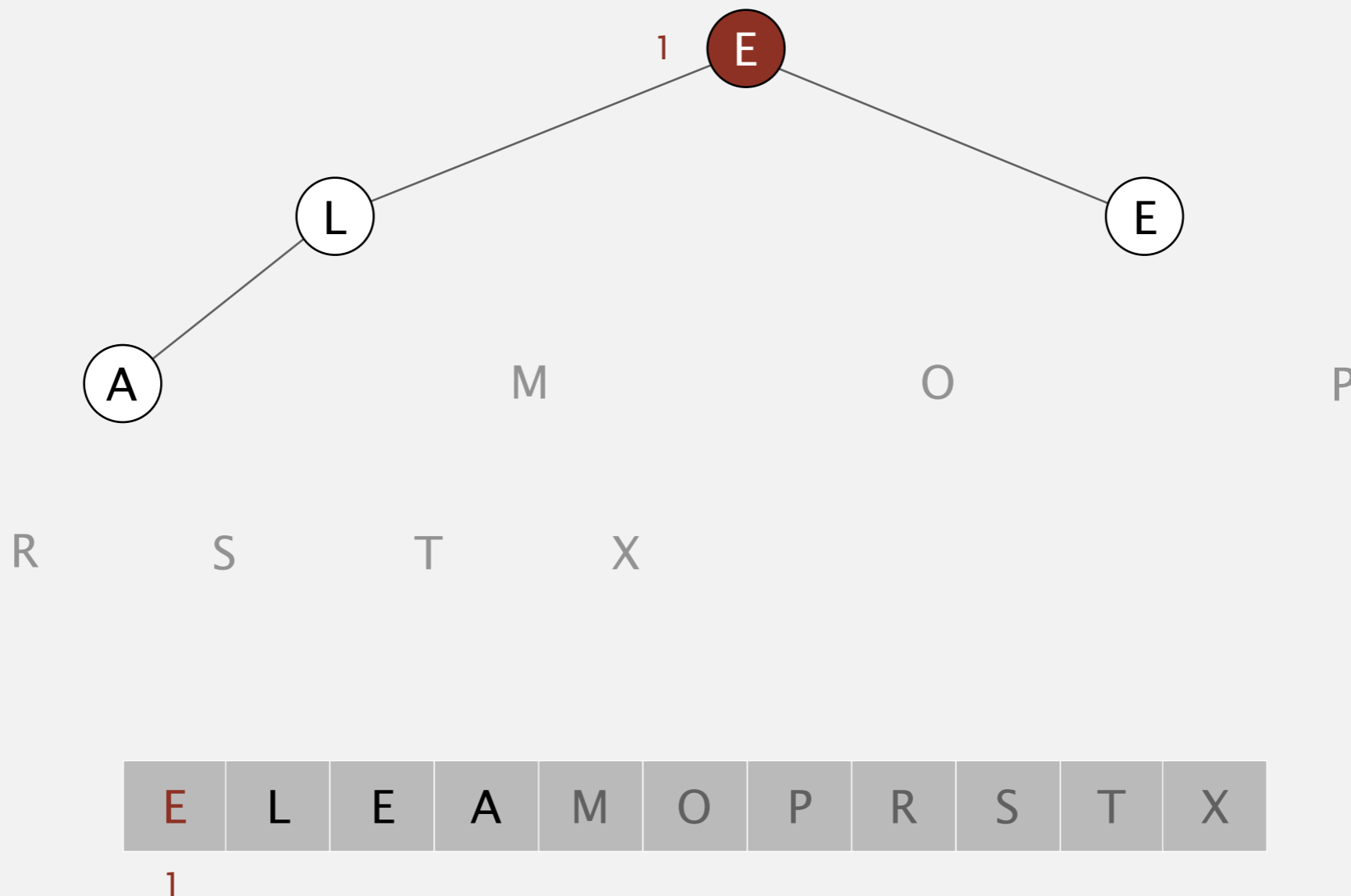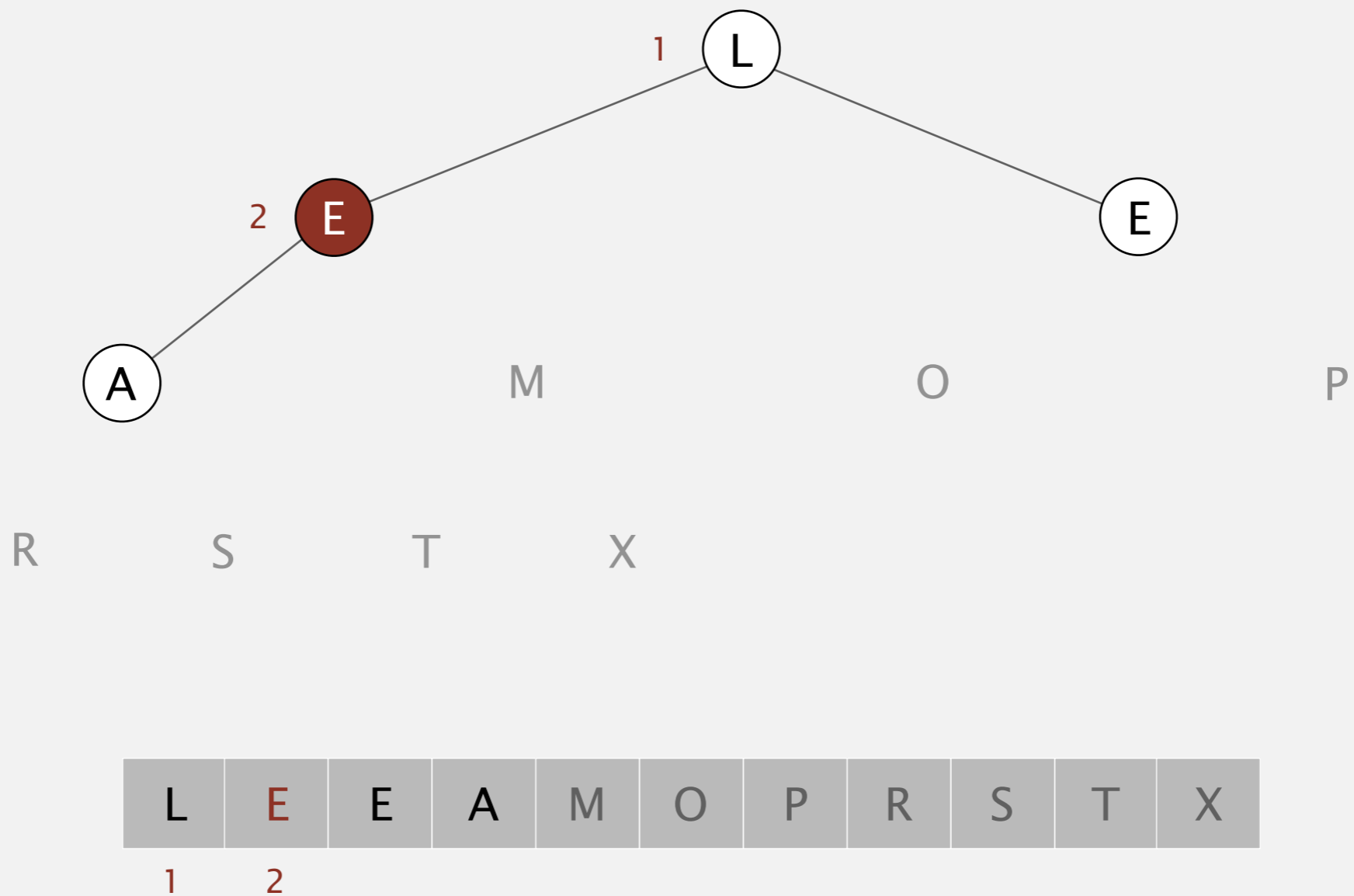