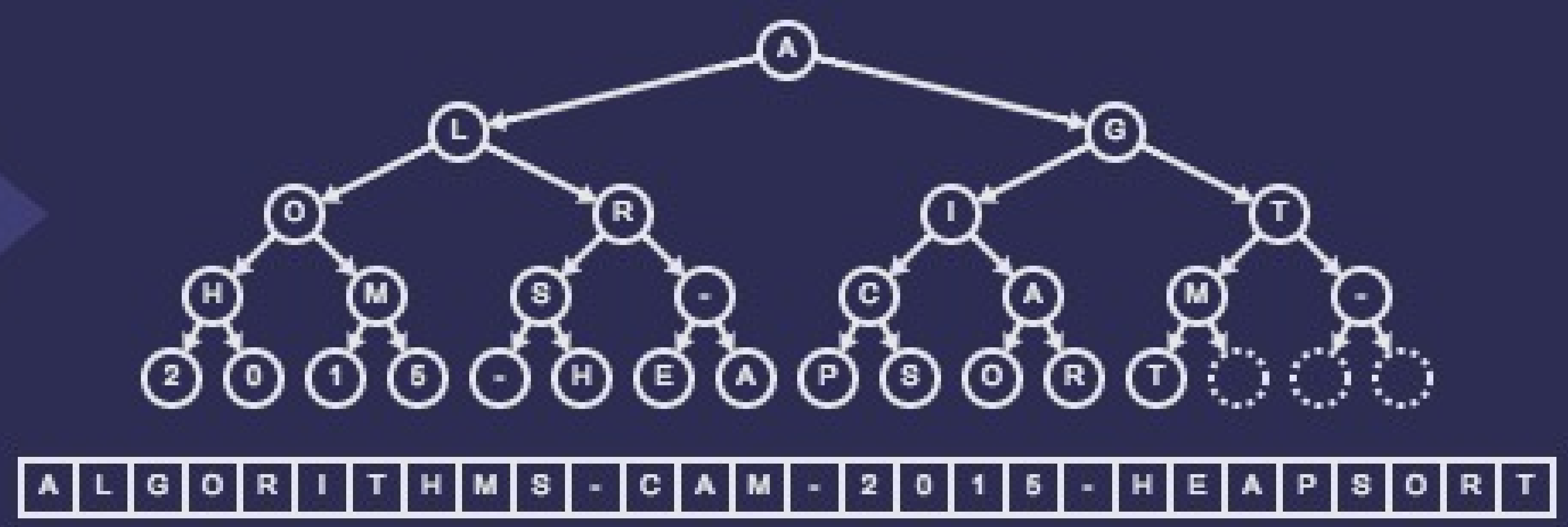
HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



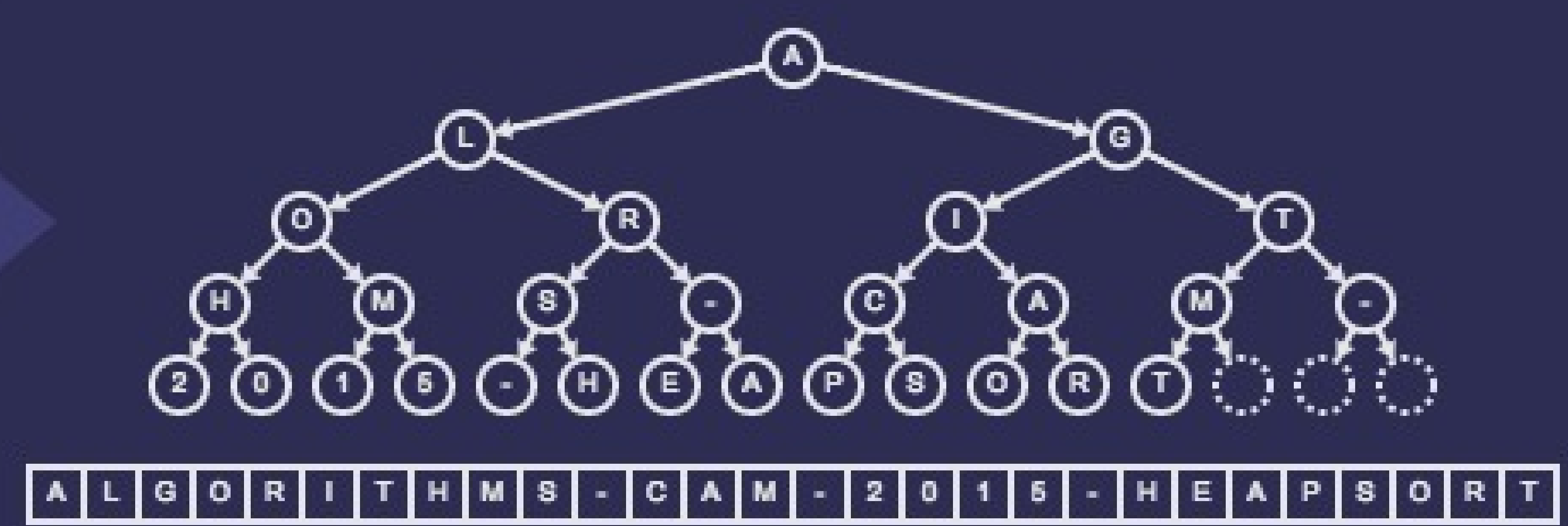
OUTPUT

Sorting an array

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

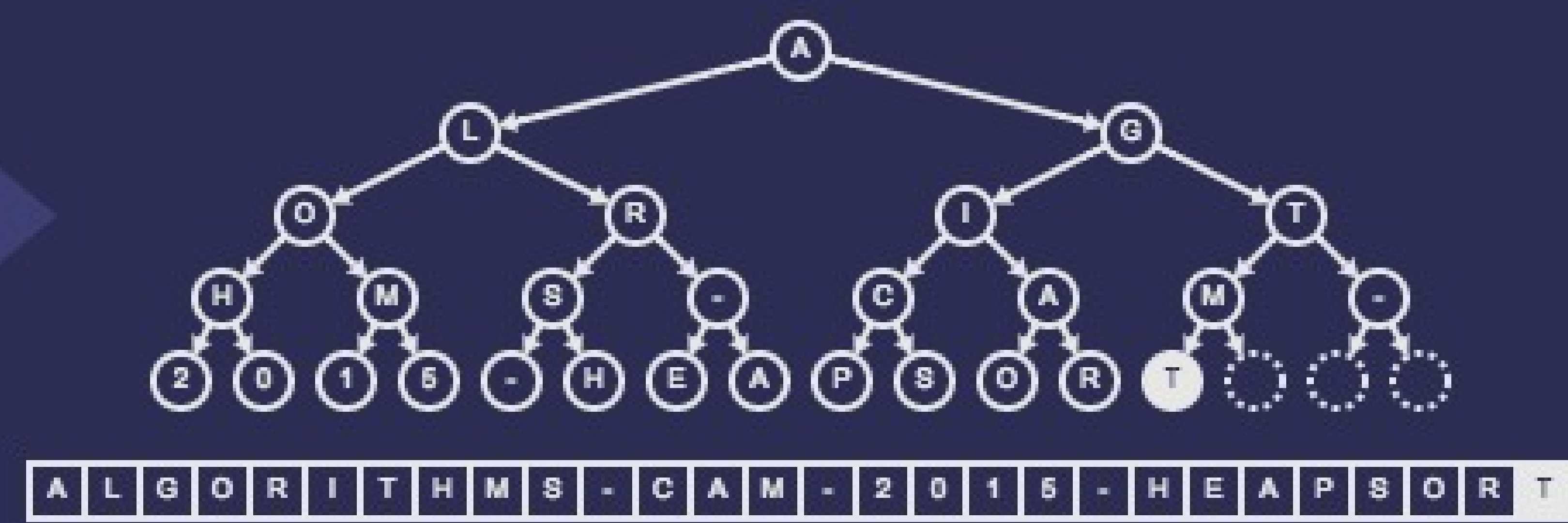
Step 1. Think of the array as a binary tree

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

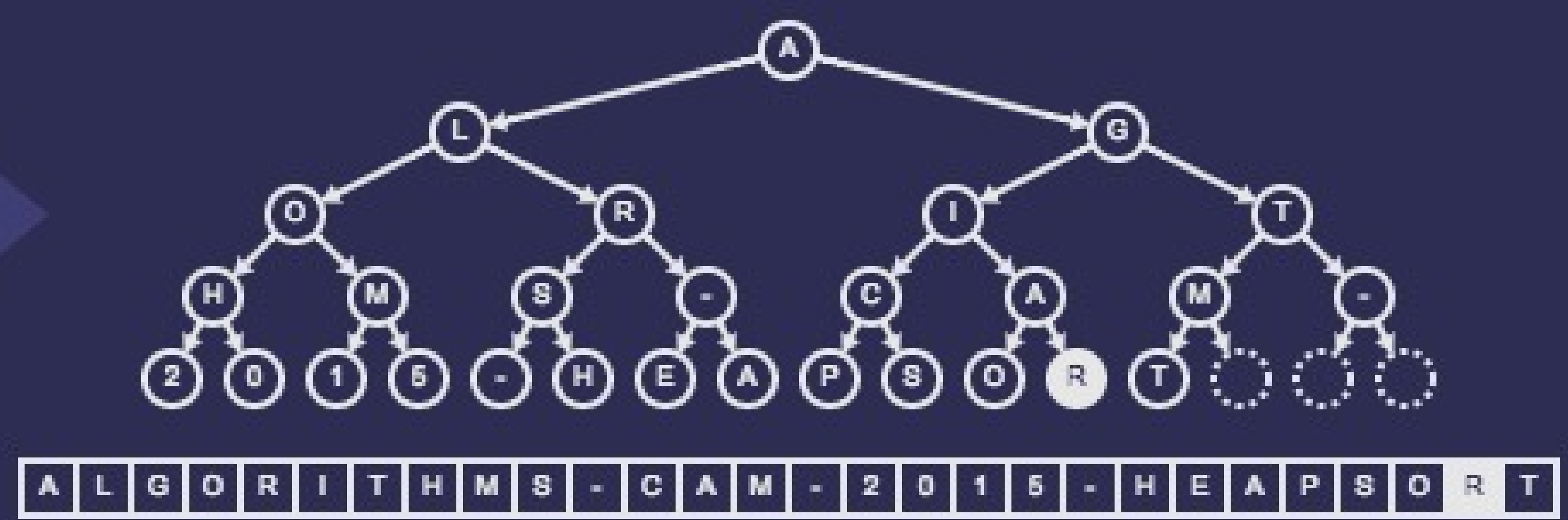


Step 2. This node has no children, so leave it

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

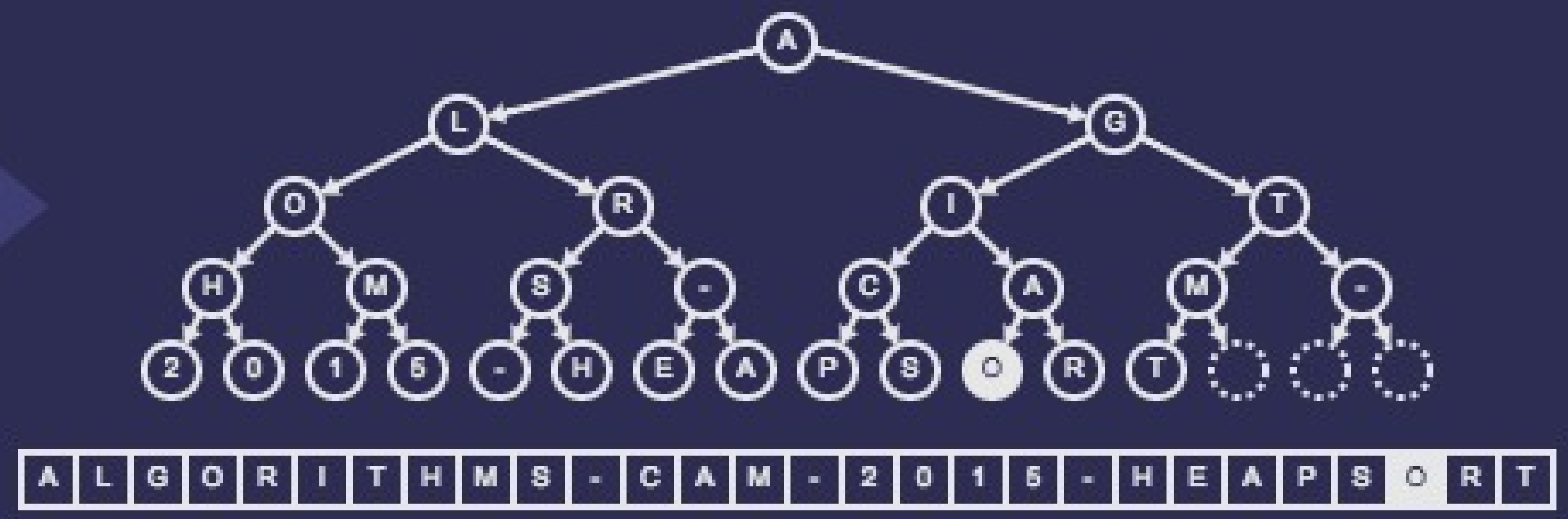
Step 3. This node has no children, so leave it

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

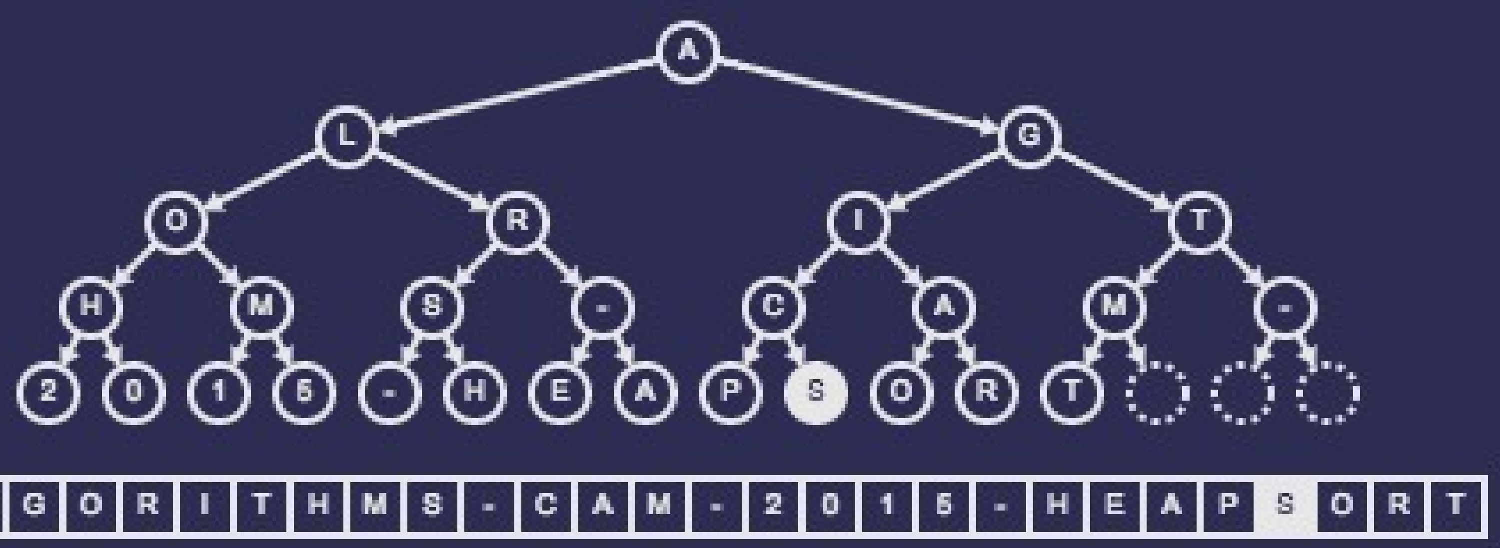


Step 4. This node has no children, so leave it

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



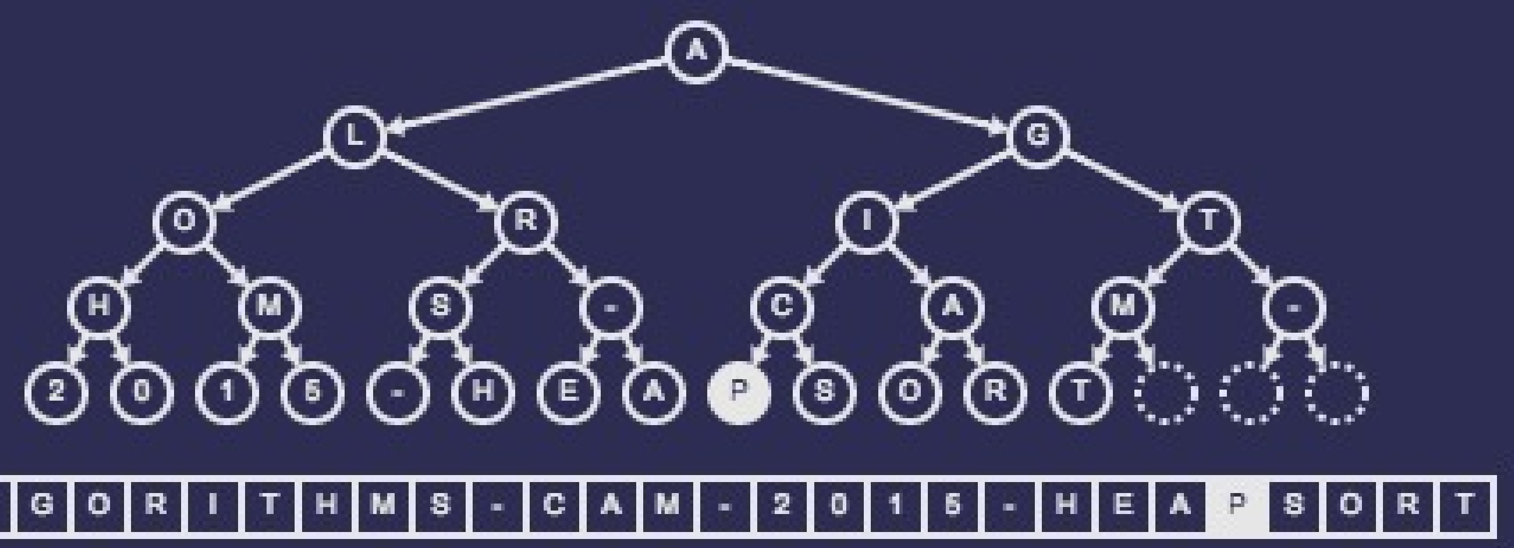
OUTPUT

Step 5. This node has no children, so leave it

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



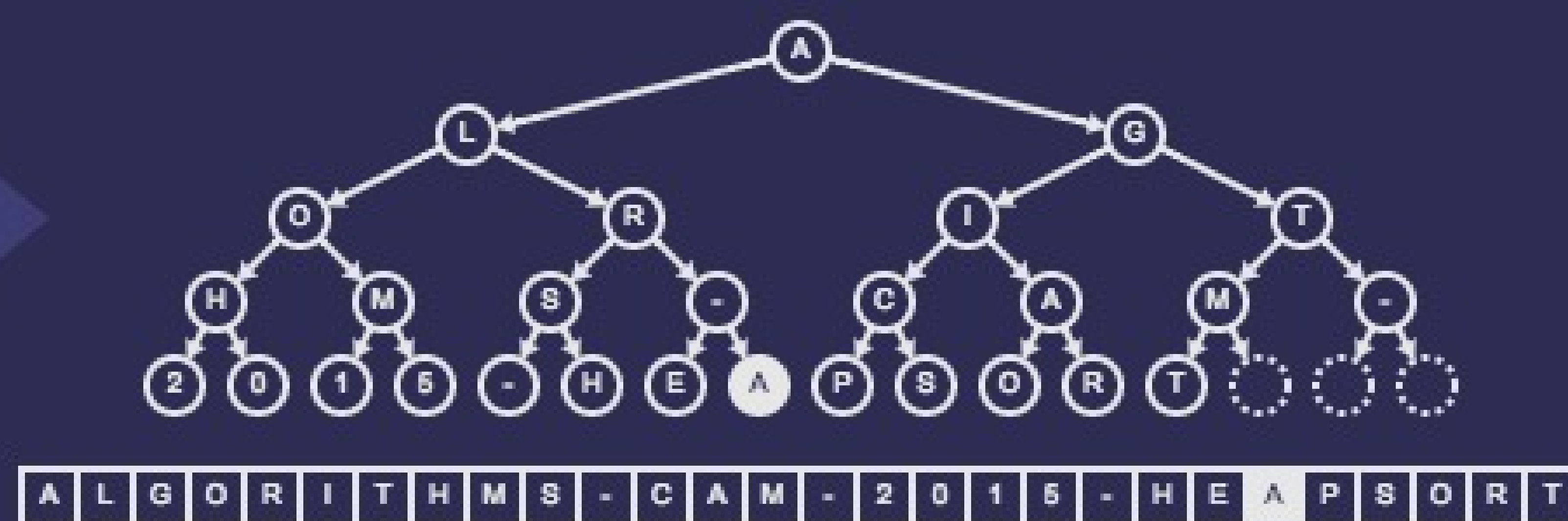
OUTPUT

Step 6. This node has no children, so leave it

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

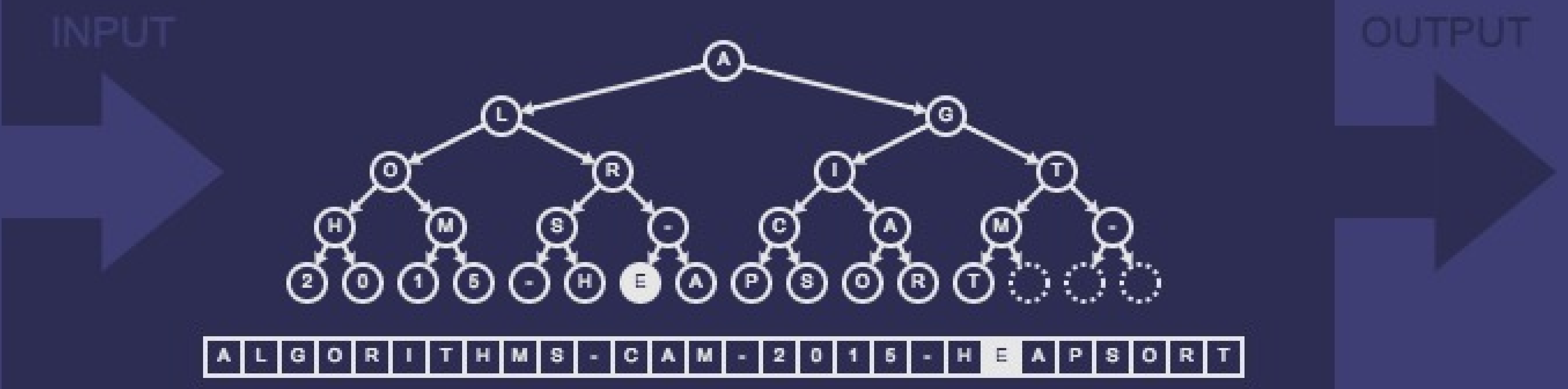


OUTPUT

Step 7. This node has no children, so leave it

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

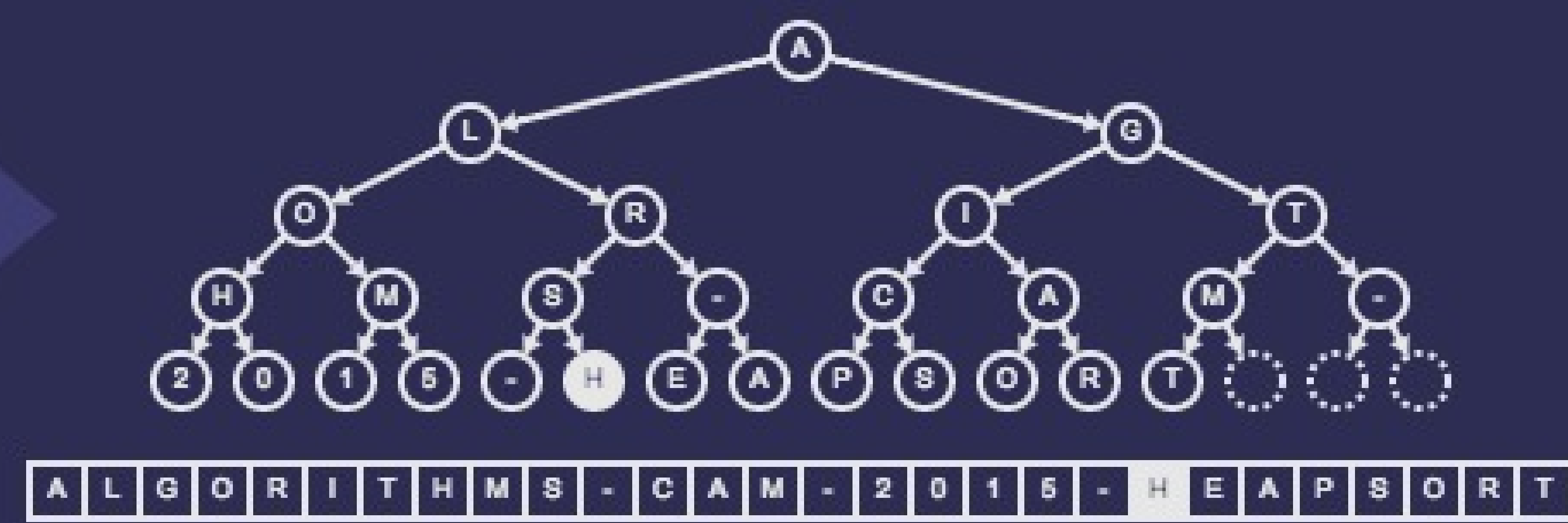


Step 8. This node has no children, so leave it

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

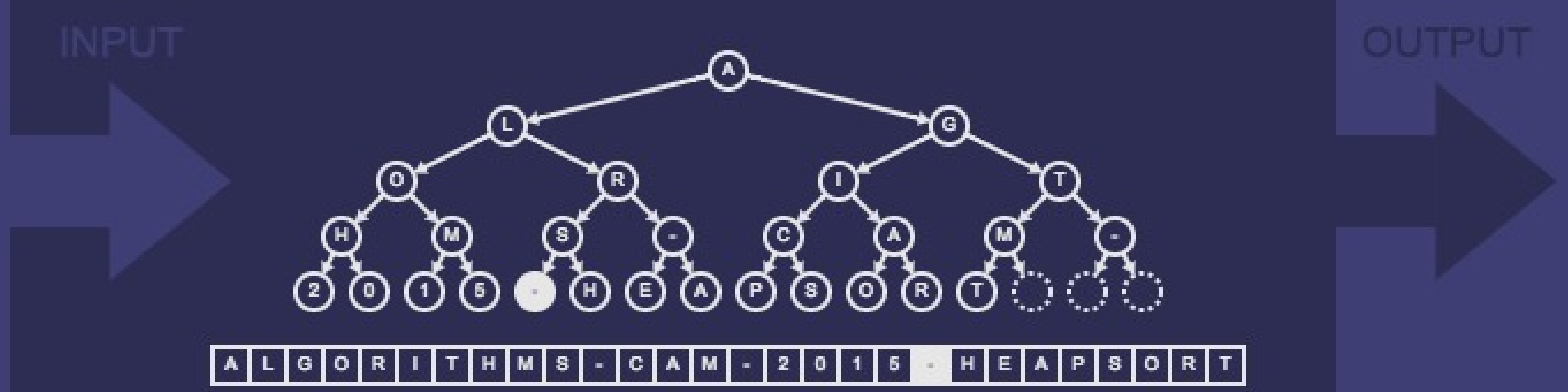


OUTPUT

Step 9. This node has no children, so leave it

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

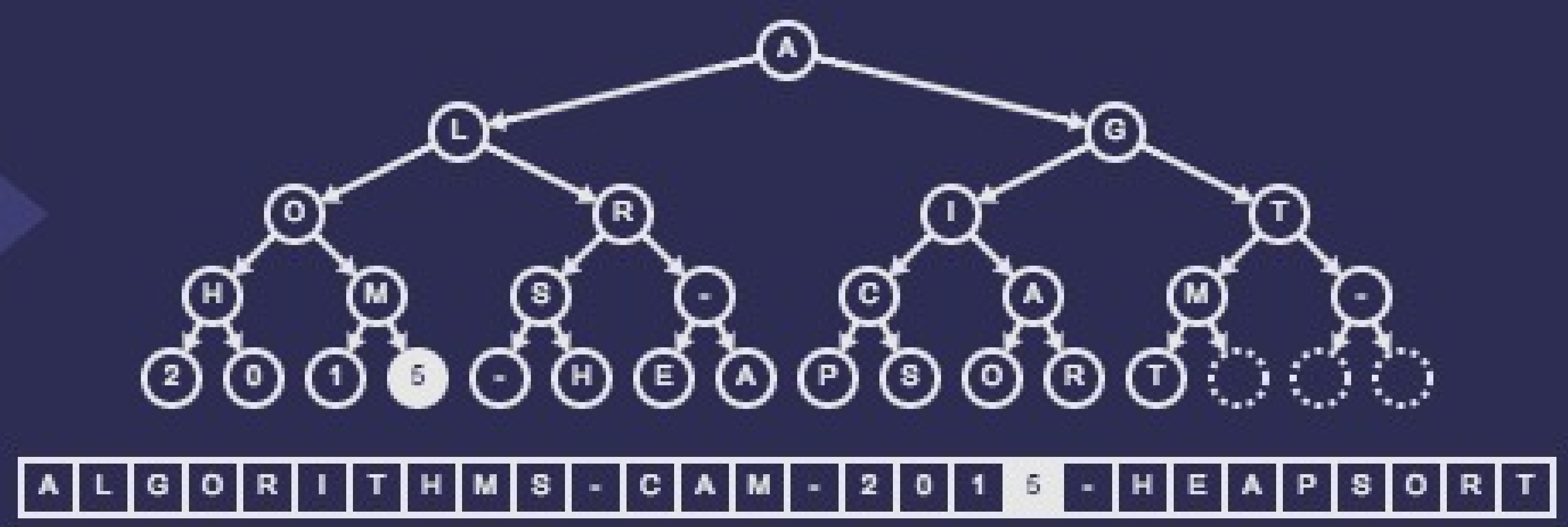


Step 10. This node has no children, so leave it

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

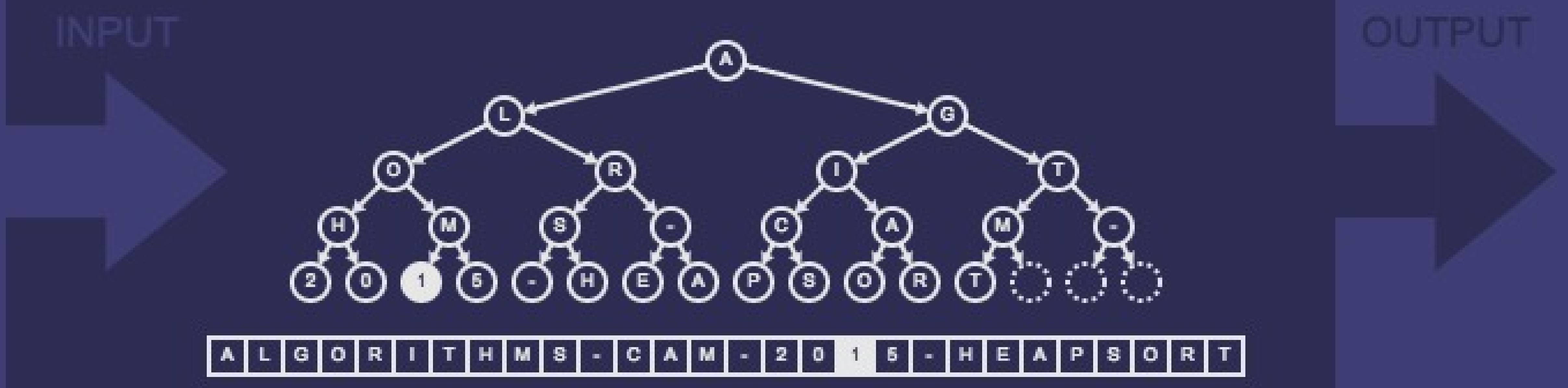


OUTPUT

Step 11. This node has no children, so leave it

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T



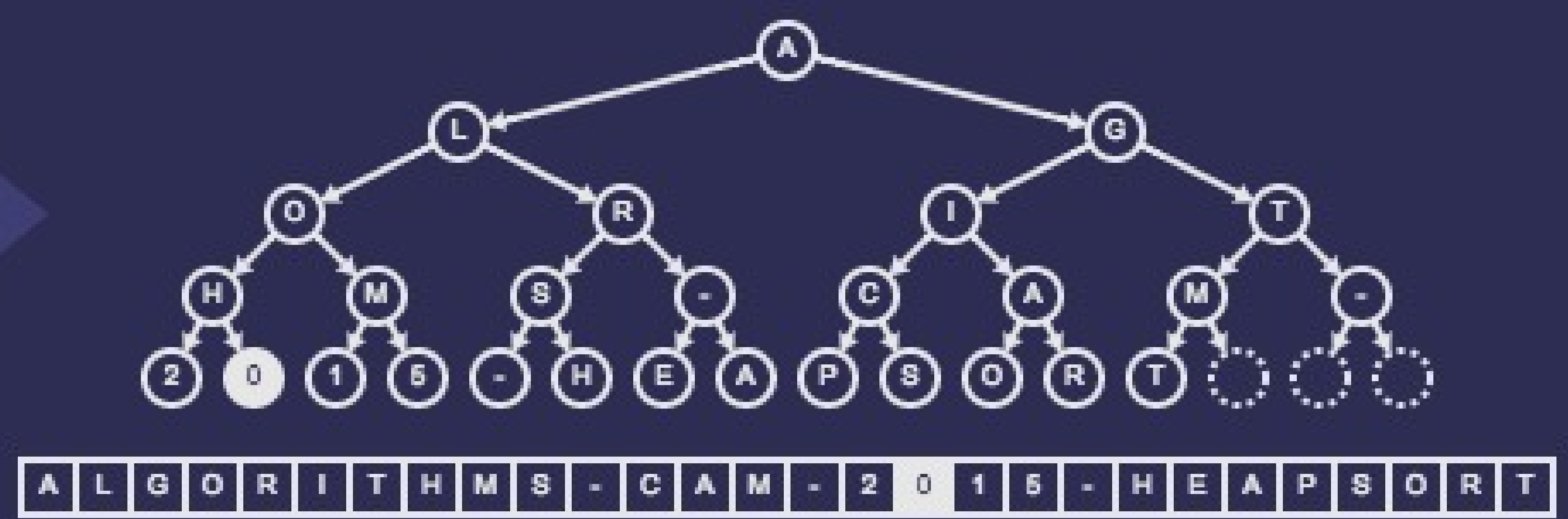
Step 12. This node has no children, so leave it

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

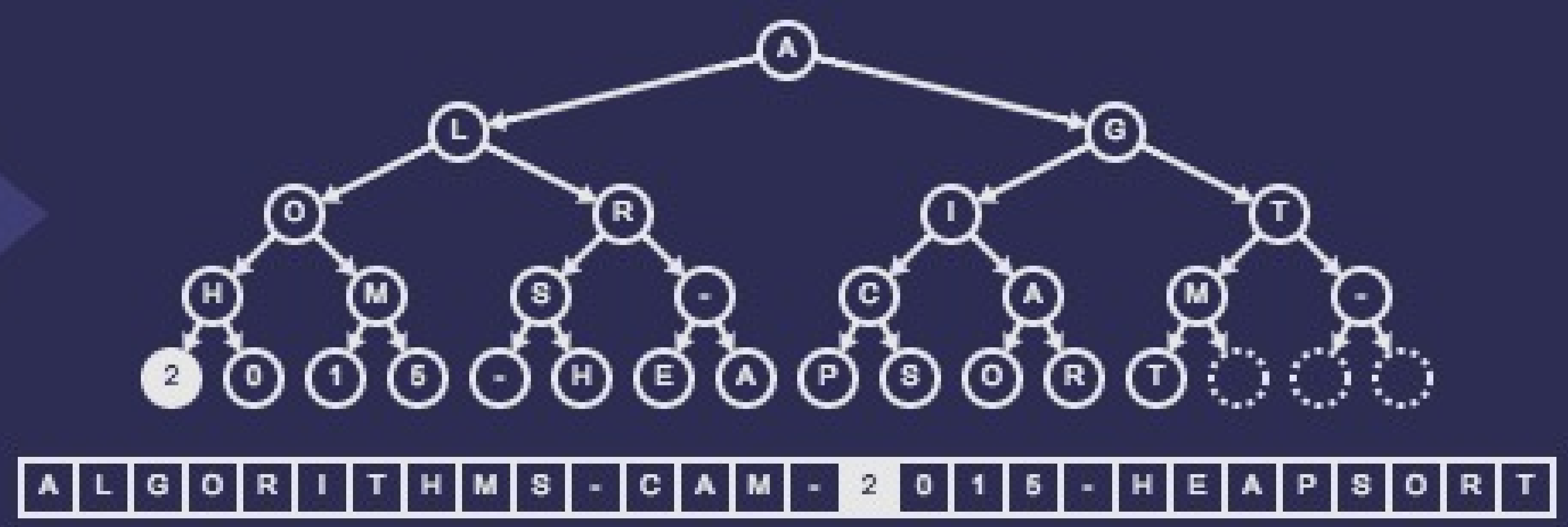


Step 13. This node has no children, so leave it

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

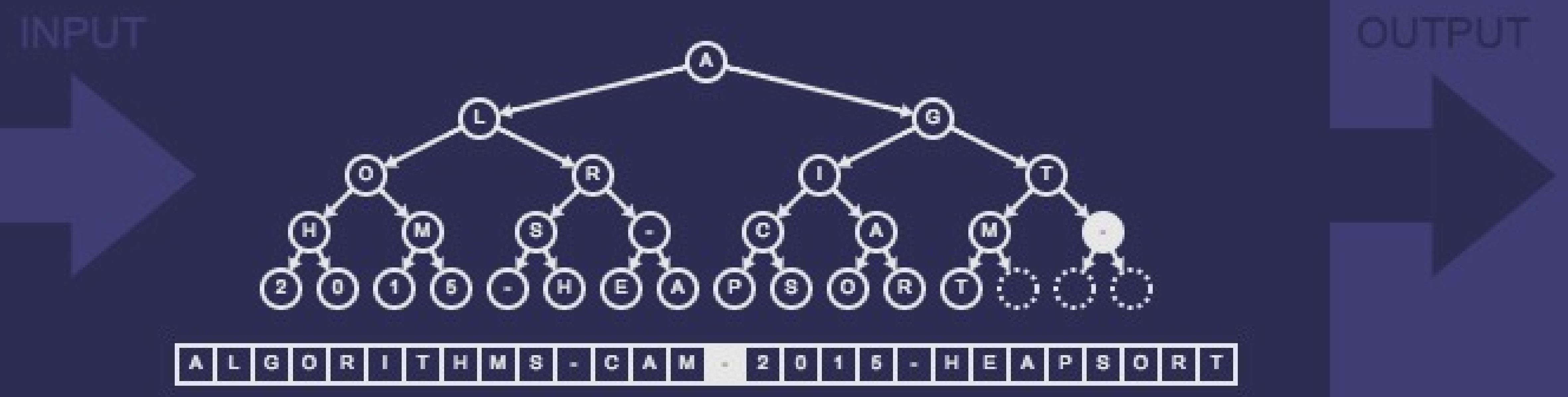


OUTPUT

Step 14. This node has no children, so leave it

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

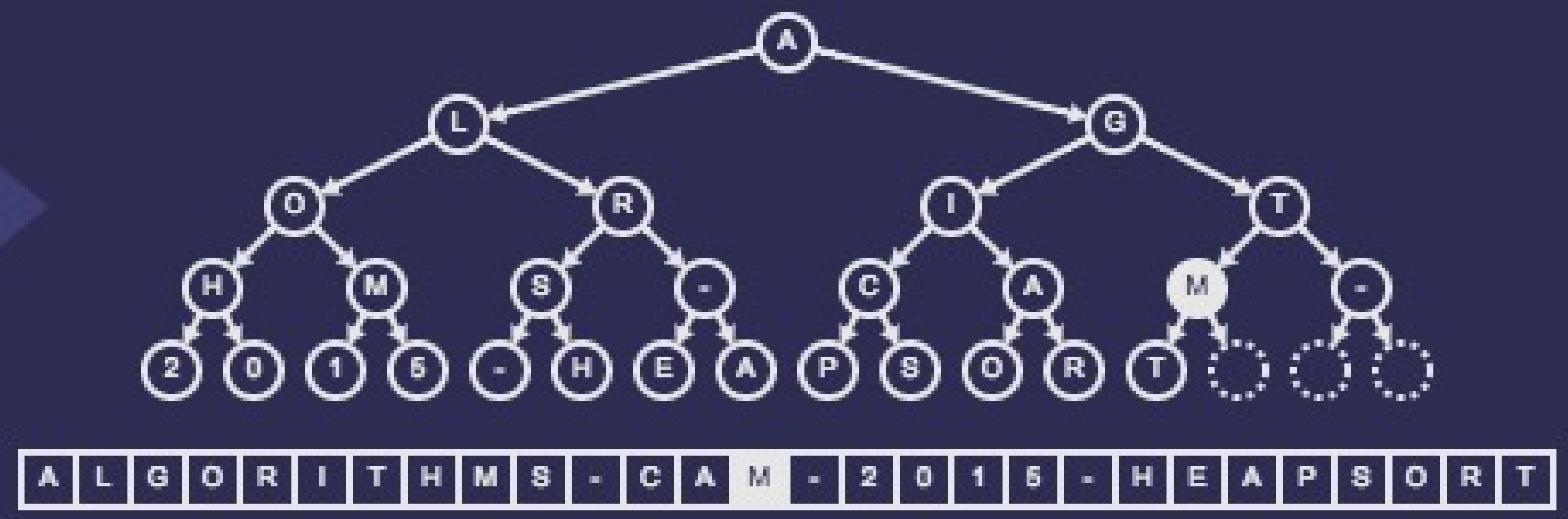


Step 15. This node has no children, so leave it

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



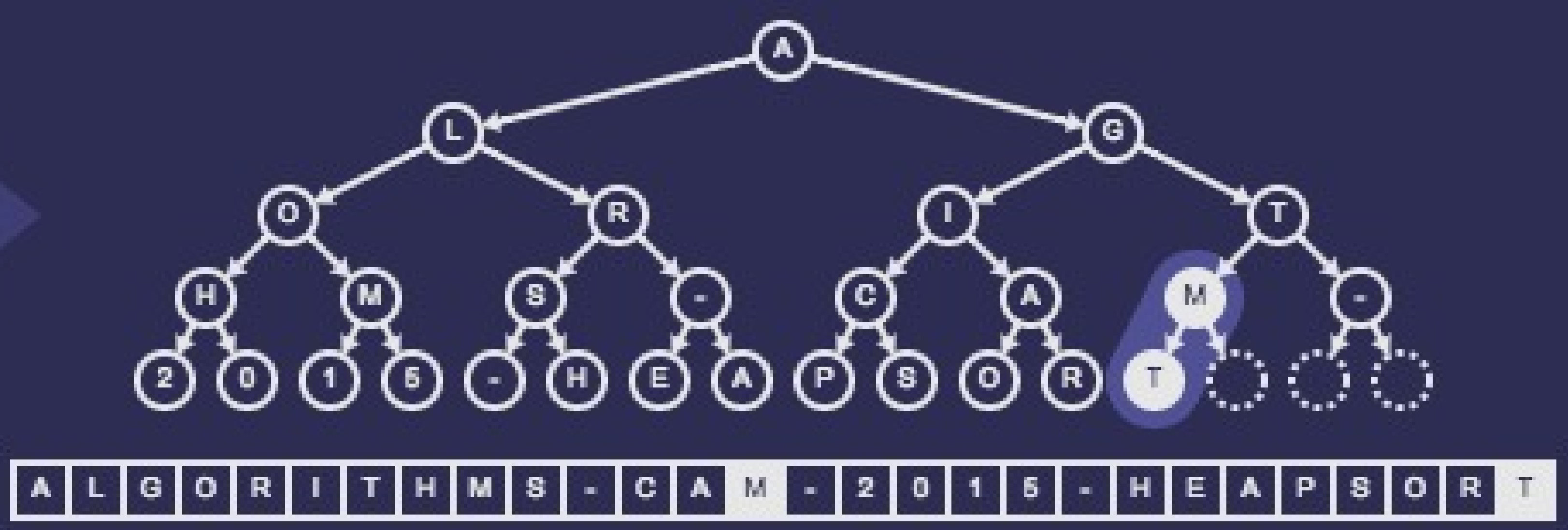
OUTPUT

Step 16. This node has children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



