# Data Structures II

▸ *heapify demo*

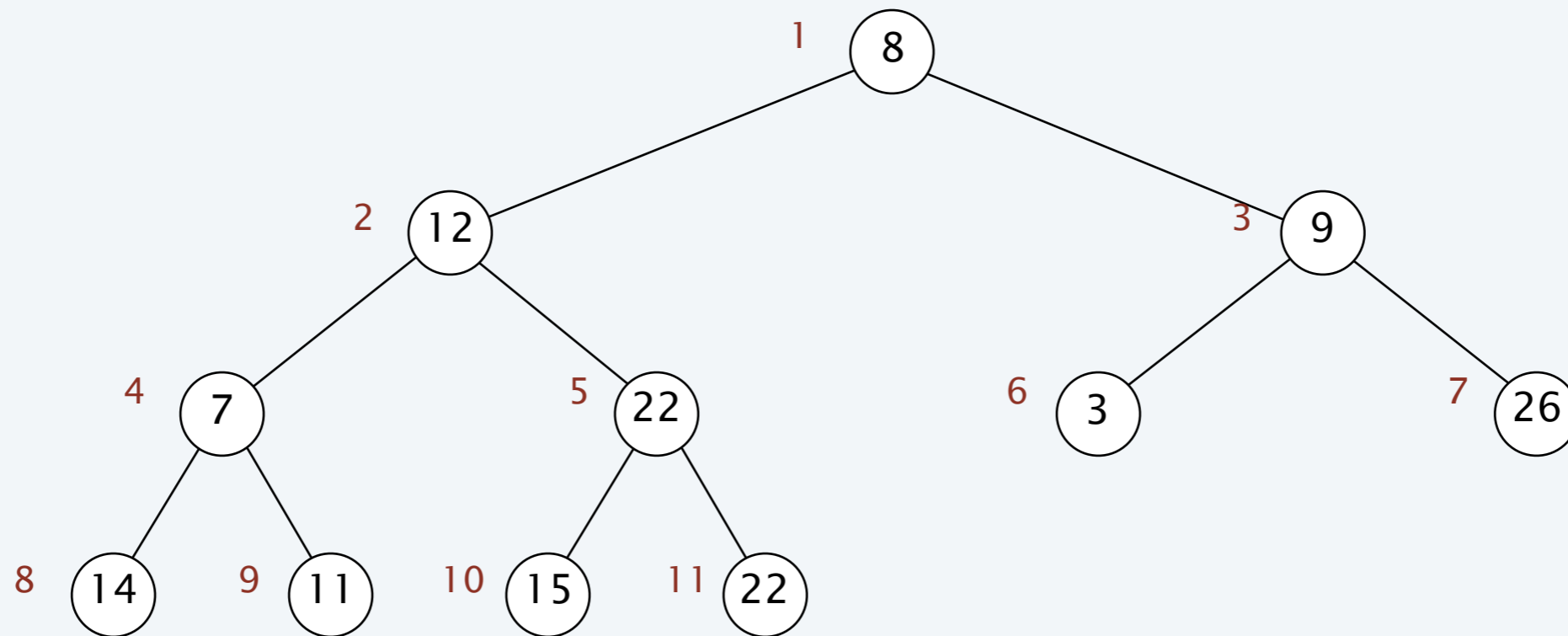# Heapify demo

Heapify. For each element in reverse-array order, sink it down.

we assume array entries are indexed 1 to n
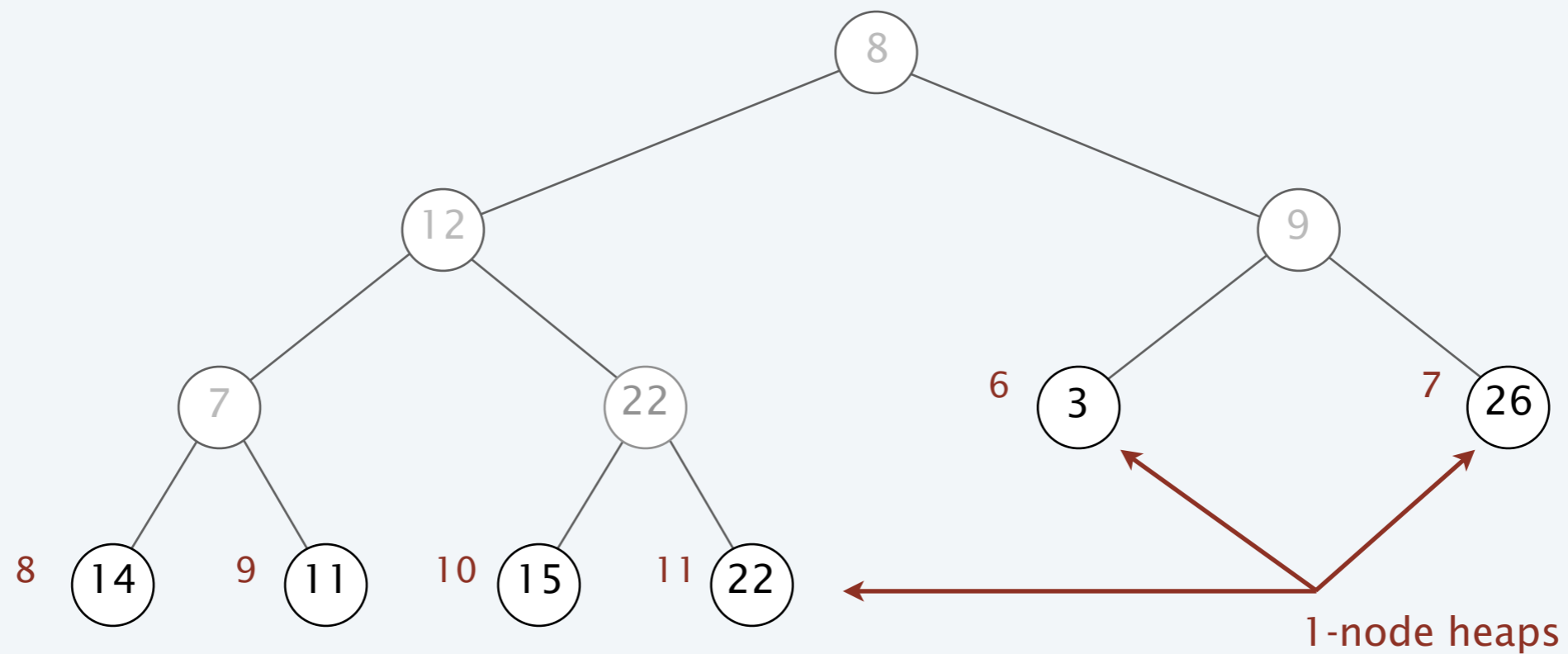
**array in arbitrary order**



| | 8 | 12 | 9 | 7 | 22 | 3 | 26 | 14 | 11 | 15 | 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |

# Heapify demo

Heapify. For each element in reverse-array order, sink it down.