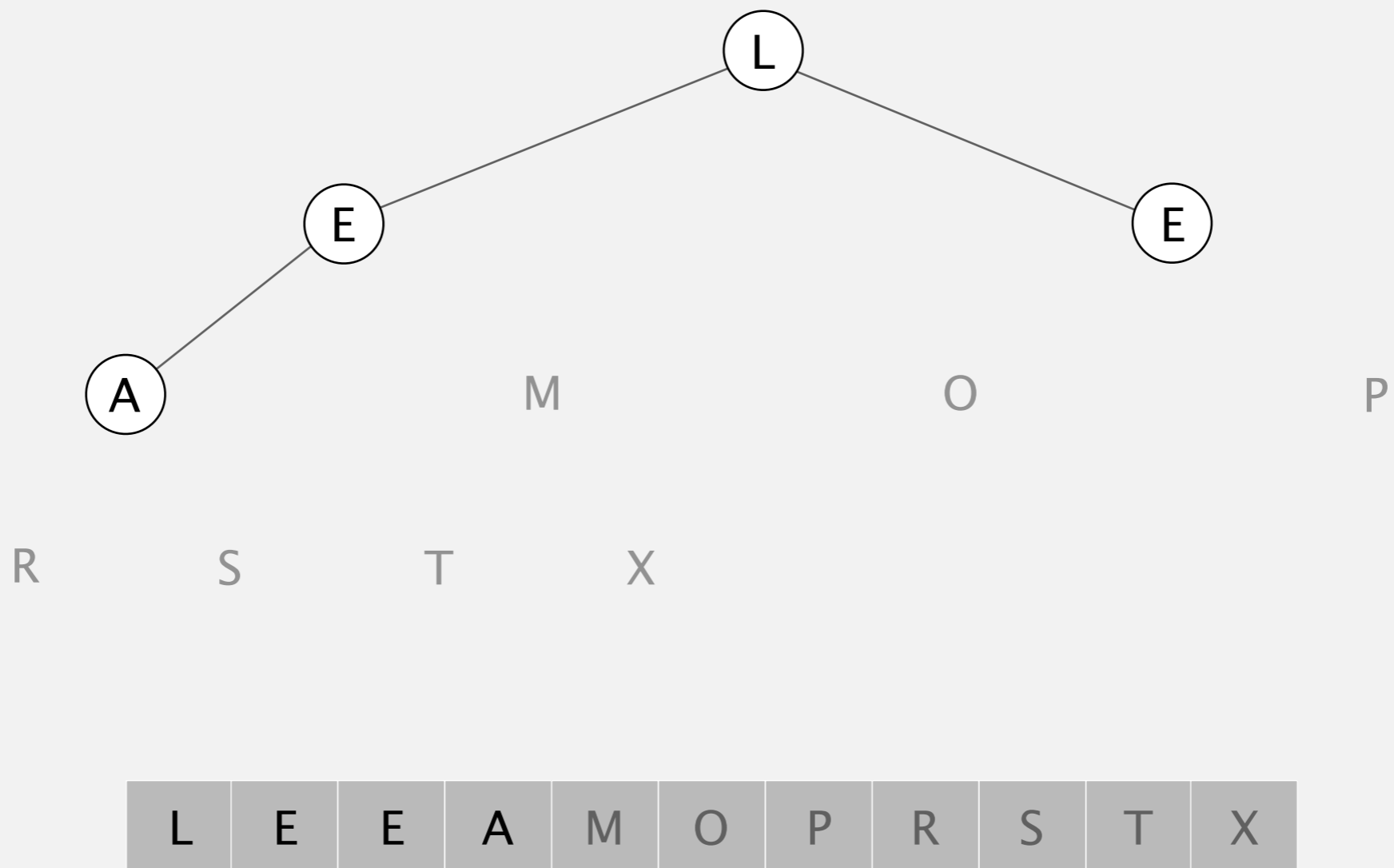Repeatedly delete the largest remaining item.