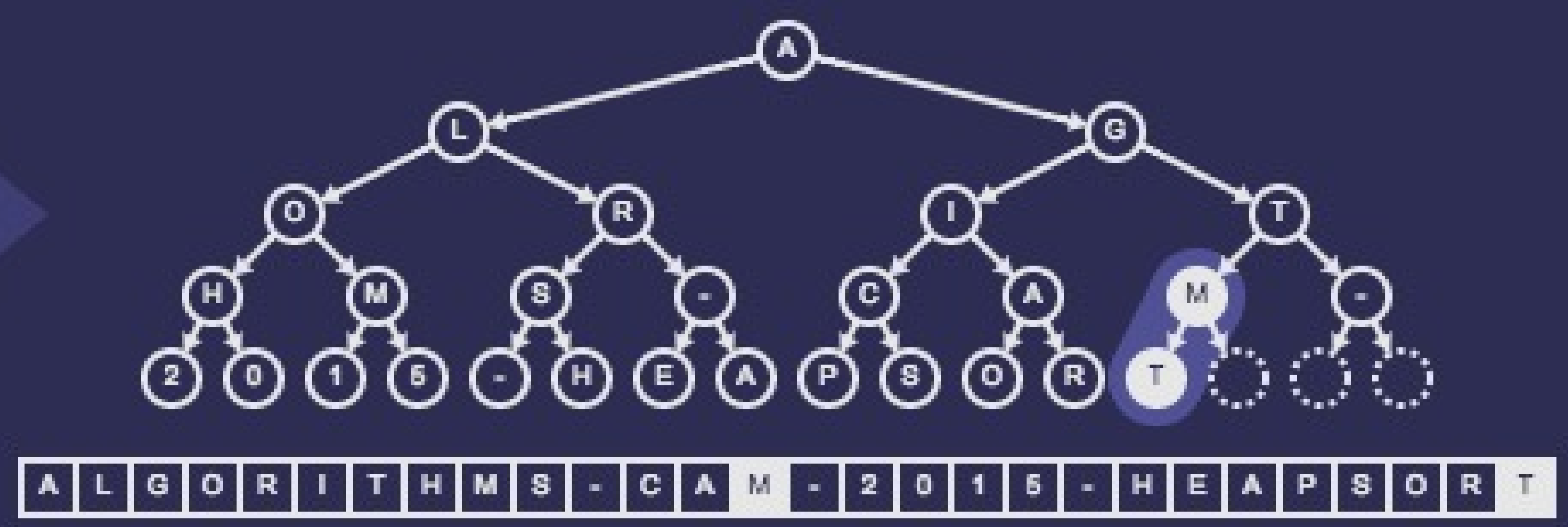
OUTPUT

Step 17. Compare the node with its child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

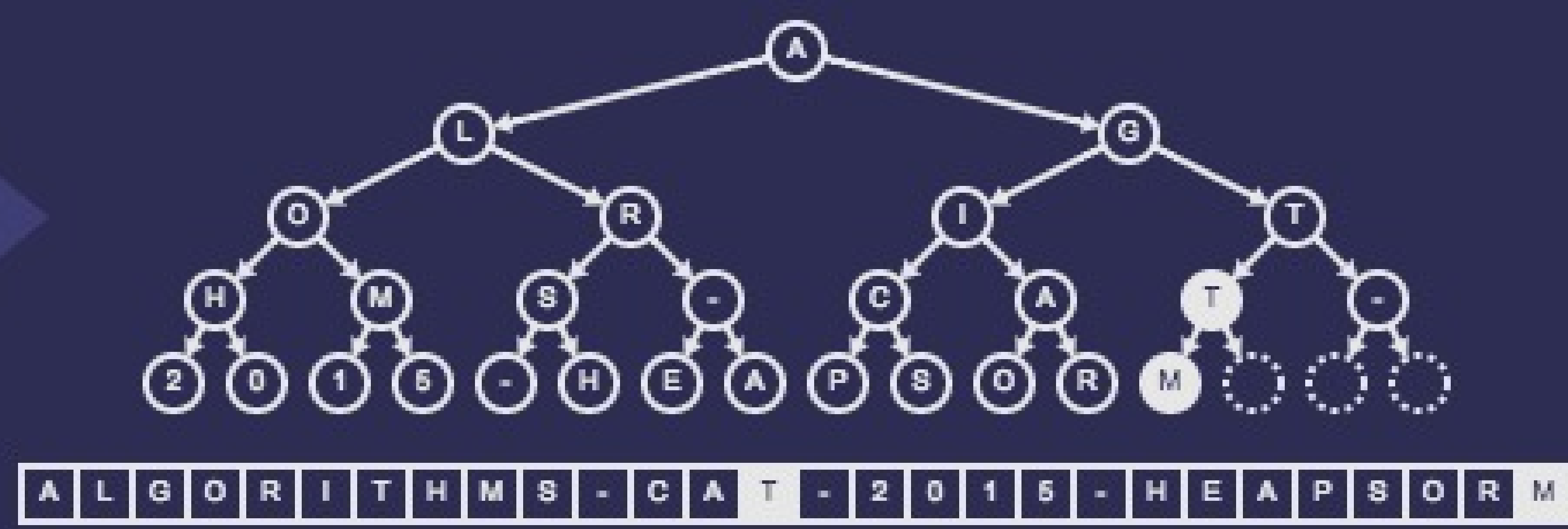
Step 17. Its child is larger than it

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

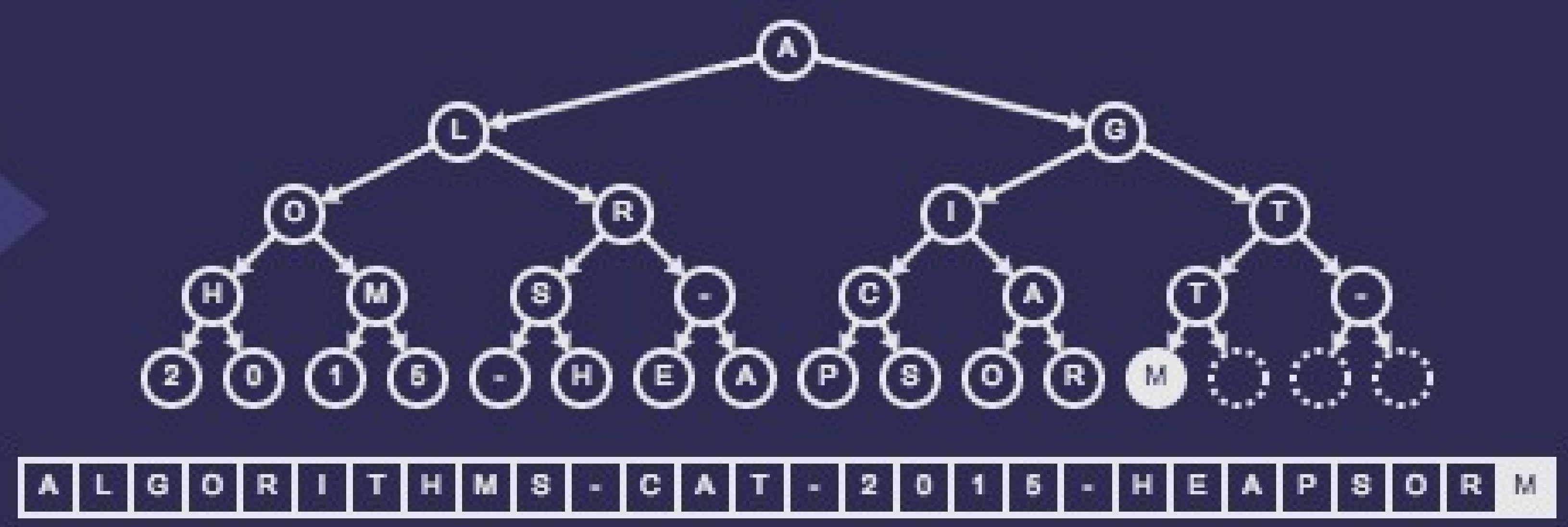


Step 17. Swap it with its child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



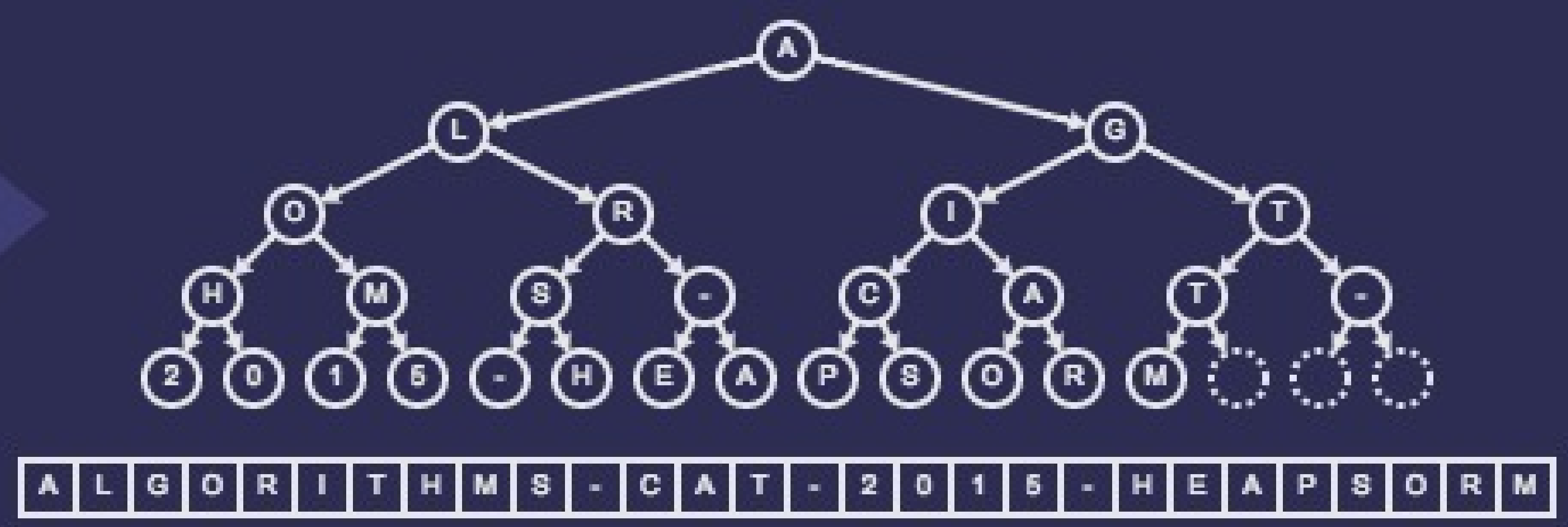
OUTPUT

Step 17. It has no children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

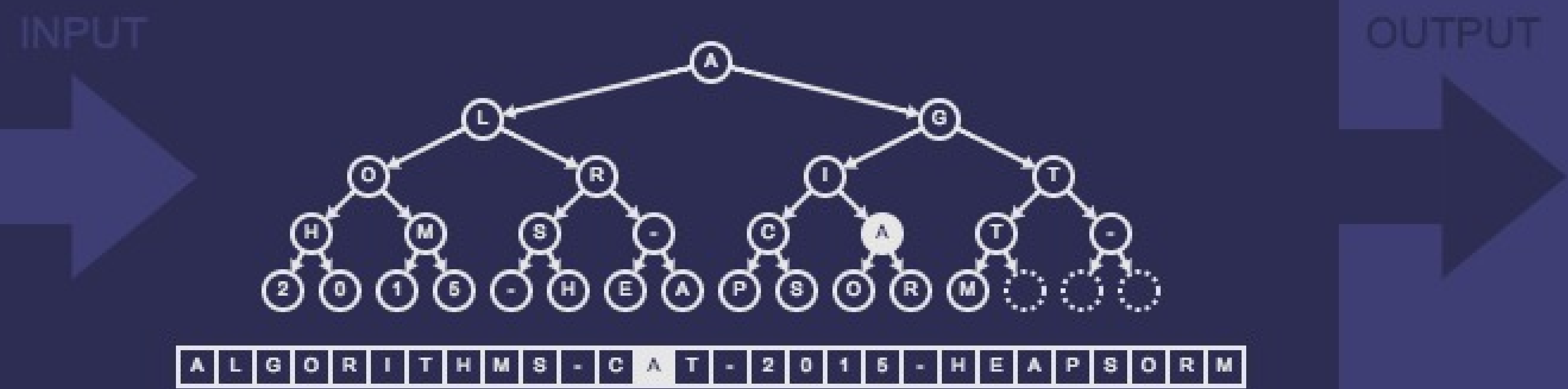


OUTPUT

Step 17. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

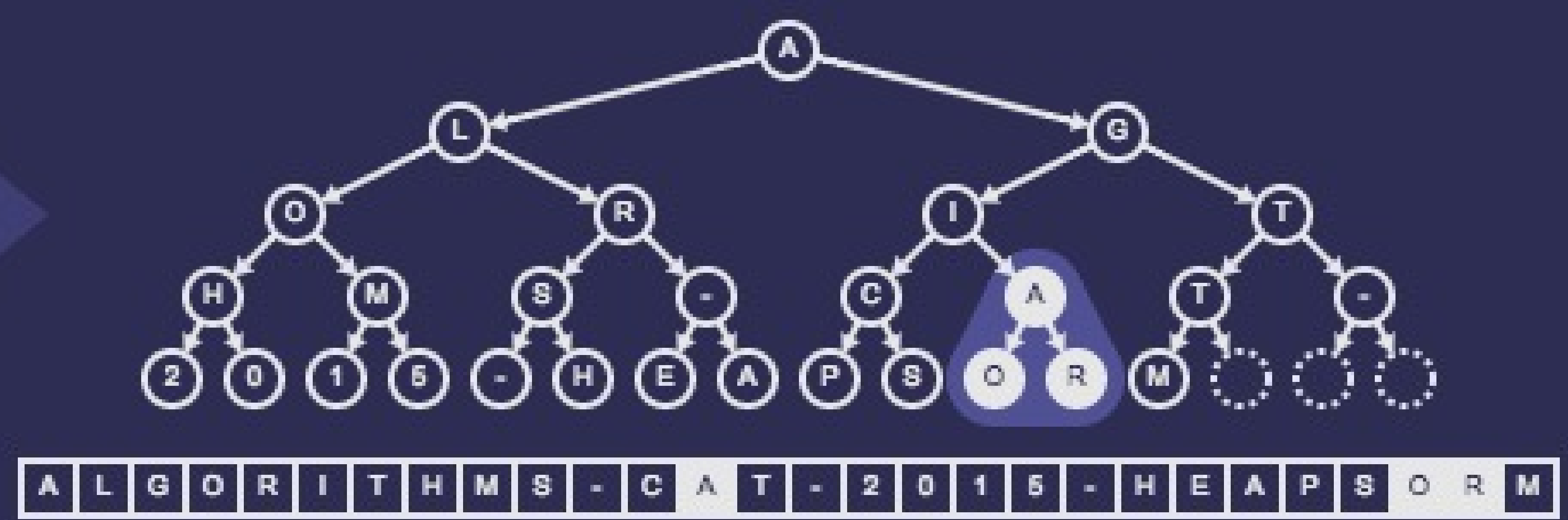


Step 18. This node has children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



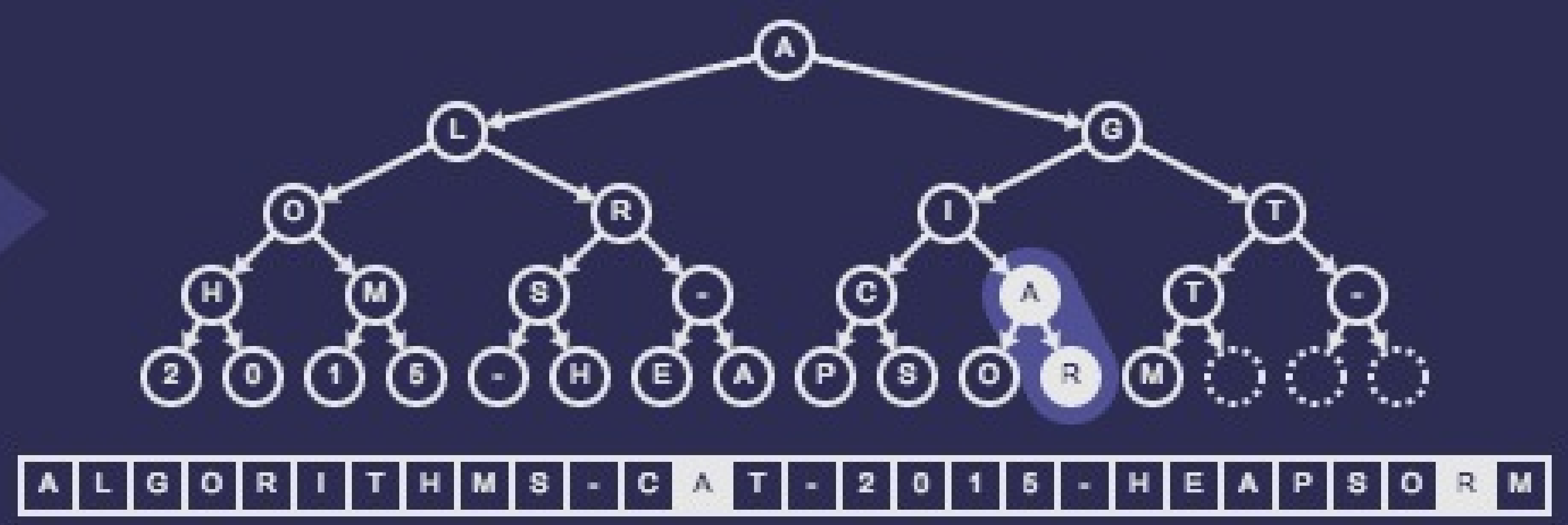
OUTPUT

Step 19. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



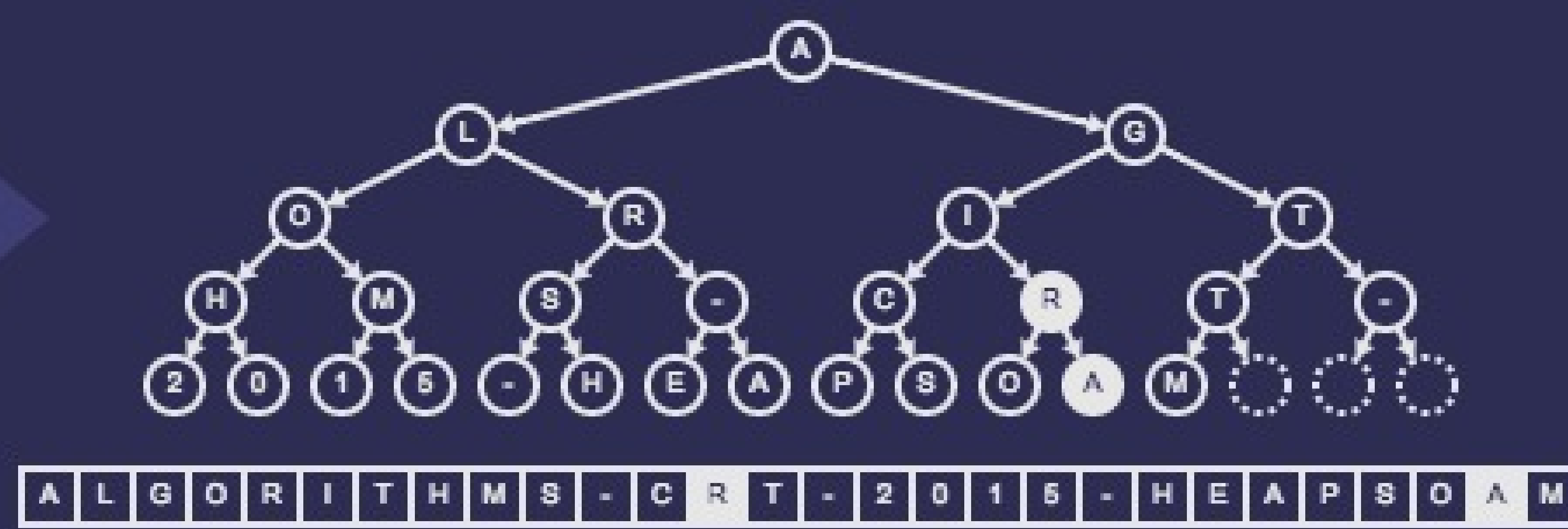
OUTPUT

Step 19. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



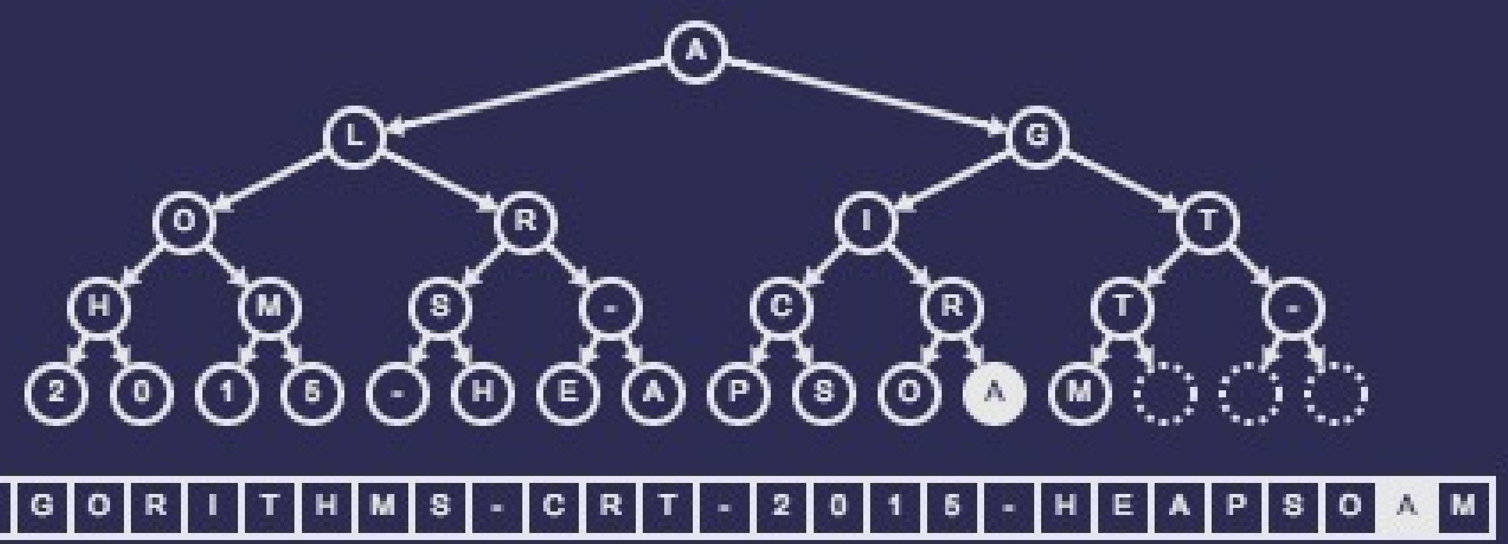
OUTPUT

Step 19. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



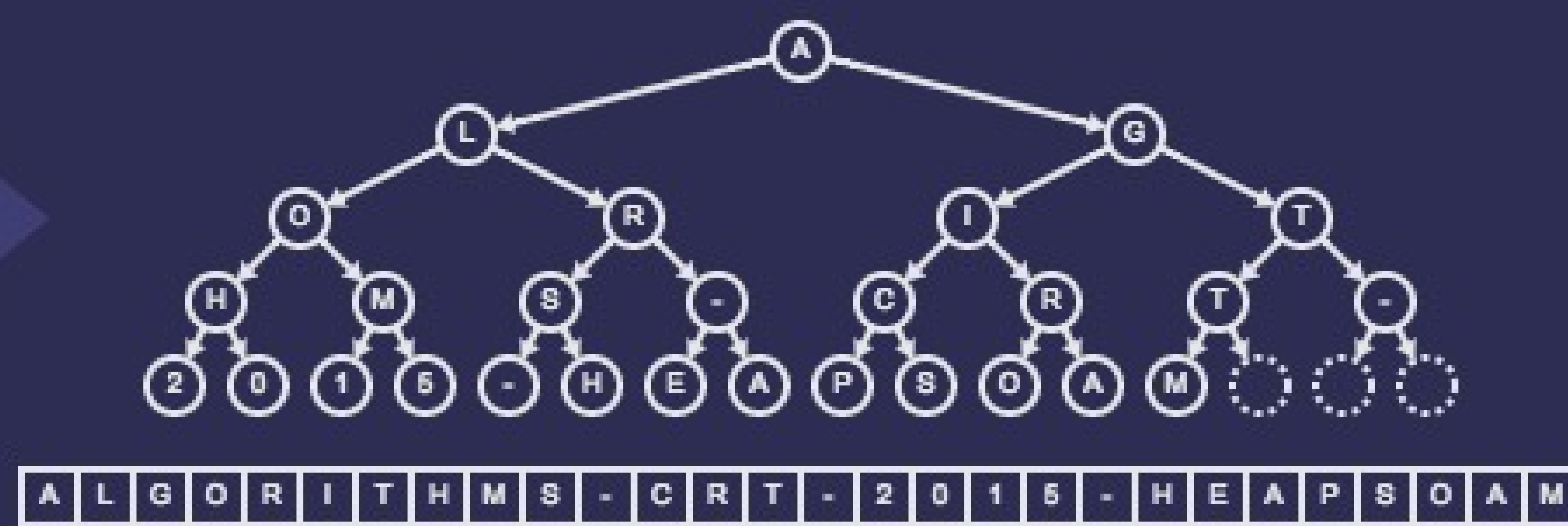
OUTPUT

Step 19. It has no children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



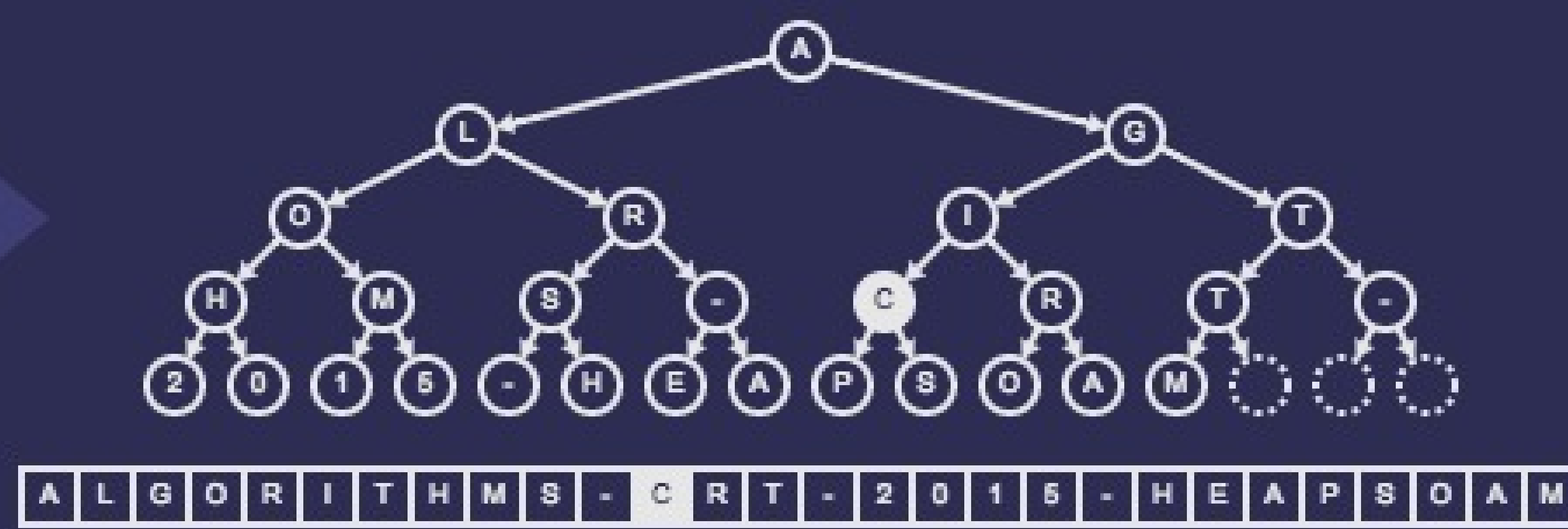
OUTPUT

Step 19. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



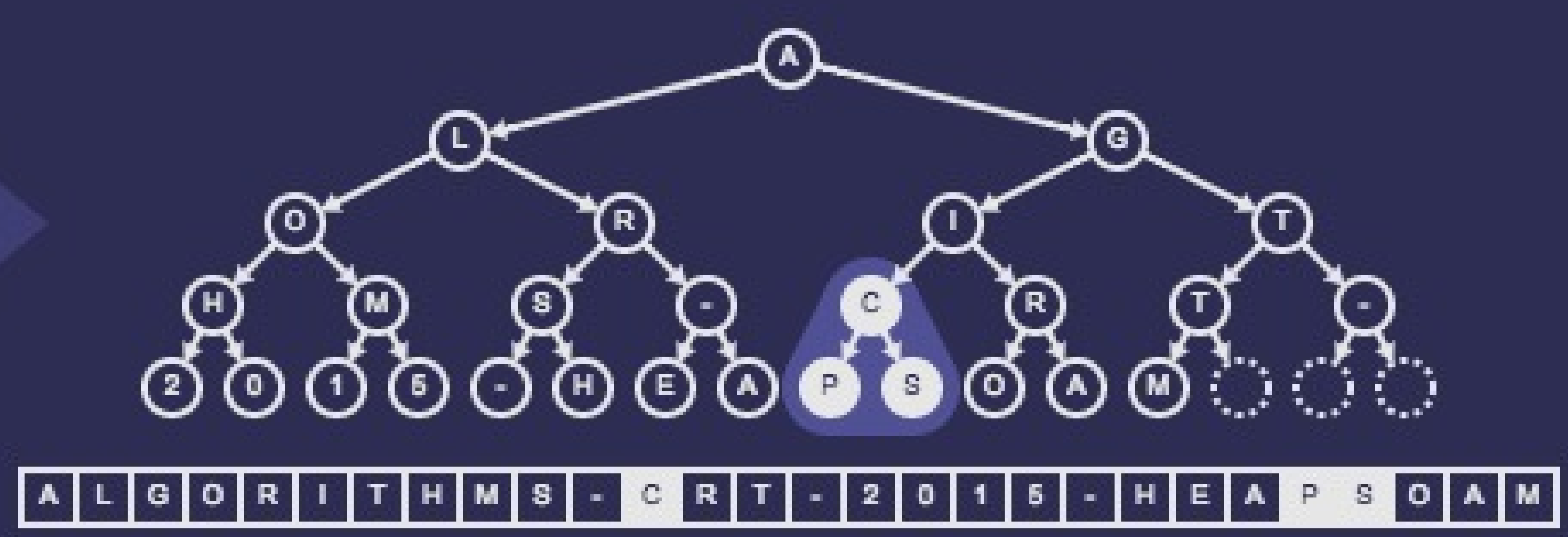
OUTPUT

Step 20. This node has children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

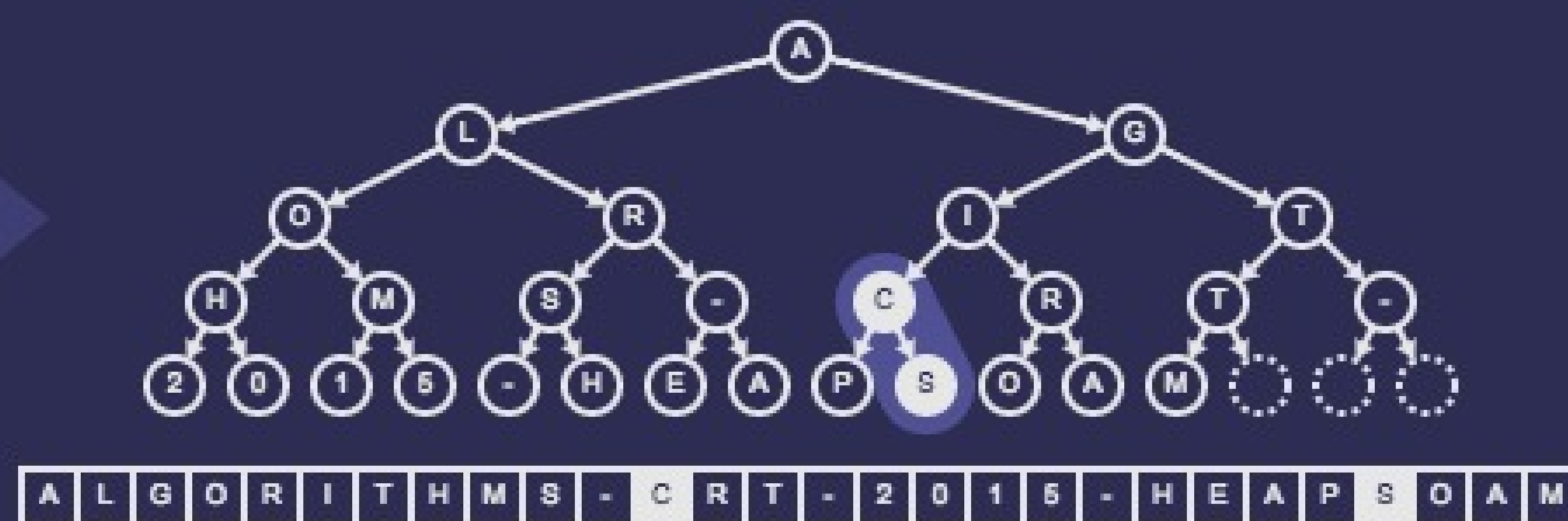
Step 21. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