1-node heaps

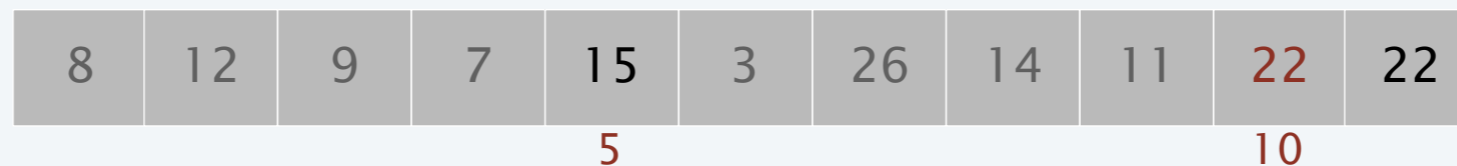| 8 | 12 | 9 | 7 | 22 | 3 | 26 | 14 | 11 | 15 | 22 |
|---|----|---|---|----|---|----|----|----|----|----|
|   |    |   |   |    | 6 | 7  | 8  | 9  | 10 | 11 |

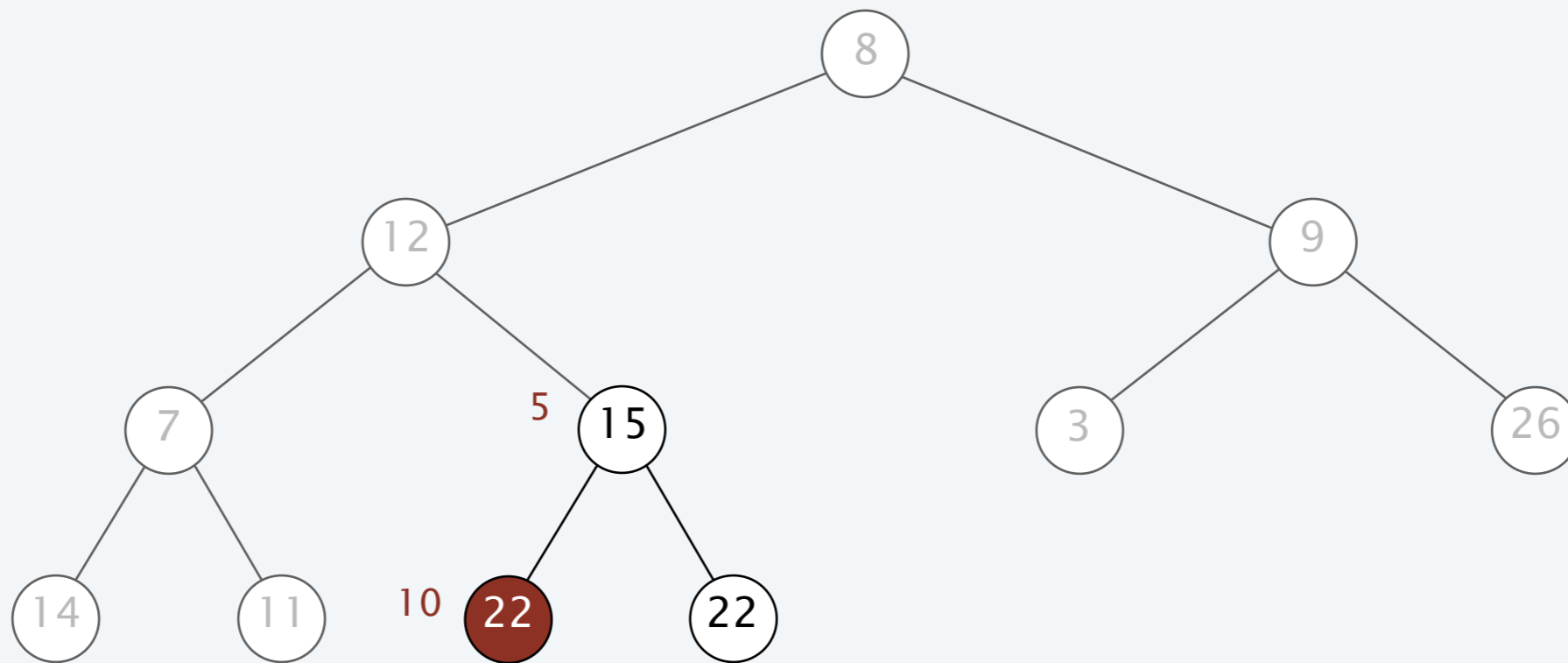# Heapify demo
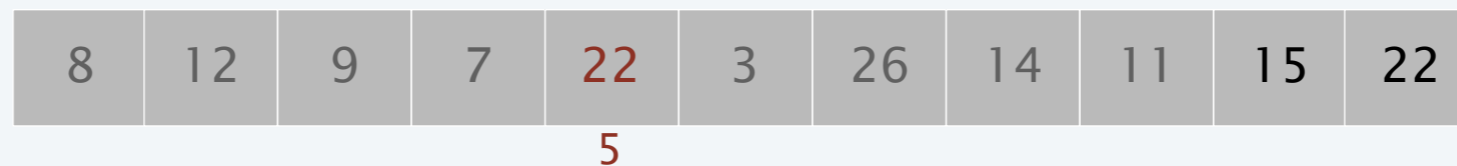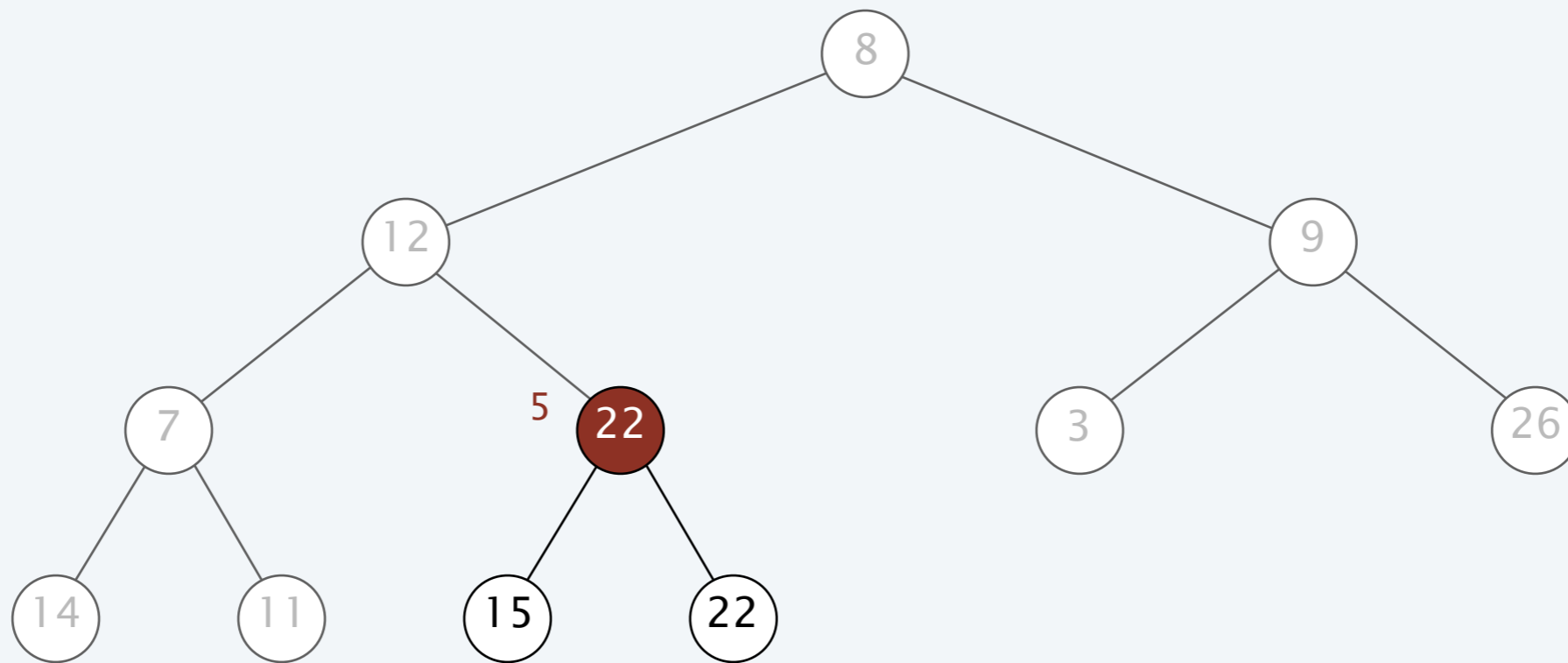
Heapify. For each element in reverse-array order, sink it down.