exchange 1 and 4

L	E	E	A	M	O	P	R	S	T	X

1   4
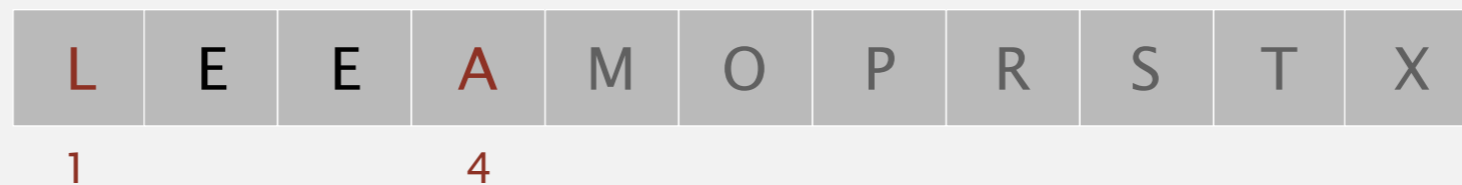
Heapsort demo

Sortdown. Repeatedly delete the largest remaining item.

exchange 1 and 4

A	E	E	L	M	O	P	R	S	T	X

1   4

Heapsort demo

Repeatedly delete the largest remaining item.

sink 1

Heapsort demo