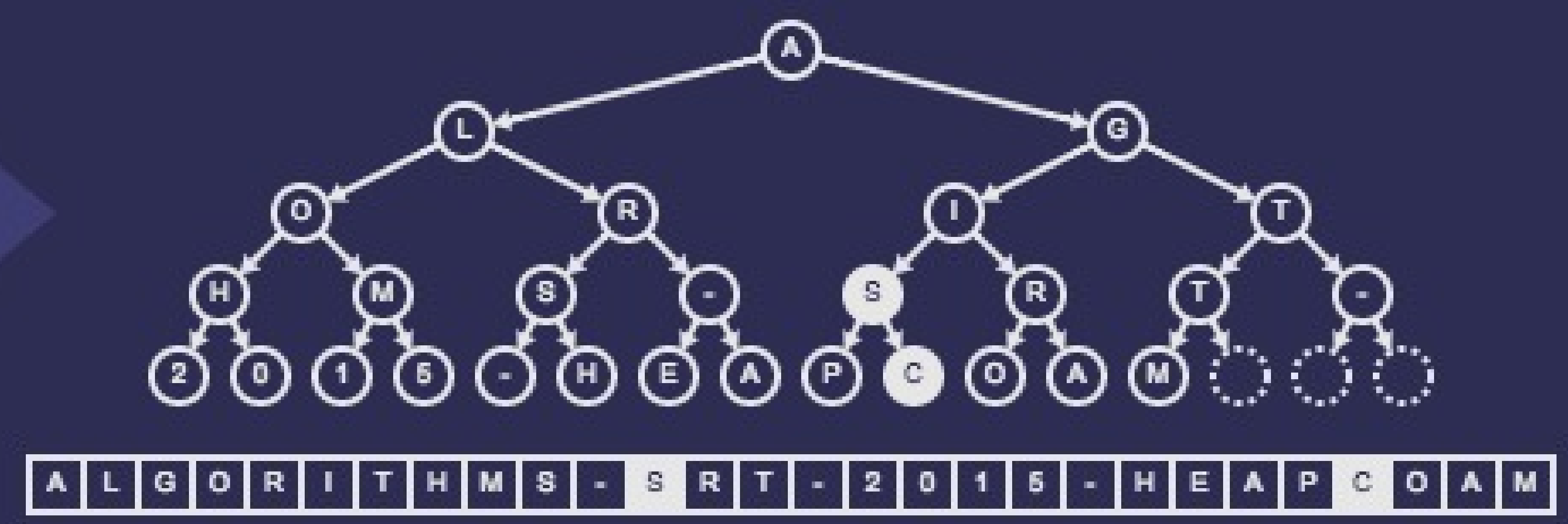


Step 21. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



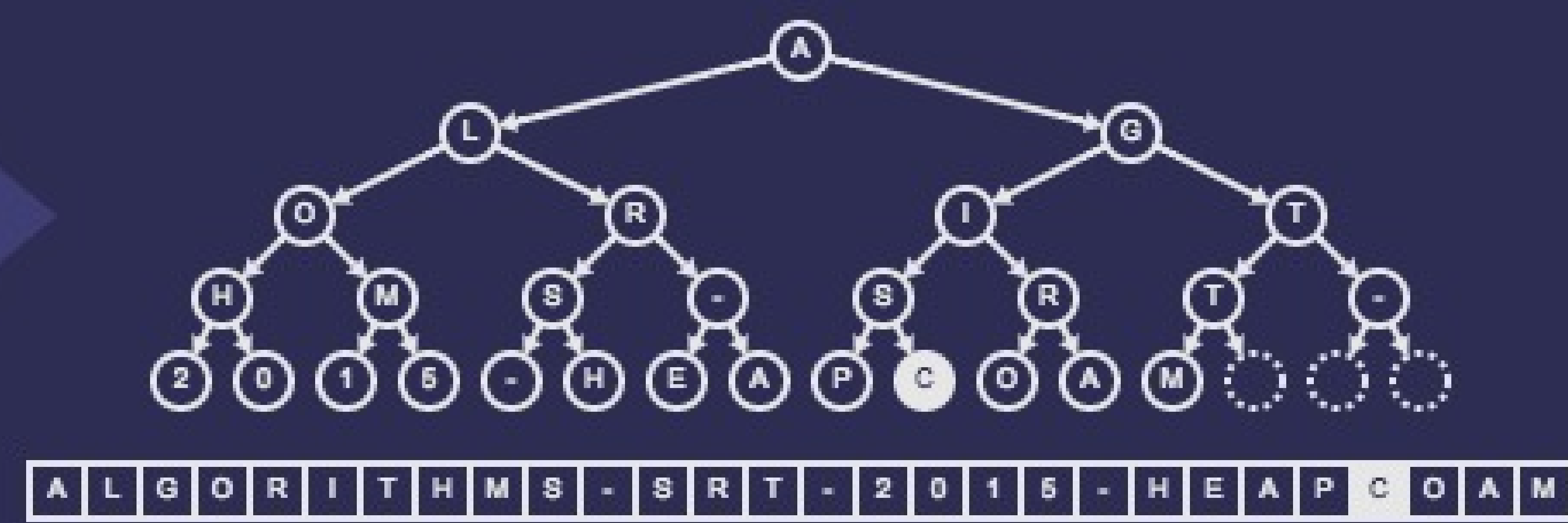
OUTPUT

Step 21. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



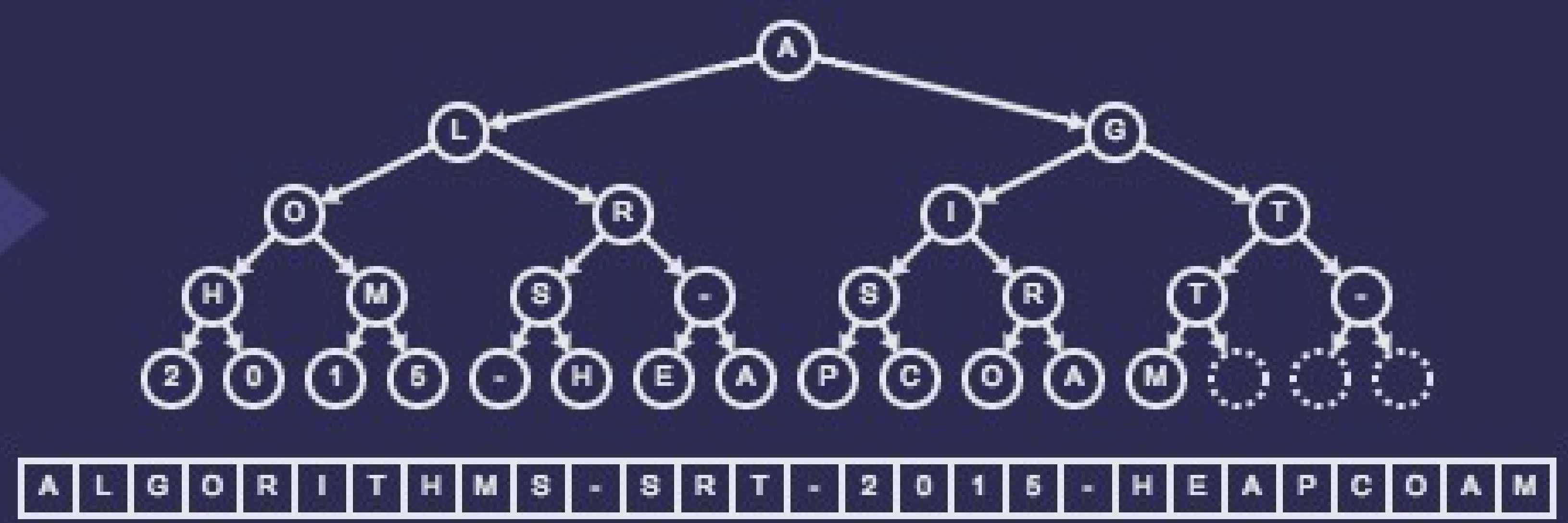
OUTPUT

Step 21. It has no children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

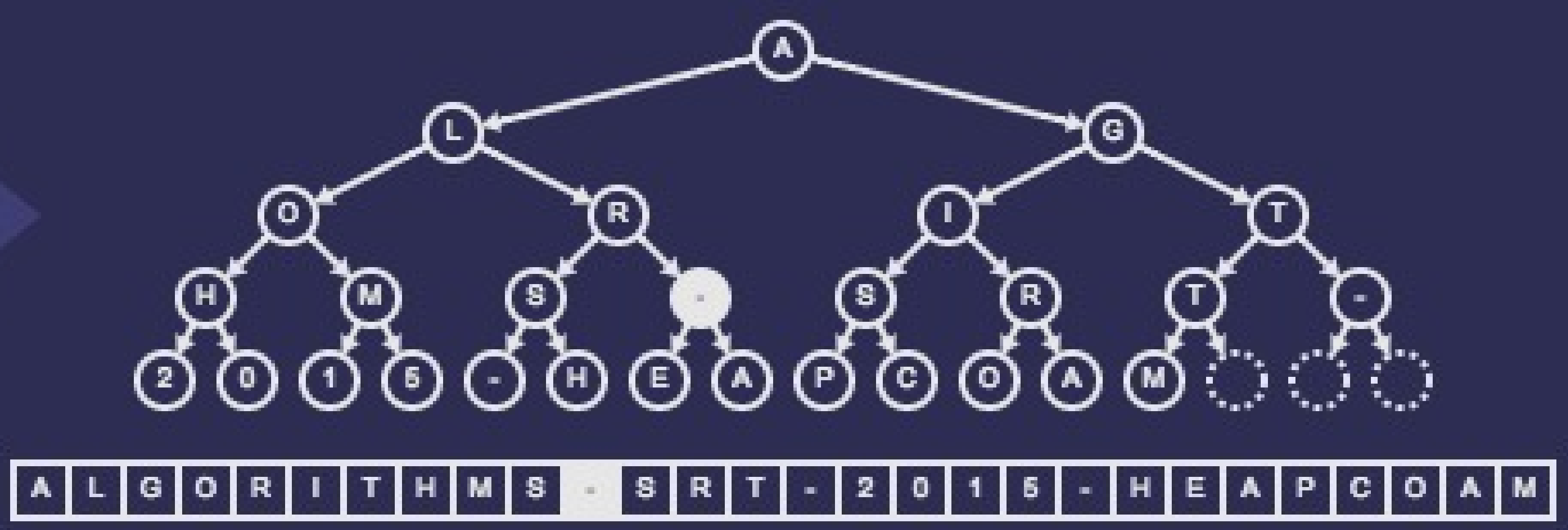
Step 21. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

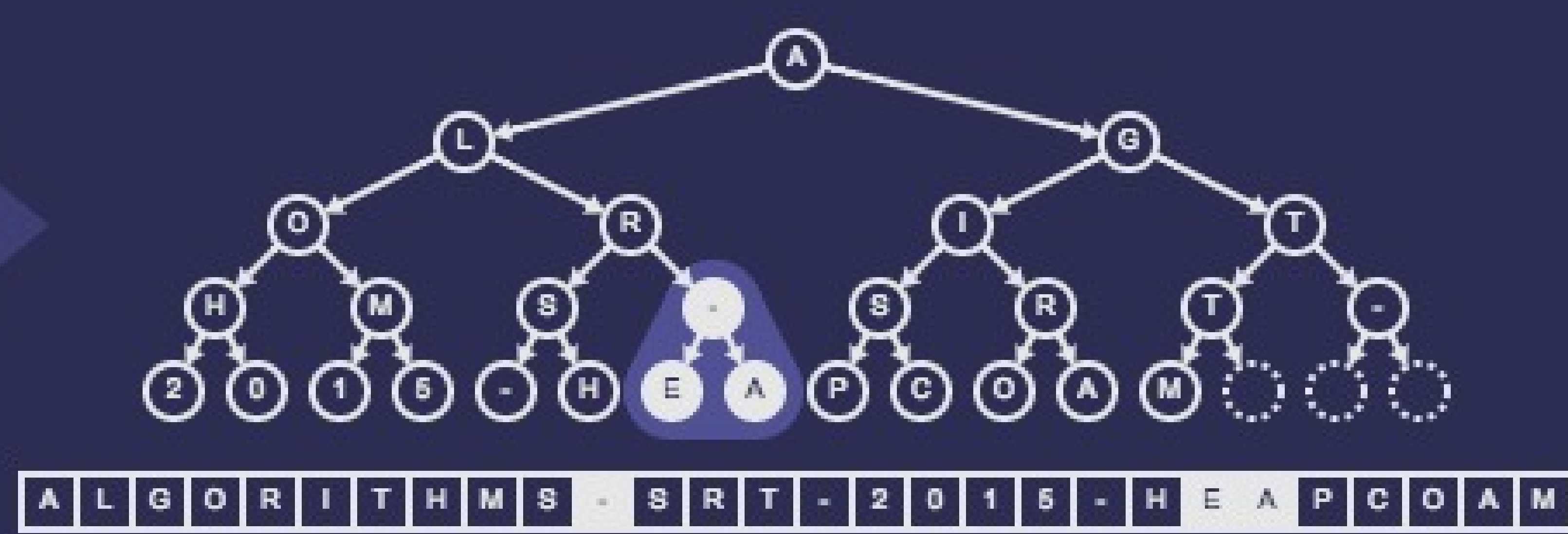


Step 22. This node has children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



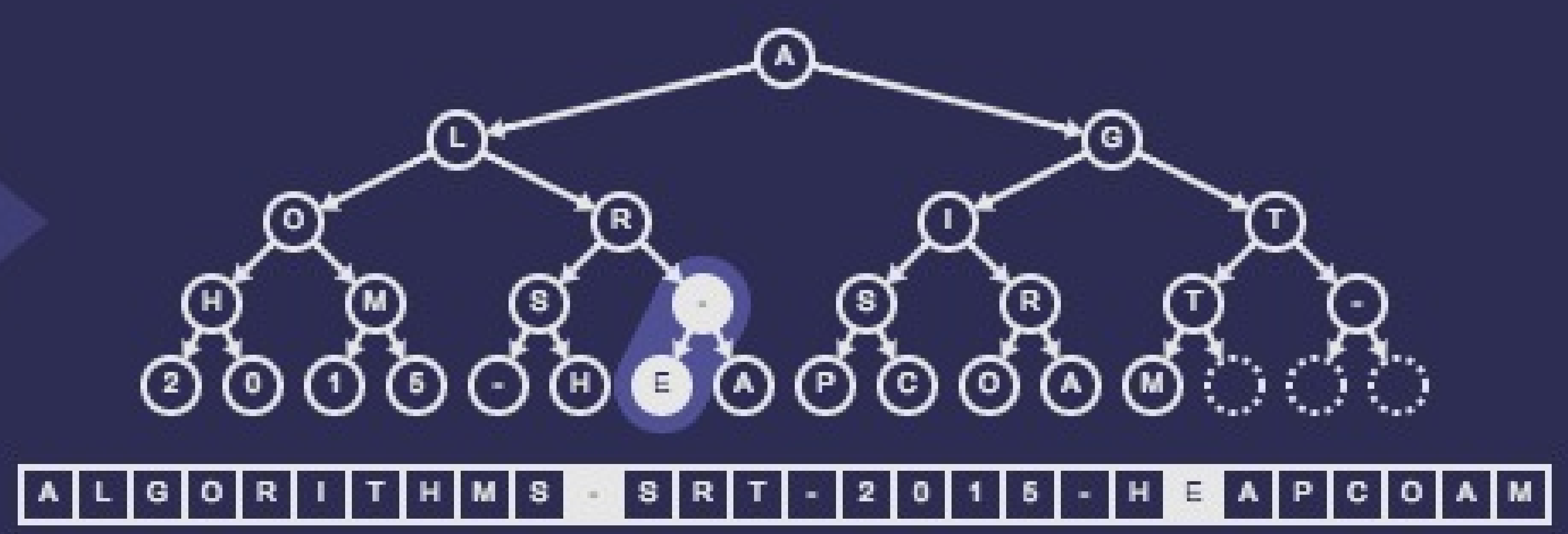
OUTPUT

Step 23. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



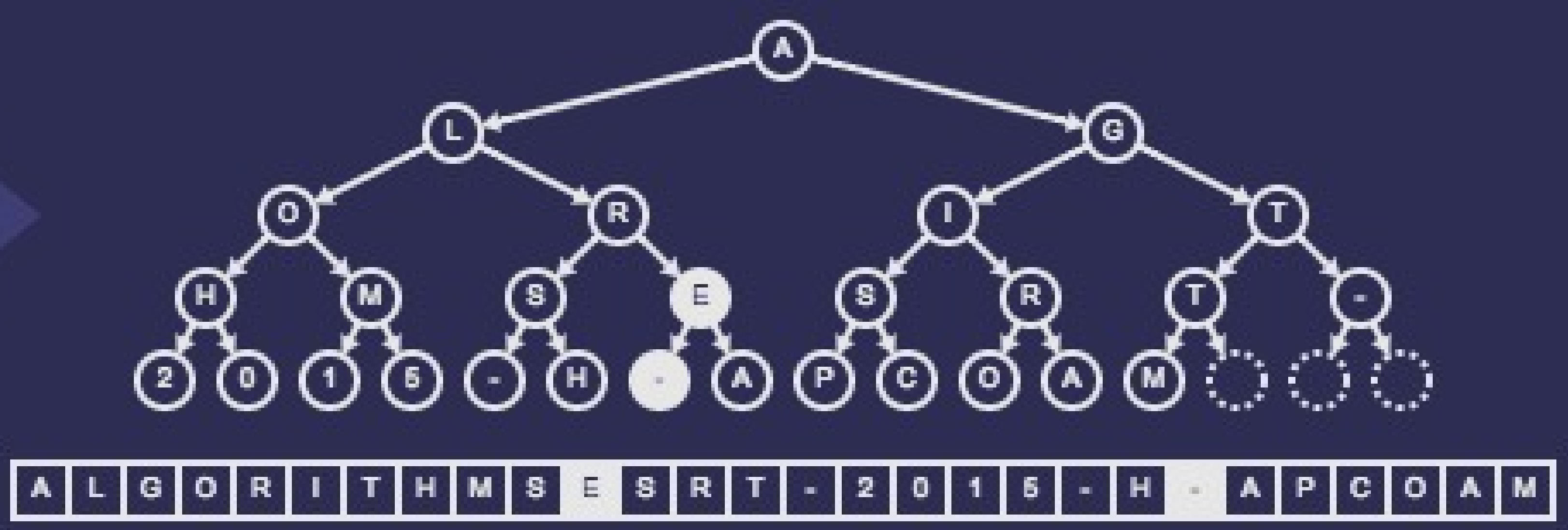
OUTPUT

Step 23. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



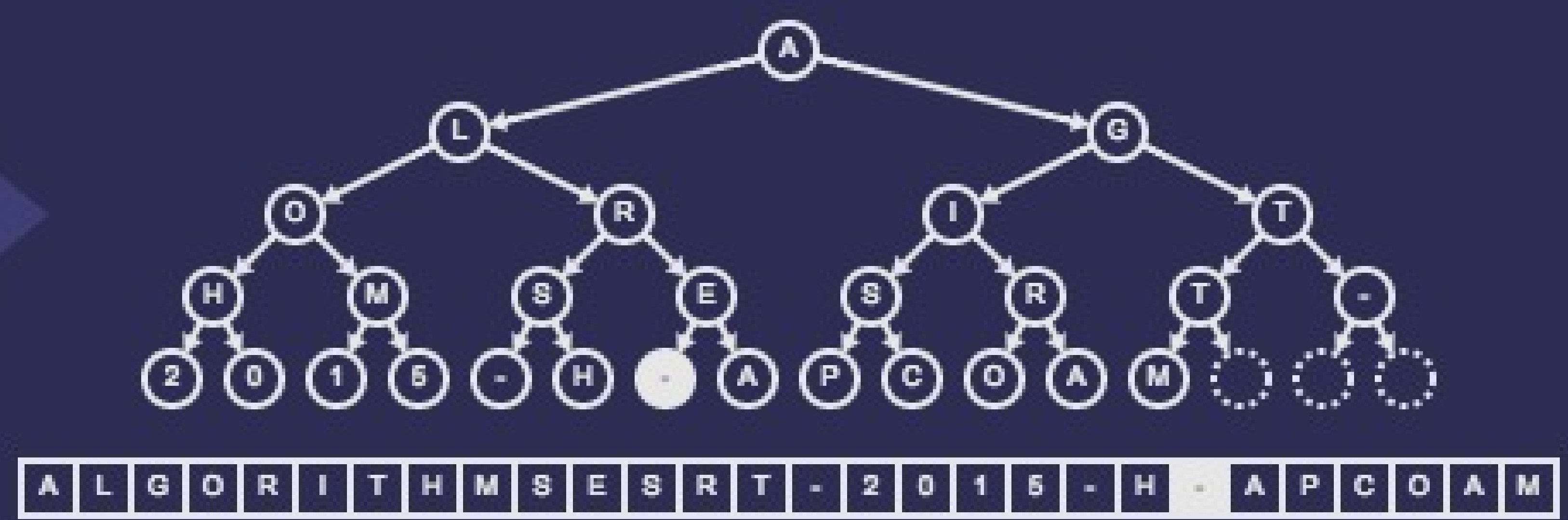
OUTPUT

Step 23. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



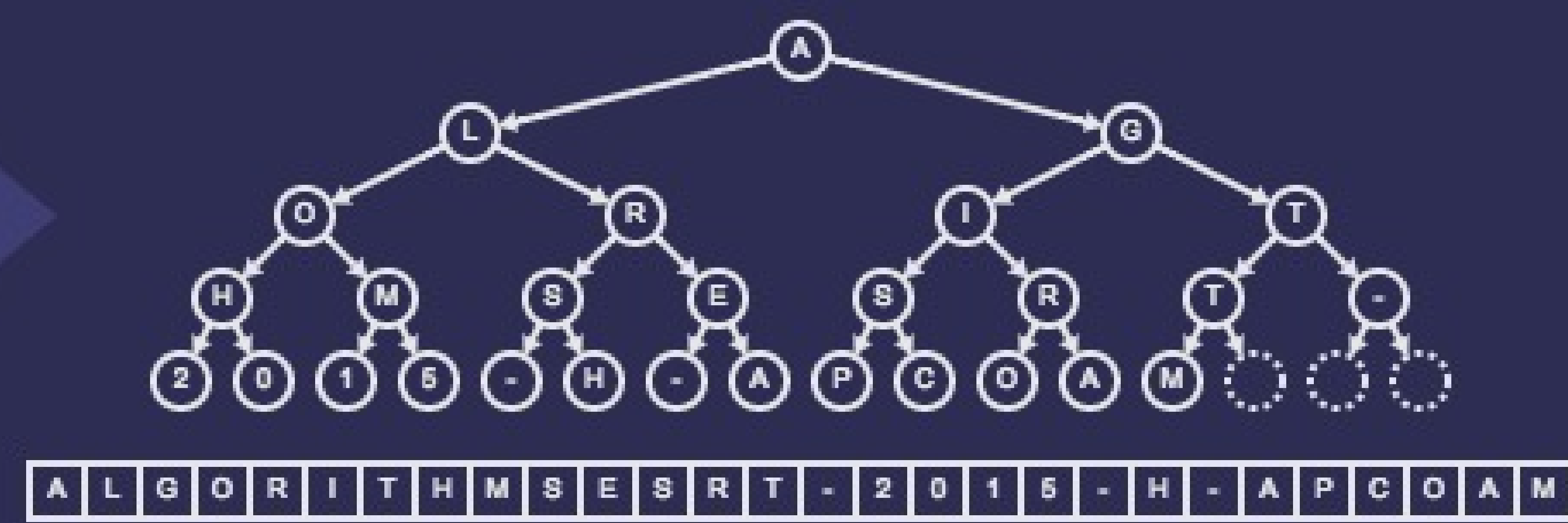
OUTPUT

Step 23. It has no children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

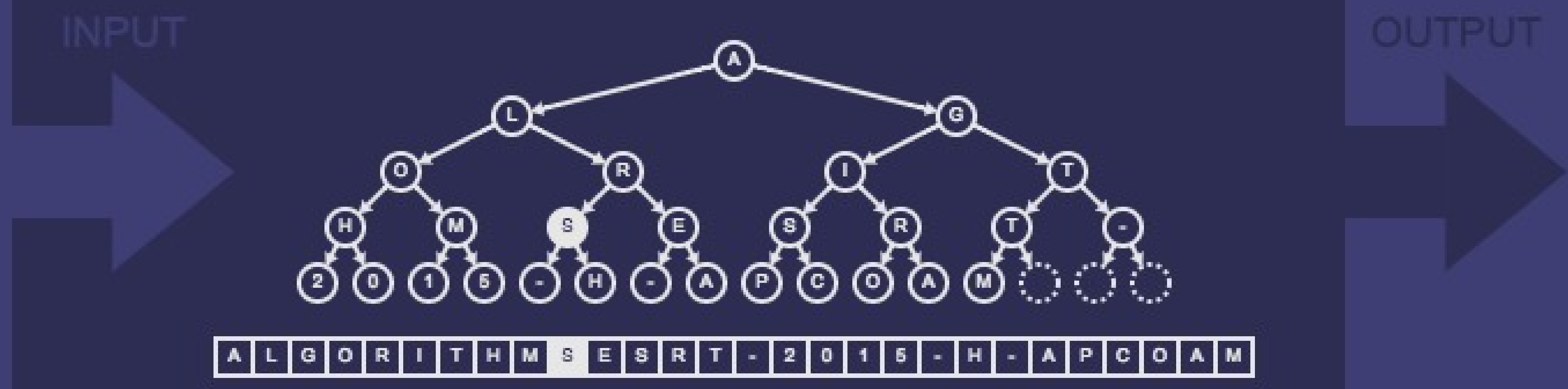


OUTPUT

Step 23. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

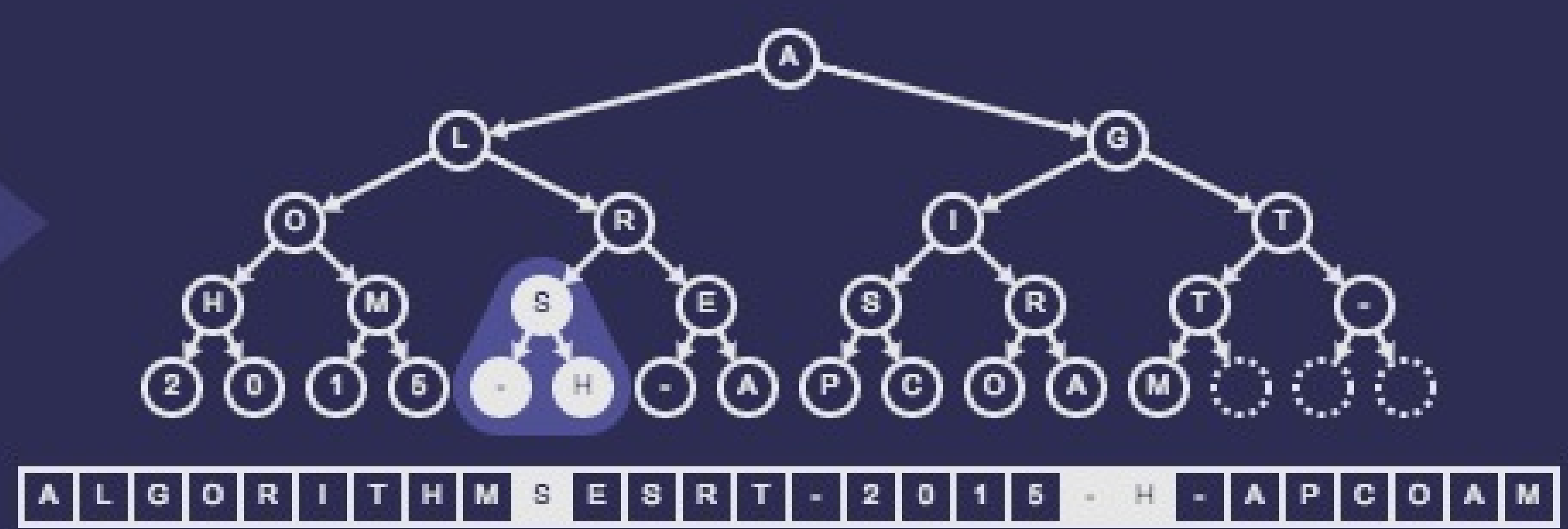


Step 24. This node has children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



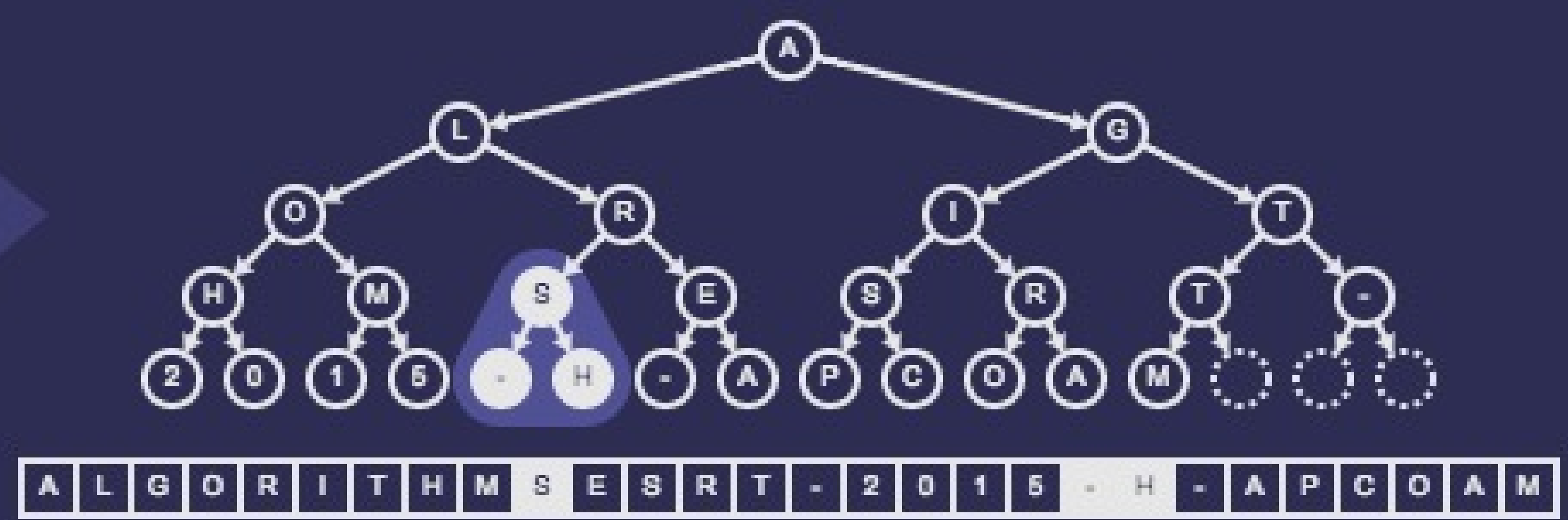
OUTPUT

Step 25. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



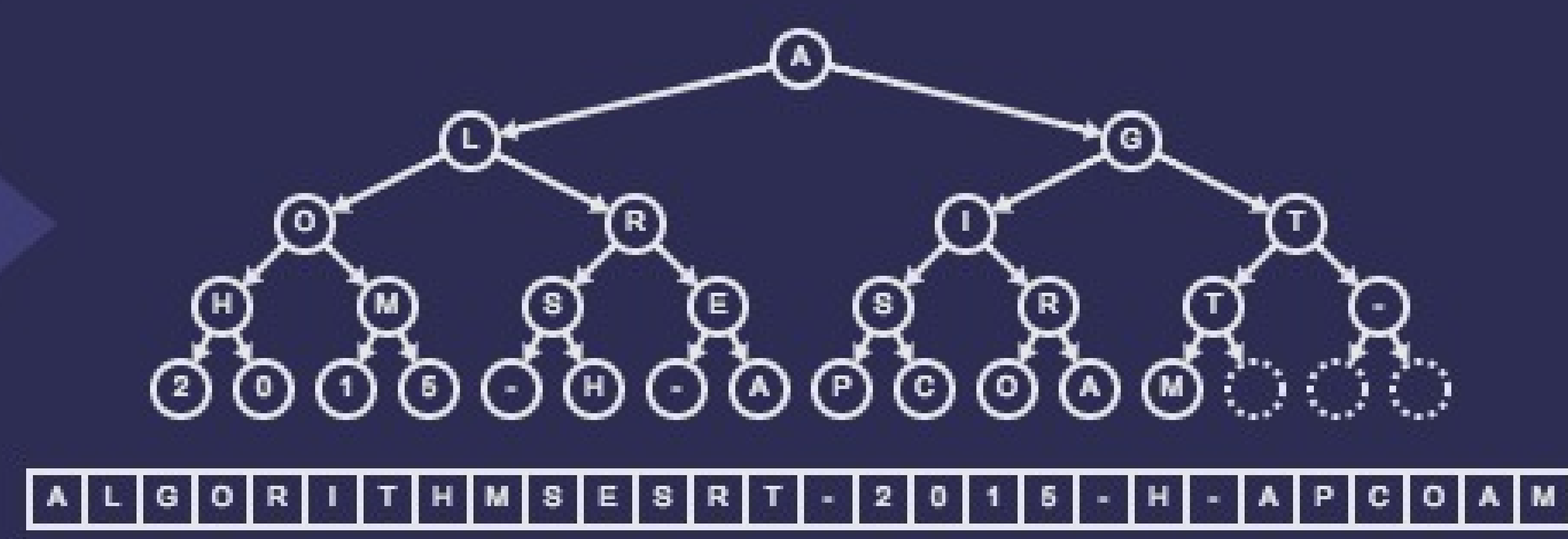
OUTPUT

Step 25. The elements are in the correct order

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



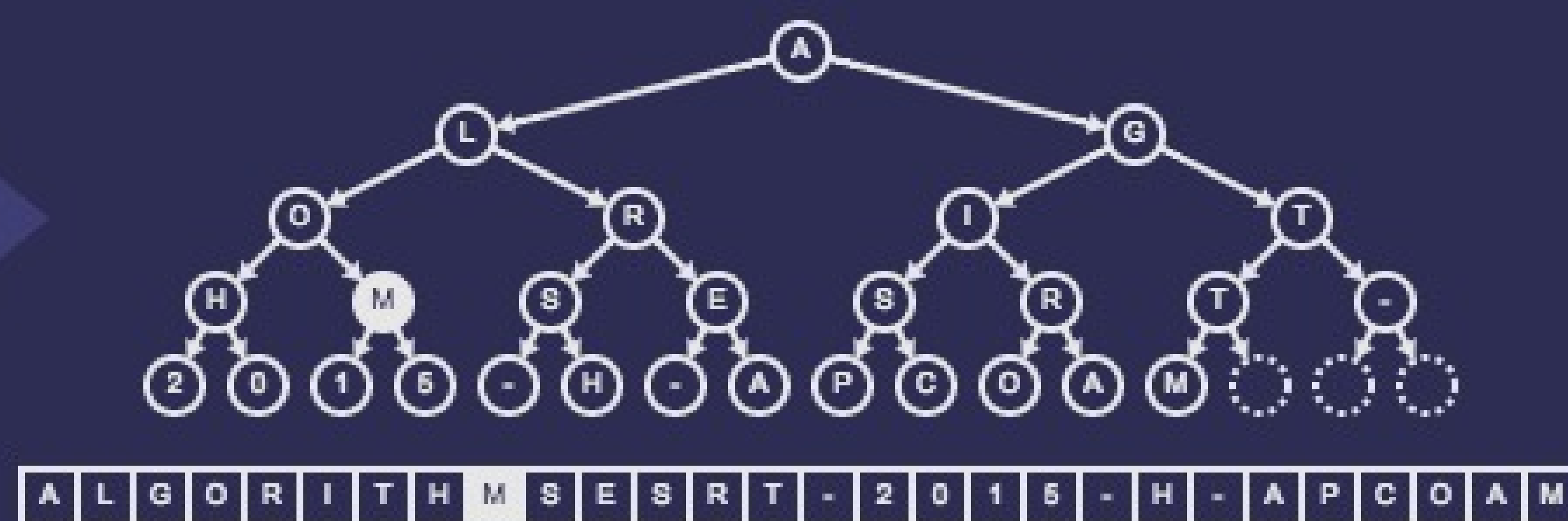
OUTPUT

Step 25. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



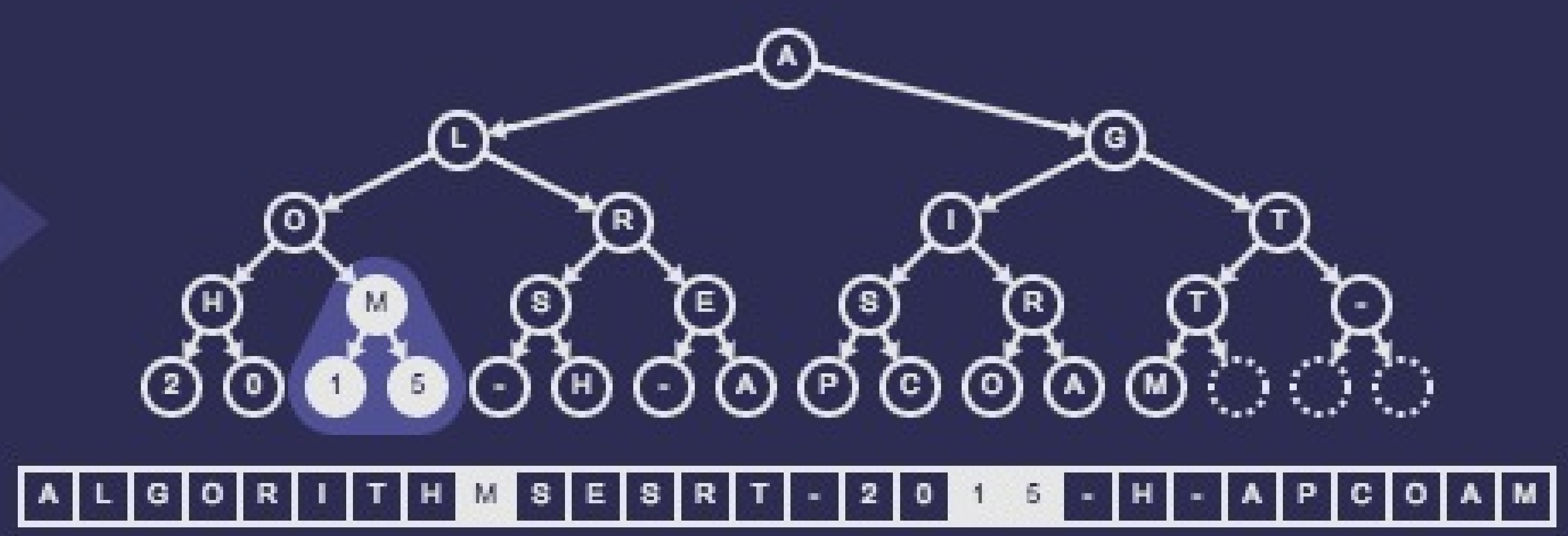
OUTPUT

Step 26. This node has children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