sink 5

# Heapify demo

Heapify. For each element in reverse-array order, sink it down.
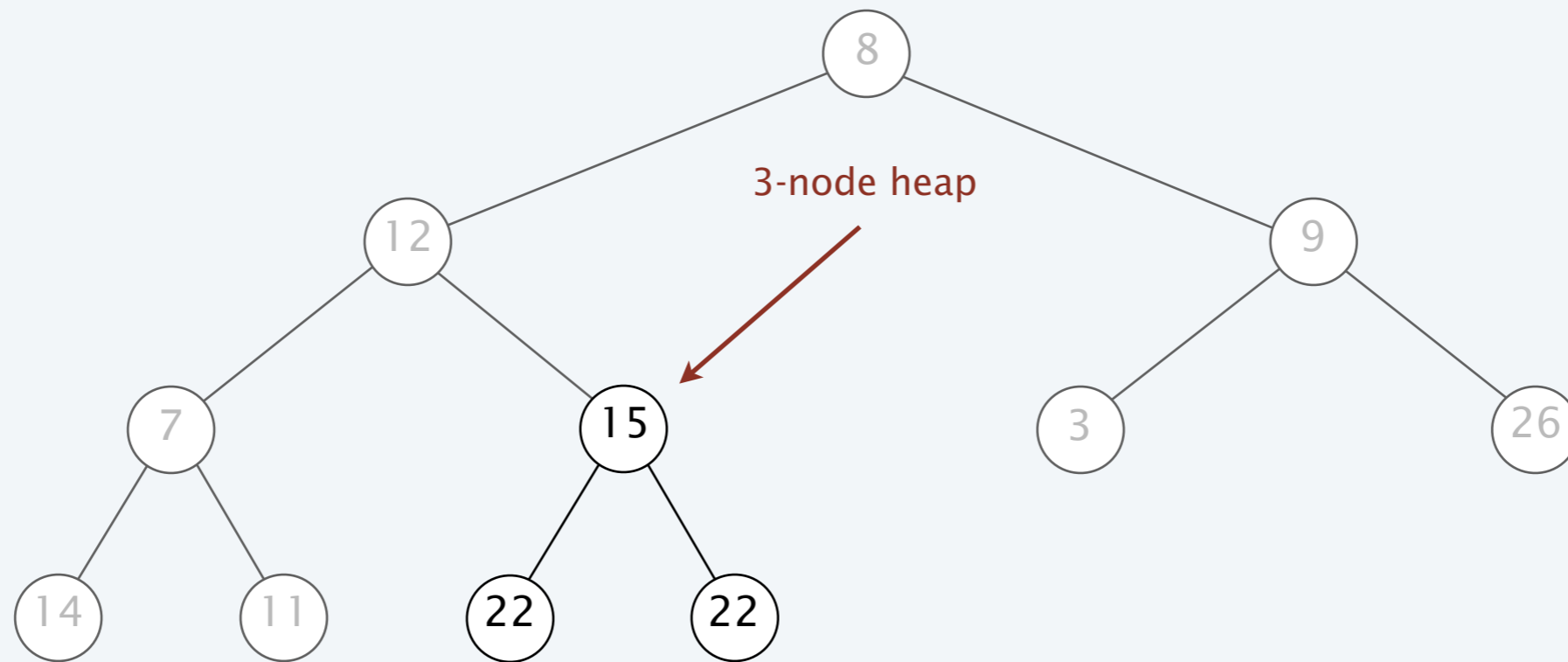
sink 5



| 8 | 12 | 9 | 7 | 15 | 3 | 26 | 14 | 11 | 22 | 22 |
|---|----|---|---|----|---|----|----|----|----|----|
|   |    |   |   | 5  |   |    |    |    | 10 |    |

# Heapify demo

Heapify. For each element in reverse-array order, sink it down.

**sink 5**



3-node heap

| 8 | 12 | 9 | 7 | 15 | 3 | 26 | 14 | 11 | 22 | 22 |
|---|----|---|---|----|---|----|----|----|----|----|
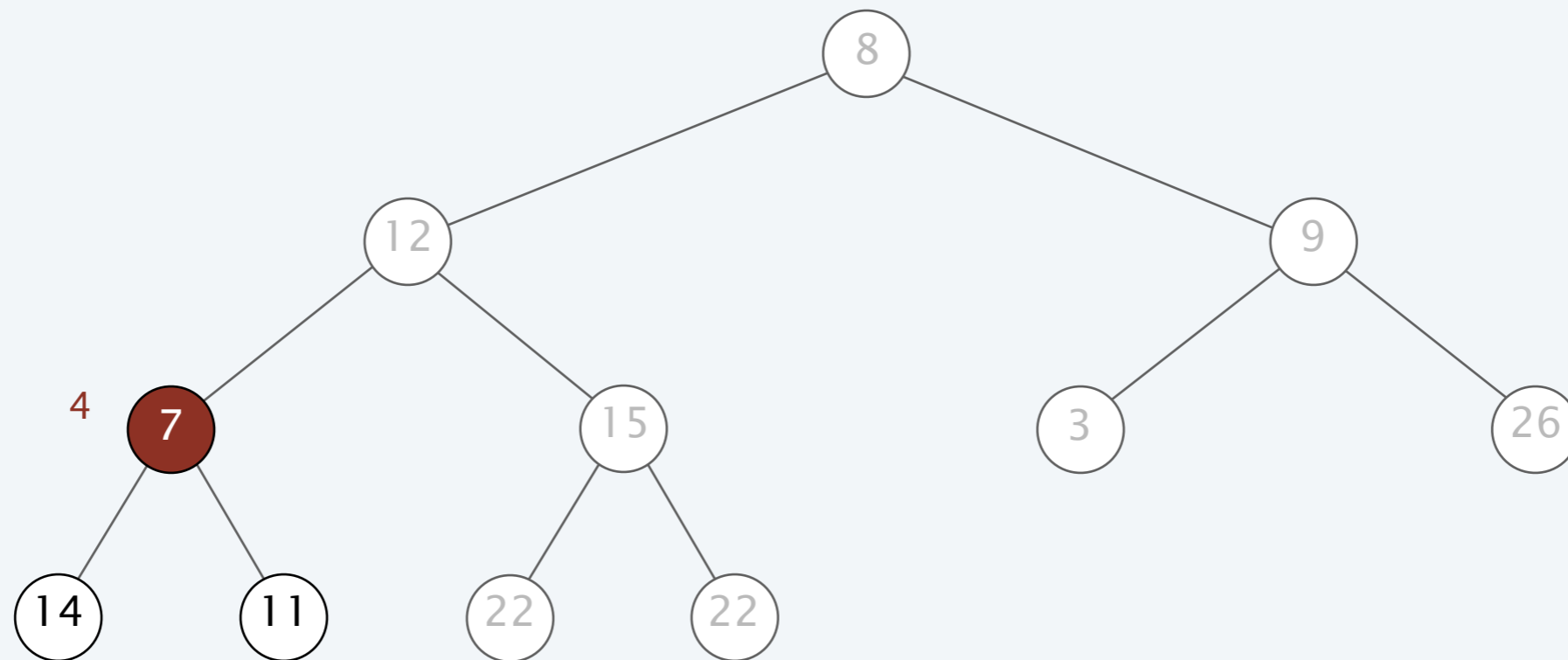
# Heapify demo