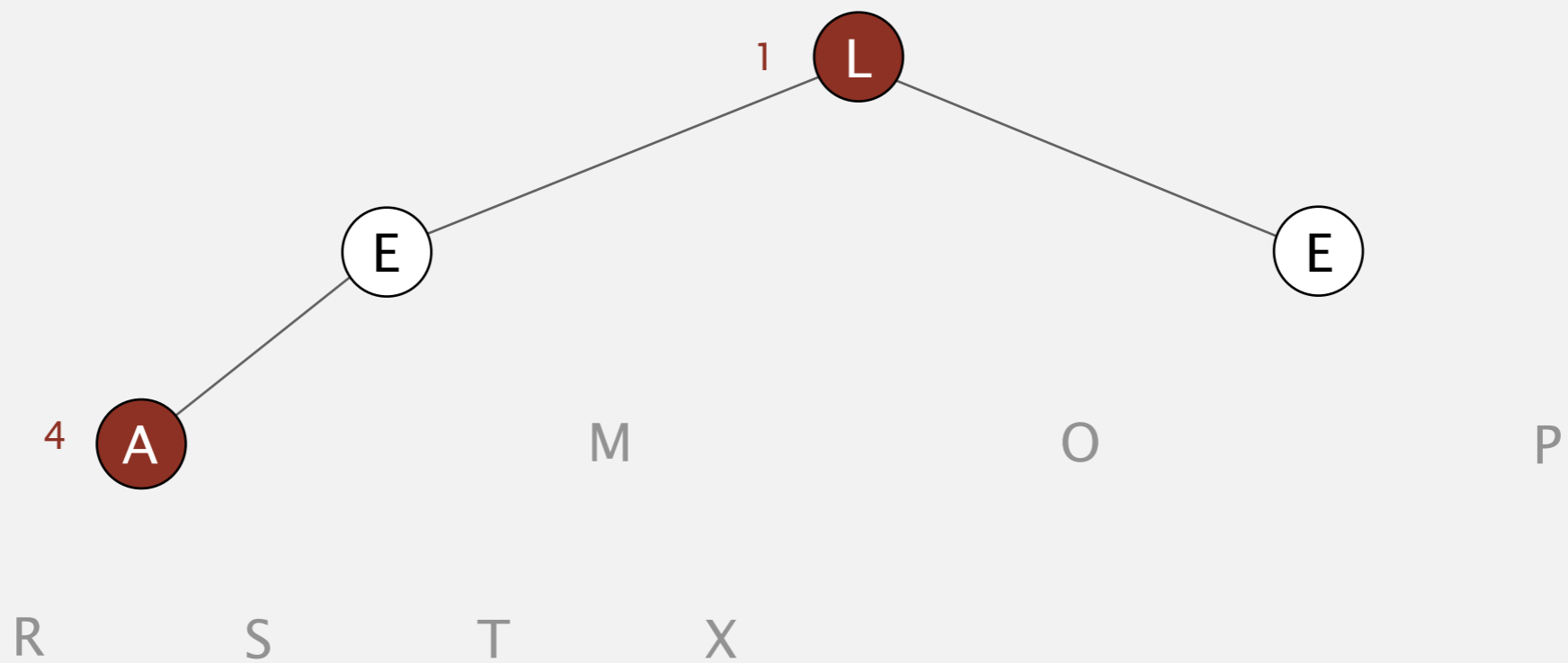
Sortdown. Repeatedly delete the largest remaining item.

sink 1

E	A	E	L	M	O	P	R	S	T	X
1	2									

Heapsort demo

Sortdown. Repeatedly delete the largest remaining item.

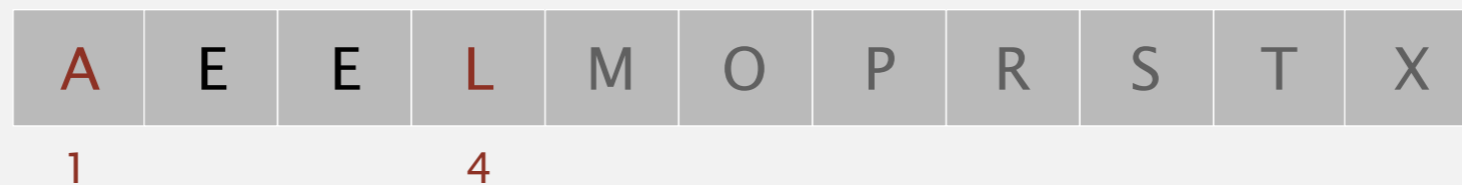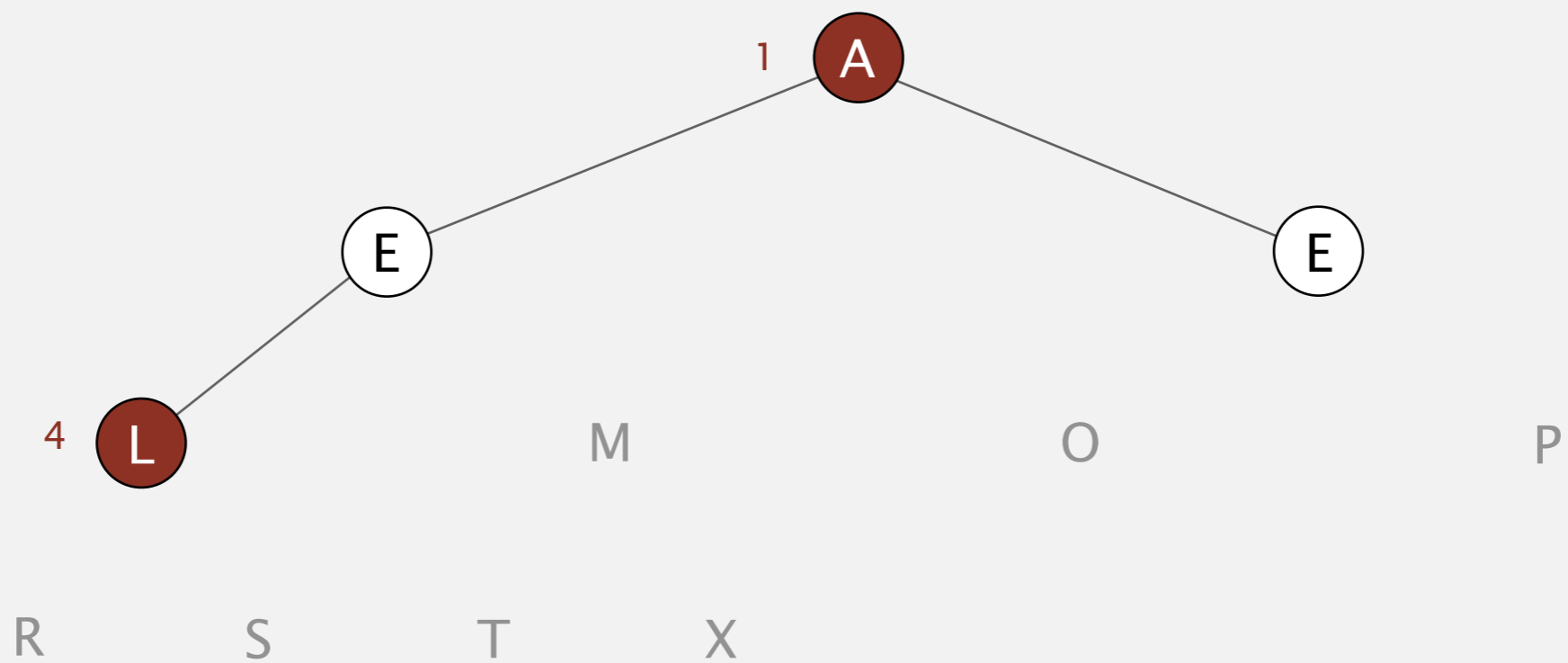| E	A	E	L	M	O	P	R	S	T	X