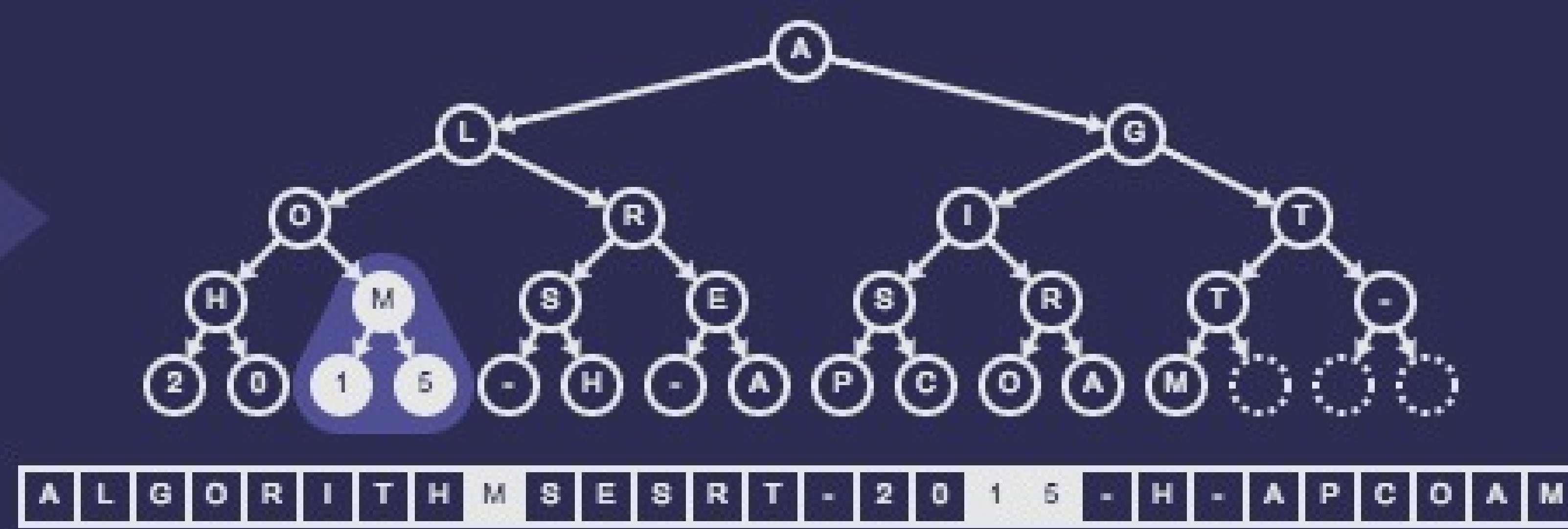
OUTPUT

Step 27. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



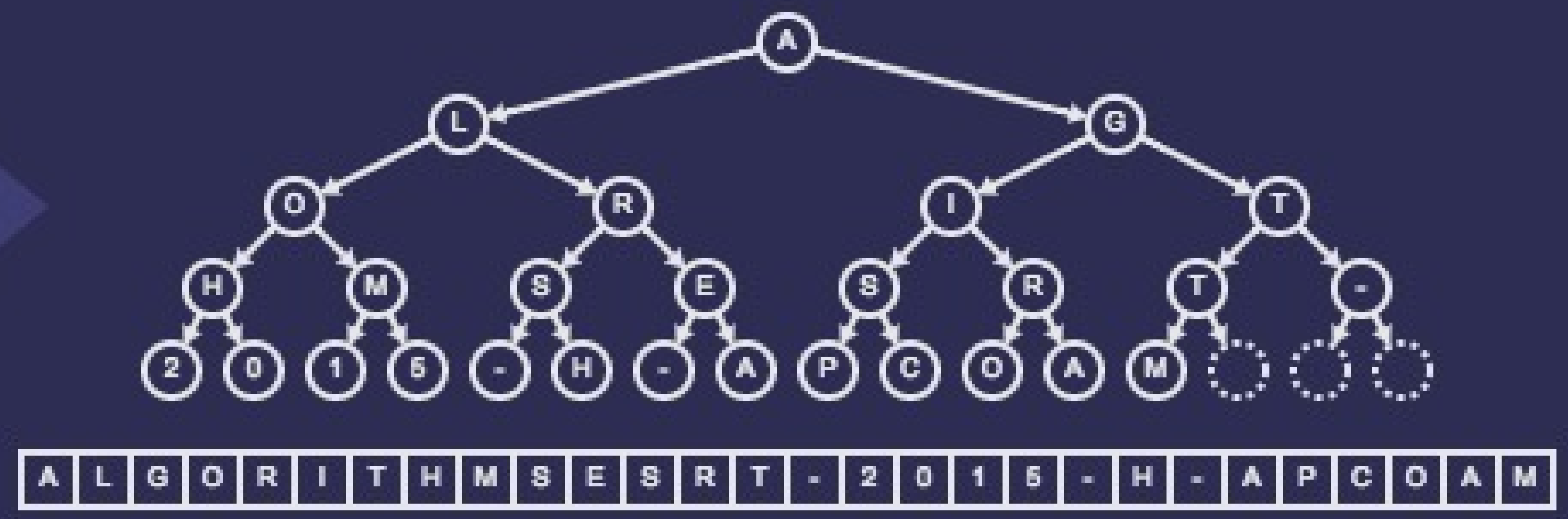
OUTPUT

Step 27. The elements are in the correct order

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



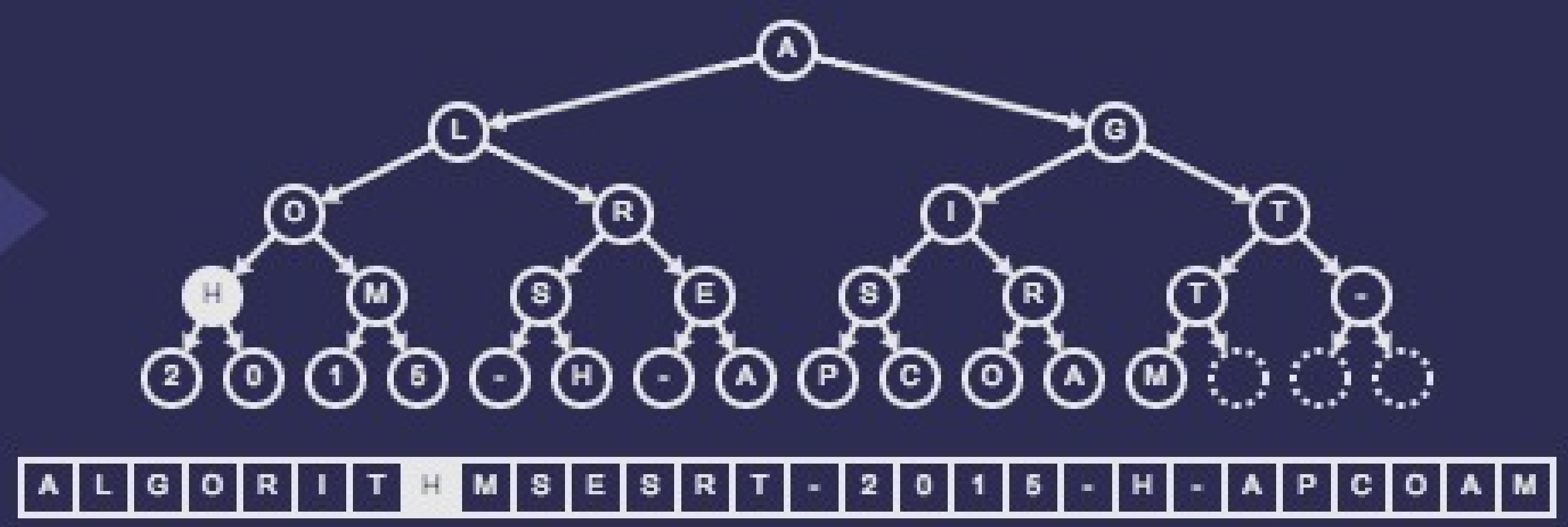
OUTPUT

Step 27. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



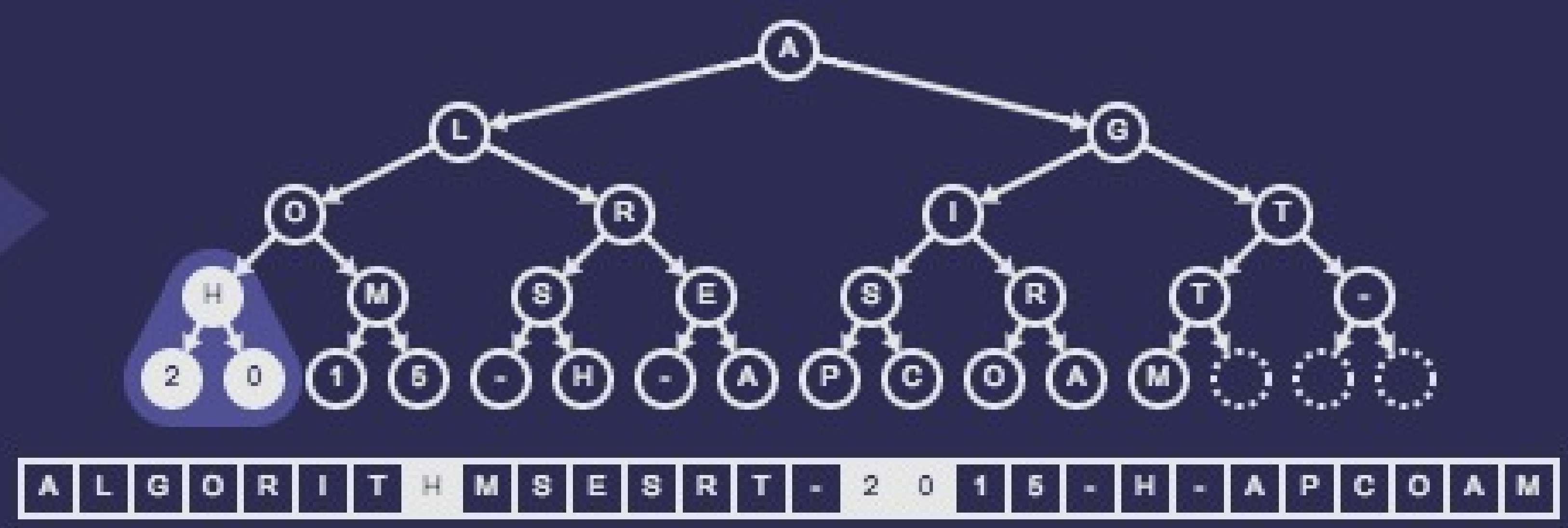
OUTPUT

Step 28. This node has children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



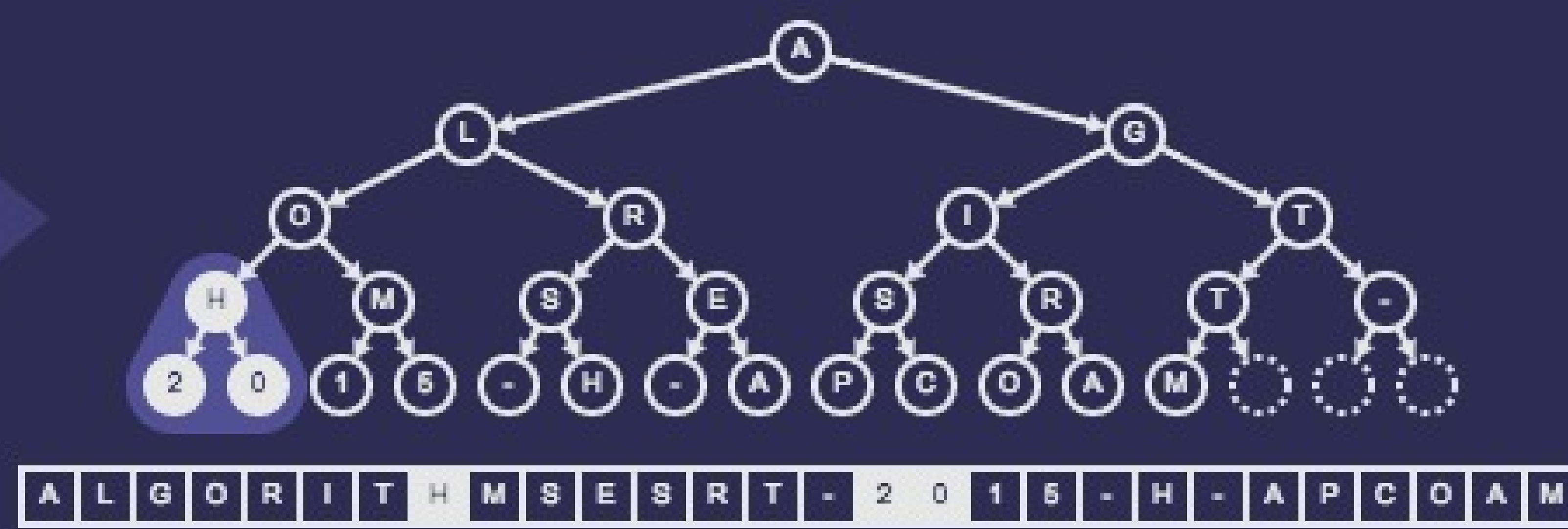
OUTPUT

Step 29. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



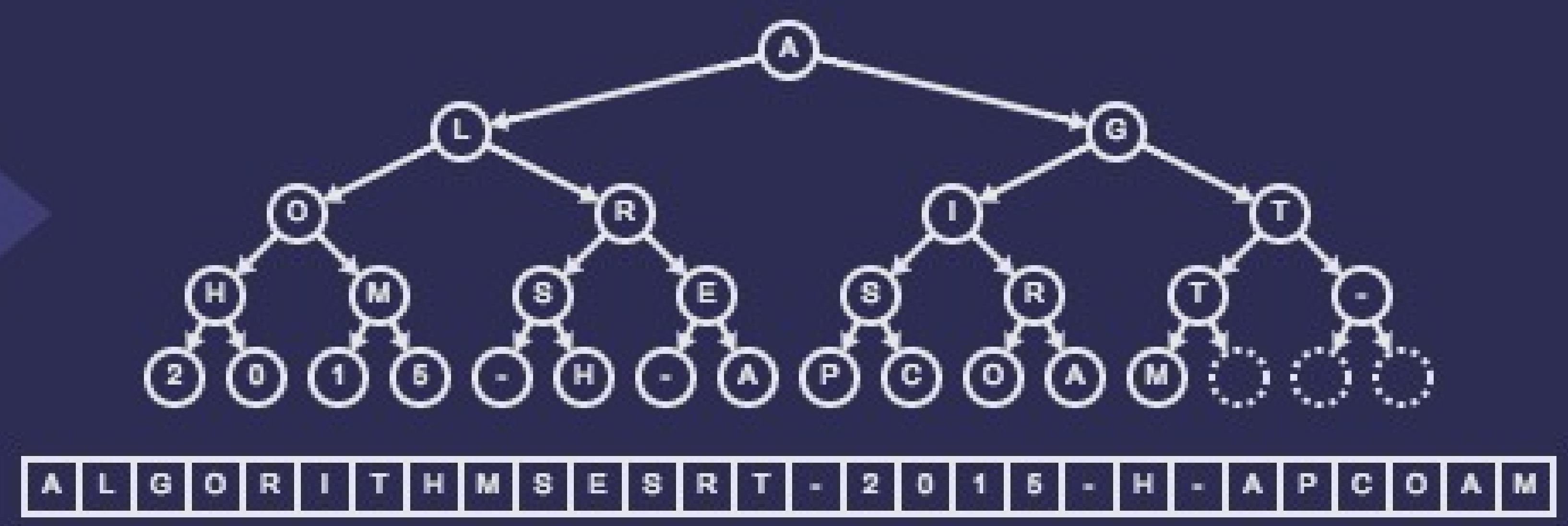
OUTPUT

Step 29. The elements are in the correct order

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



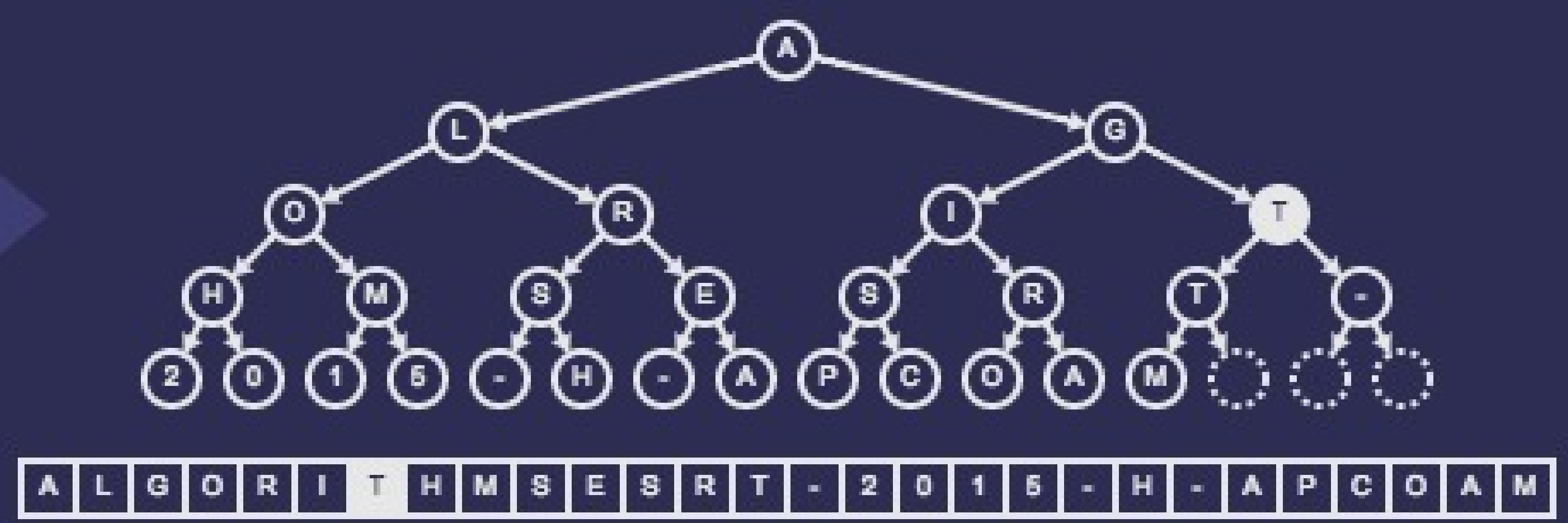
OUTPUT

Step 29. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



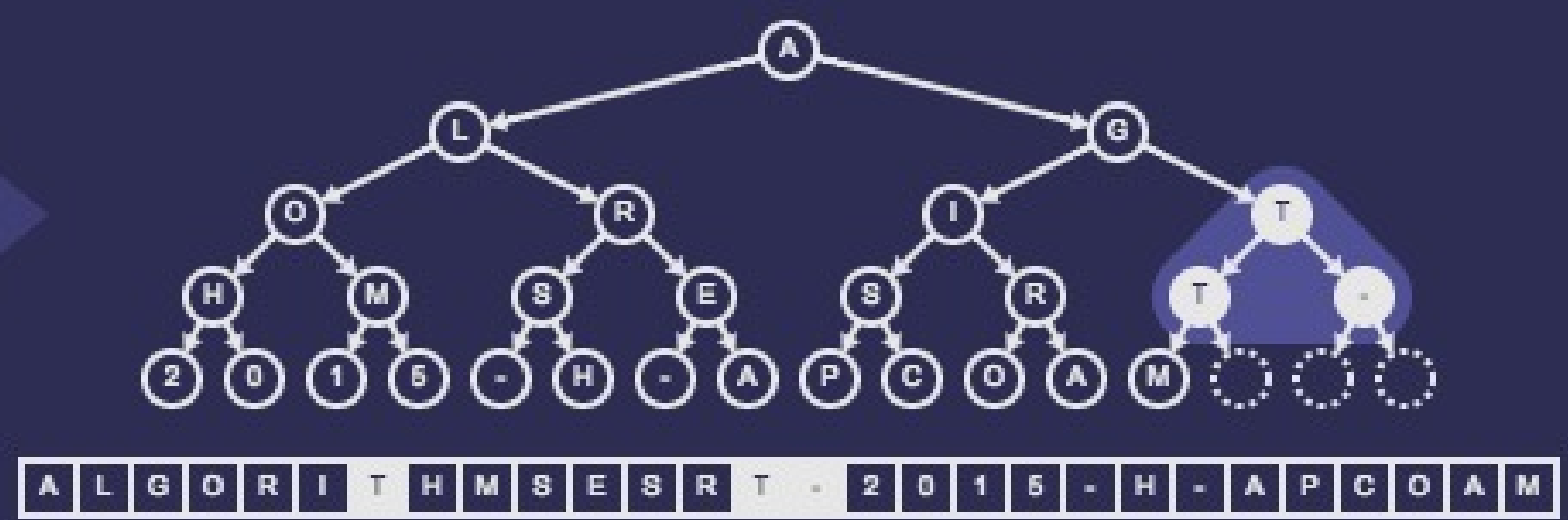
OUTPUT

Step 30. This node has children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



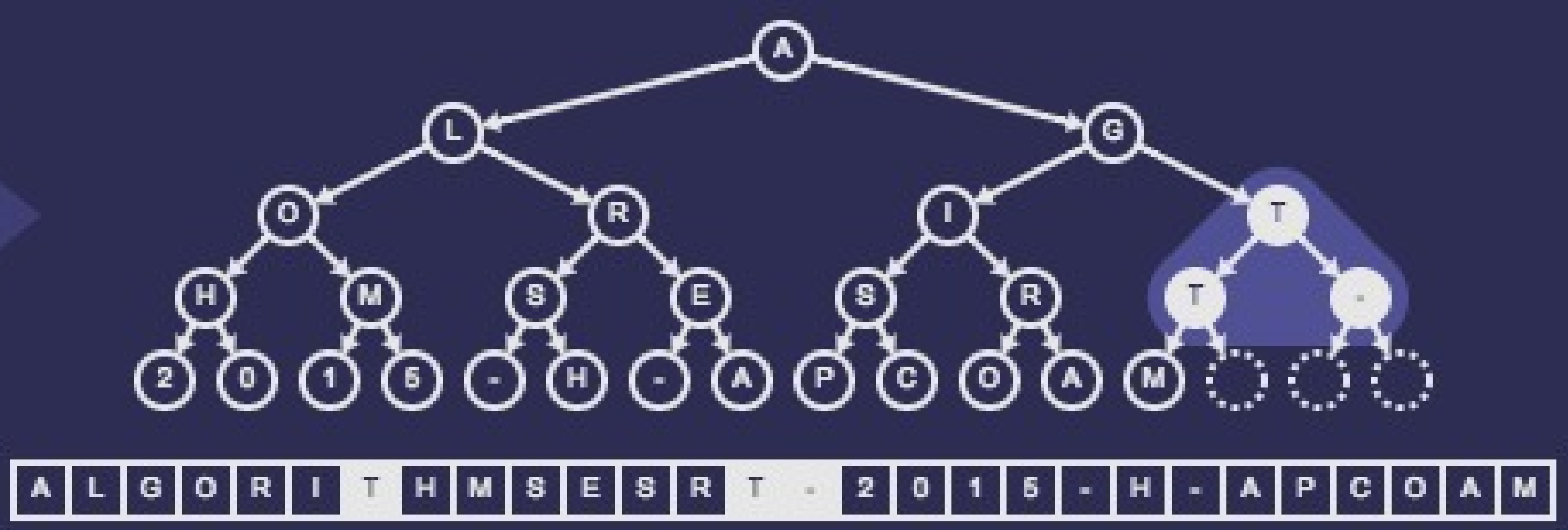
OUTPUT

Step 31. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



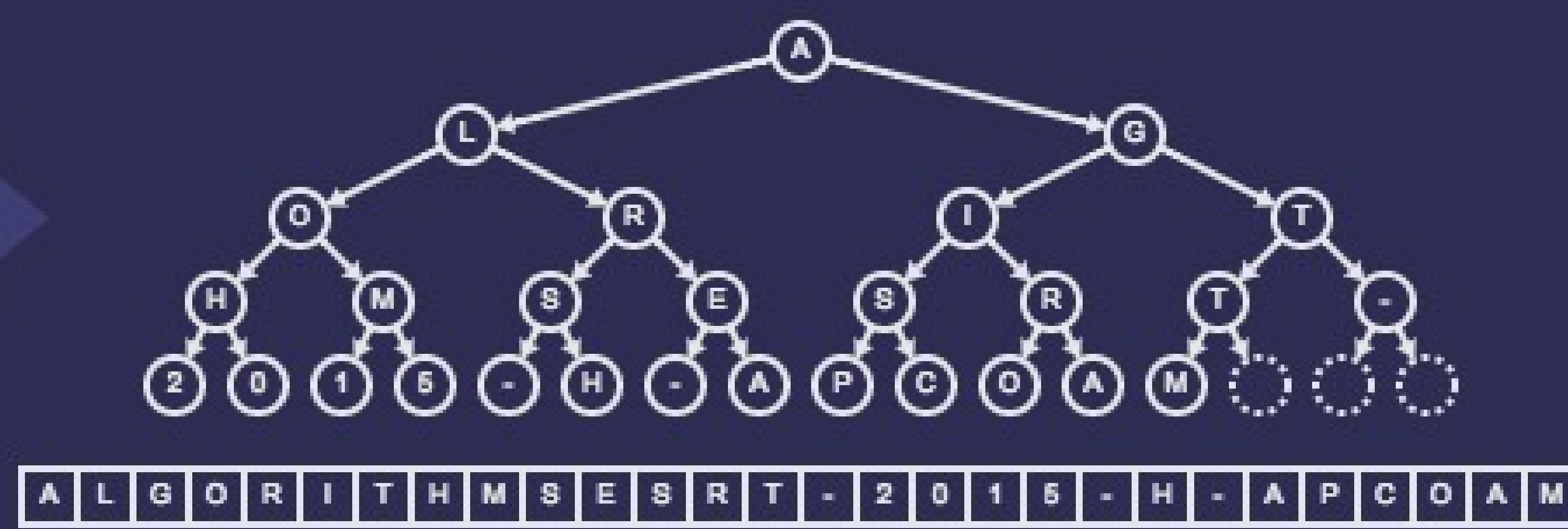
OUTPUT

Step 31. The elements are in the correct order

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



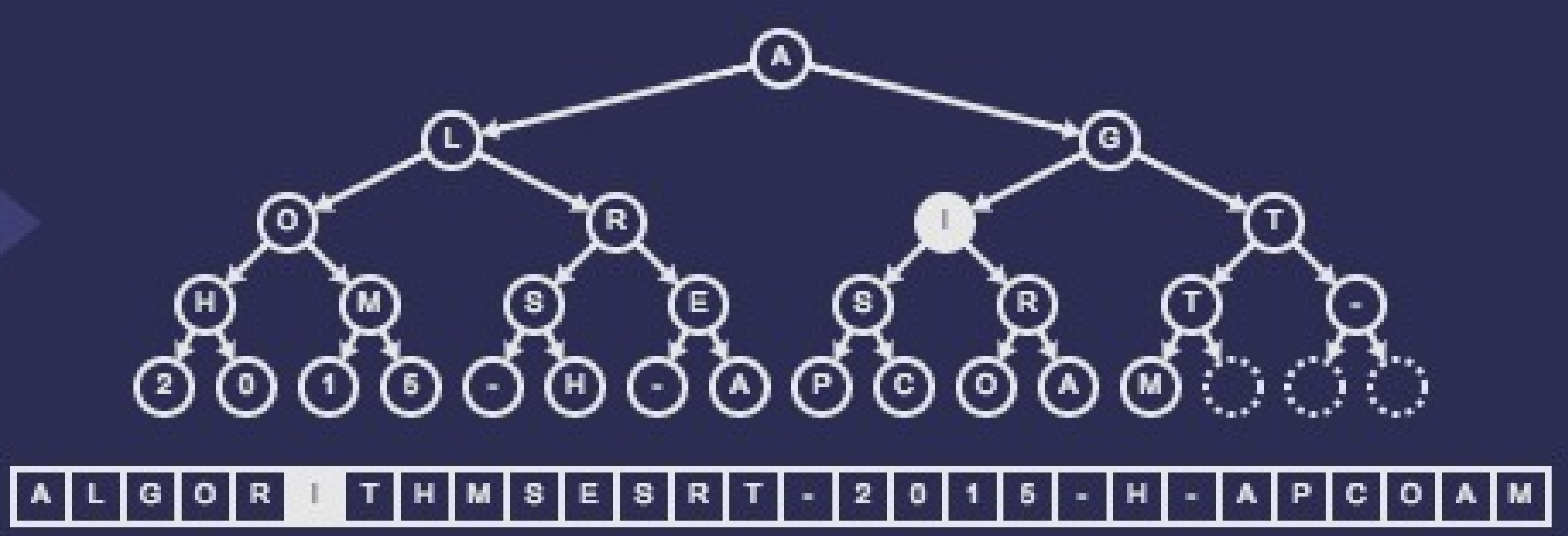
OUTPUT

Step 31. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



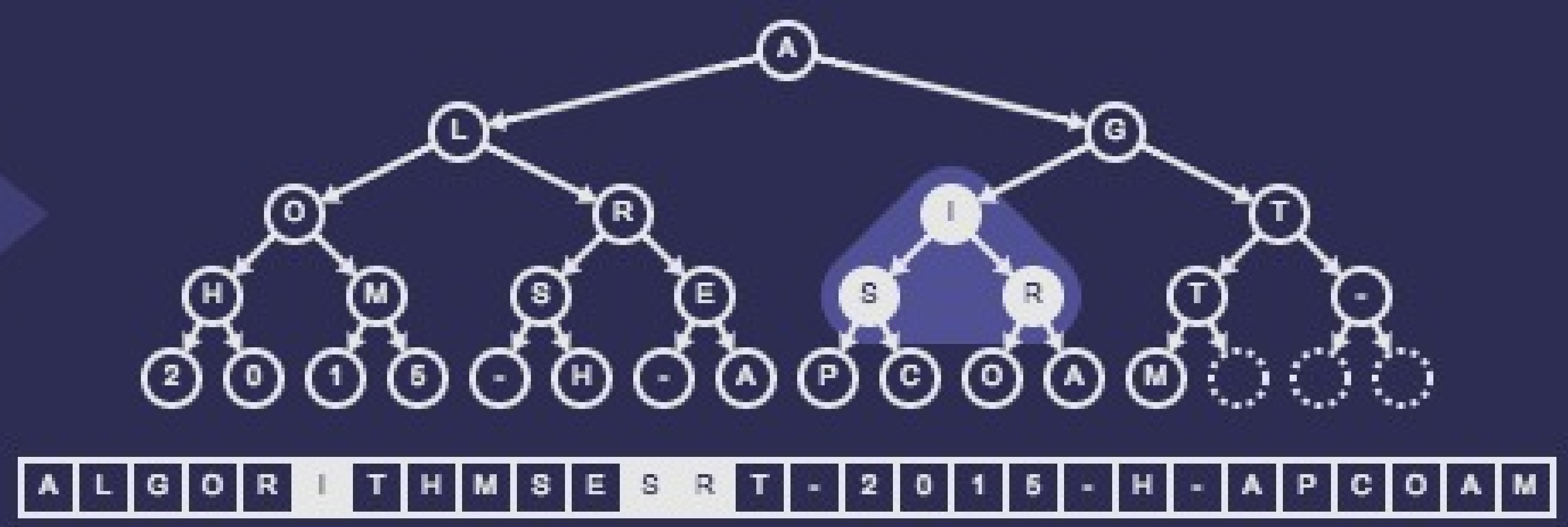
OUTPUT

Step 32. This node has children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



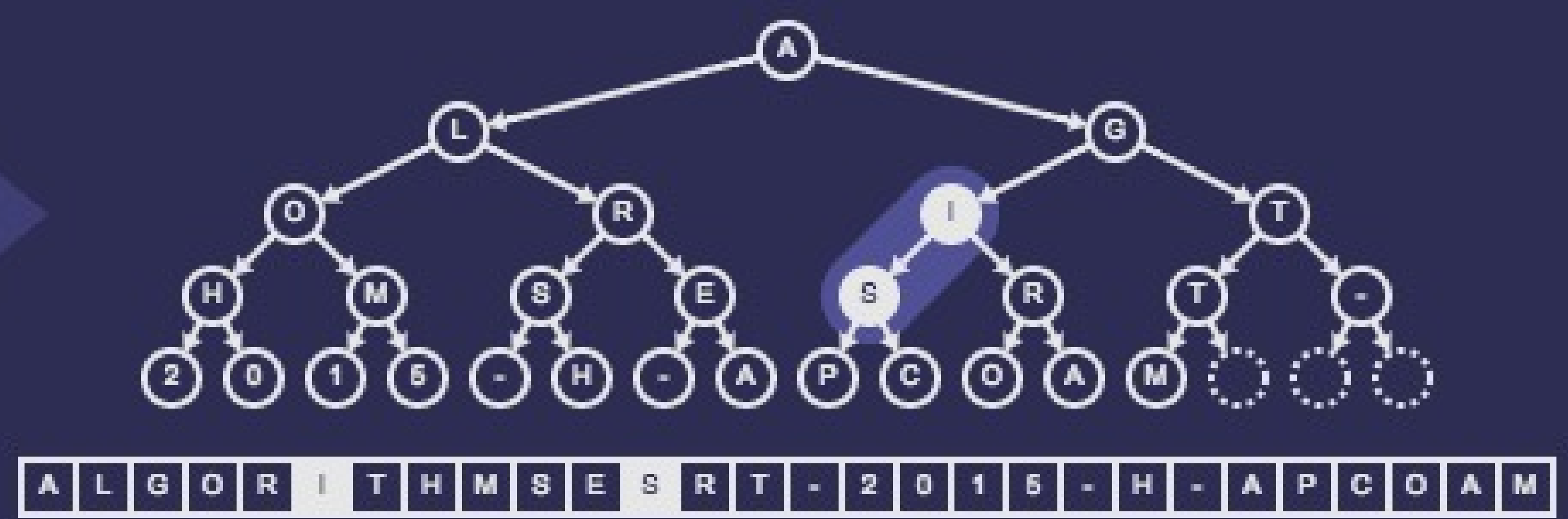
OUTPUT

Step 33. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

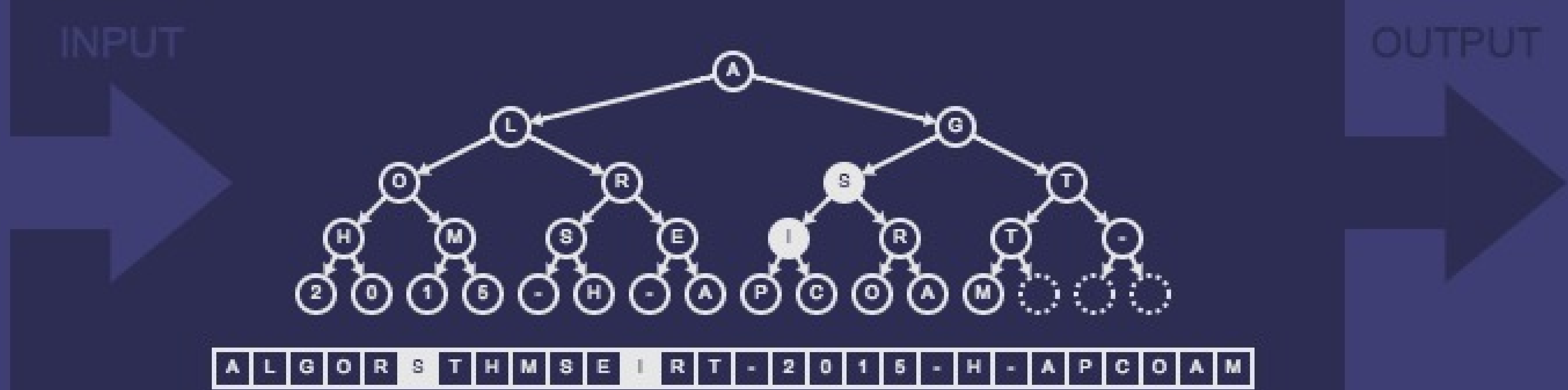


OUTPUT

Step 33. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

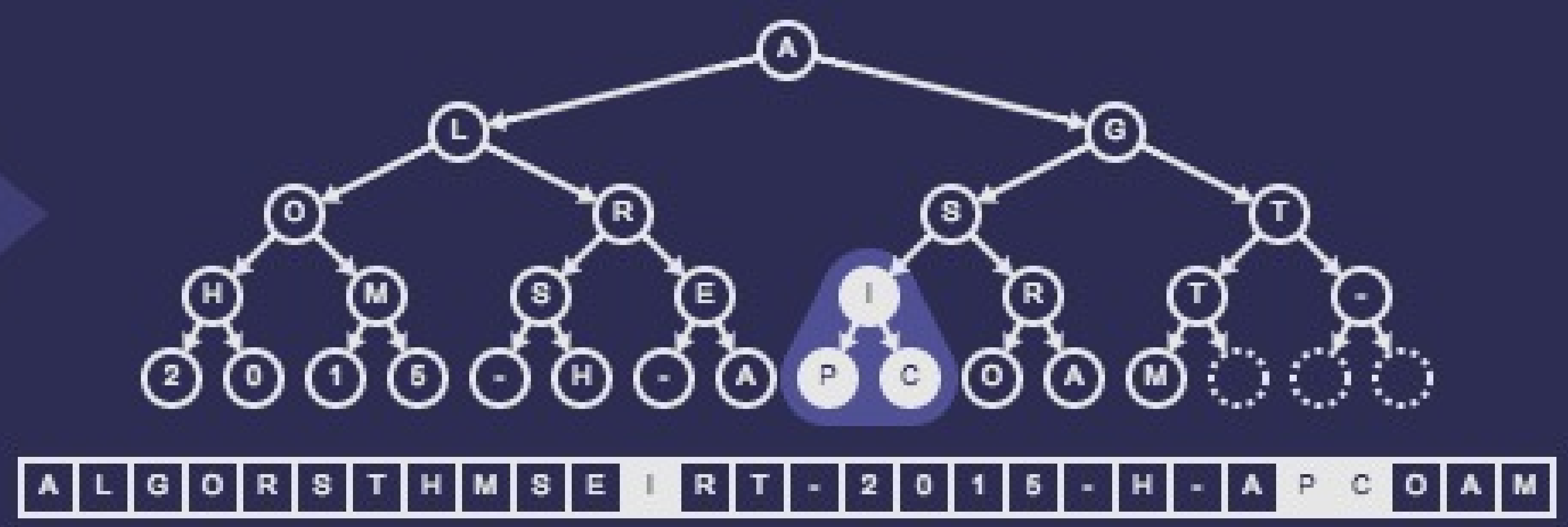


Step 33. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



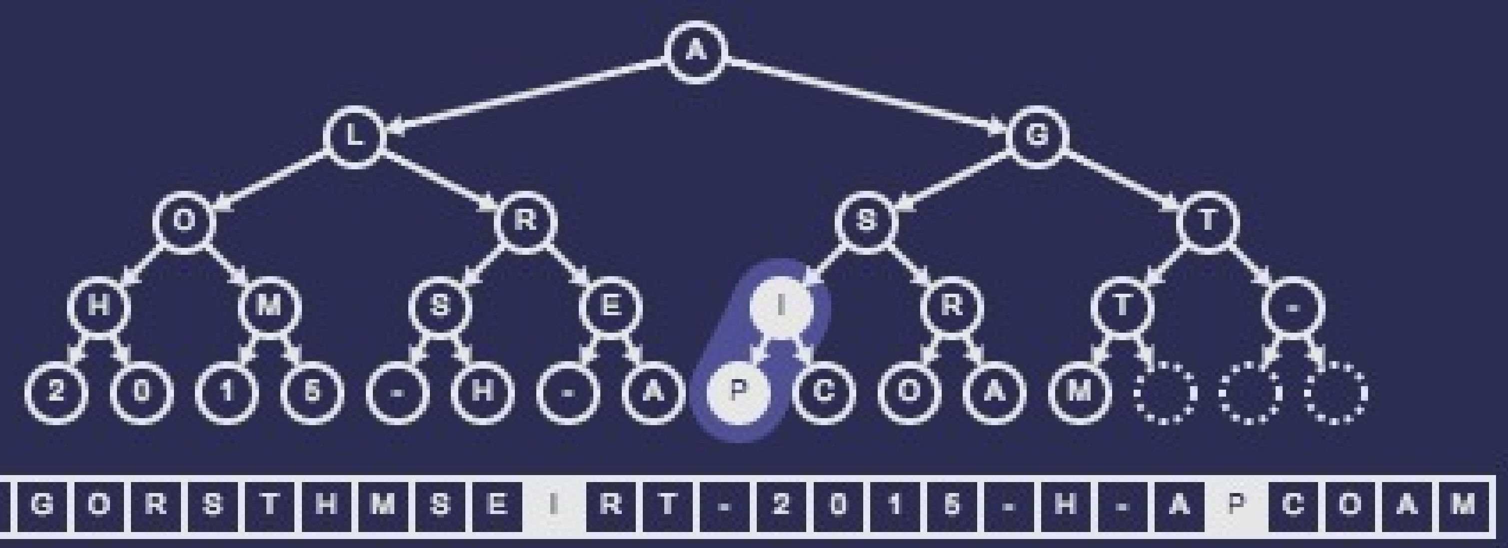
OUTPUT

Step 34. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



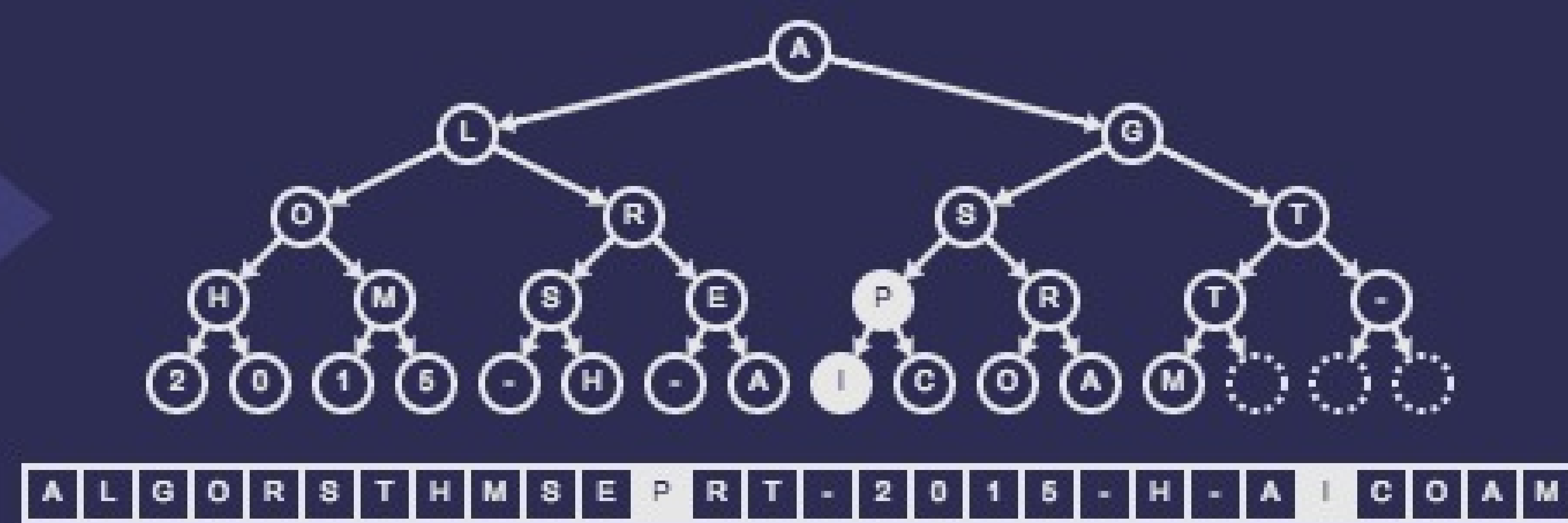
OUTPUT

Step 34. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



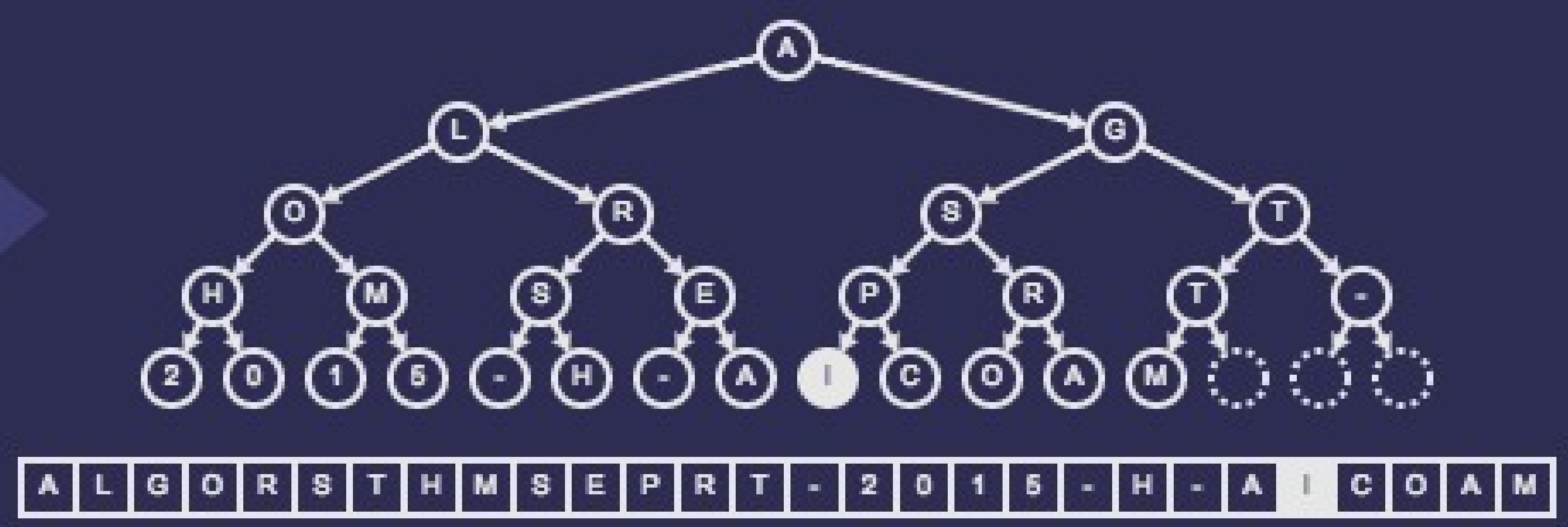
OUTPUT

Step 34. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

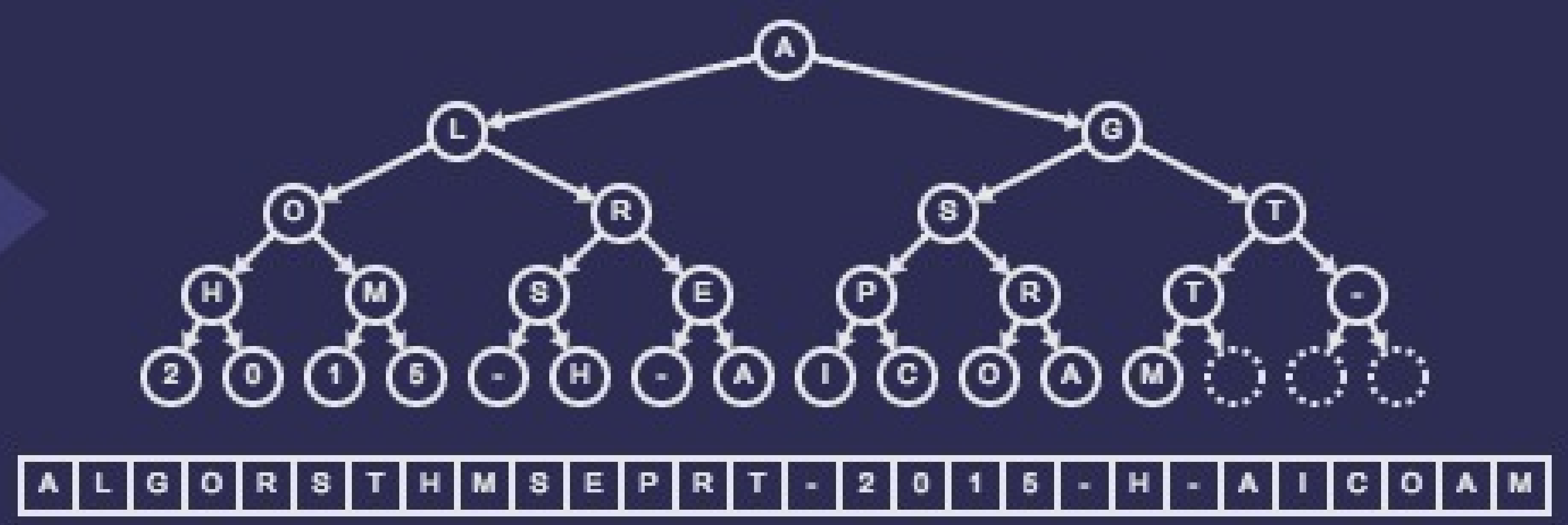
Step 34. It has no children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