Heapify. For each element in reverse-array order, sink it down.

sink 4



| 8 | 12 | 9 | 7 | 15 | 3 | 26 | 14 | 11 | 22 | 22 |
|---|----|---|---|----|---|----|----|----|----|----|
|   |    |   | 4 |    |   |    |    |    |    |    |

# Heapify demo

Heapify. For each element in reverse-array order, sink it down.

**sink 4**



3-node heap

| 8 | 12 | 9 | 7 | 15 | 3 | 26 | 14 | 11 | 22 | 22 |
|---|----|---|---|----|---|----|----|----|----|----|

# Heapify demo

Heapify. For each element in reverse-array order, sink it down.

**sink 3**



| 8 | 12 | 9 | 7 | 15 | 3 | 26 | 14 | 11 | 22 | 22 |
|---|----|---|---|----|---|----|----|----|----|----|

# Heapify demo

Heapify.  For each element in reverse-array order, sink it down.

**sink 3**



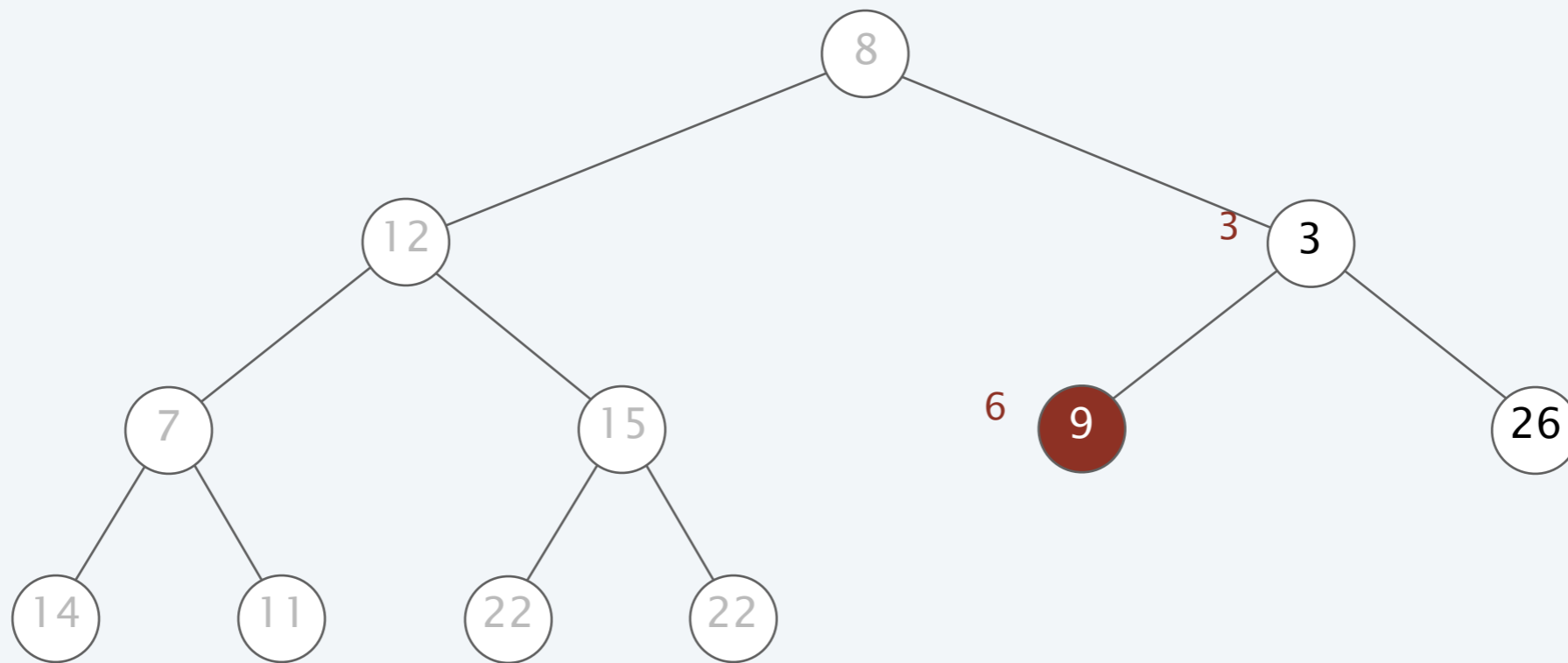| 8 | 12 | 3 | 7 | 15 | 9 | 26 | 14 | 11 | 22 | 22 |
|---|----|---|---|----|---|----|----|----|----|----|
|   |    | 3 |   |    | 6 |    |    |    |    |    |

# Heapify demo

Heapify. For each element in reverse-array order, sink it down.