Heapsort demo

Sortdown. Repeatedly delete the largest remaining item.

exchange 1 and 3

Heapsort demo

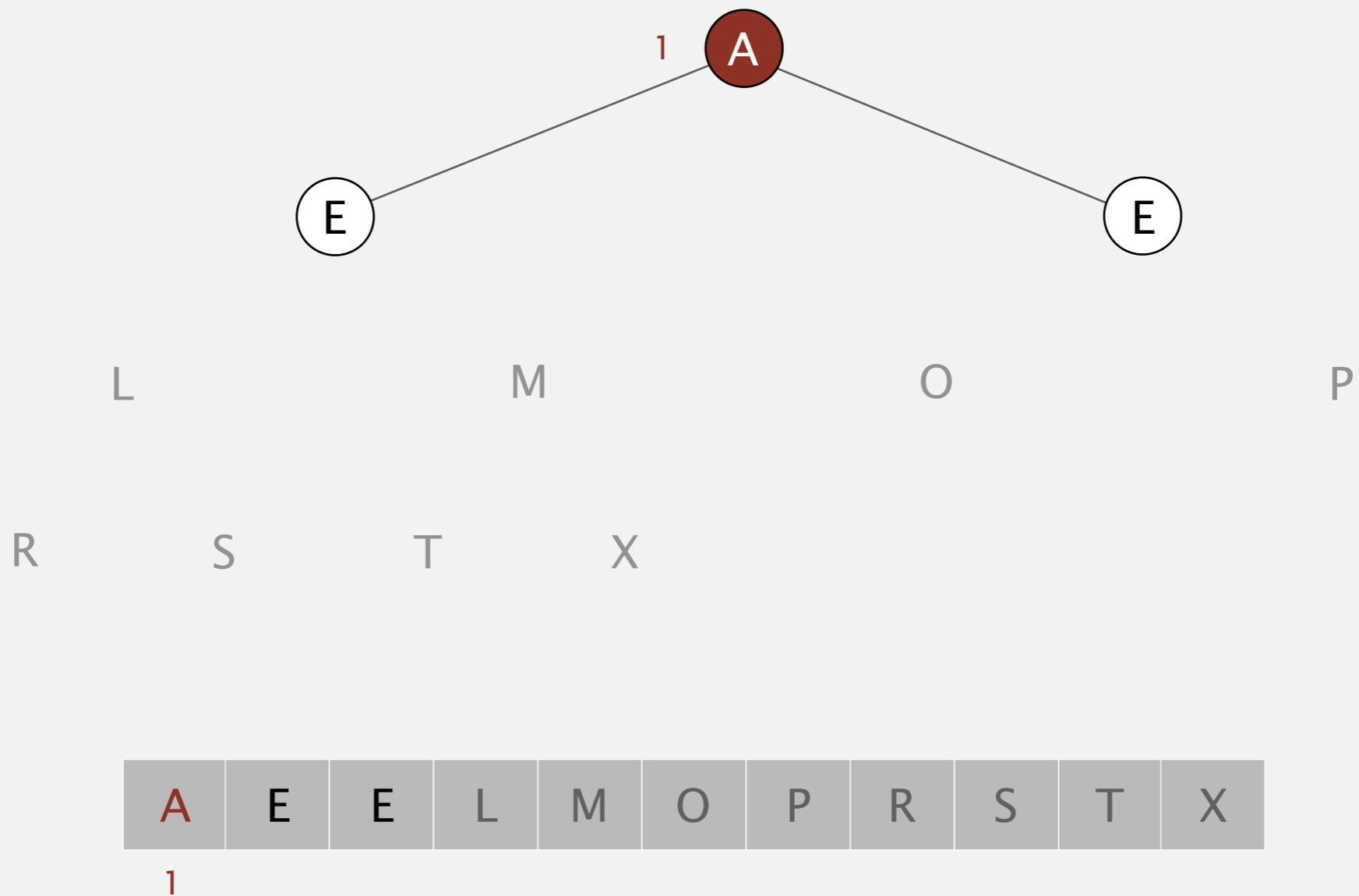