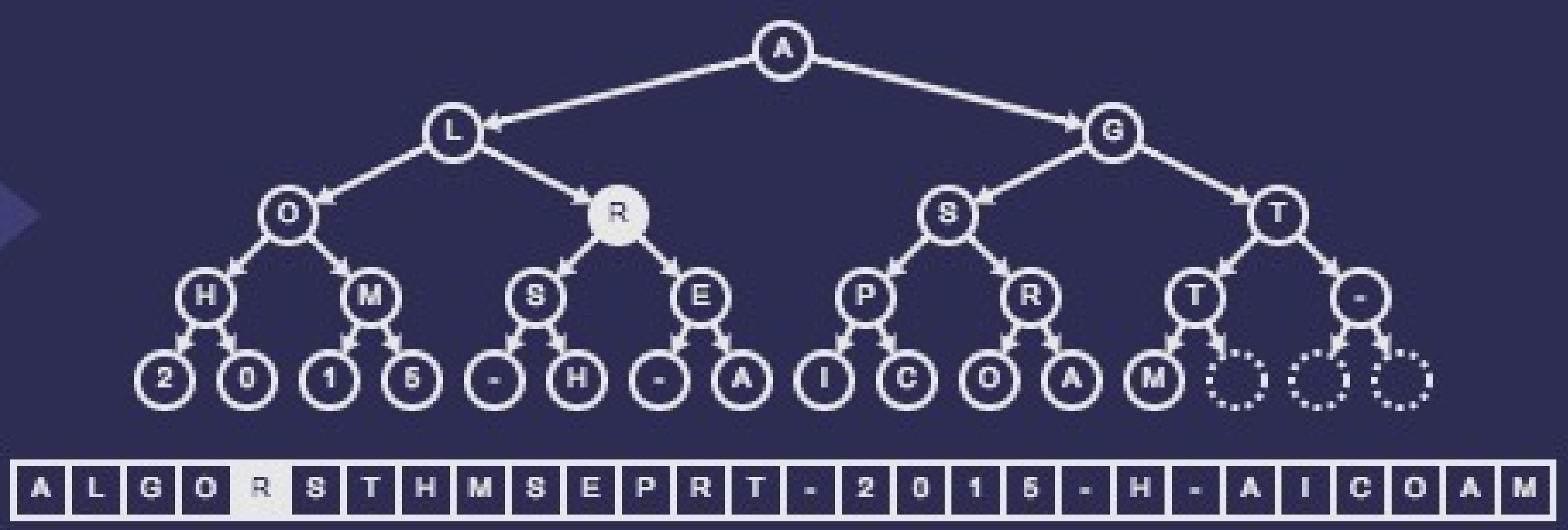


Step 34. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



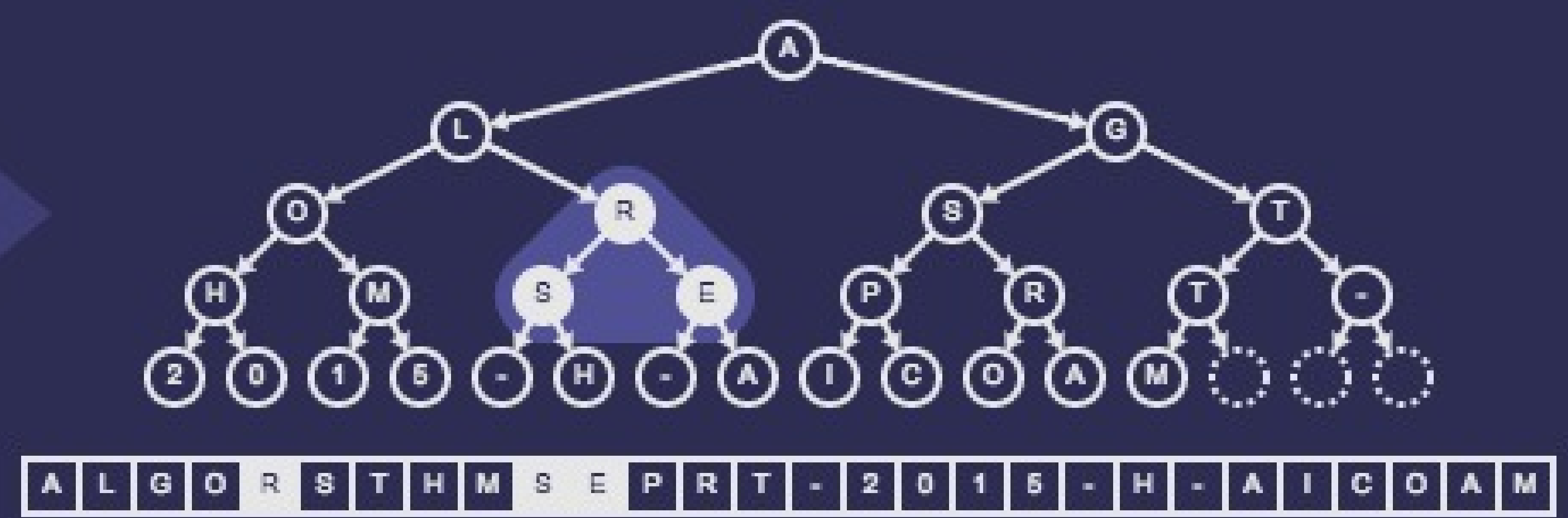
OUTPUT

Step 35. This node has children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



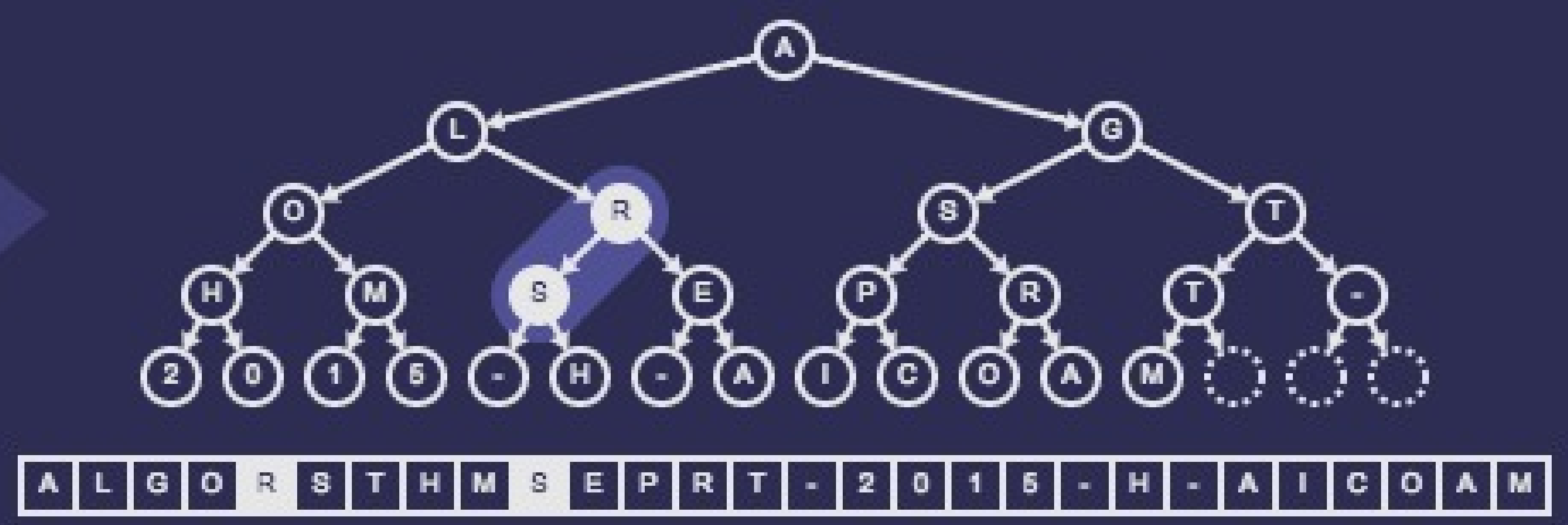
OUTPUT

Step 36. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



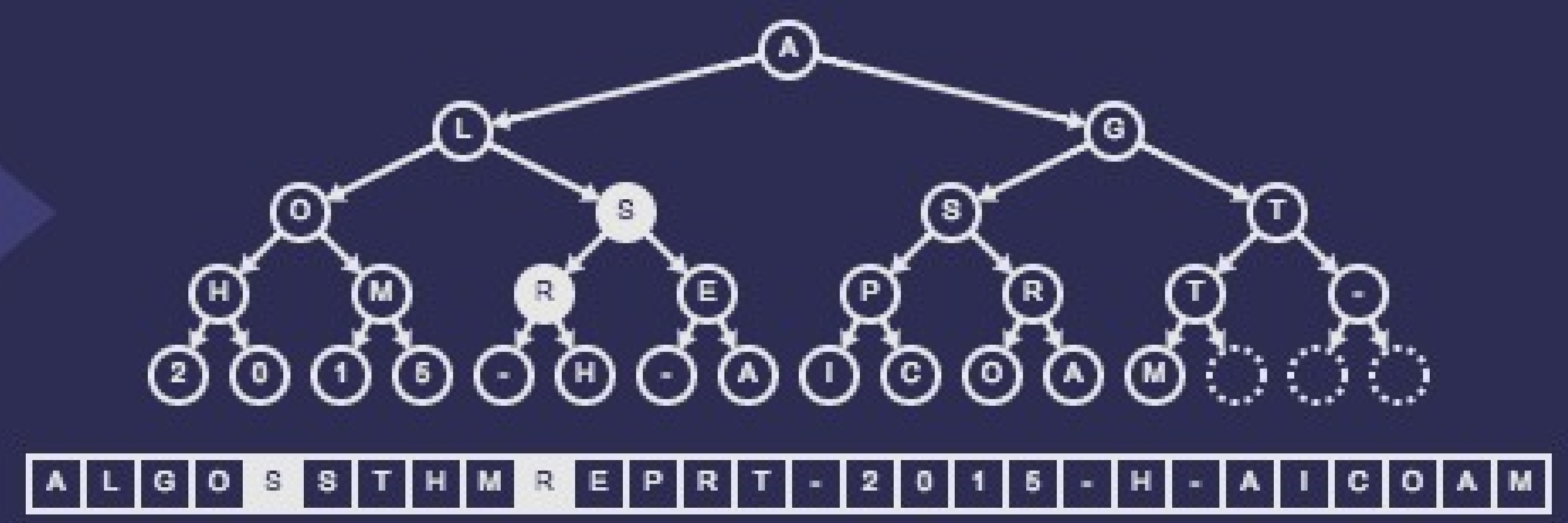
OUTPUT

Step 36. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



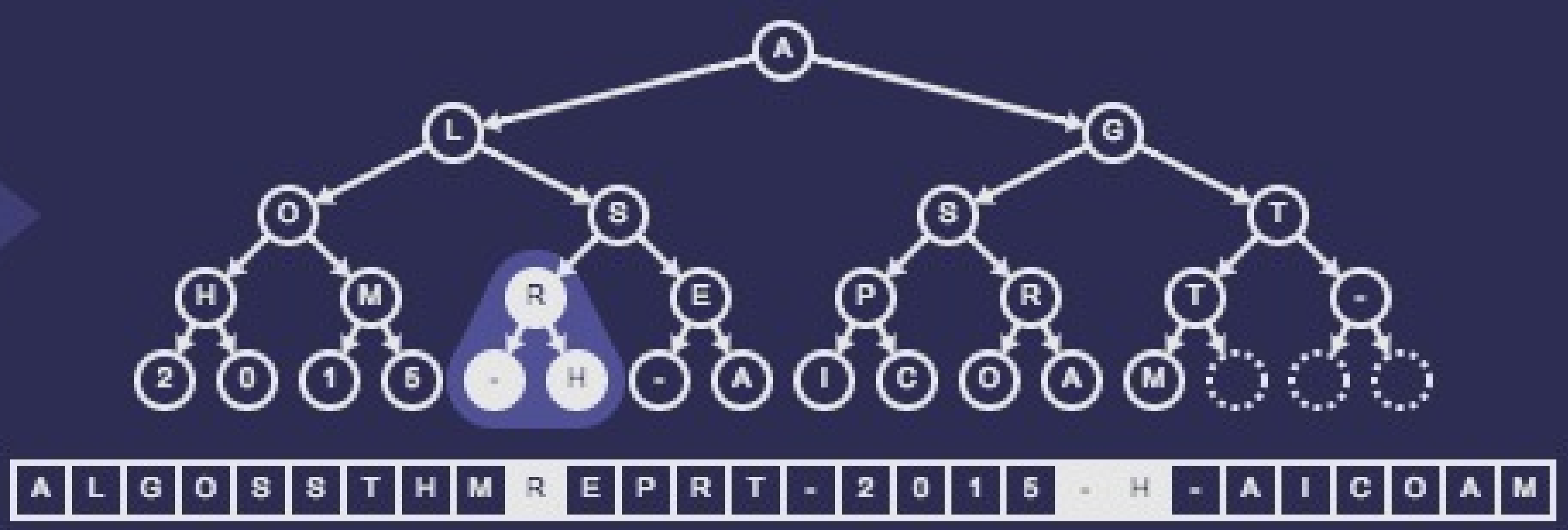
OUTPUT

Step 36. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

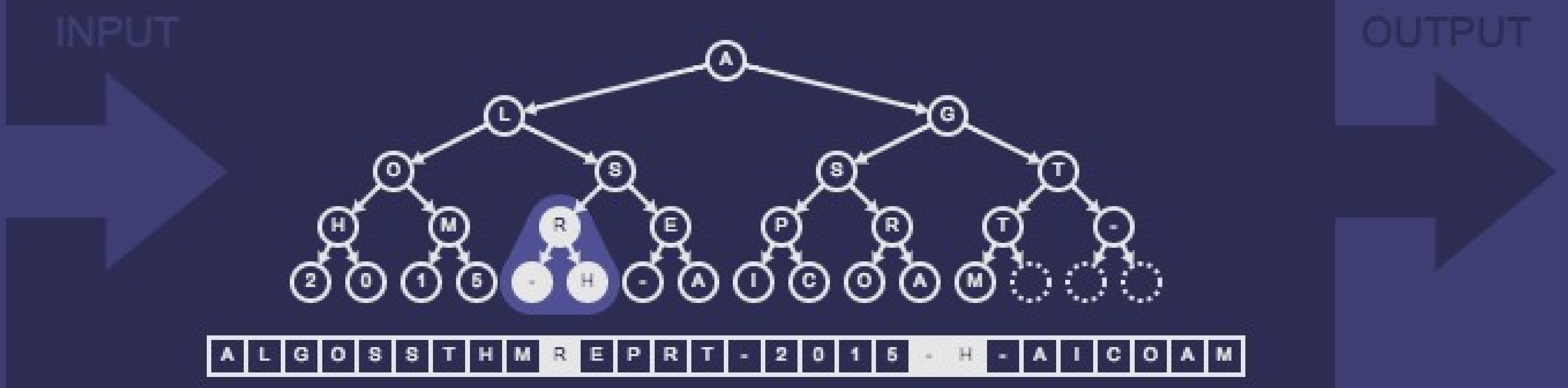


OUTPUT

Step 37. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

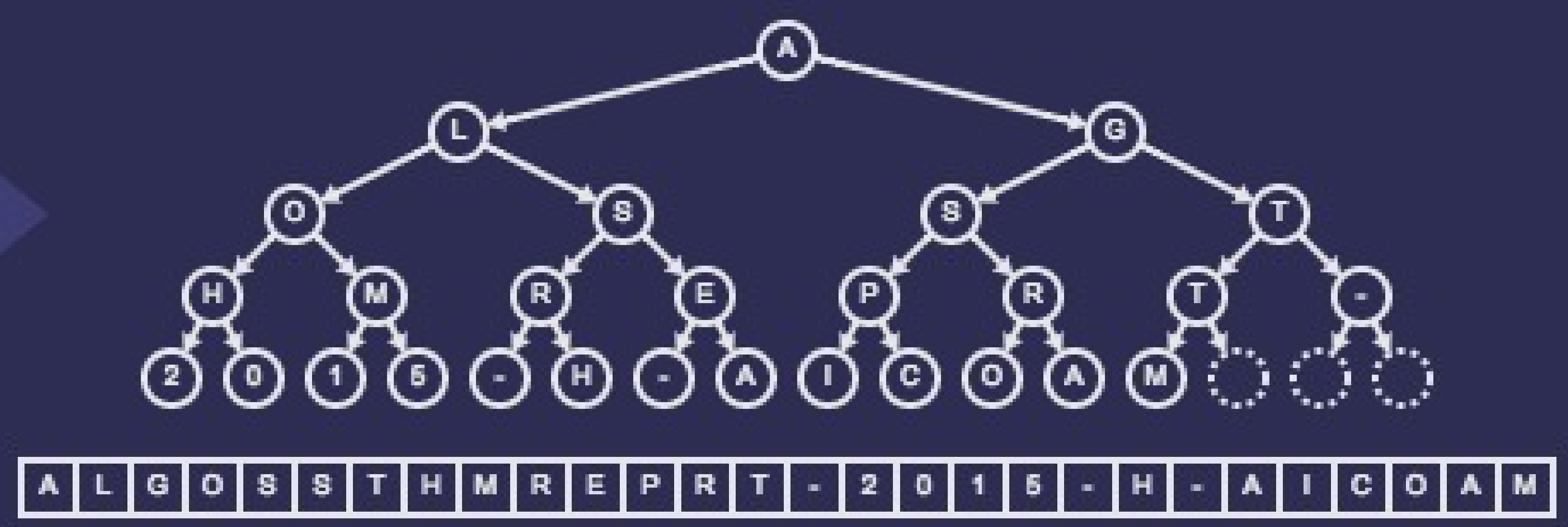


Step 37. The elements are in the correct order

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



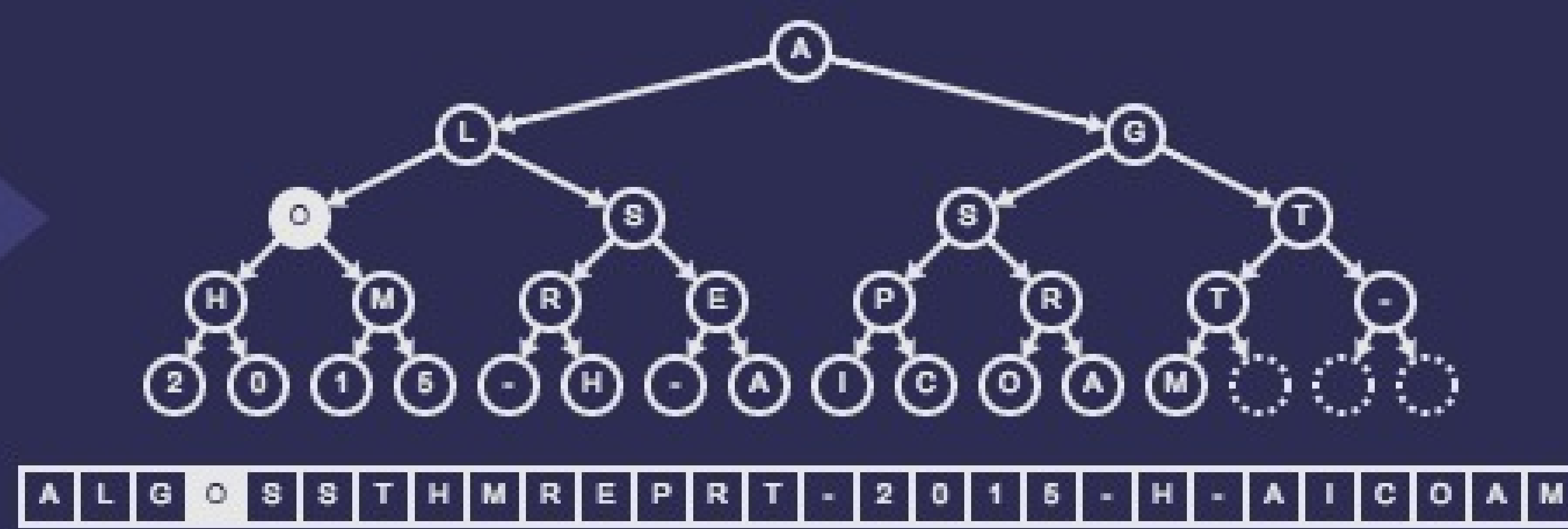
OUTPUT

Step 37. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



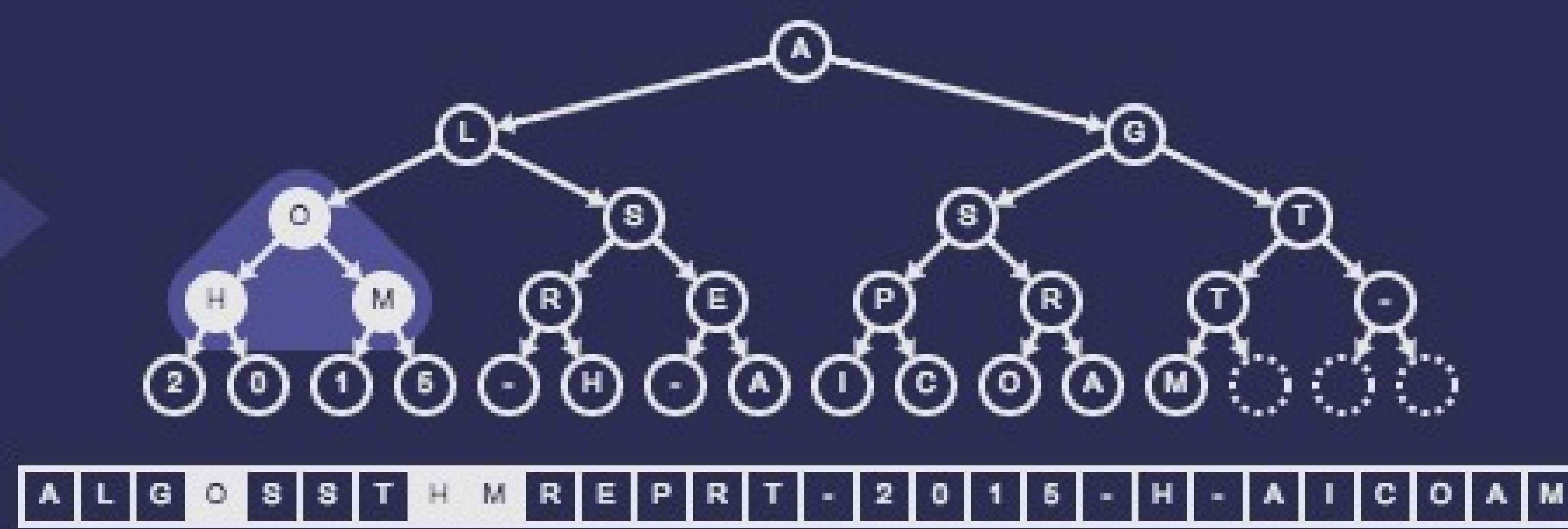
OUTPUT

Step 38. This node has children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



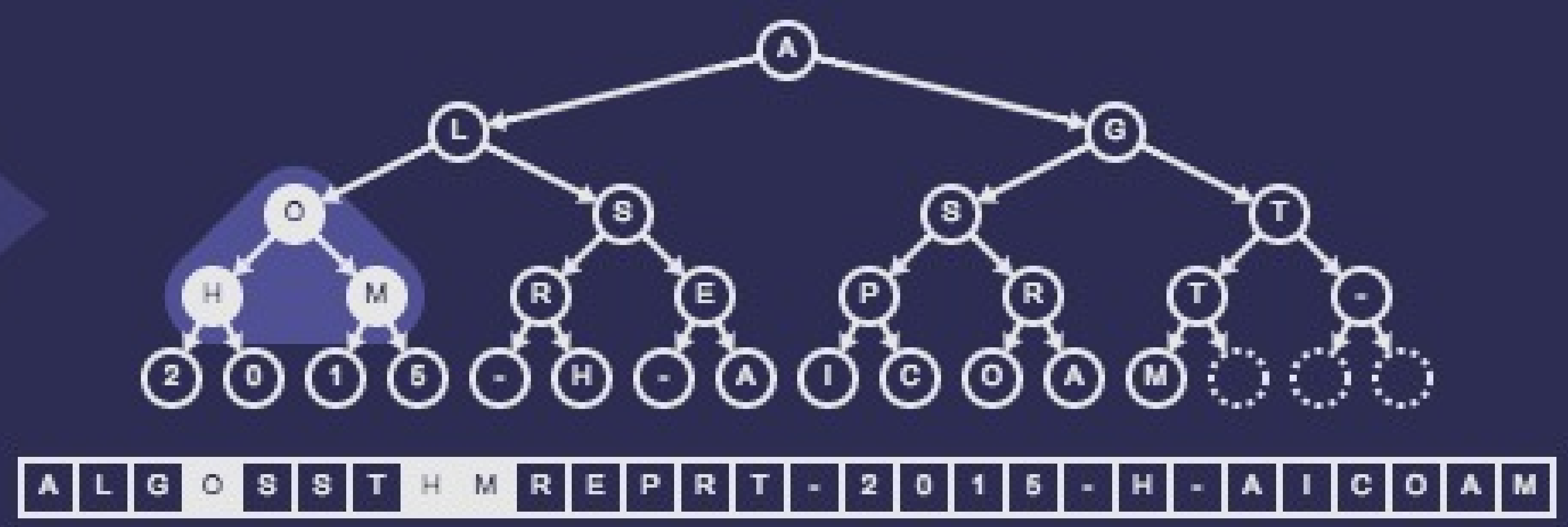
OUTPUT

Step 39. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



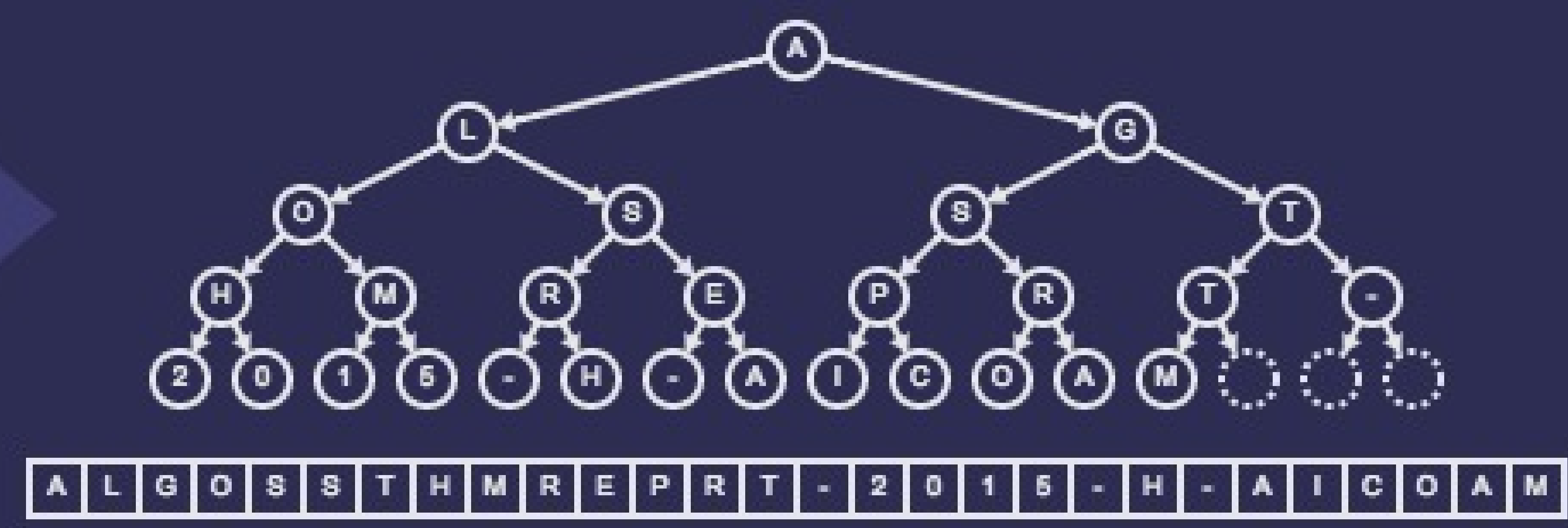
OUTPUT

Step 39. The elements are in the correct order

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

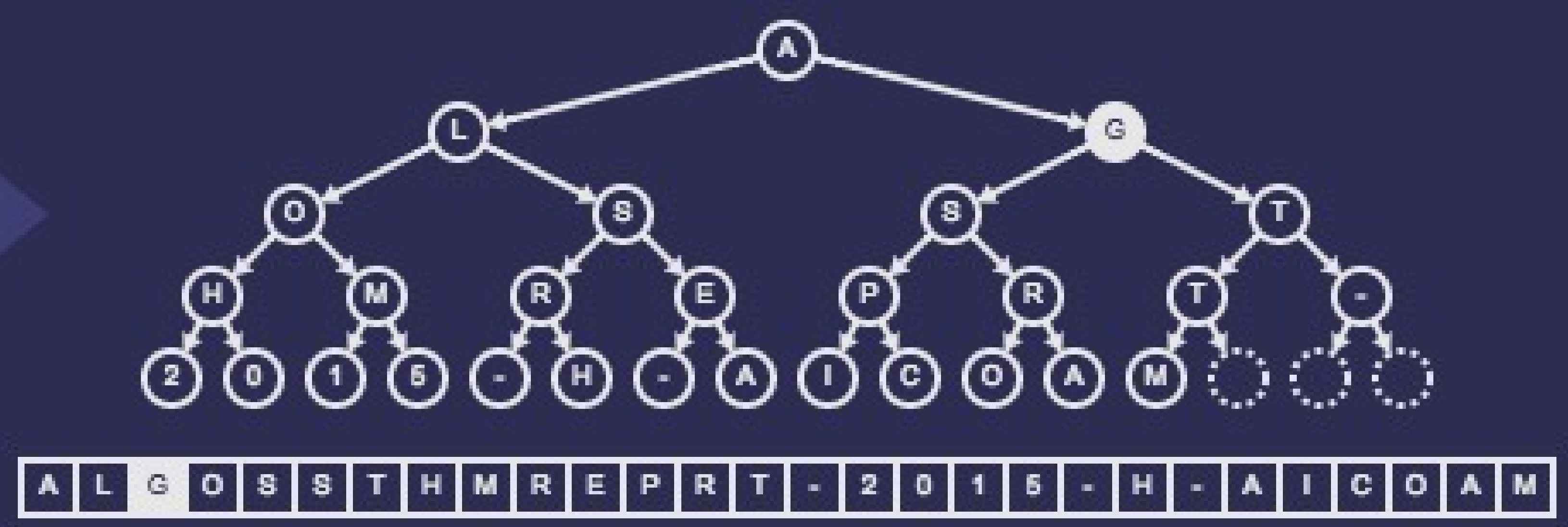
Step 39. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

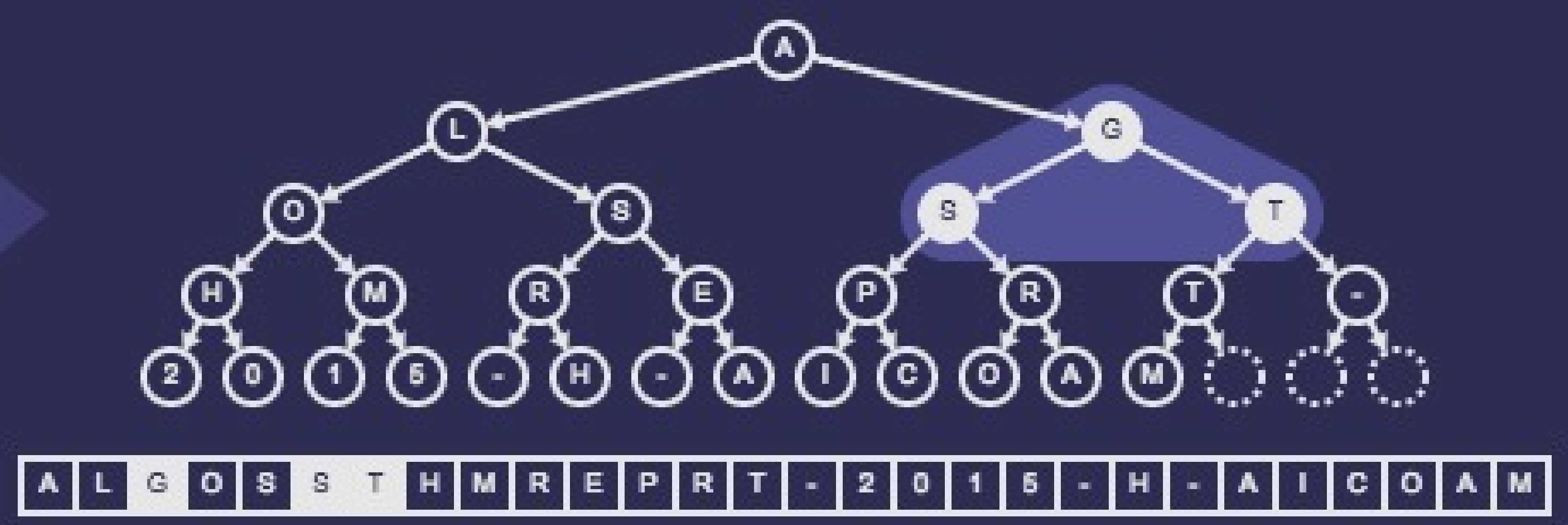


Step 40. This node has children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