sink 3



3-node heap
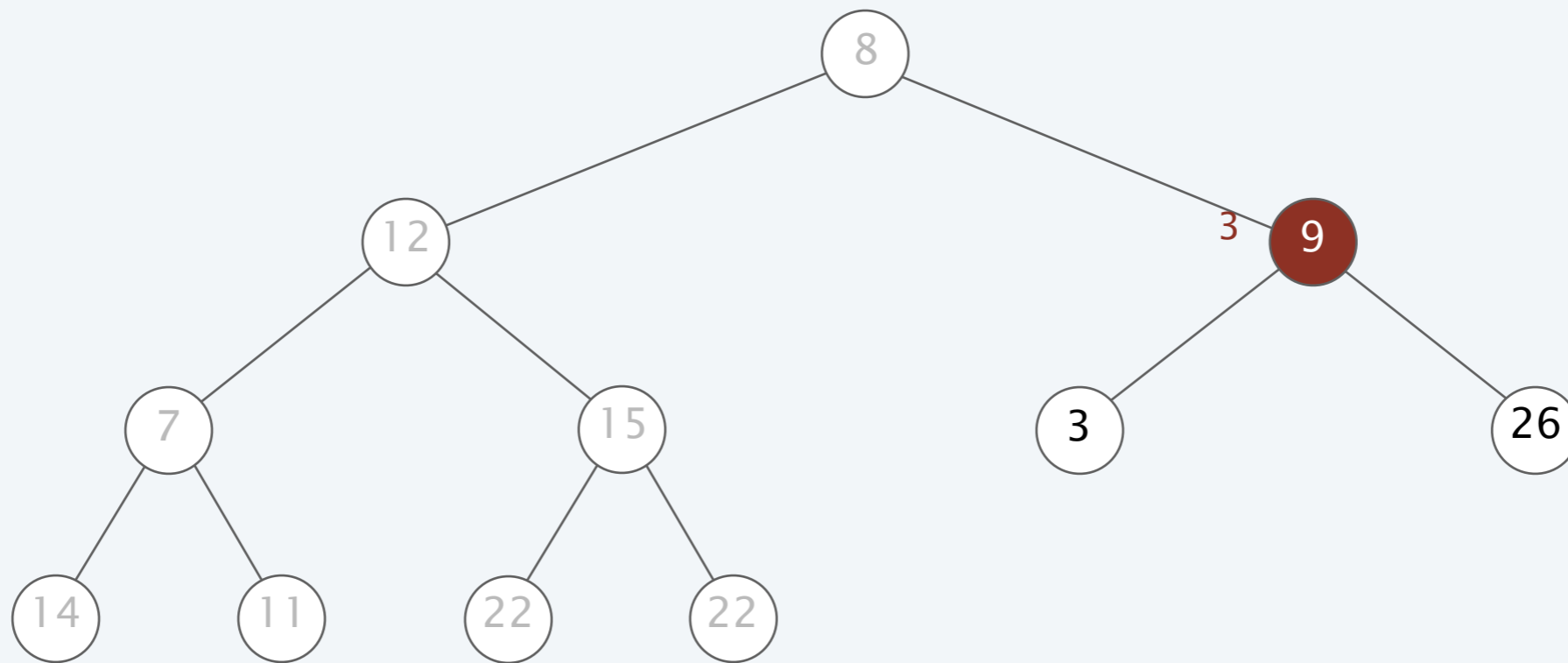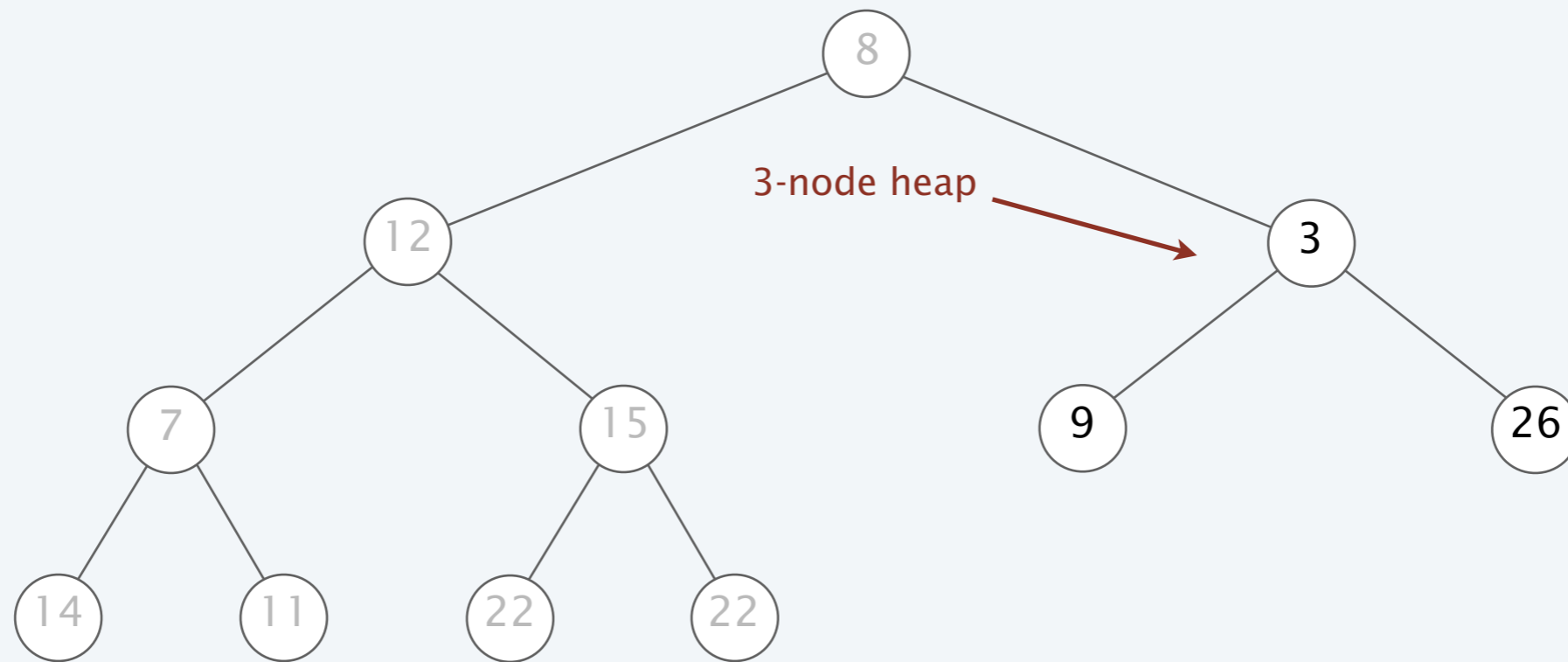
| 8 | 12 | 3 | 7 | 15 | 26 | 26 | 14 | 11 | 22 | 22 |
|---|----|---|---|----|----|----|----|----|----|----|

# Heapify demo

Heapify. For each element in reverse-array order, sink it down.