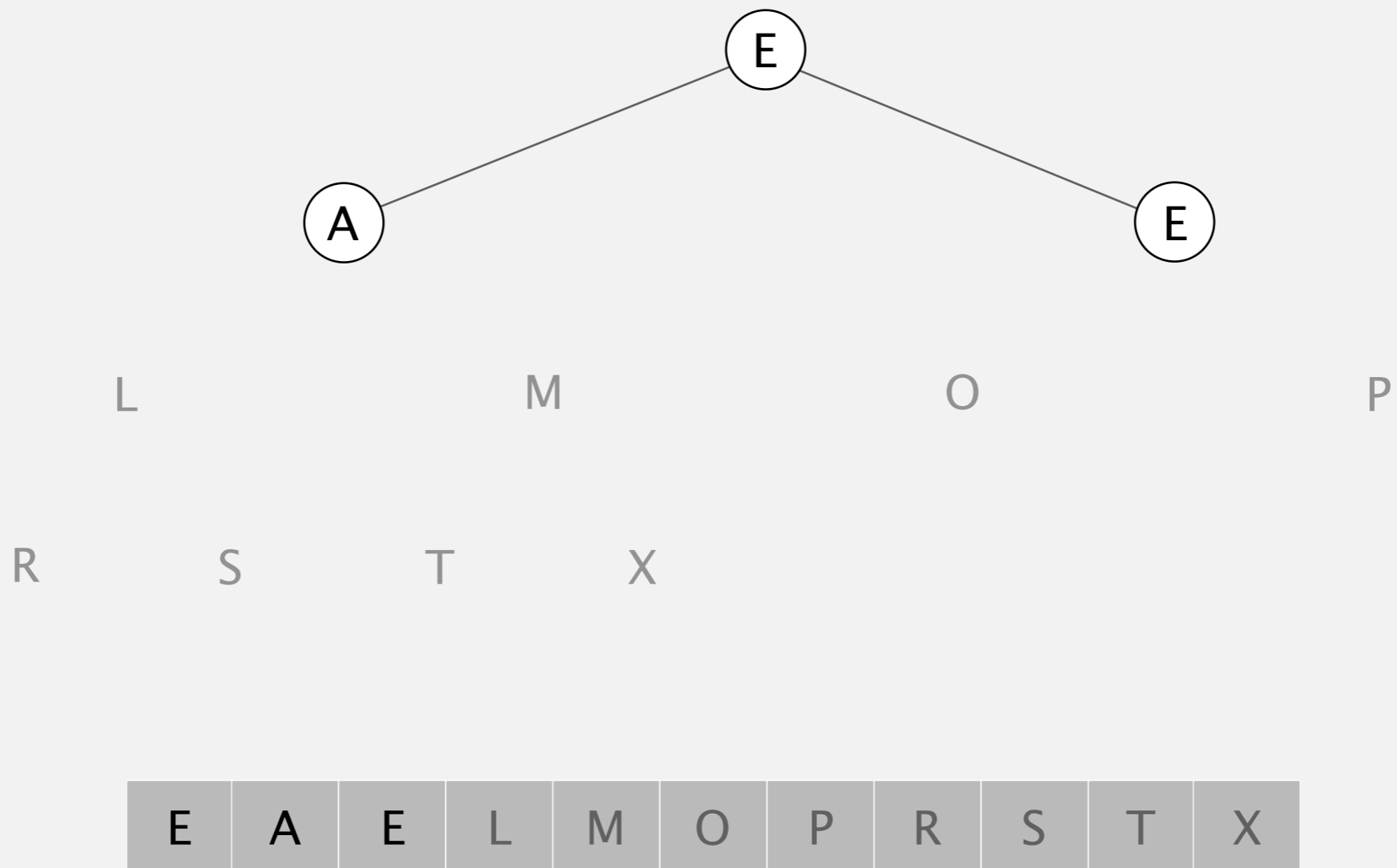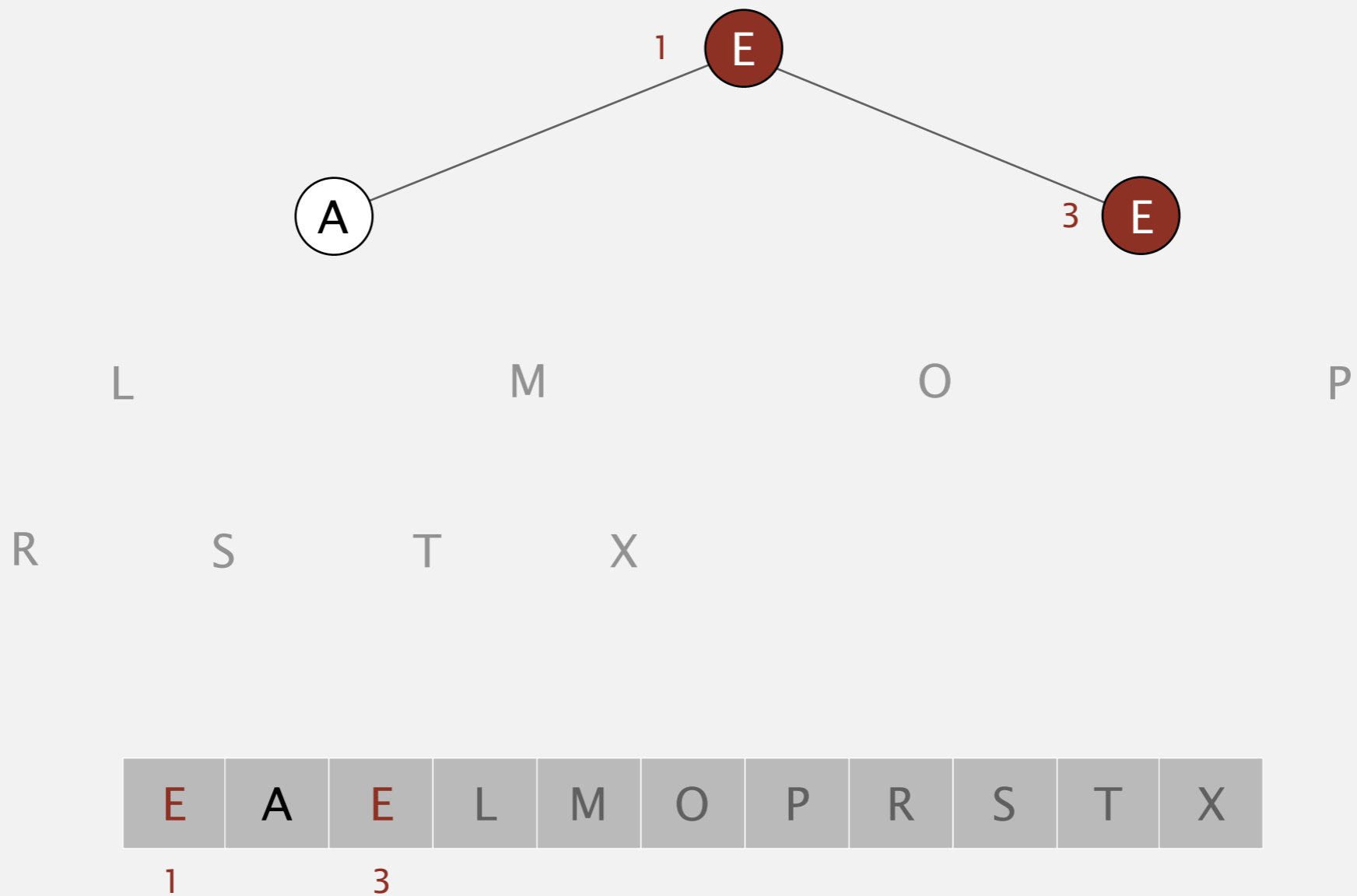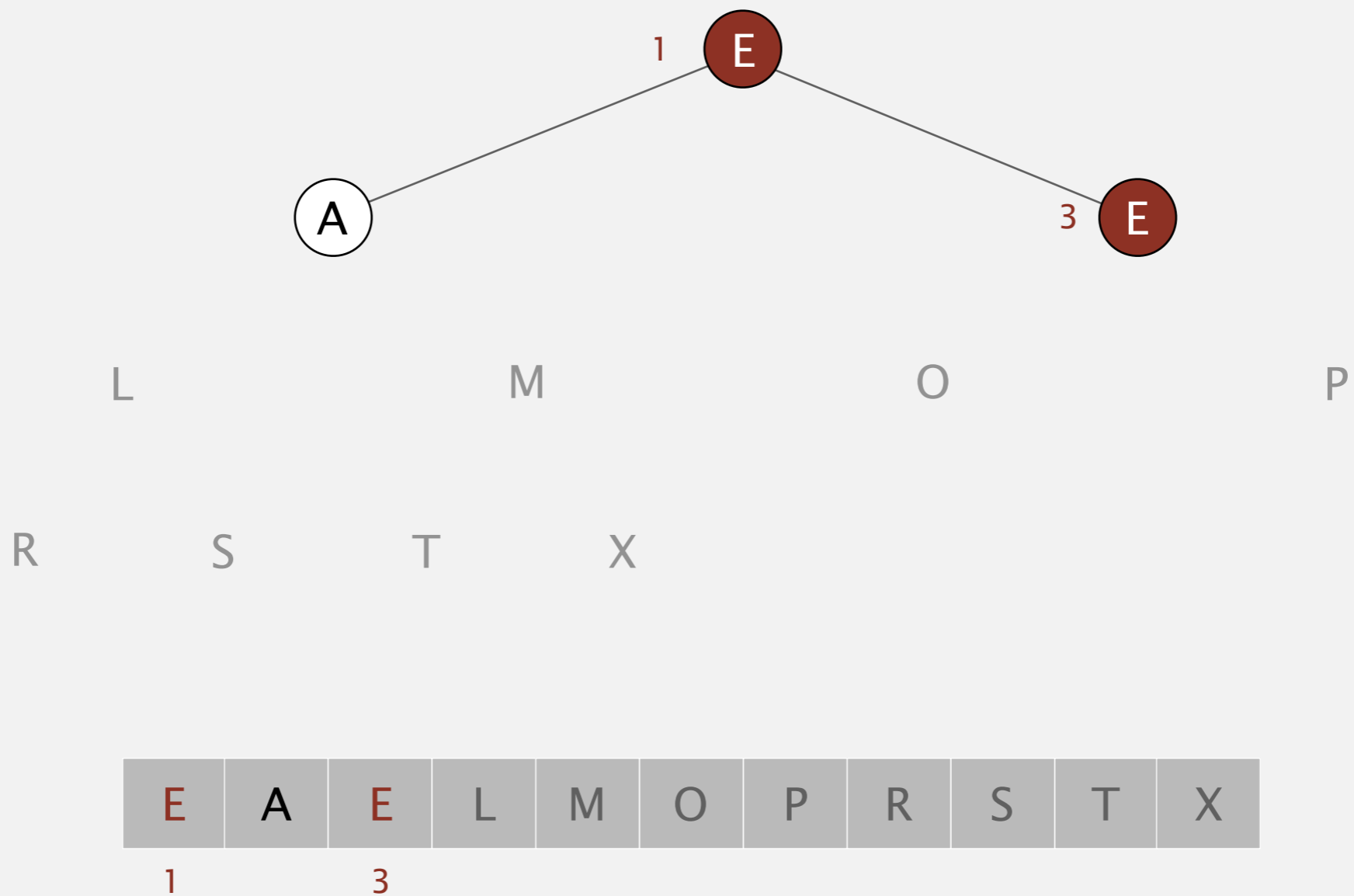Sortdown. Repeatedly delete the largest remaining item.