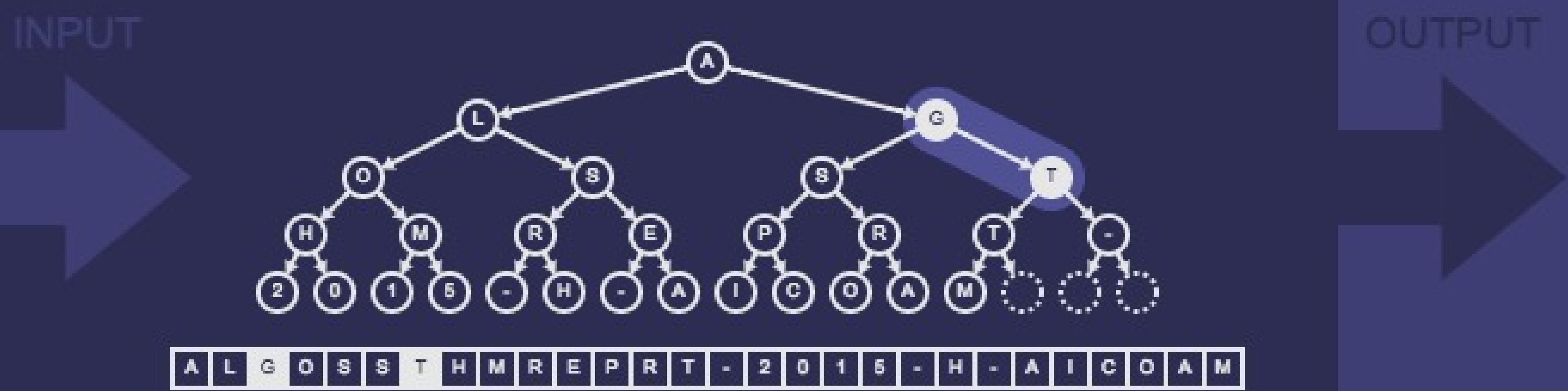


OUTPUT

Step 41. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

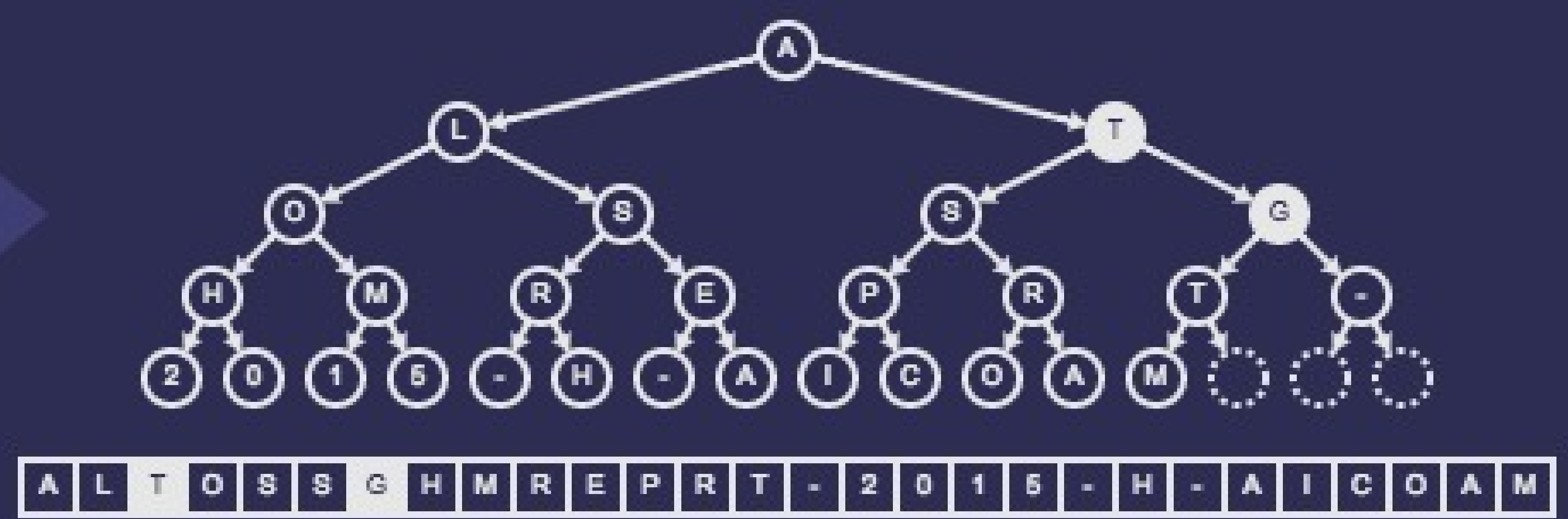


Step 41. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



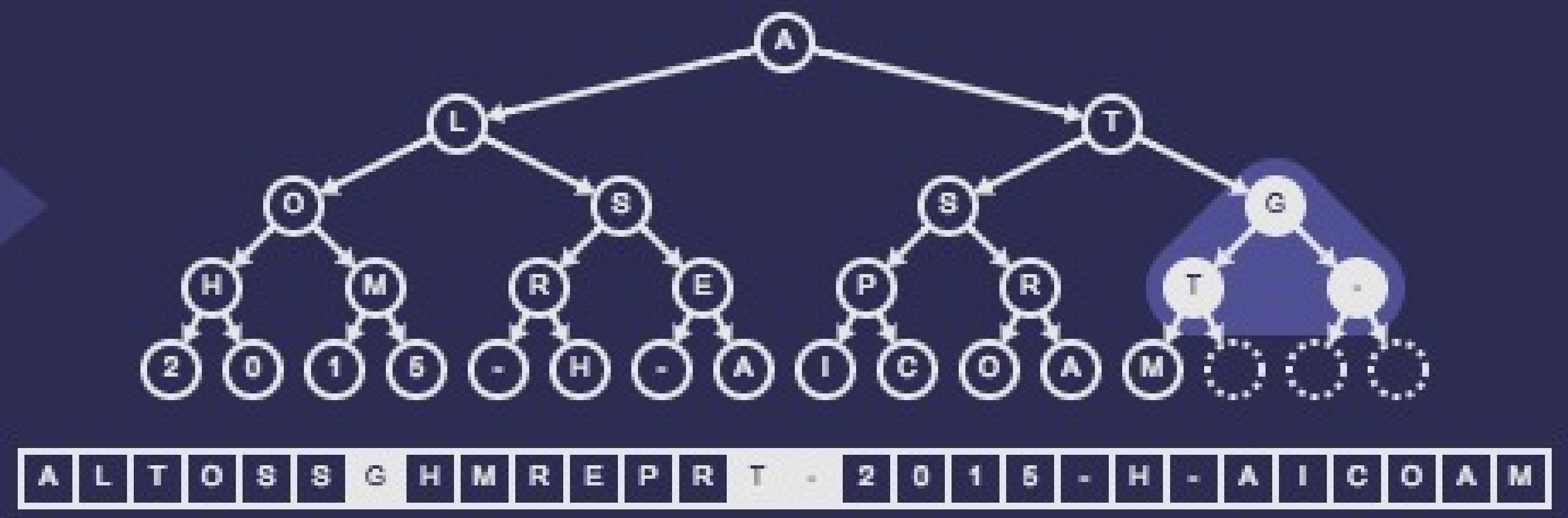
OUTPUT

Step 41. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



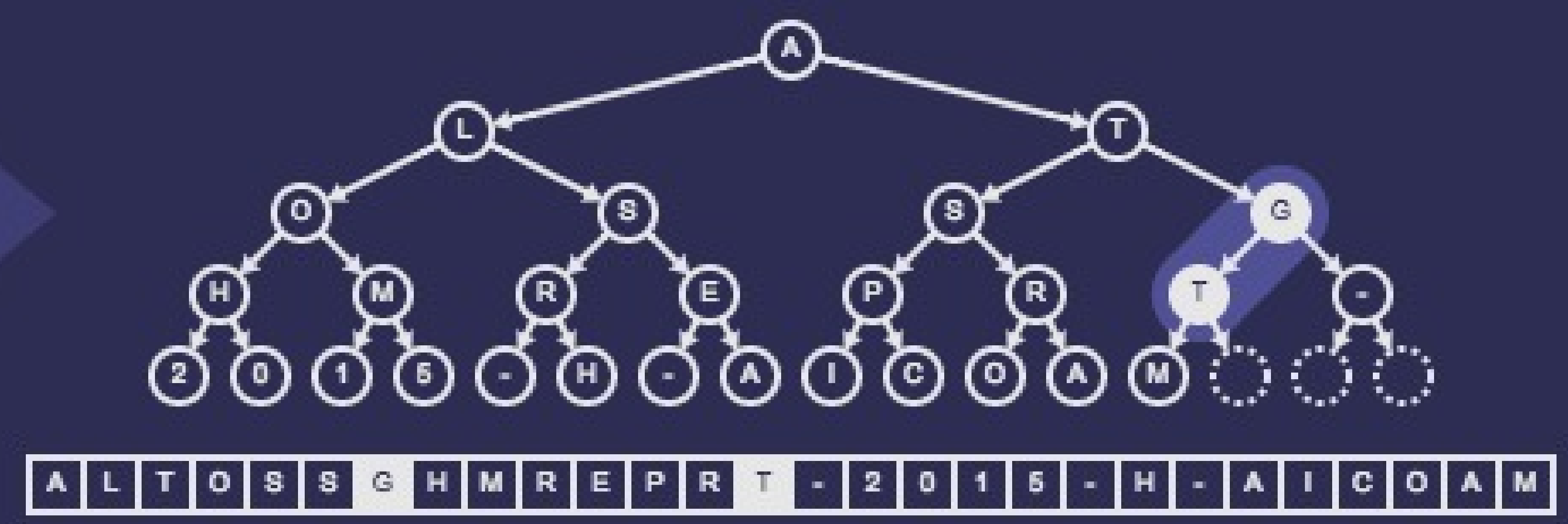
OUTPUT

Step 42. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



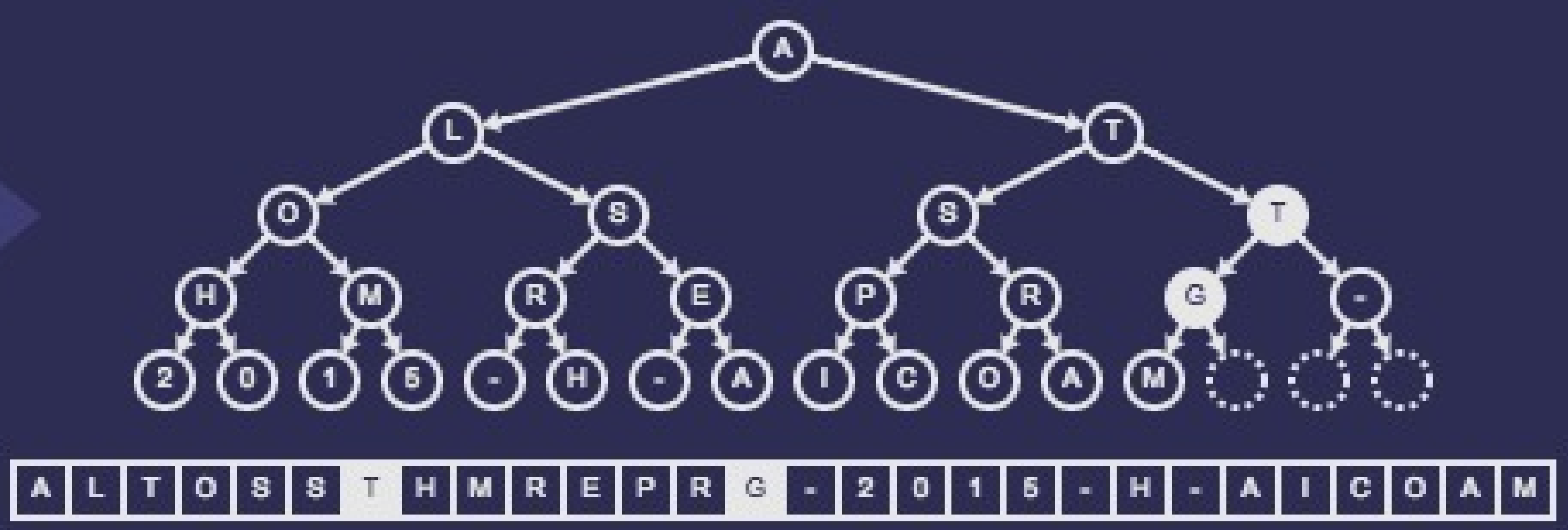
OUTPUT

Step 42. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



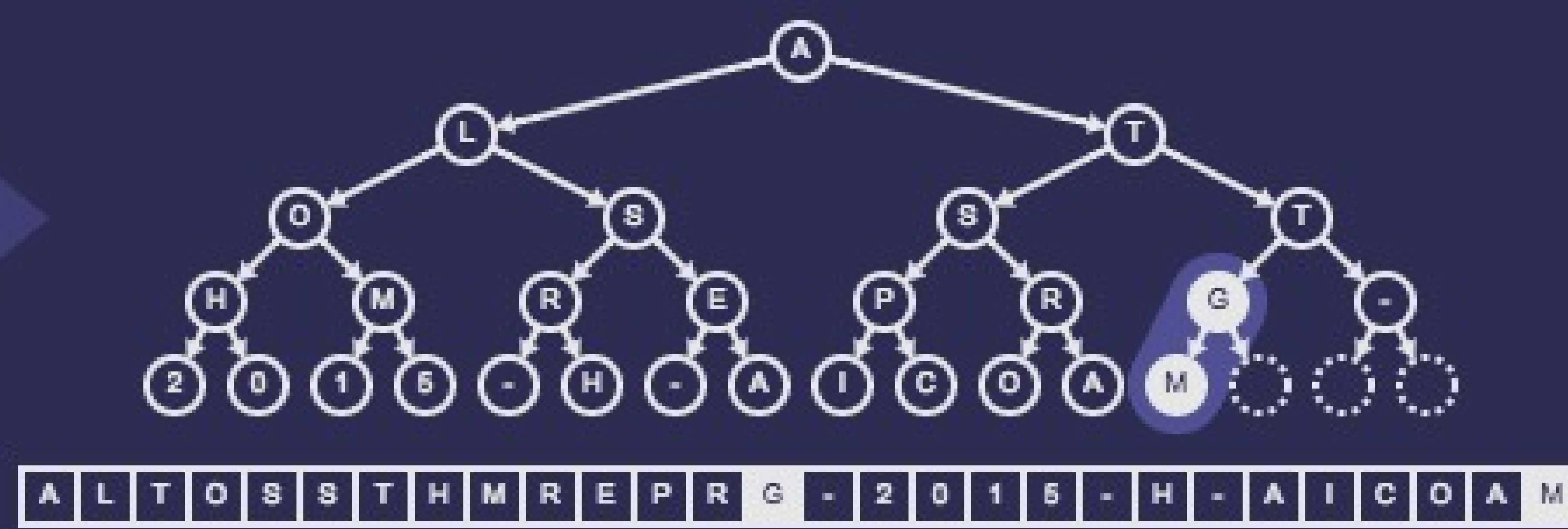
OUTPUT

Step 42. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

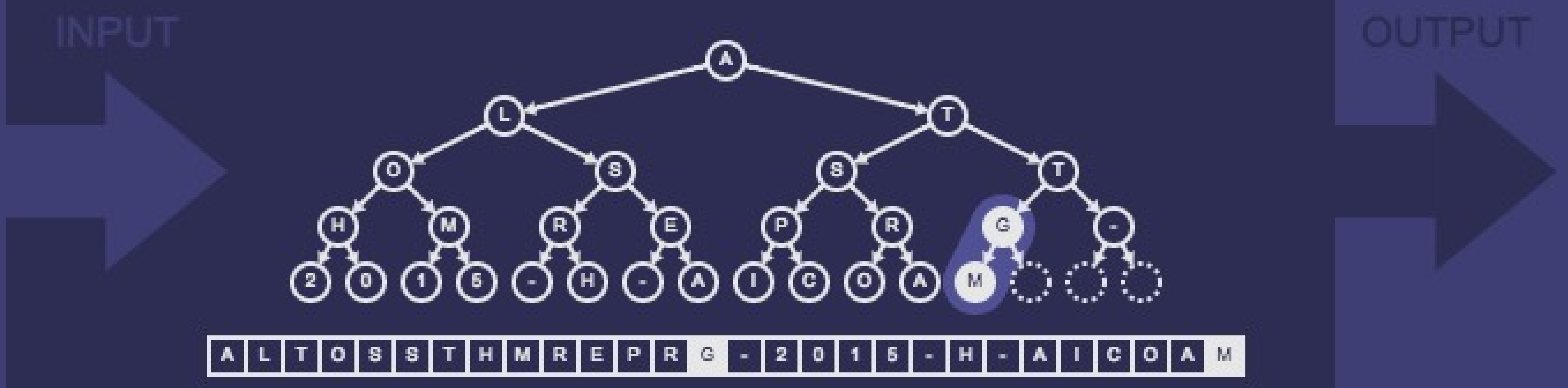


OUTPUT

Step 43. Compare the node with its child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

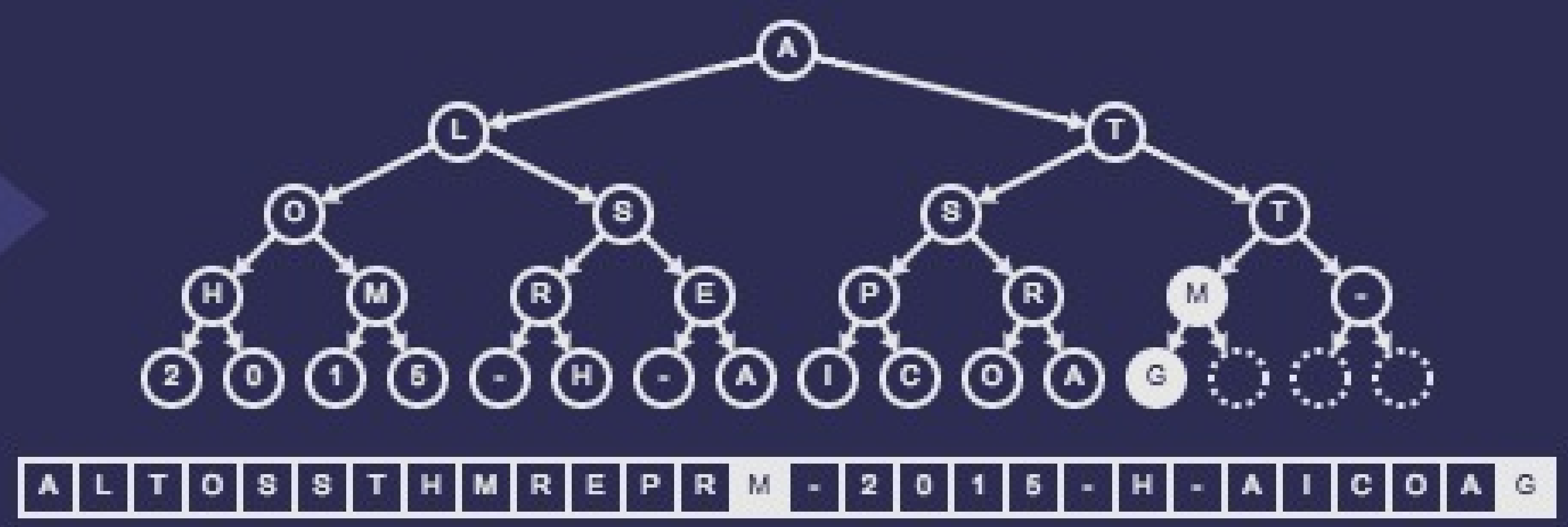


Step 43. Its child is larger than it

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



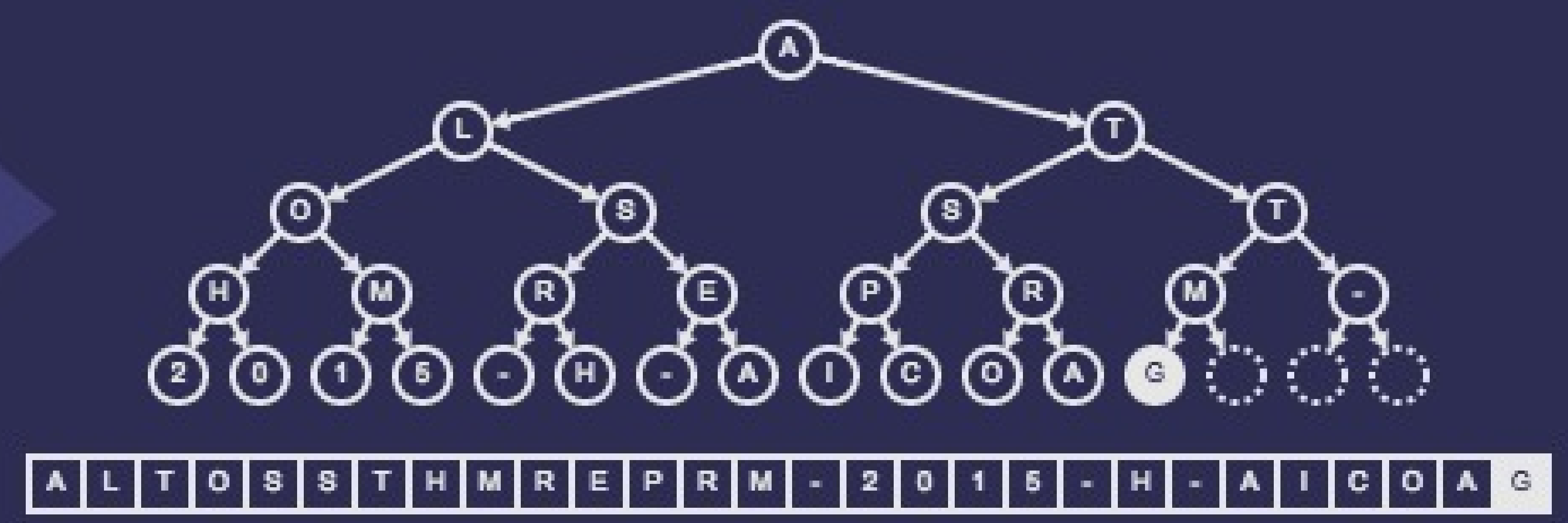
OUTPUT

Step 43. Swap it with its child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



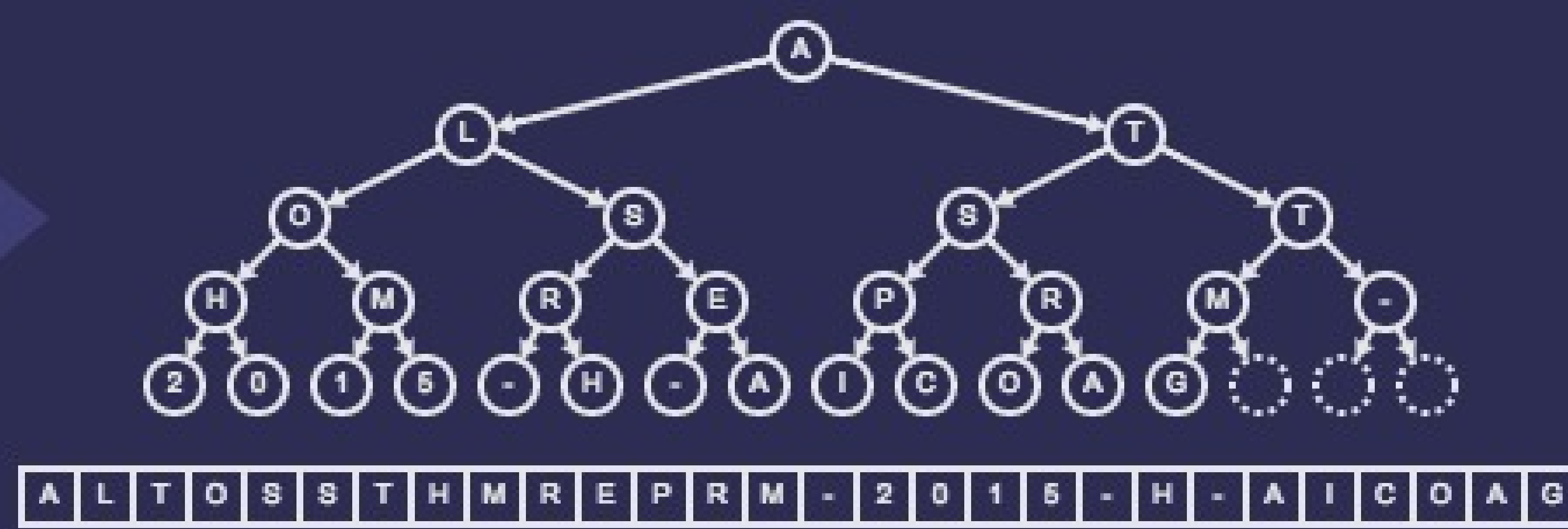
OUTPUT

Step 43. It has no children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



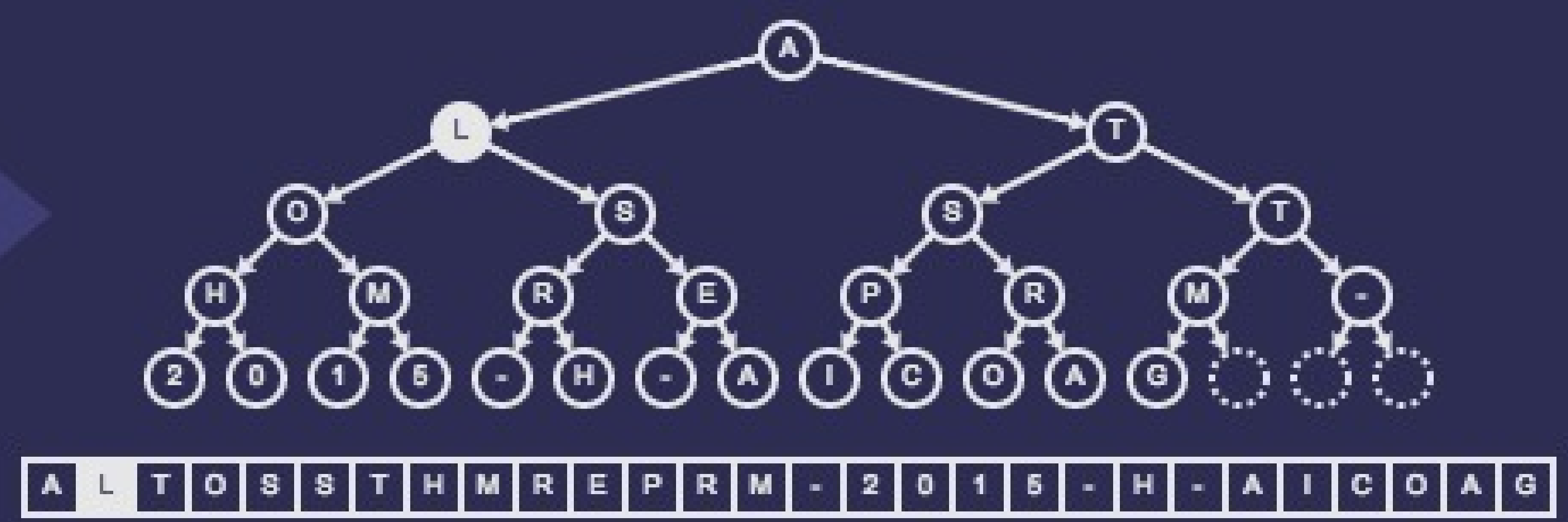
OUTPUT

Step 43. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



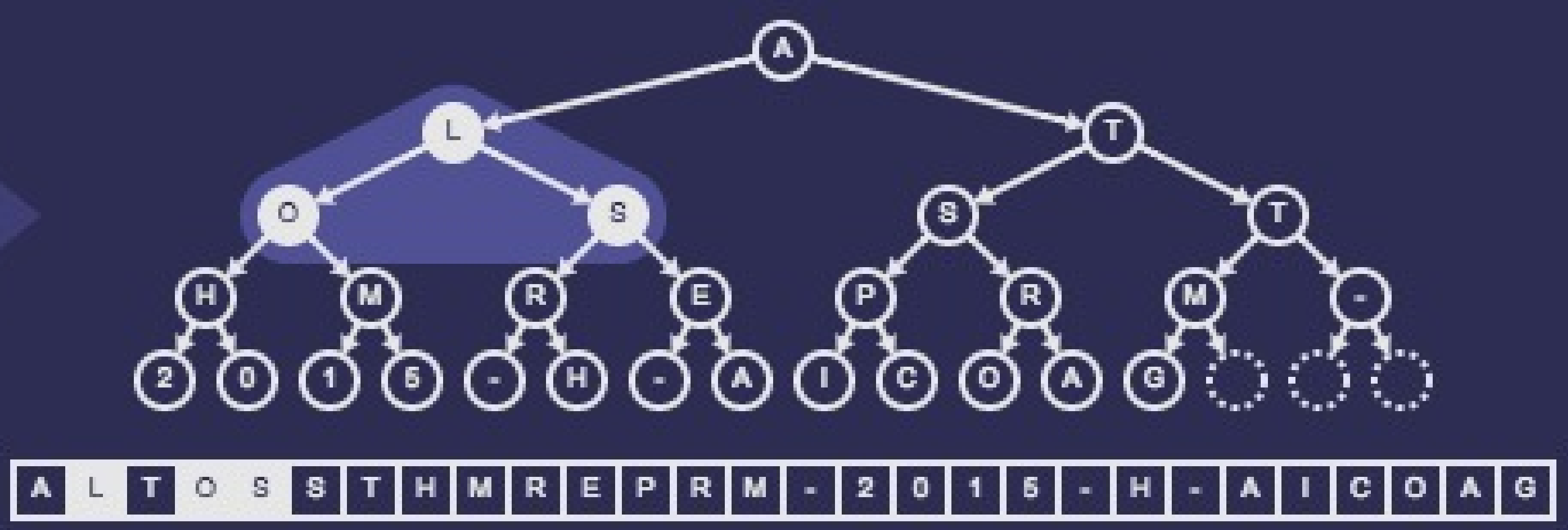
OUTPUT

Step 44. This node has children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



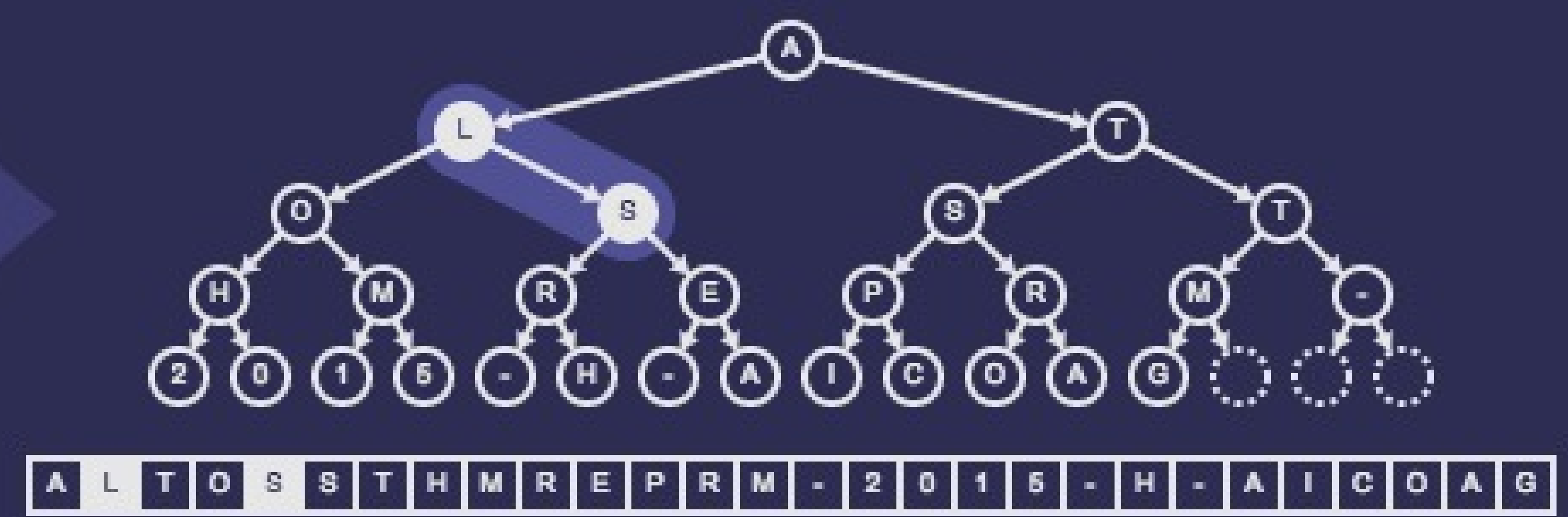
OUTPUT

Step 45. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



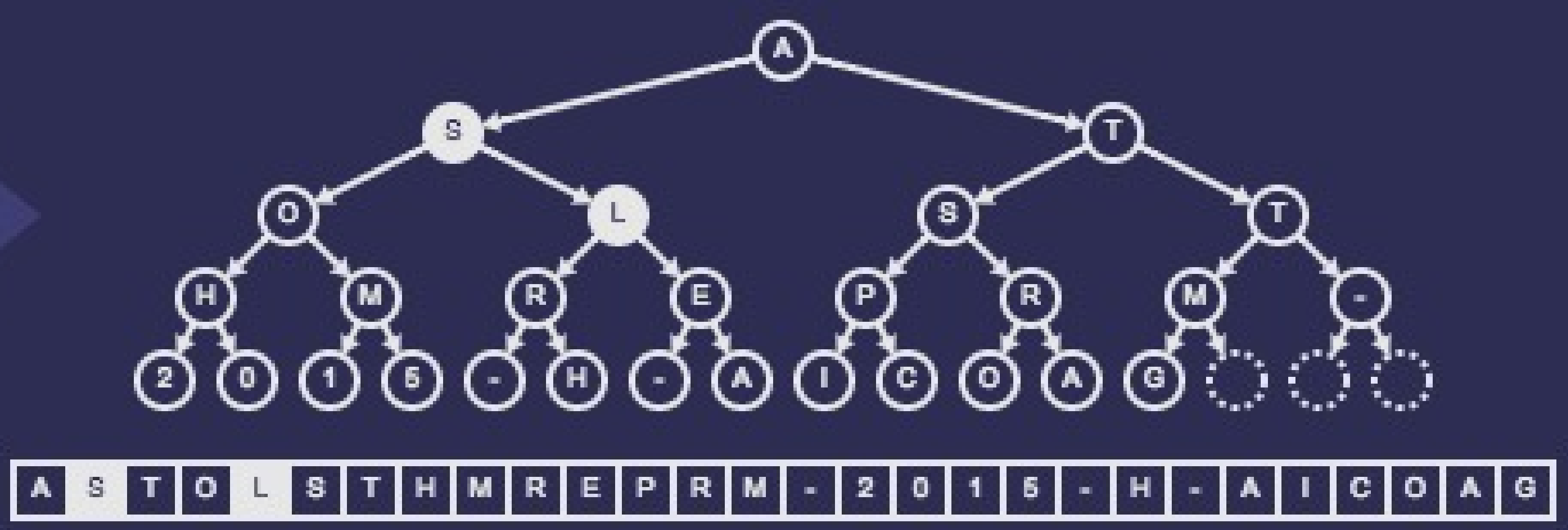
OUTPUT

Step 45. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



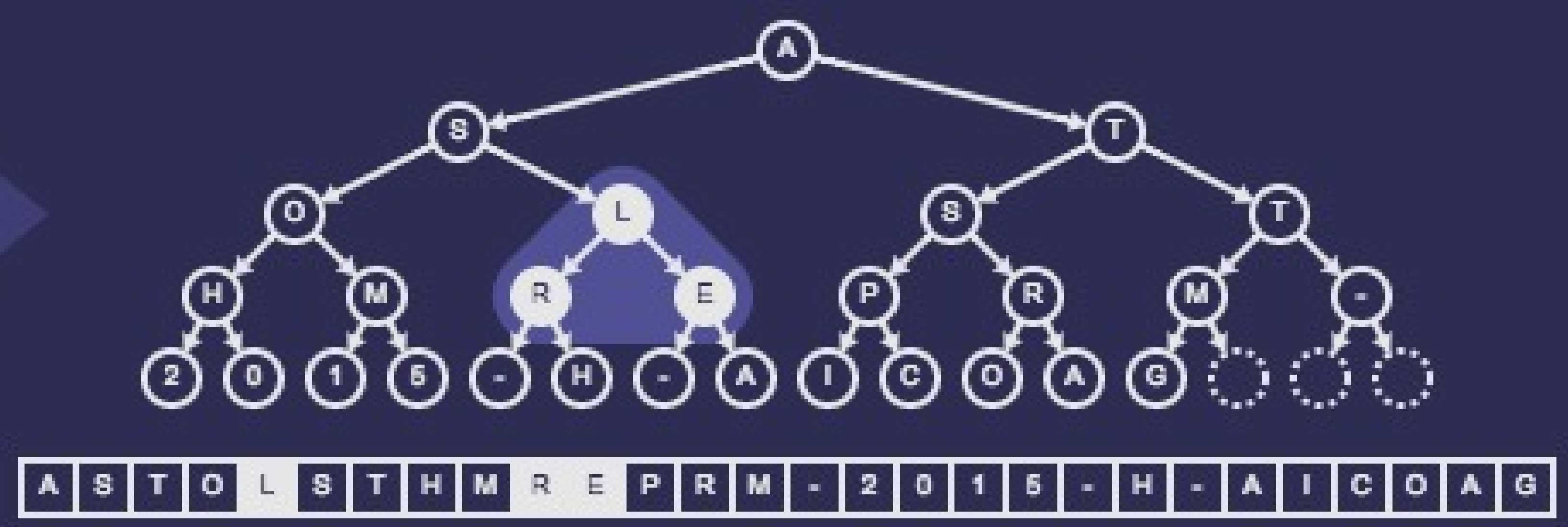
OUTPUT

Step 45. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

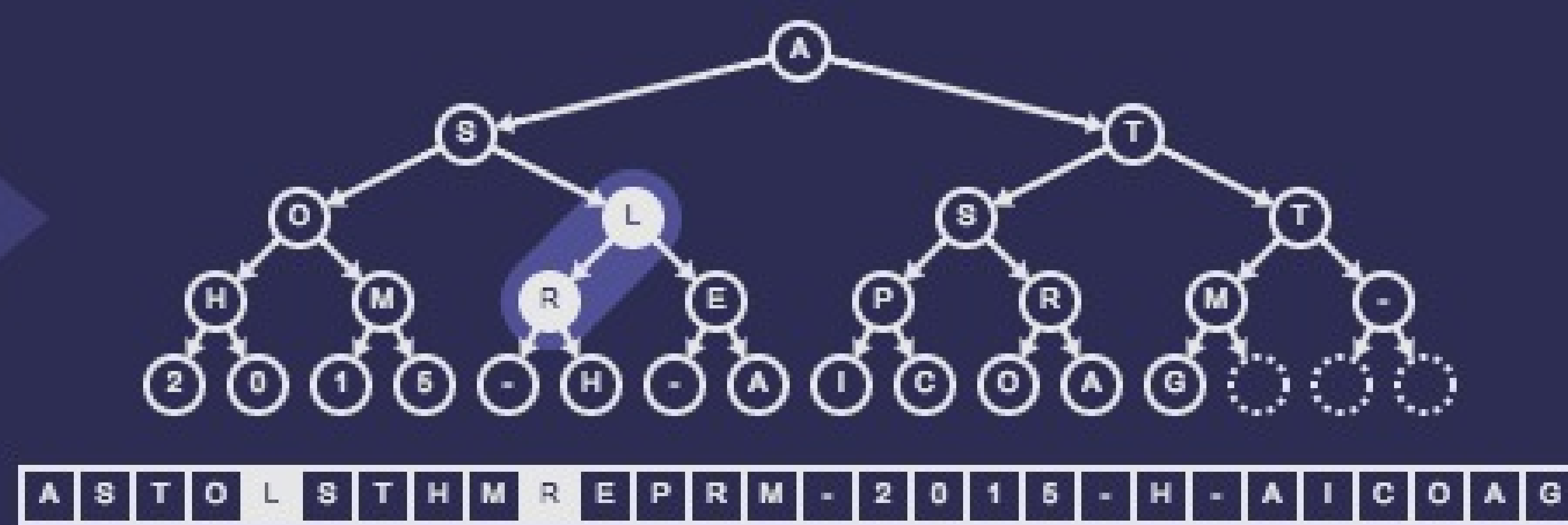
Step 46. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