**sink 2**



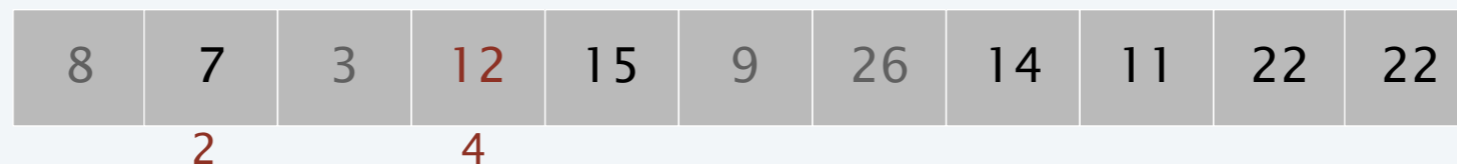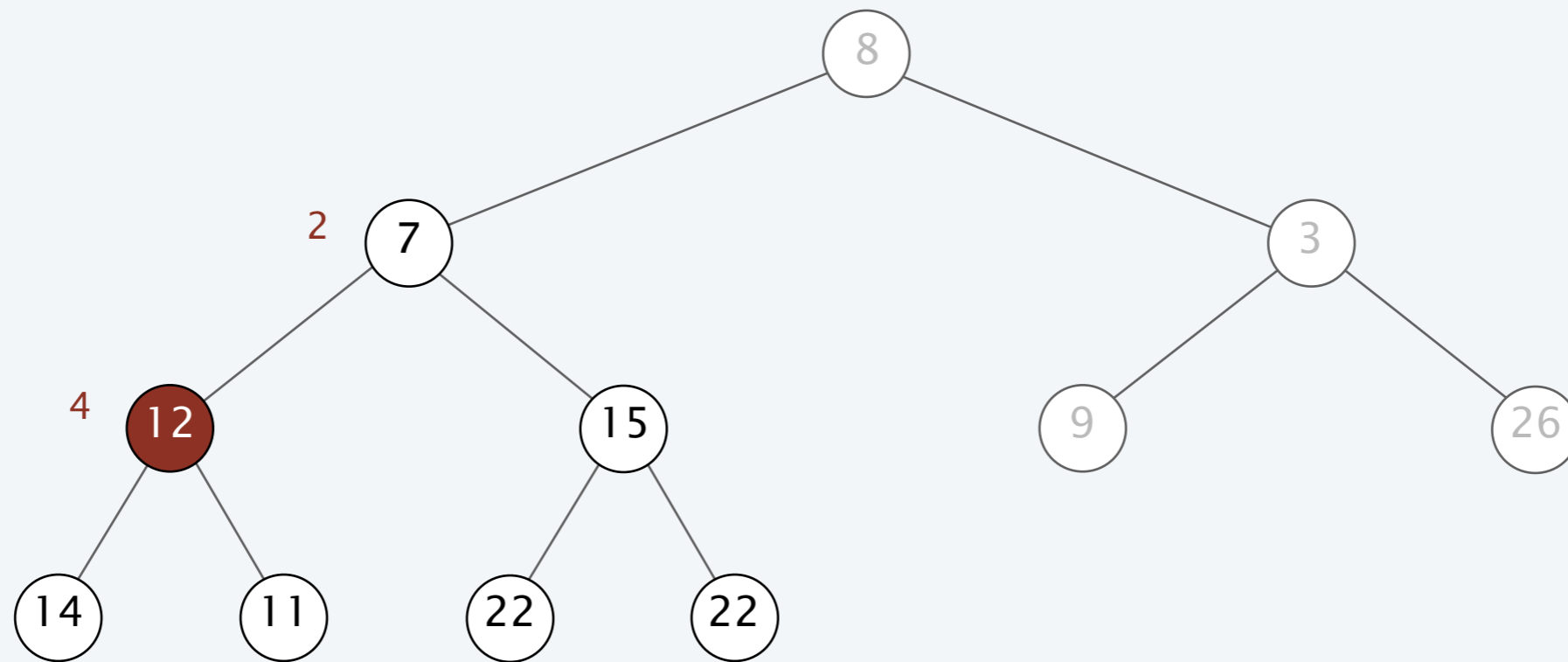| 8 | 12 | 3 | 7 | 15 | 9 | 26 | 14 | 11 | 22 | 22 |
|---|----|---|---|----|---|----|----|----|----|----|
|   | 2  |   |   |    |   |    |    |    |    |    |

# Heapify demo

Heapify. For each element in reverse-array order, sink it down.

sink 2