exchange 1 and 3

Heapsort demo

Repeatedly delete the largest remaining item.

sink 1

E	A	E	L	M	O	P	R	S	T	X

1

Heapsort demo

Sortdown. Repeatedly delete the largest remaining item.

| E | A | E | L | M | O | P | R | S | T | X |

Heapsort demo

Sortdown. Repeatedly delete the largest remaining item.

exchange 1 and 2

E	A	E	L	M	O	P	R	S	T	X

1   2

Heapsort demo

Sortdown. Repeatedly delete the largest remaining item.

exchange 1 and 2

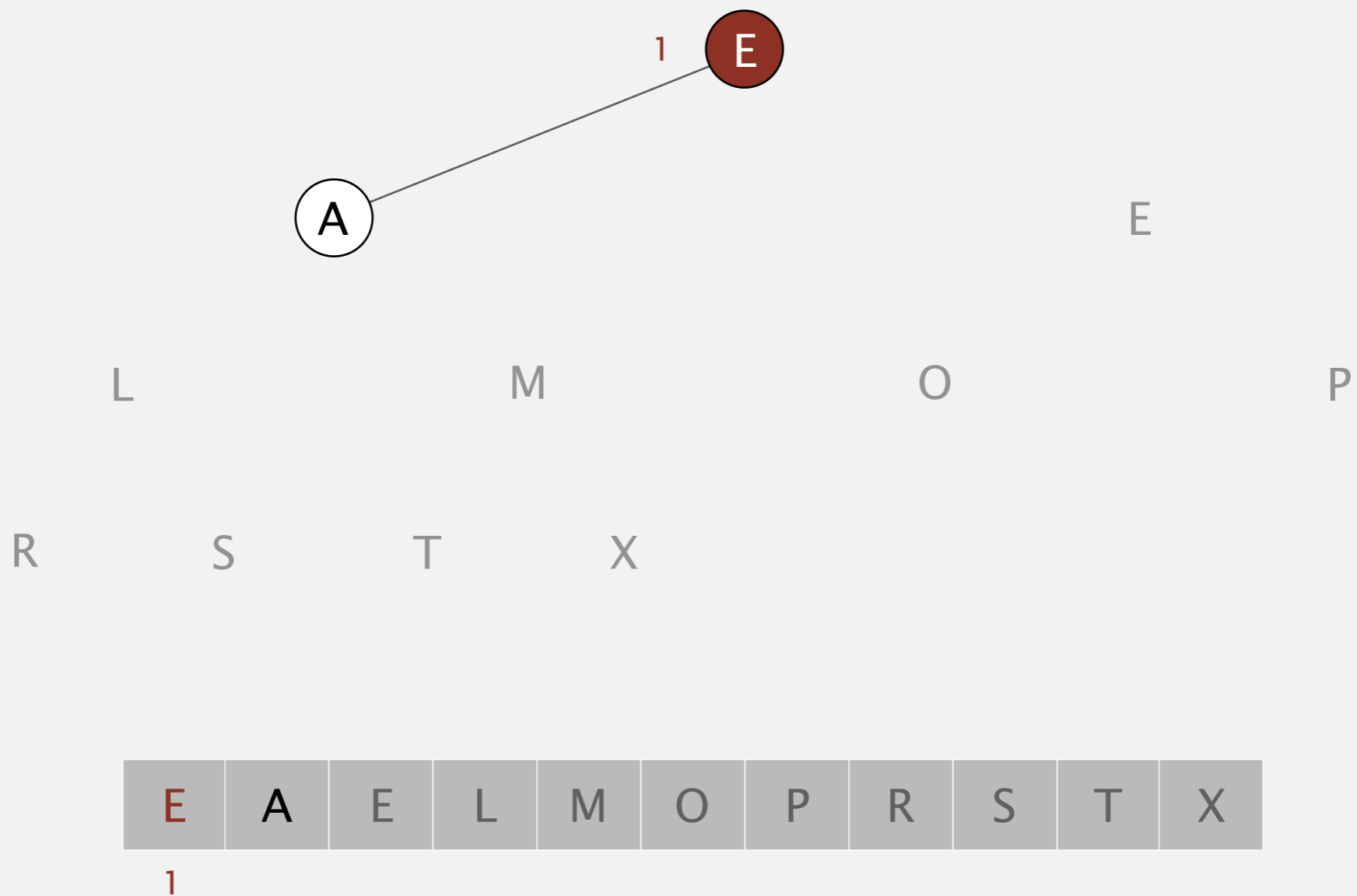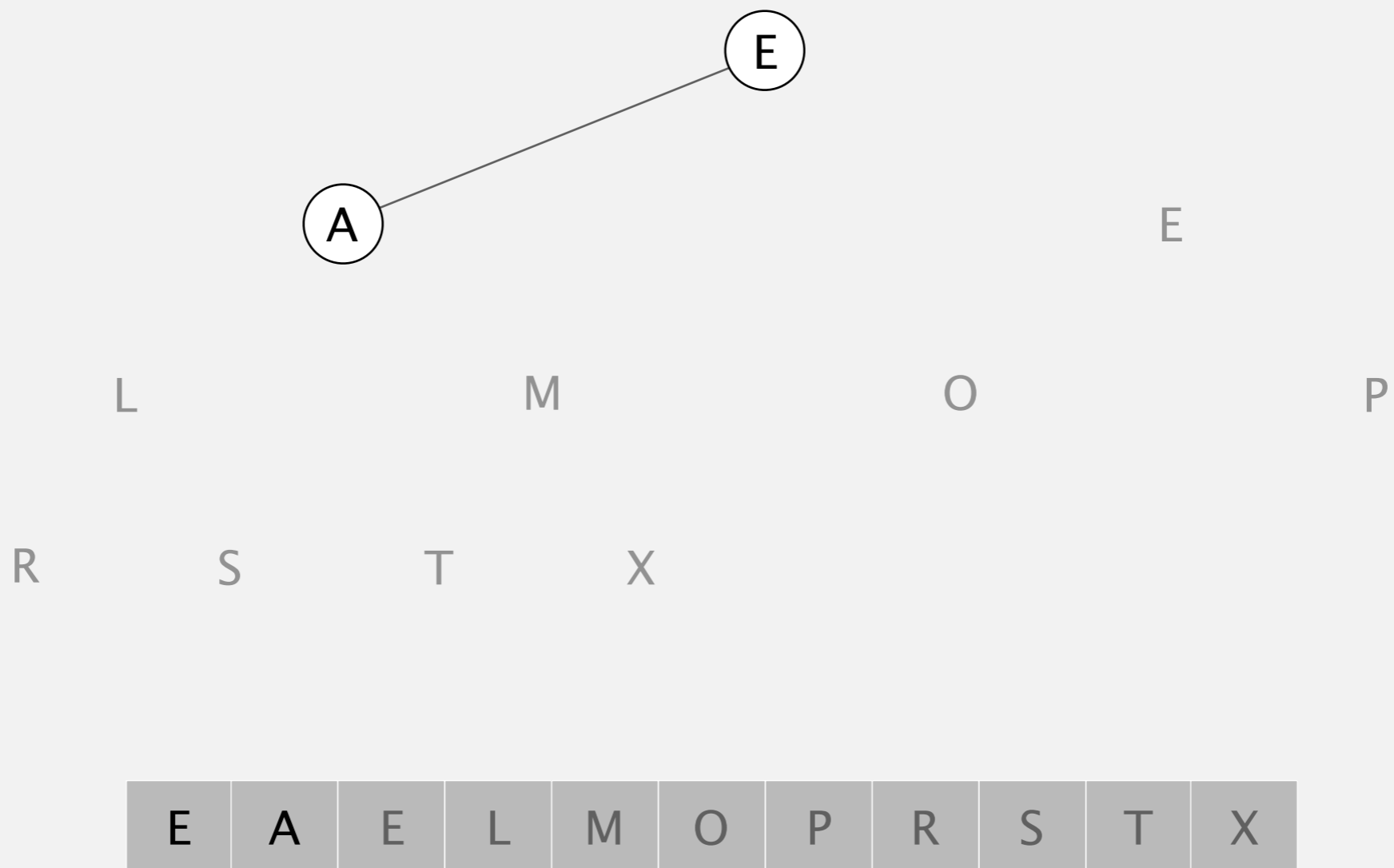| A	E	E	L	M	O	P	R	S	T	X

Heapsort demo

Sortdown. Repeatedly delete the largest remaining item.