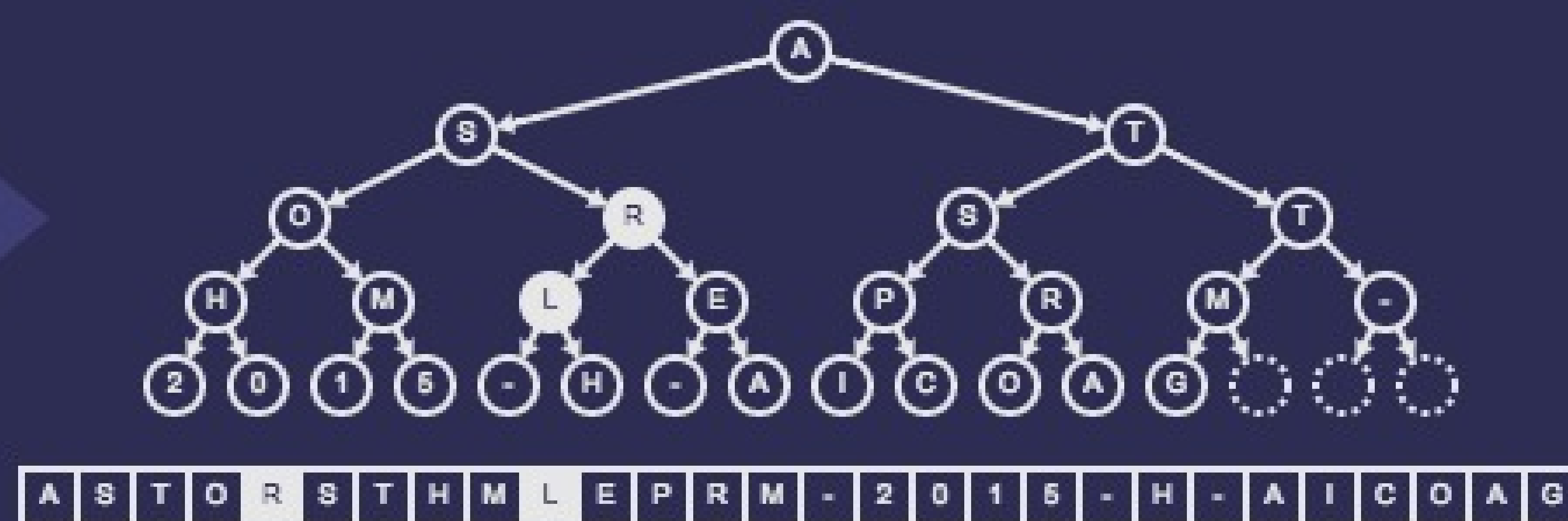


Step 46. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



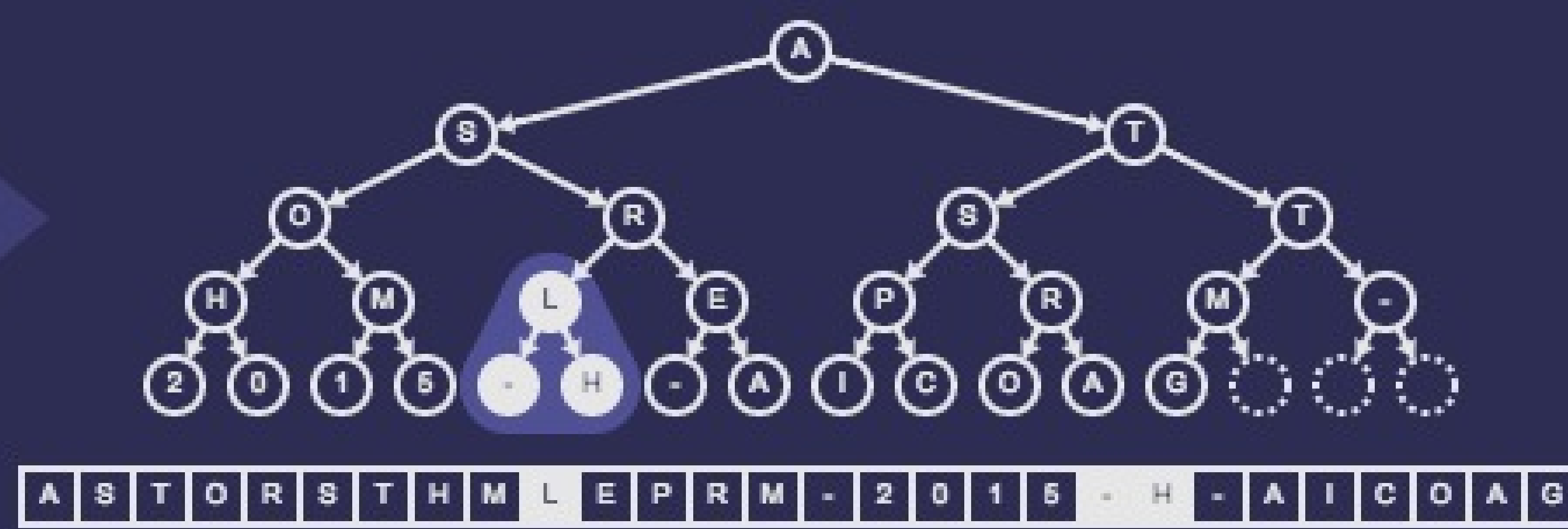
OUTPUT

Step 46. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



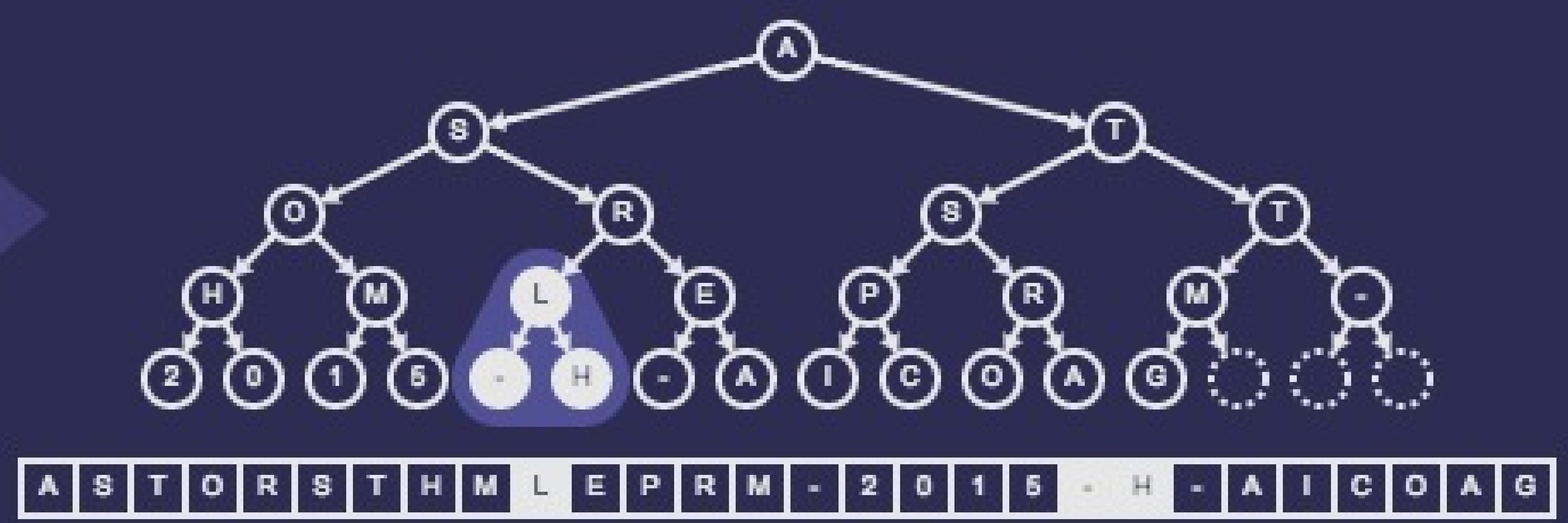
OUTPUT

Step 47. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

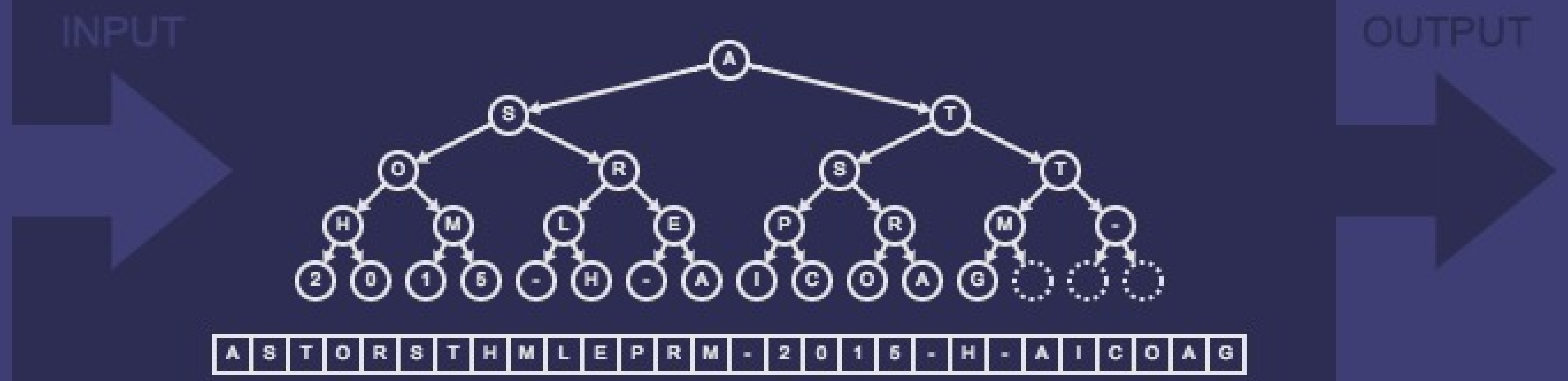


OUTPUT

Step 47. The elements are in the correct order

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

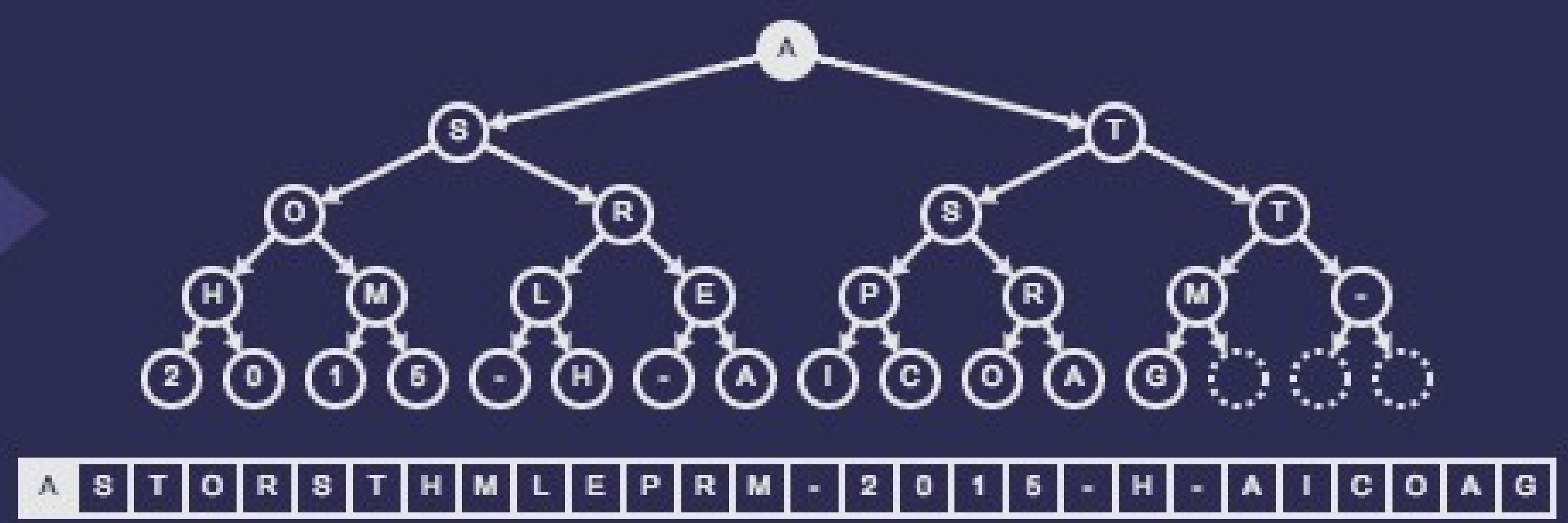


Step 47. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



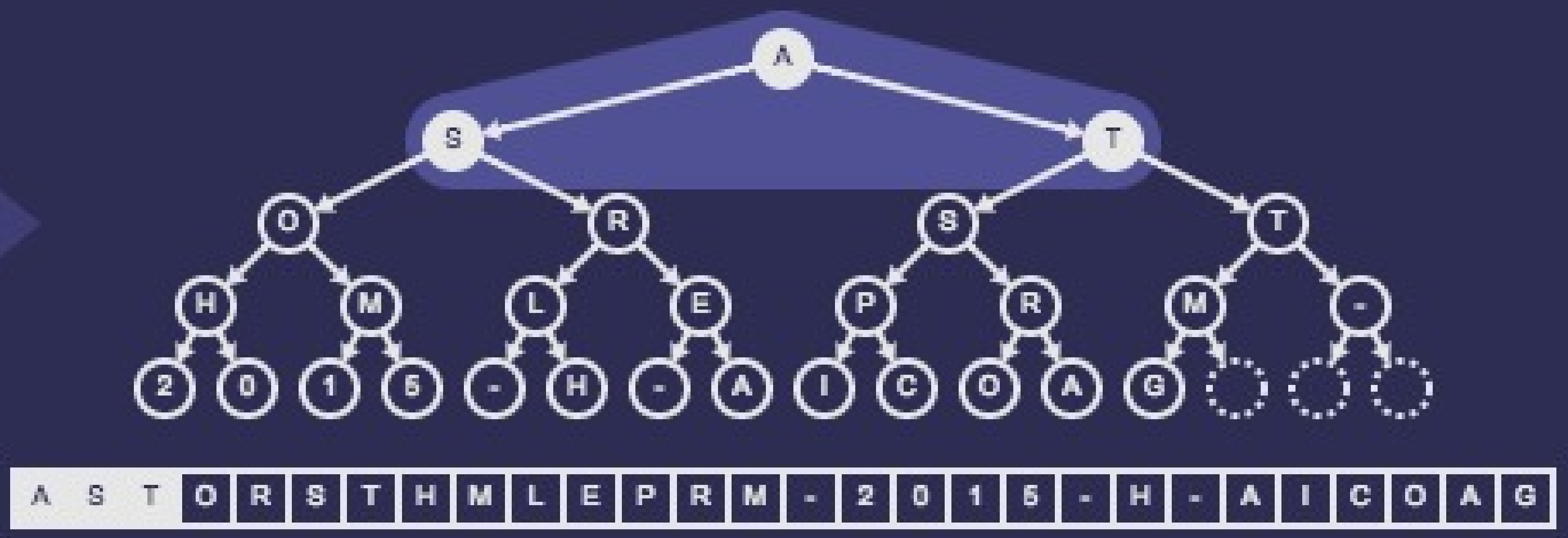
OUTPUT

Step 48. This node has children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



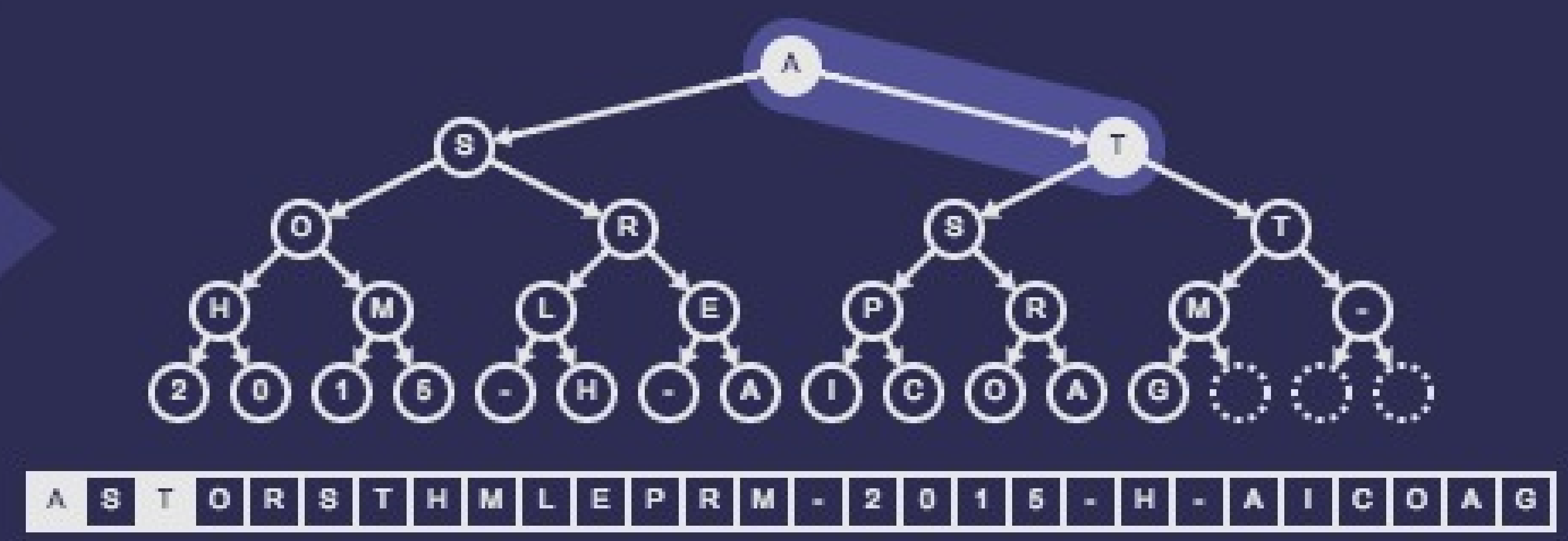
OUTPUT

Step 49. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

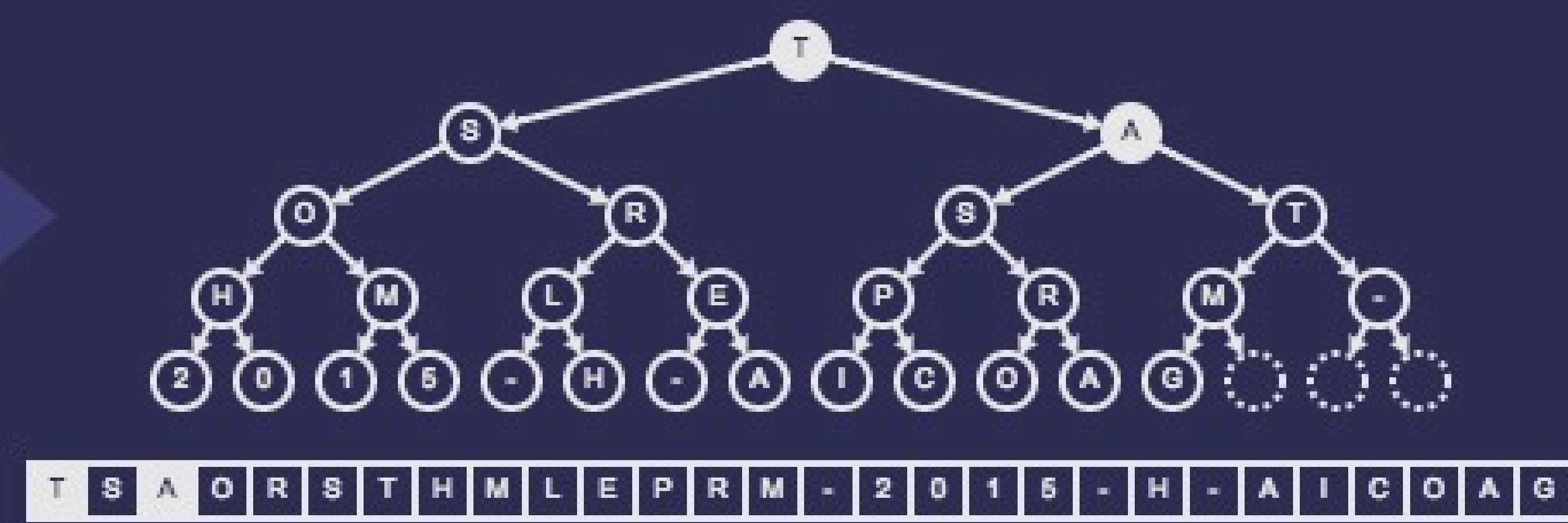
Step 49. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

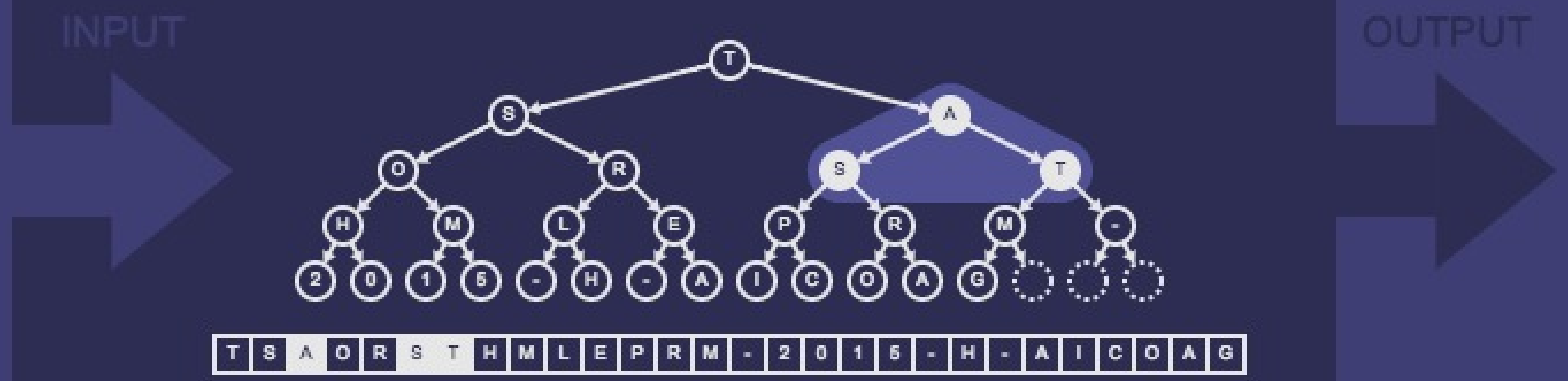
OUTPUT



Step 49. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

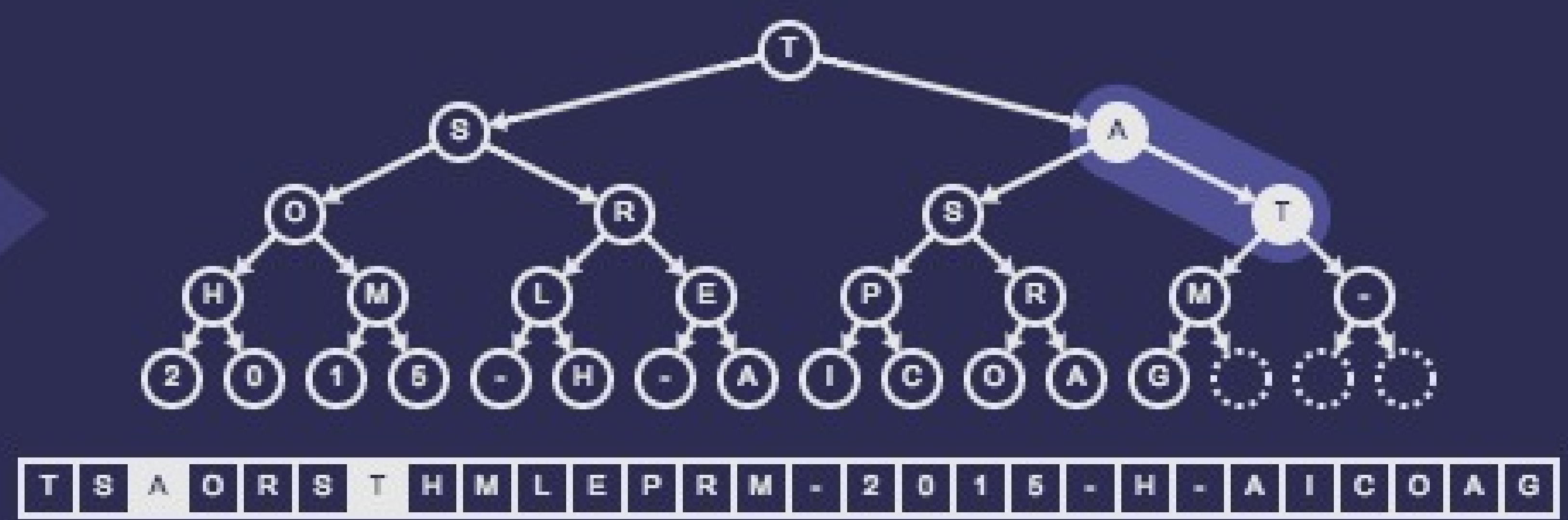


Step 50. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



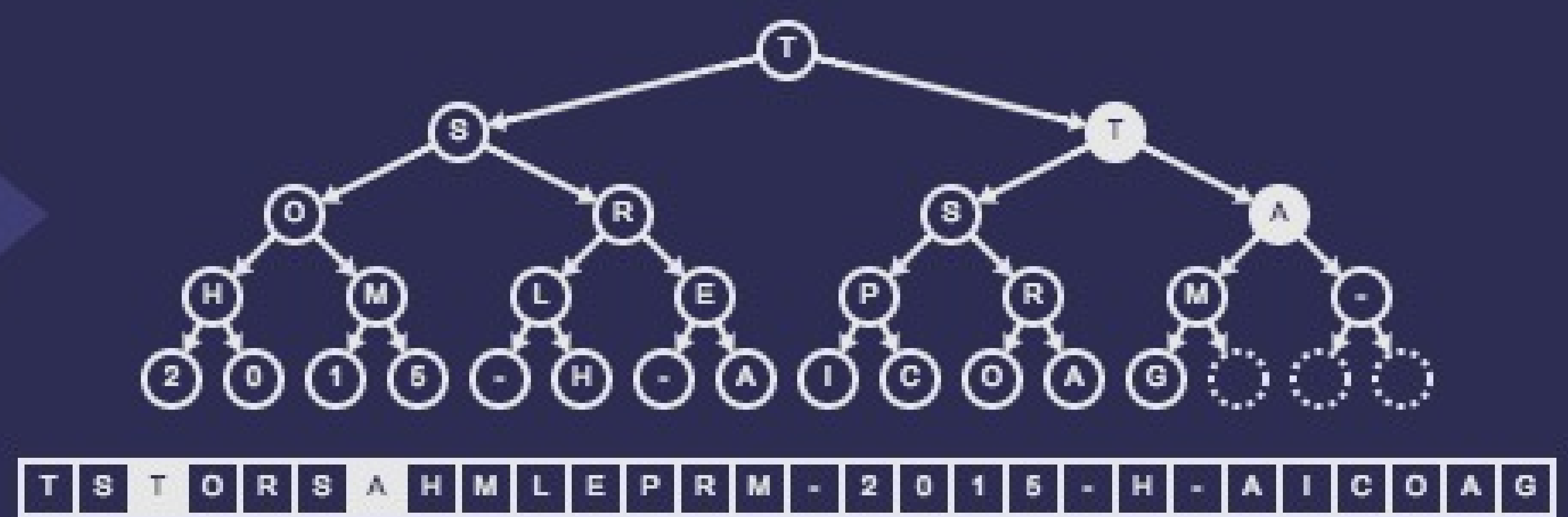
OUTPUT

Step 50. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



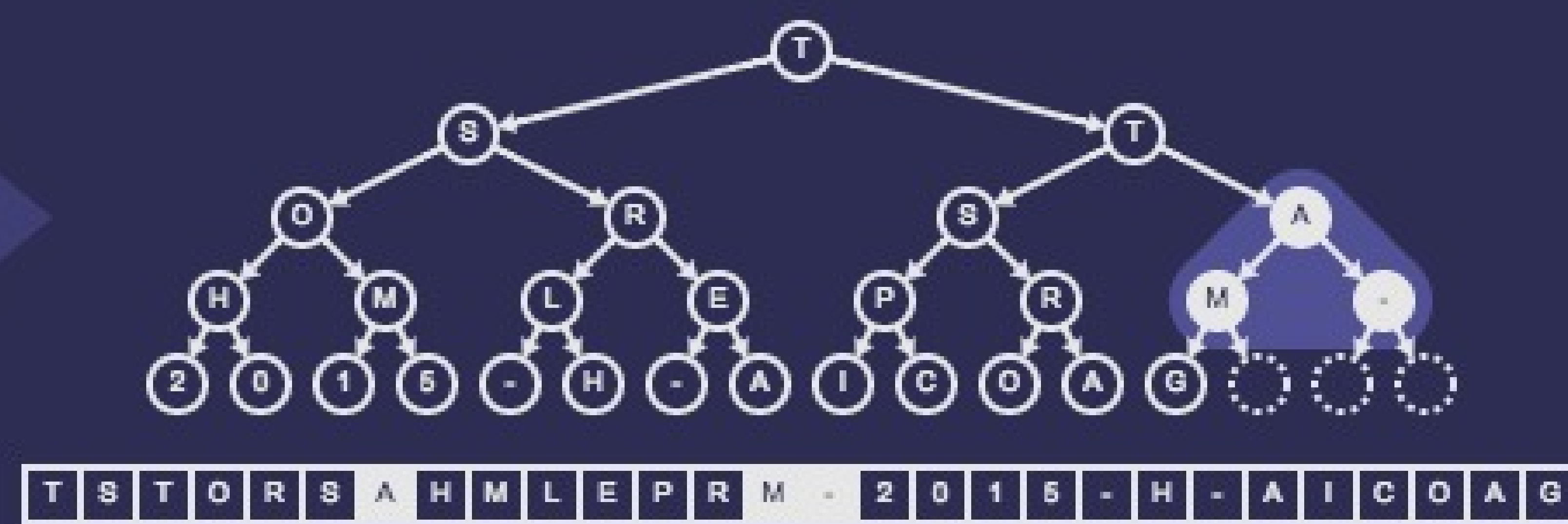
OUTPUT

Step 50. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



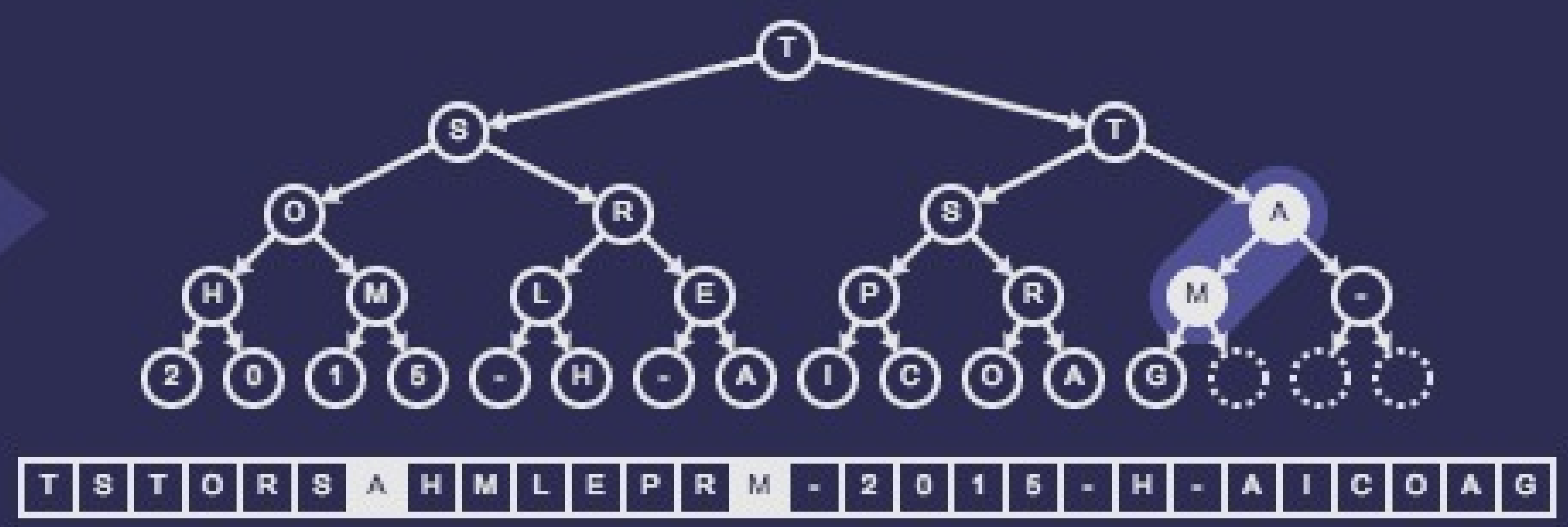
OUTPUT

Step 51. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



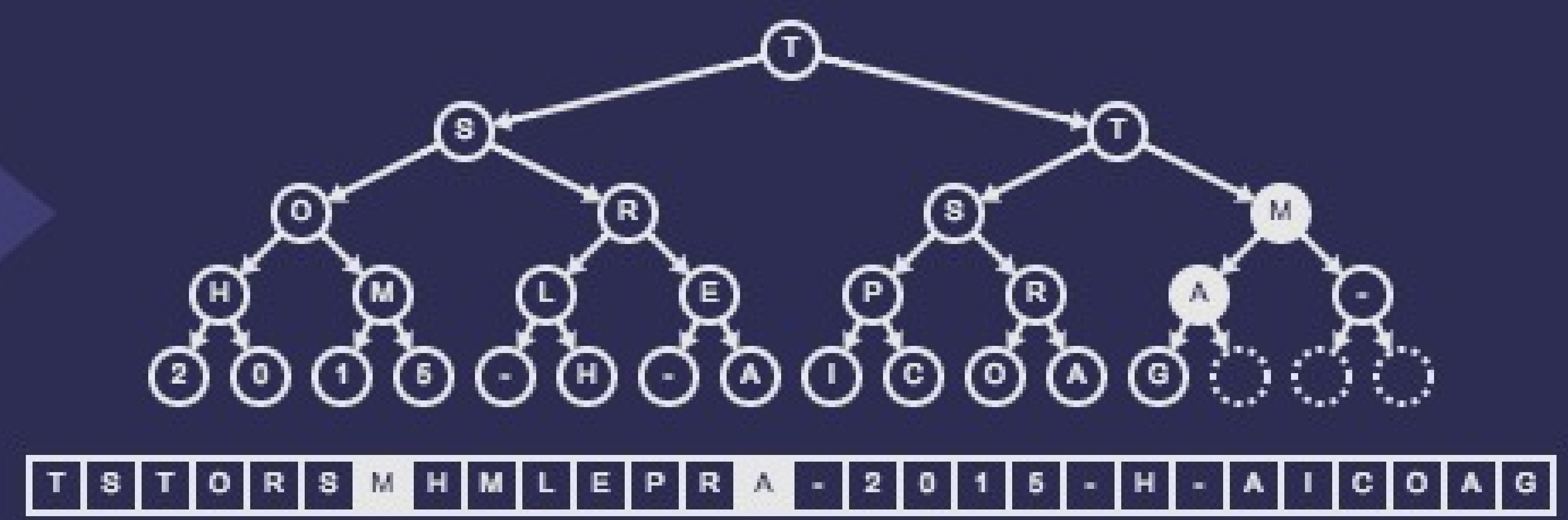
OUTPUT

Step 51. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



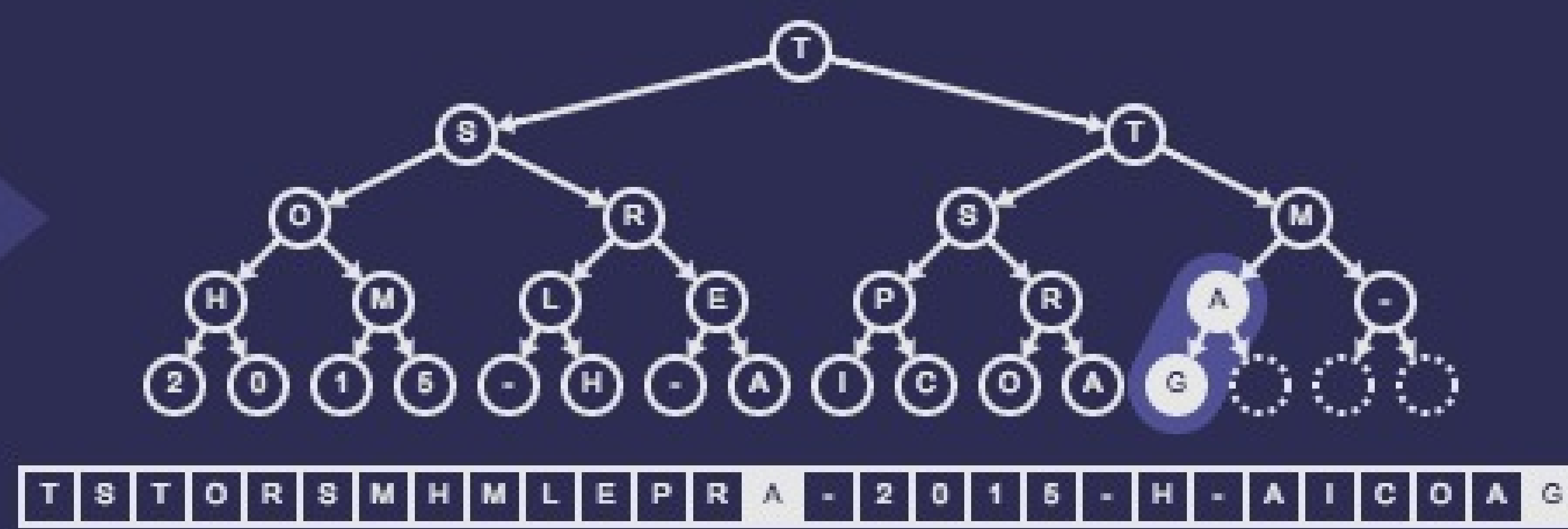
OUTPUT

Step 51. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



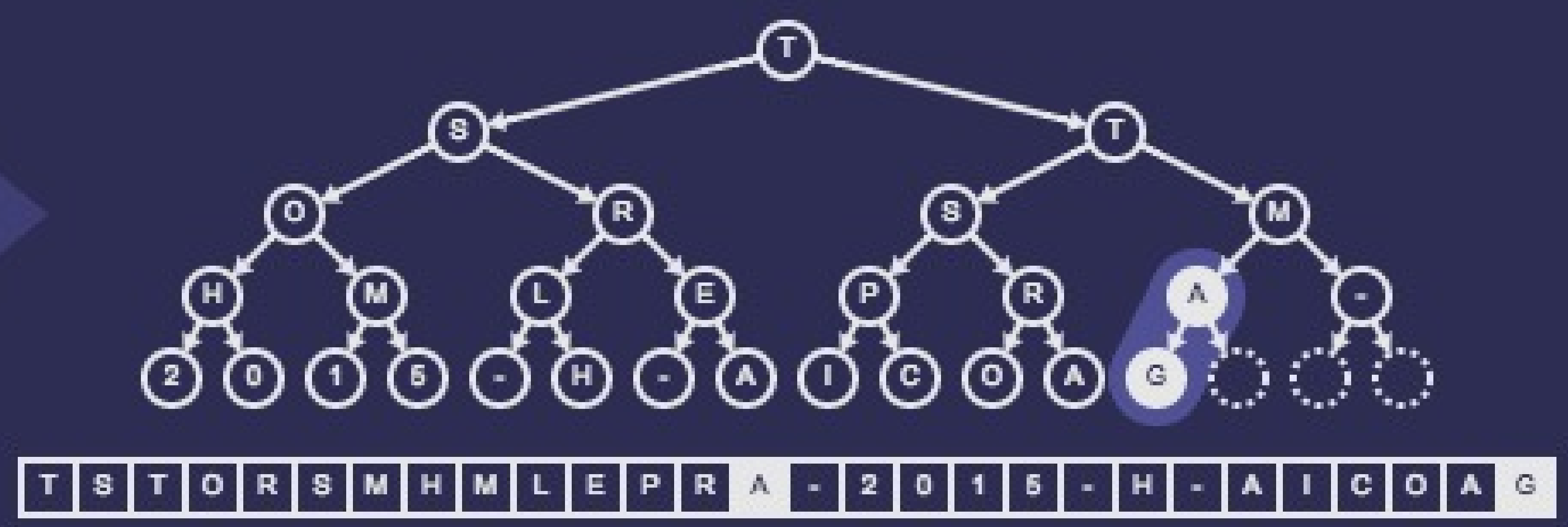
OUTPUT

Step 52. Compare the node with its child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