| 8 | 7 | 3 | 12 | 15 | 9 | 26 | 14 | 11 | 22 | 22 |
|---|---|---|----|----|---|----|----|----|----|----|
|   | 2 |   | 4  |    |   |    |    |    |    |    |
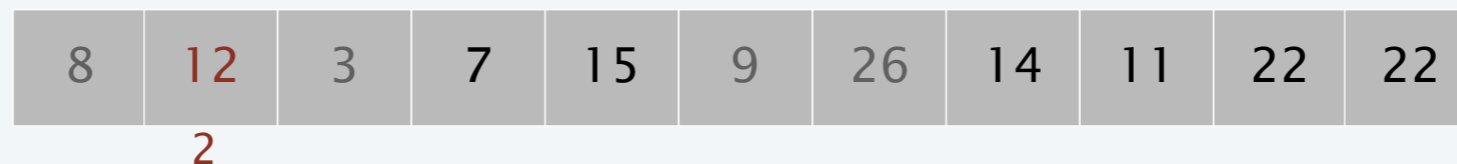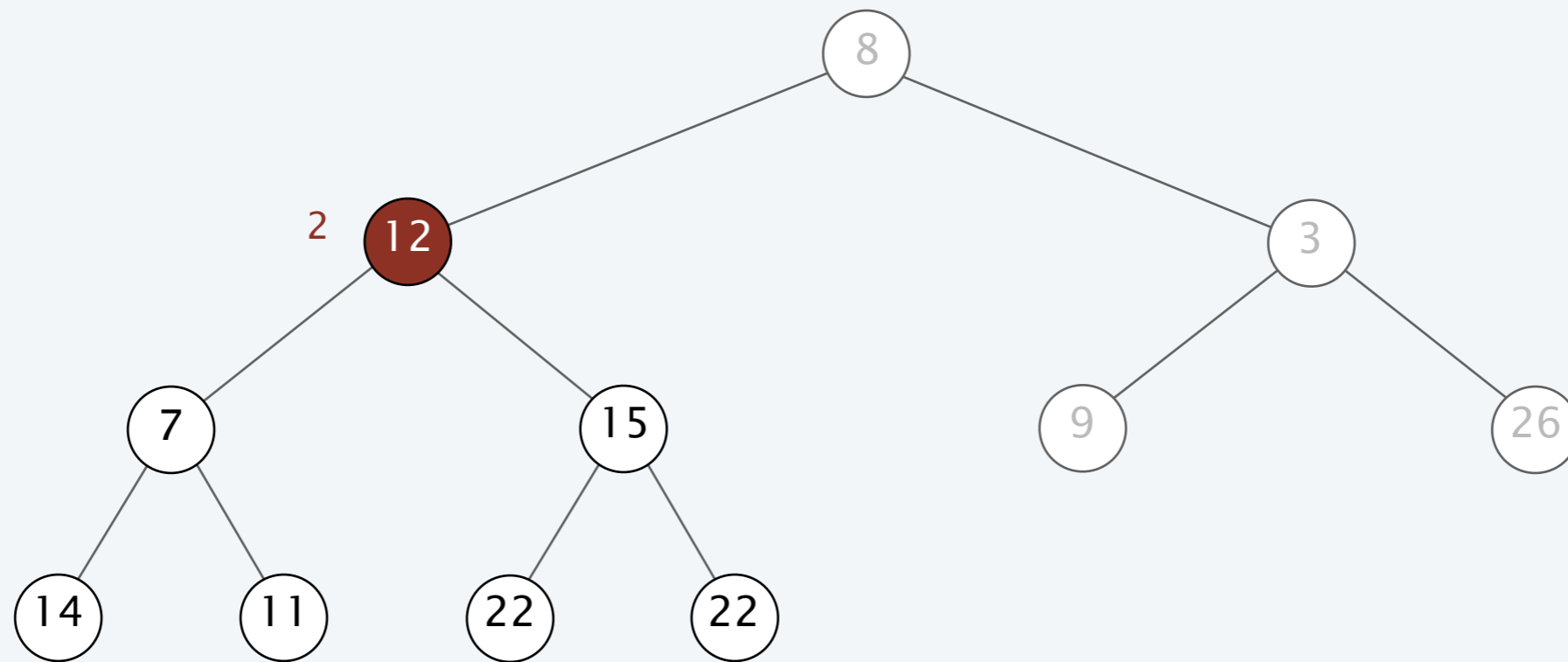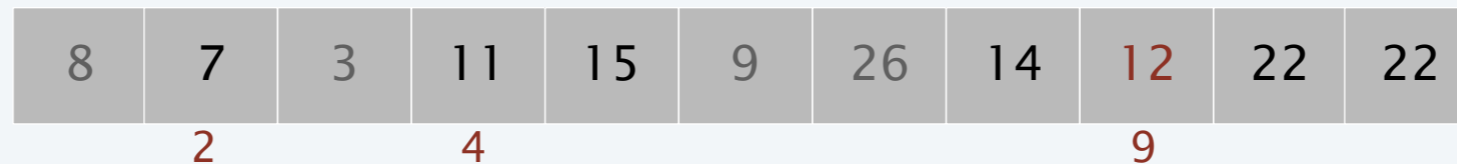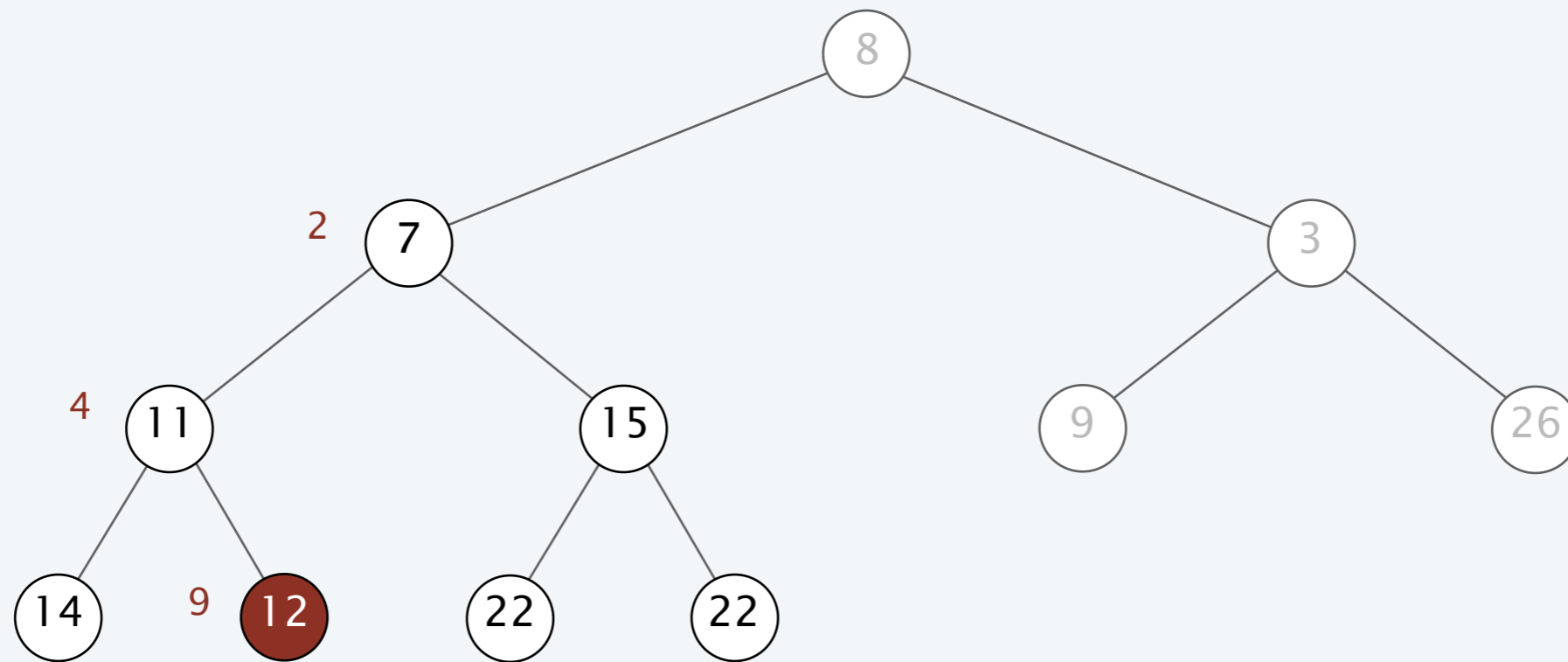
# Heapify demo