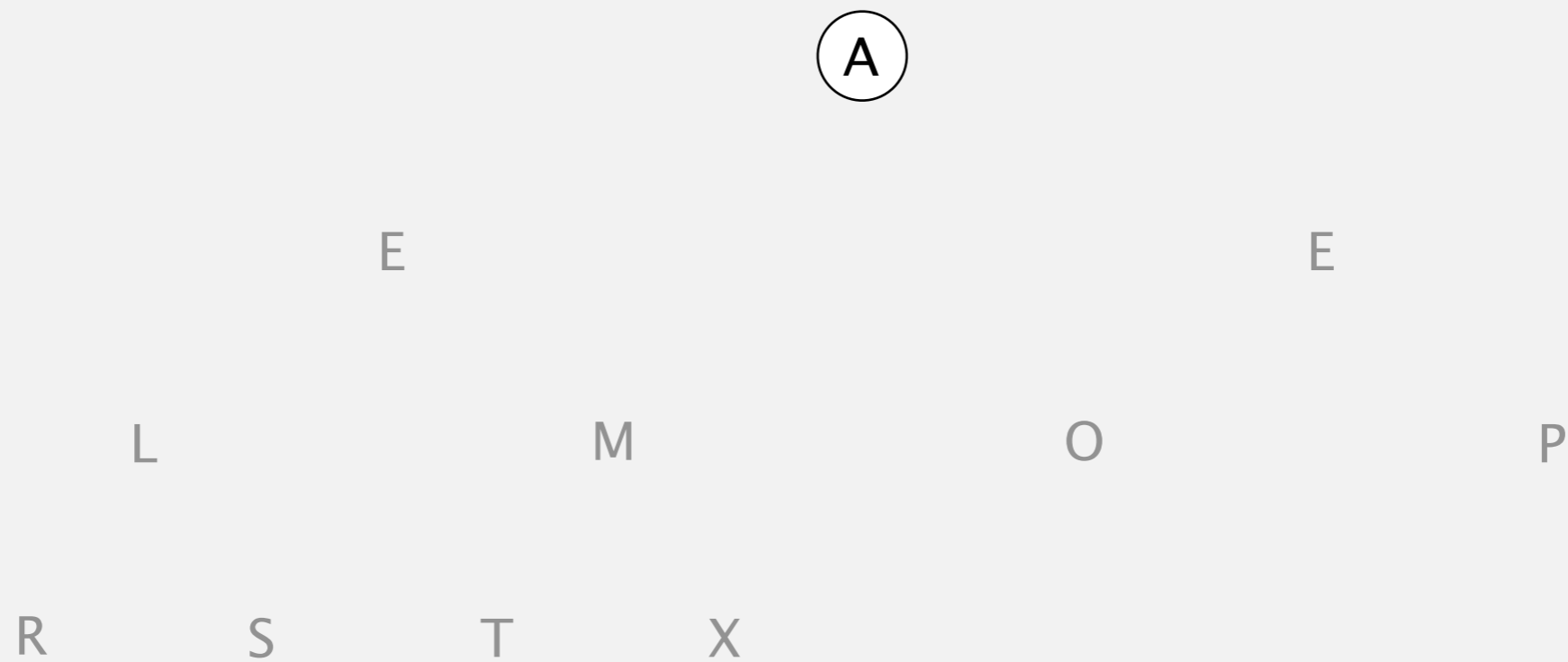# Heapsort demo

Repeatedly delete the largest remaining item.

end of sortdown phase
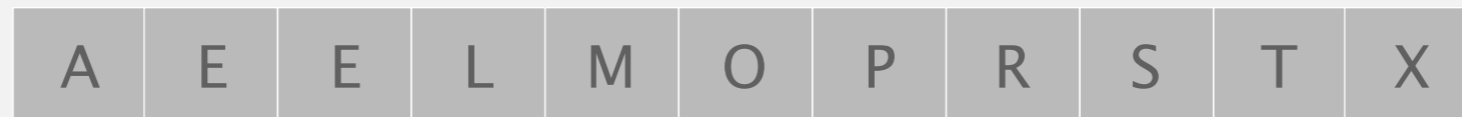
A

E   E

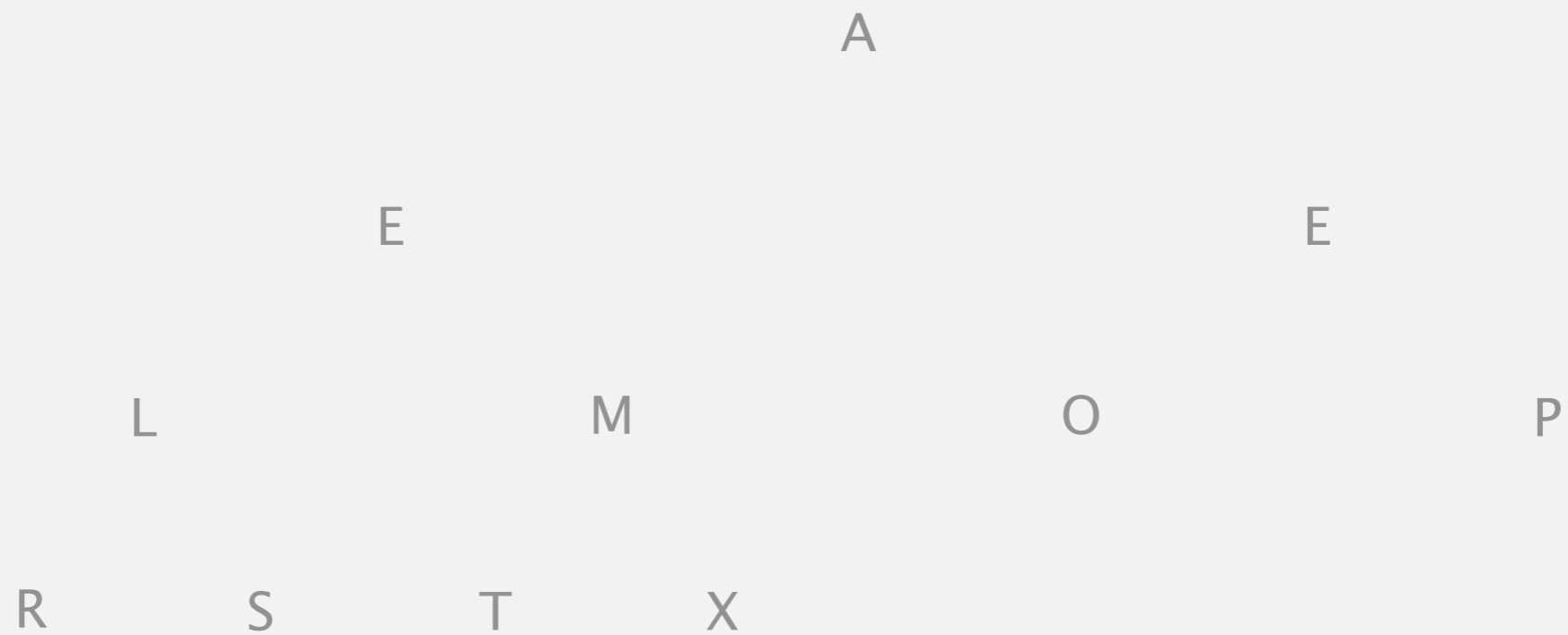L   M   O   P

R   S   T   X

| A | E | E | L | M | O | P | R | S | T | X |

Heapsort demo

Repeatedly delete the largest remaining item.

array in sorted order

A	E	E	L	M	O	P	R	S	T	X
1	2	3	4	5	6	7	8	9	10	11