Heapify.  For each element in reverse-array order, sink it down.



sink 2

| | 8 | 7 | 3 | 11 | 15 | 9 | 26 | 14 | 12 | 22 | 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2 | | 4 | | | | | 9 | | |

# Heapify demo

Heapify. For each element in reverse-array order, sink it down.

**sink 2**



7-node heap

| 8 | 7 | 3 | 11 | 15 | 9 | 26 | 14 | 12 | 22 | 22 |
|---|---|---|---|---|---|---|---|---|---|---|

# Heapify demo

Heapify. For each element in reverse-array order, sink it down.

**sink 1**



| | 8 | 7 | 3 | 11 | 15 | 9 | 26 | 14 | 12 | 22 | 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|

# Heapify demo

Heapify. For each element in reverse-array order, sink it down.

**sink 1**

# Heapify demo

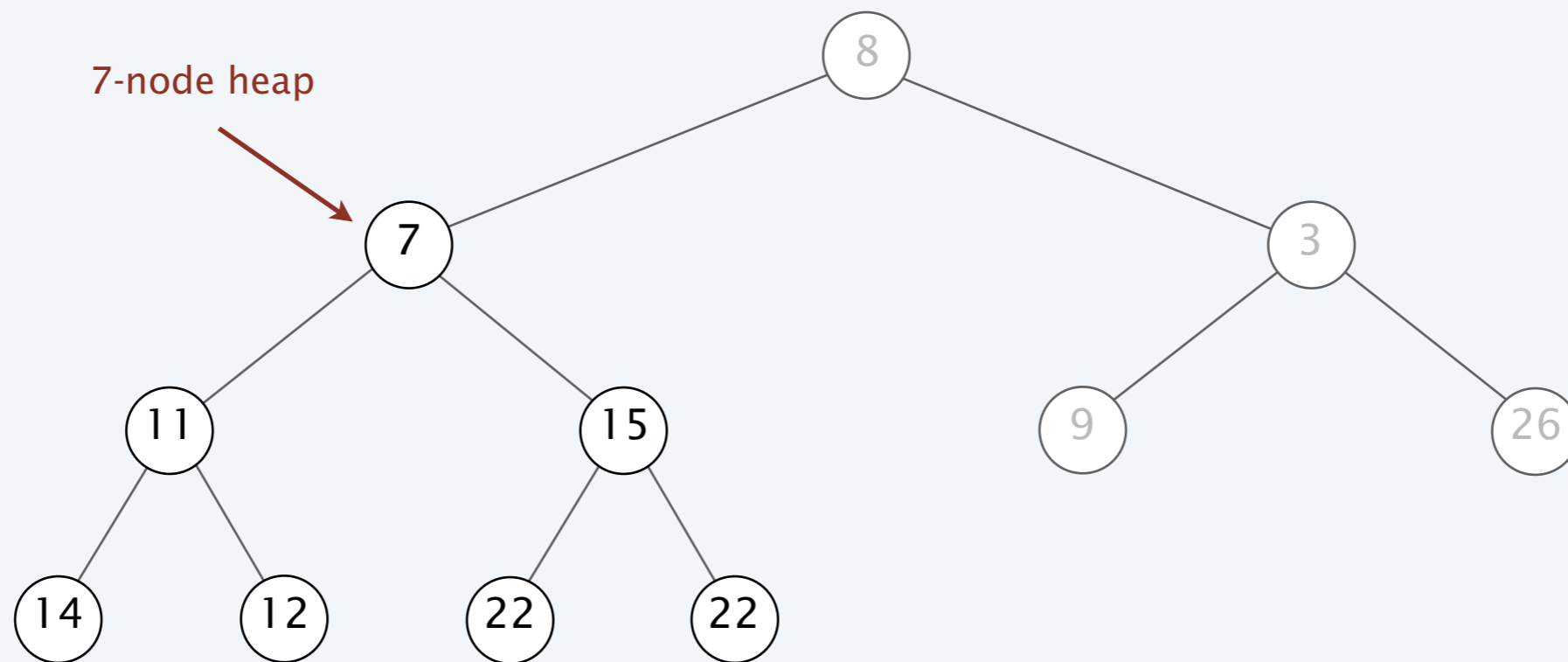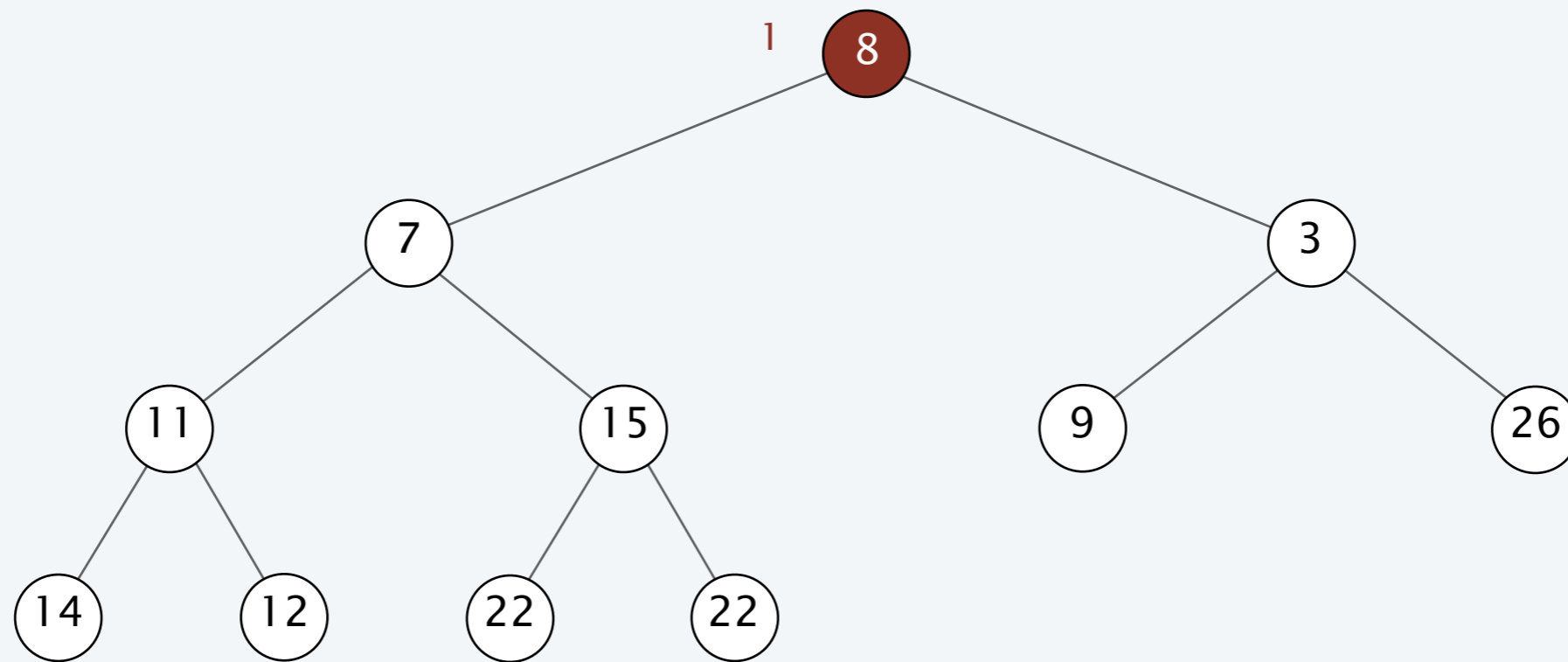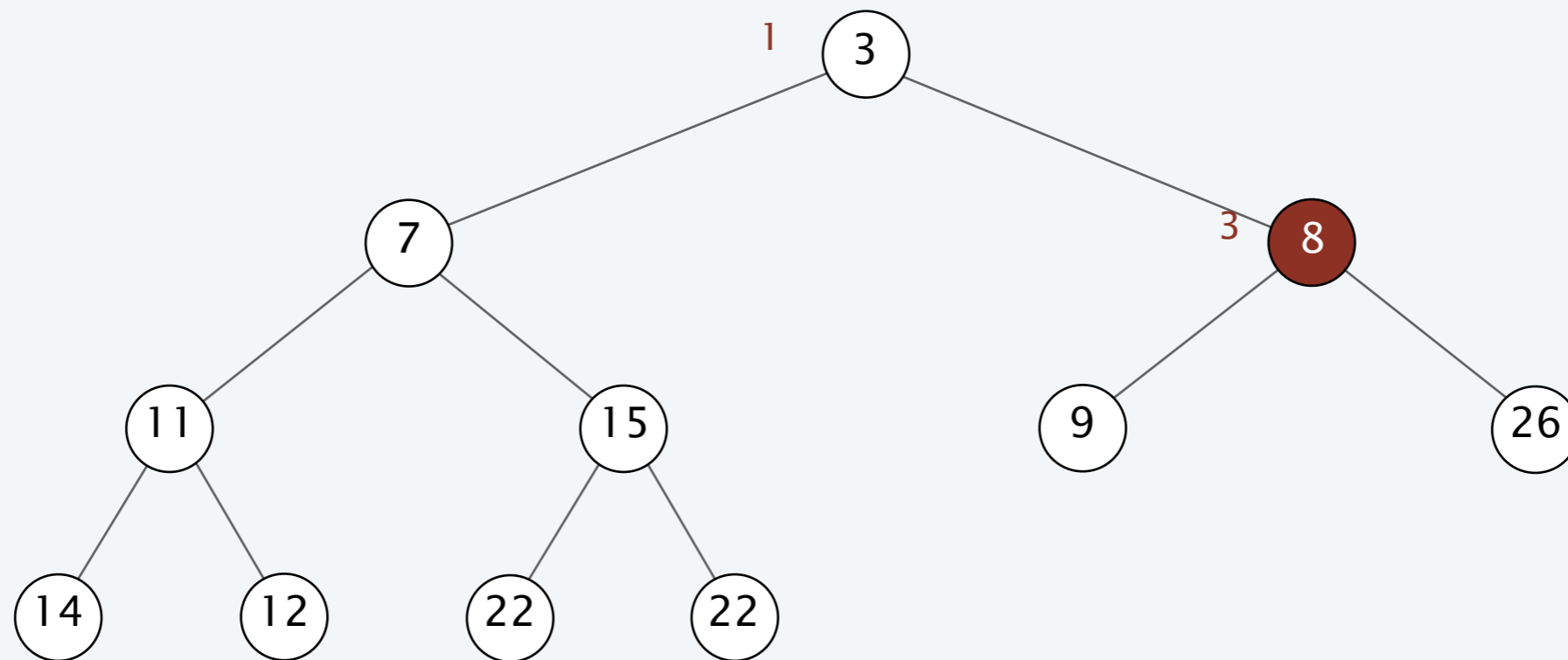Heapify. For each element in reverse-array order, sink it down.

**array is heap ordered**

11-node heap



| 3 | 7 | 8 | 11 | 15 | 9 | 26 | 14 | 12 | 22 | 22 |
|---|---|---|----|----|---|----|----|----|----|----|