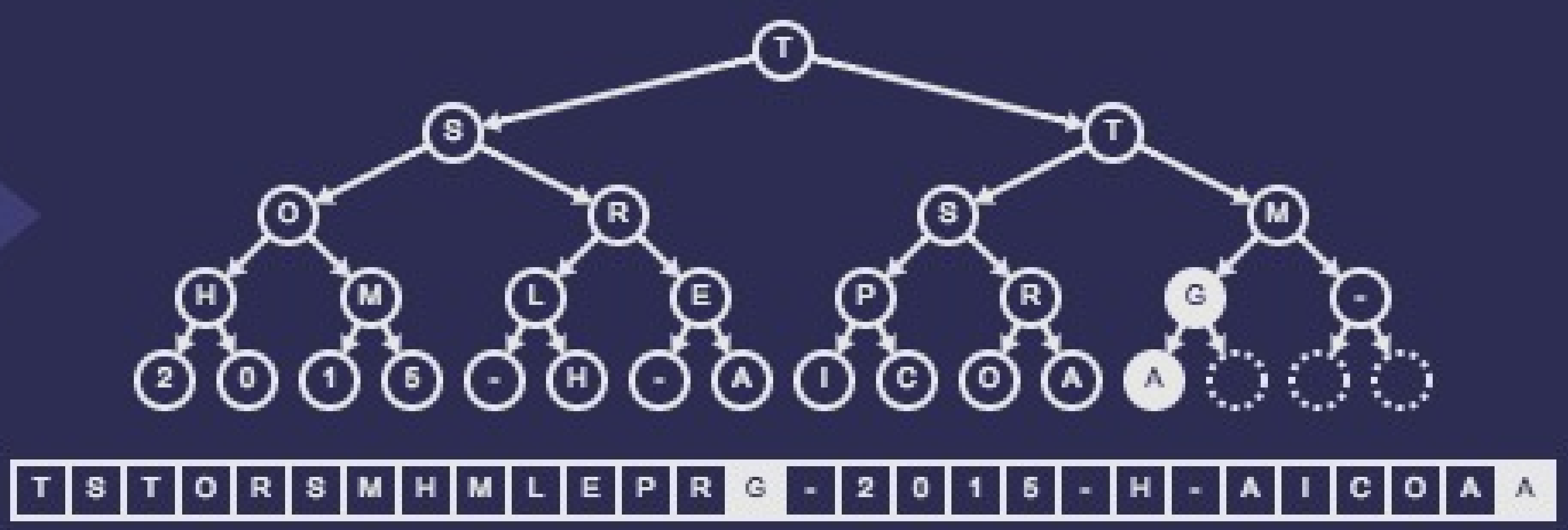
Step 52. Its child is larger than it

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

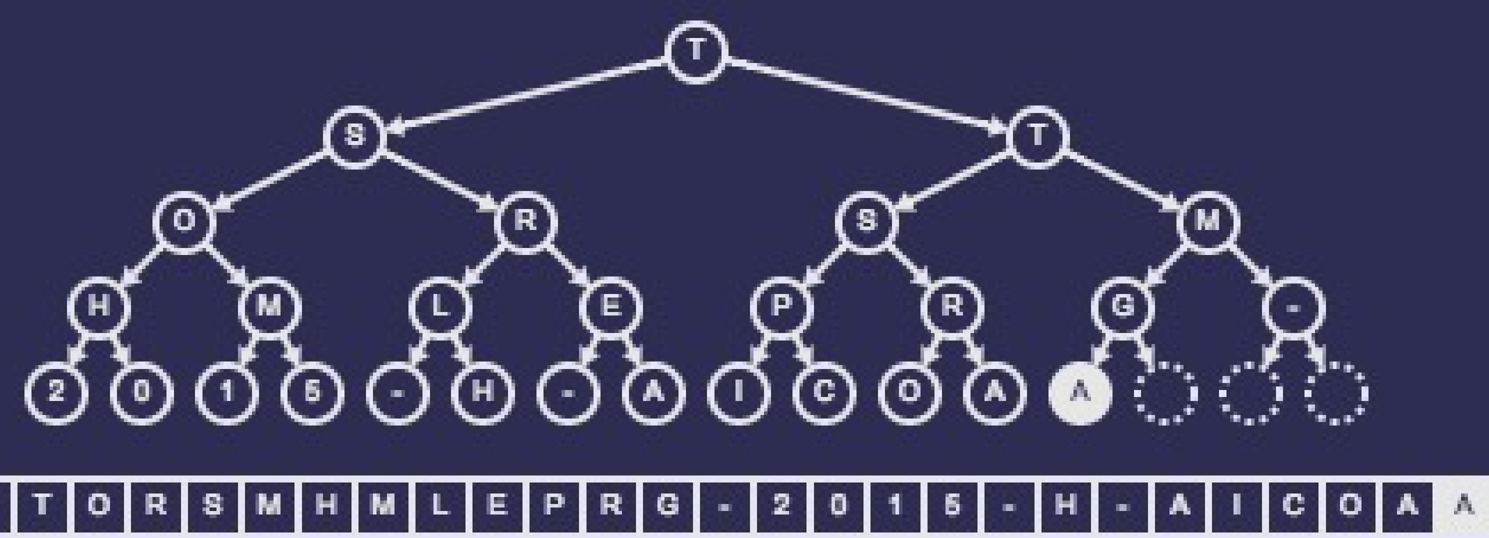


Step 52. Swap it with its child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



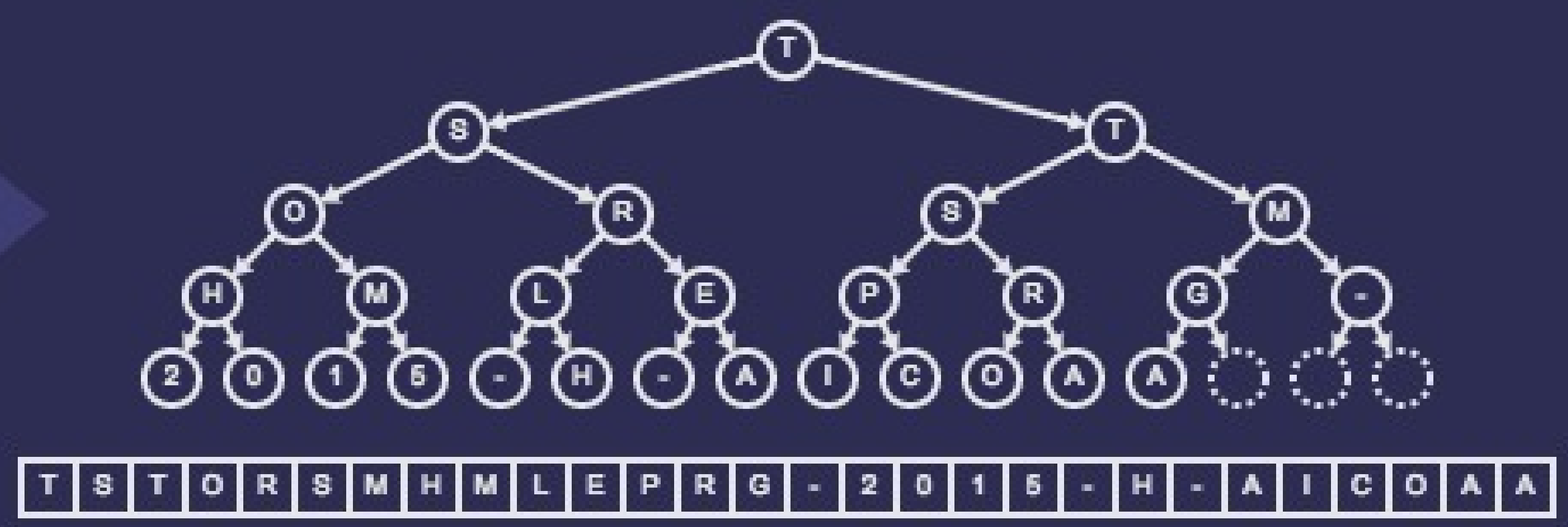
OUTPUT

Step 52. It has no children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



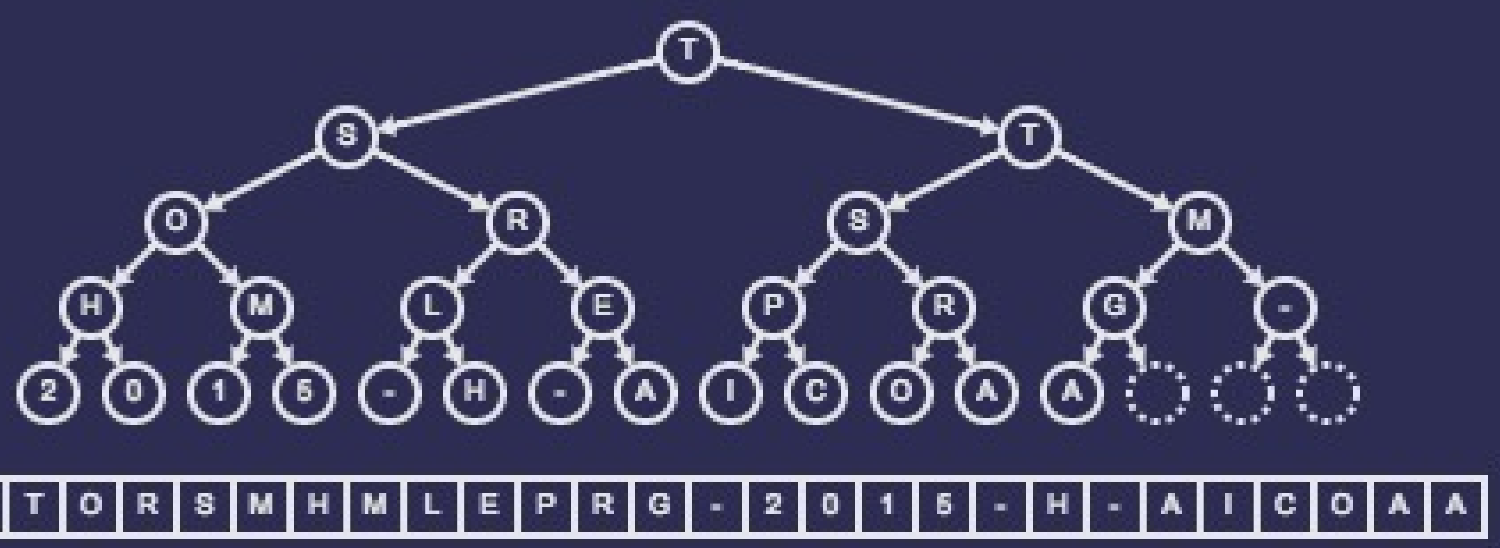
OUTPUT

Step 52. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



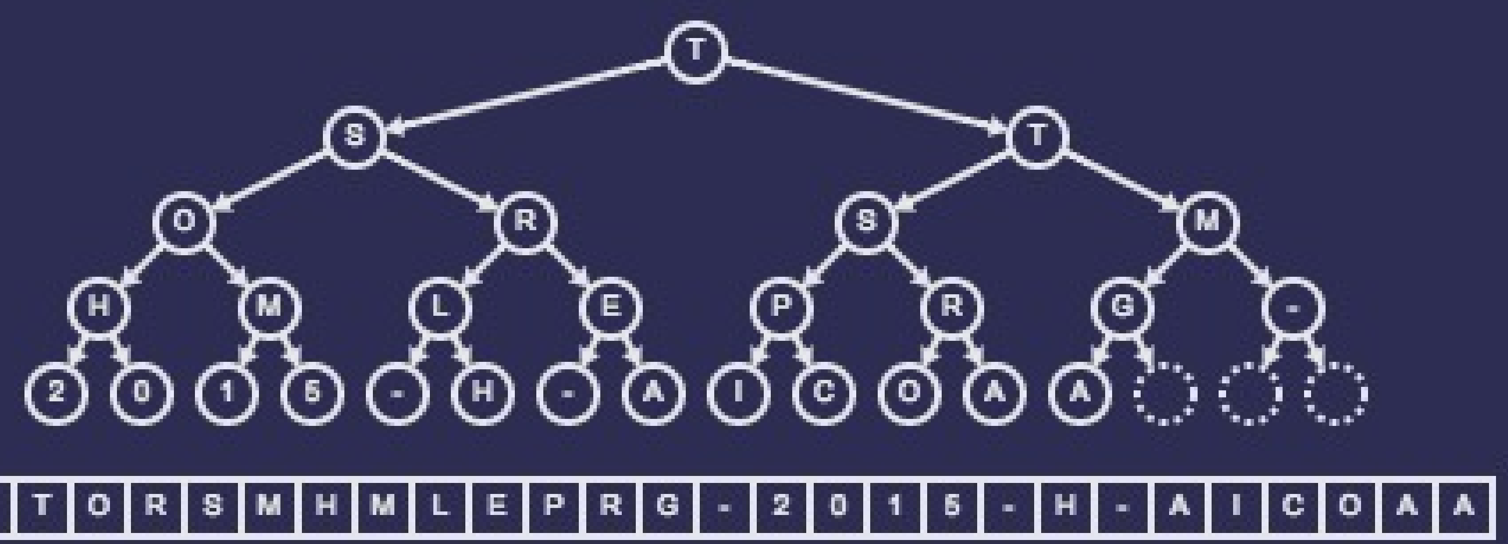
OUTPUT

Step 53. The tree is now a max-heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



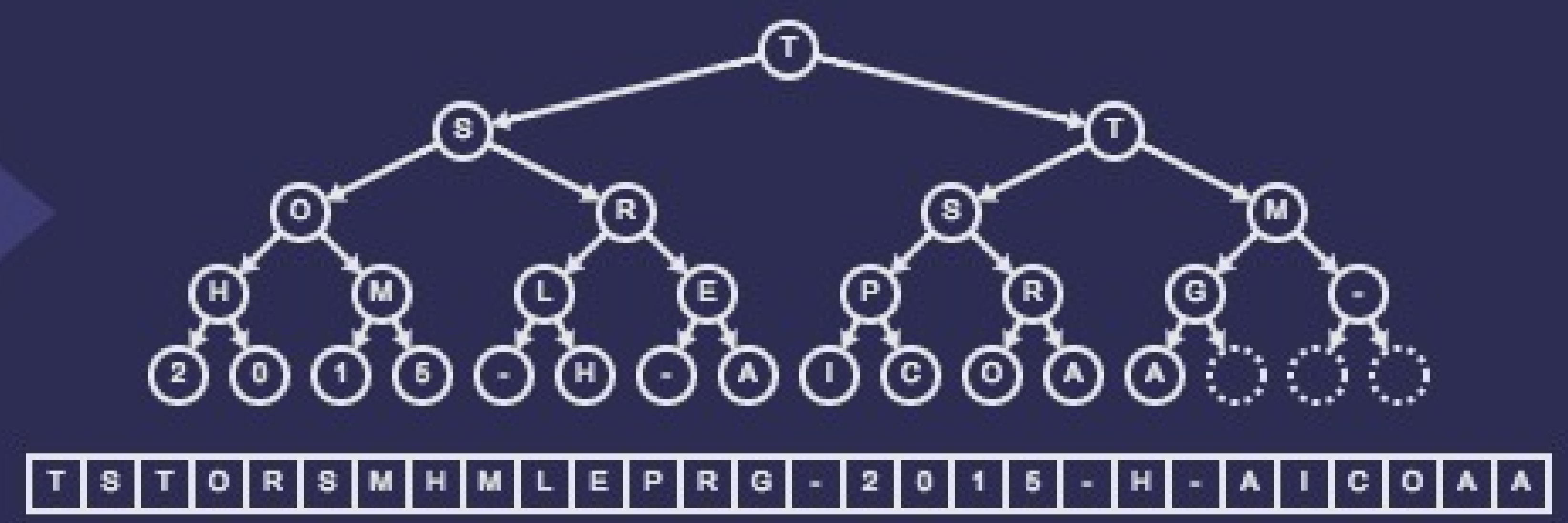
OUTPUT

Step 54. We now keep taking the root element

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



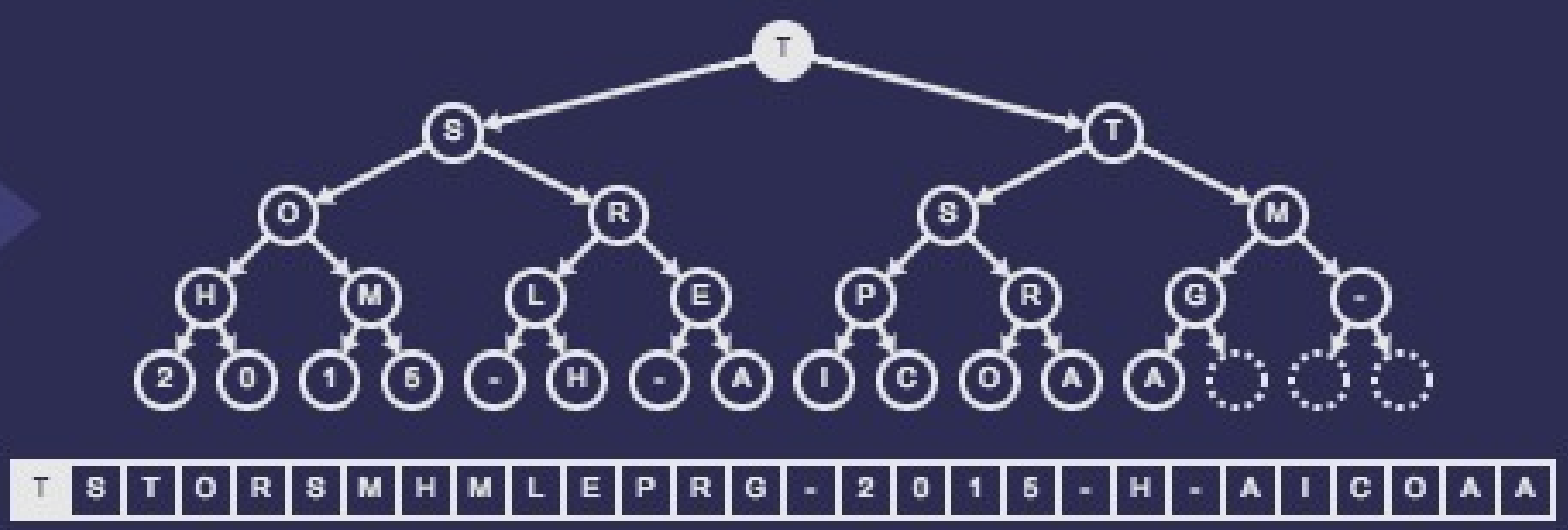
OUTPUT

Removing the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



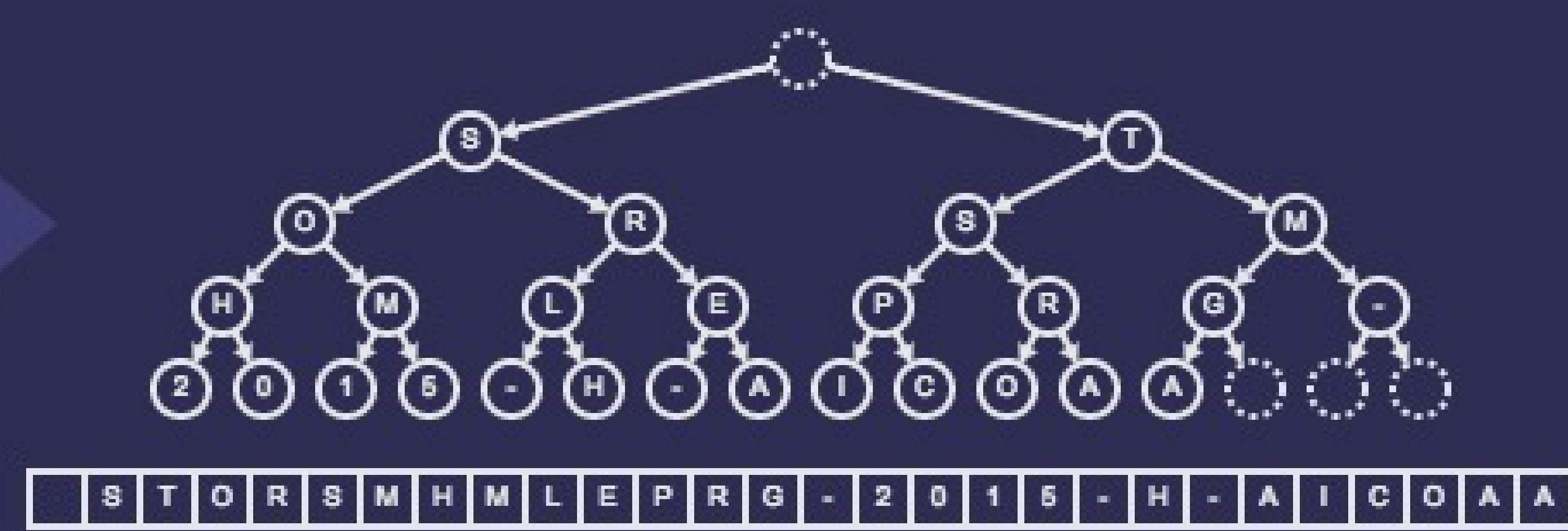
OUTPUT

Step 1. Find the root of the heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

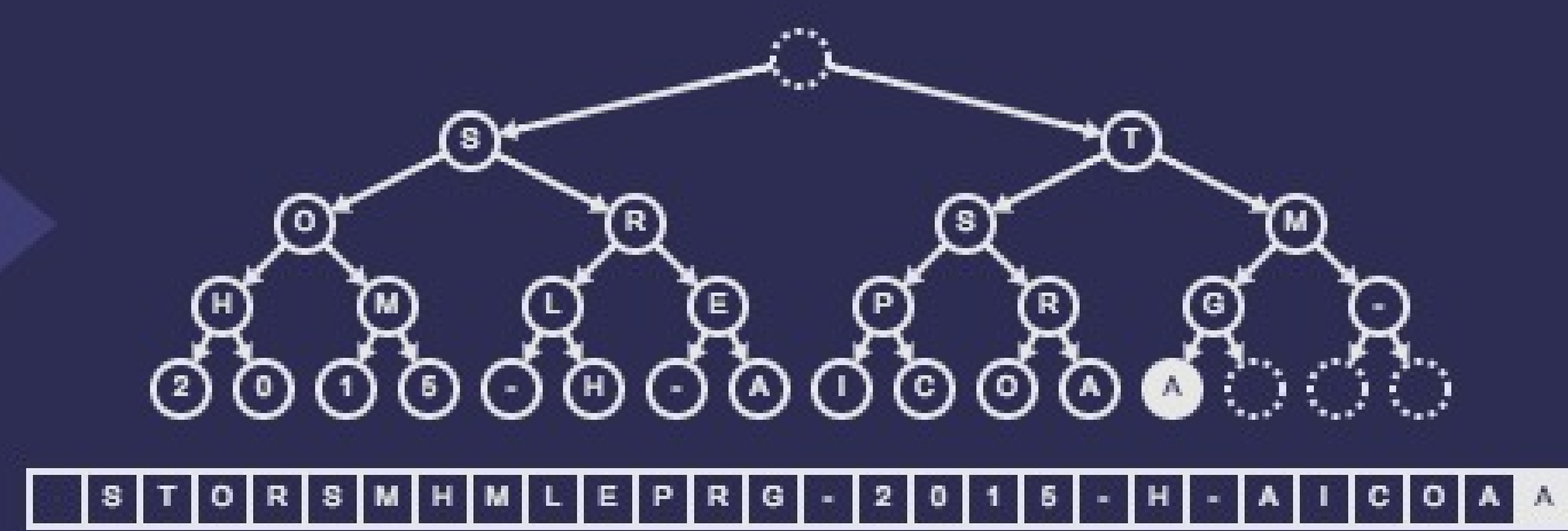
T

Step 2. Output the value of the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

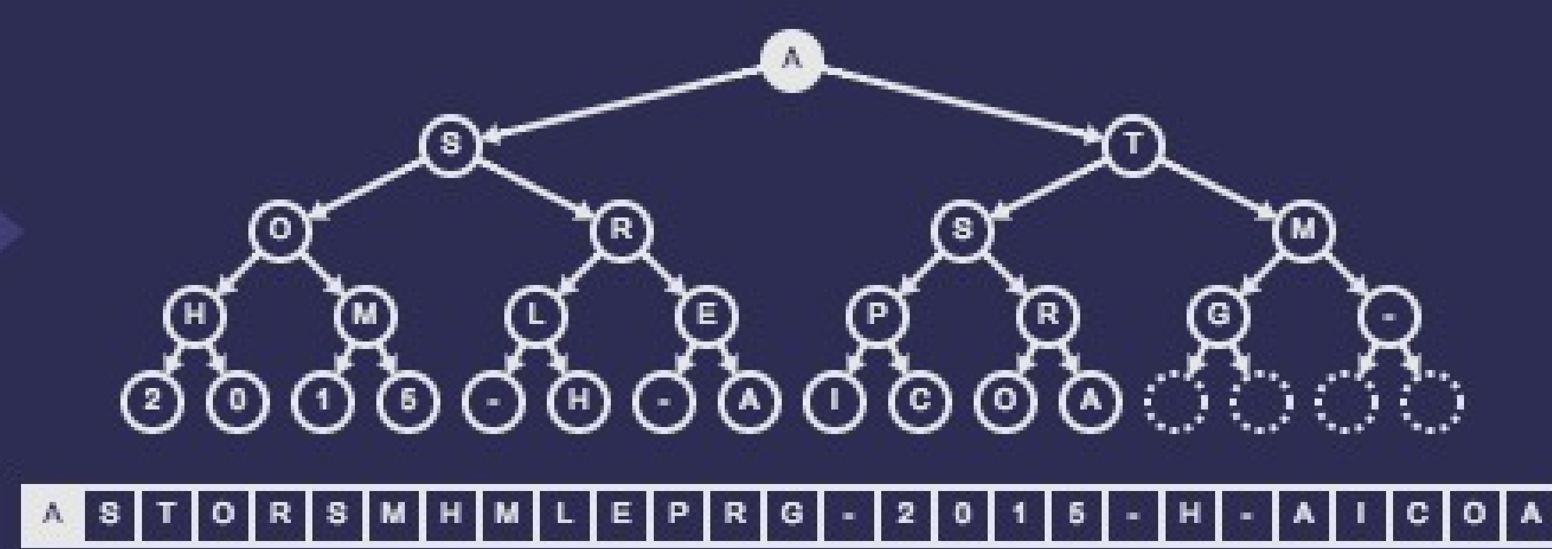
T

Step 3. Find the last node

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

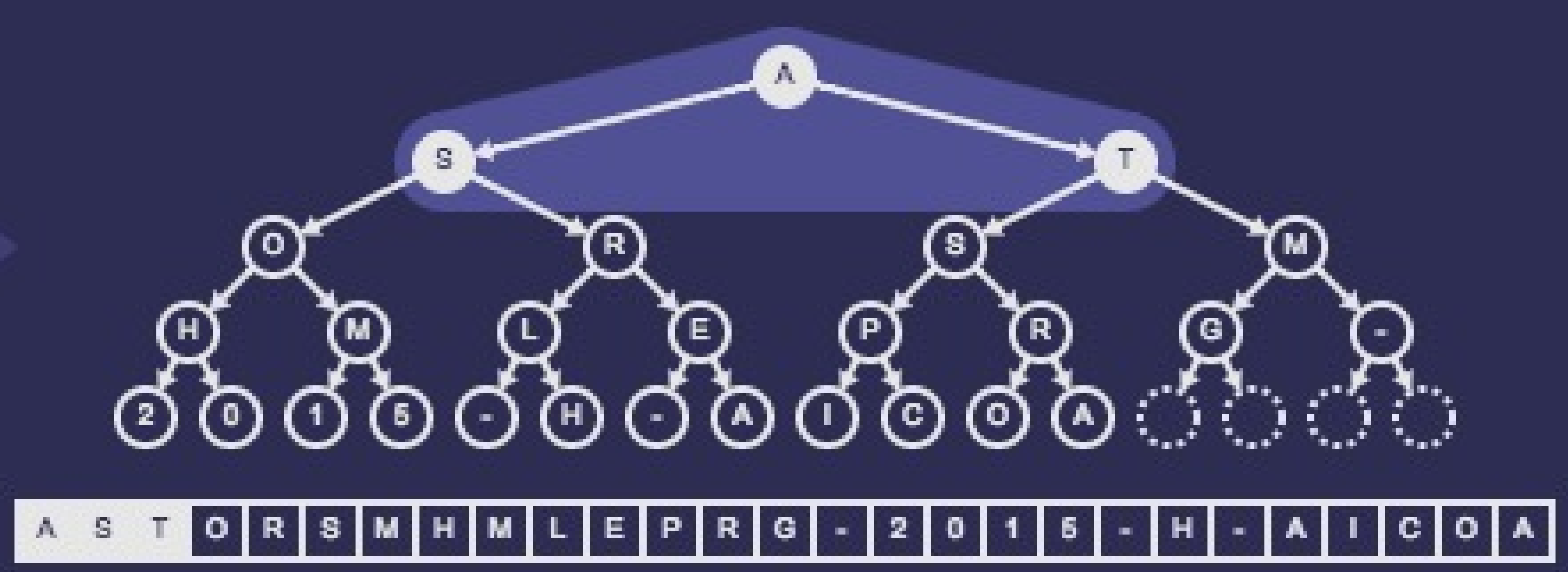
T

Step 4. Move the last node to the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

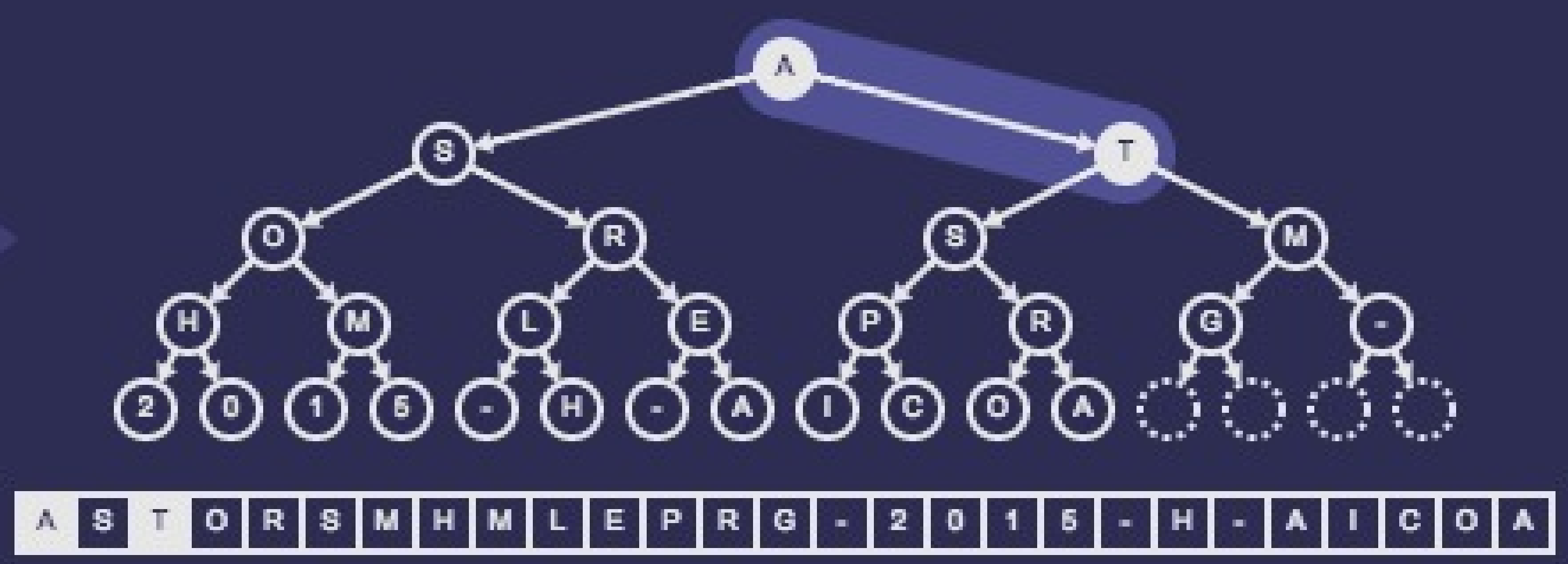
T

Step 5. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

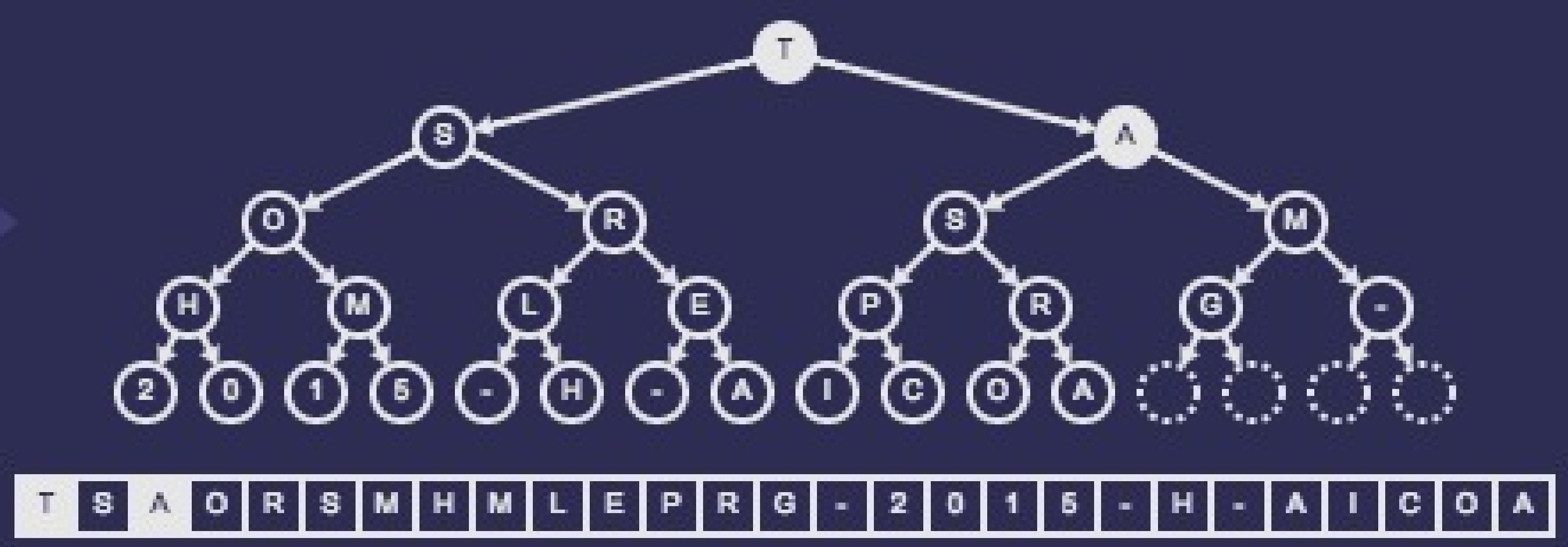
T

Step 6. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

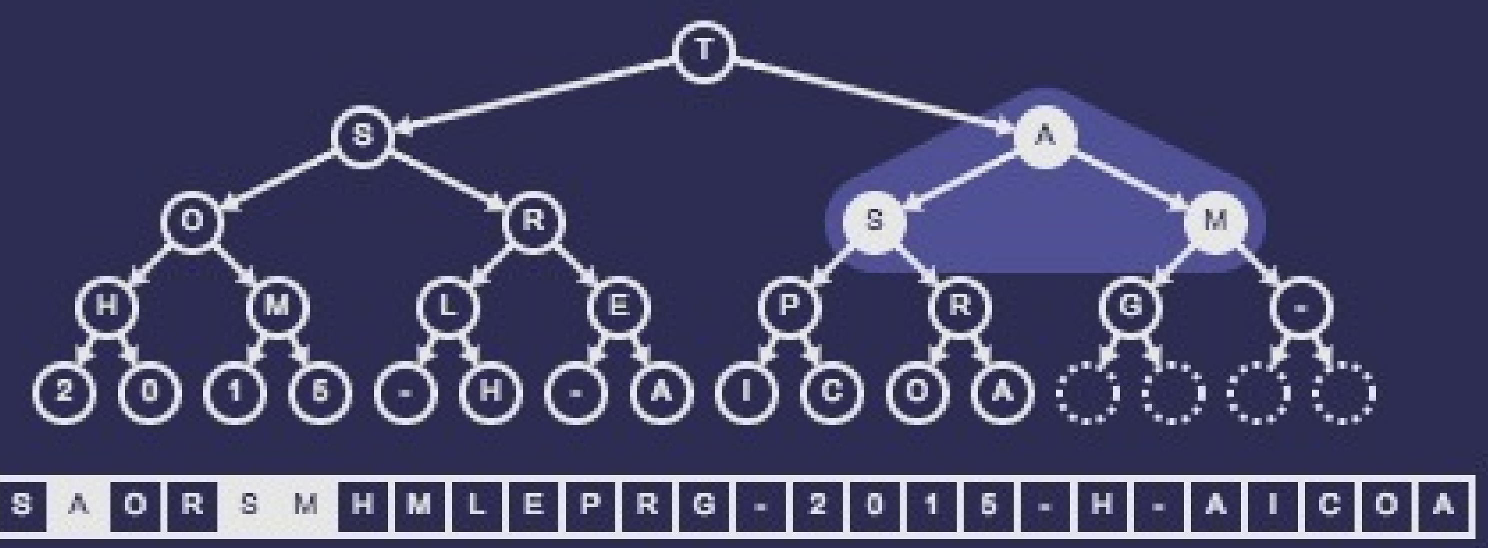
T

Step 6. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

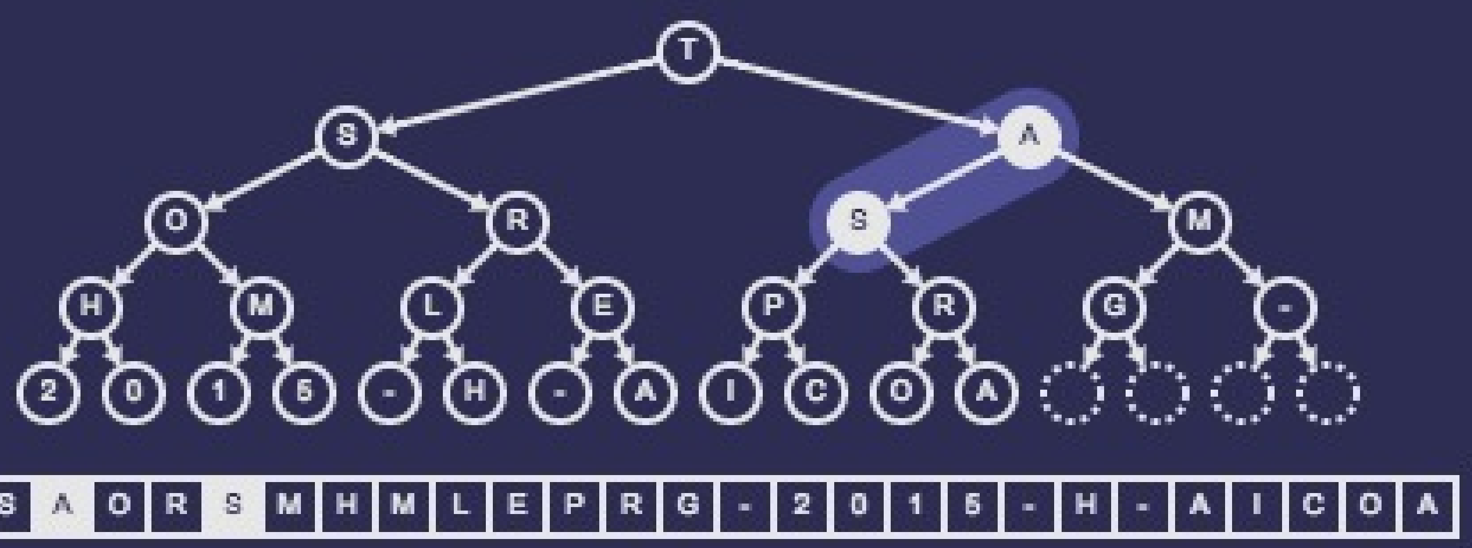
T

Step 6. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

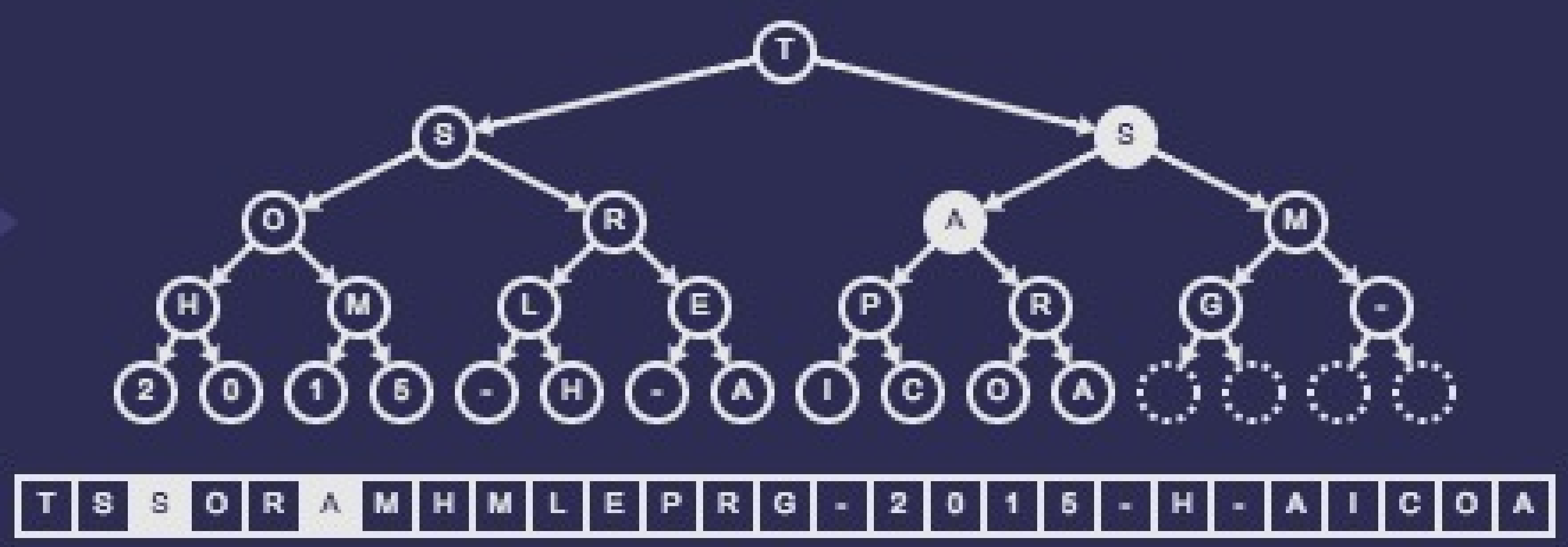
T

Step 7. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

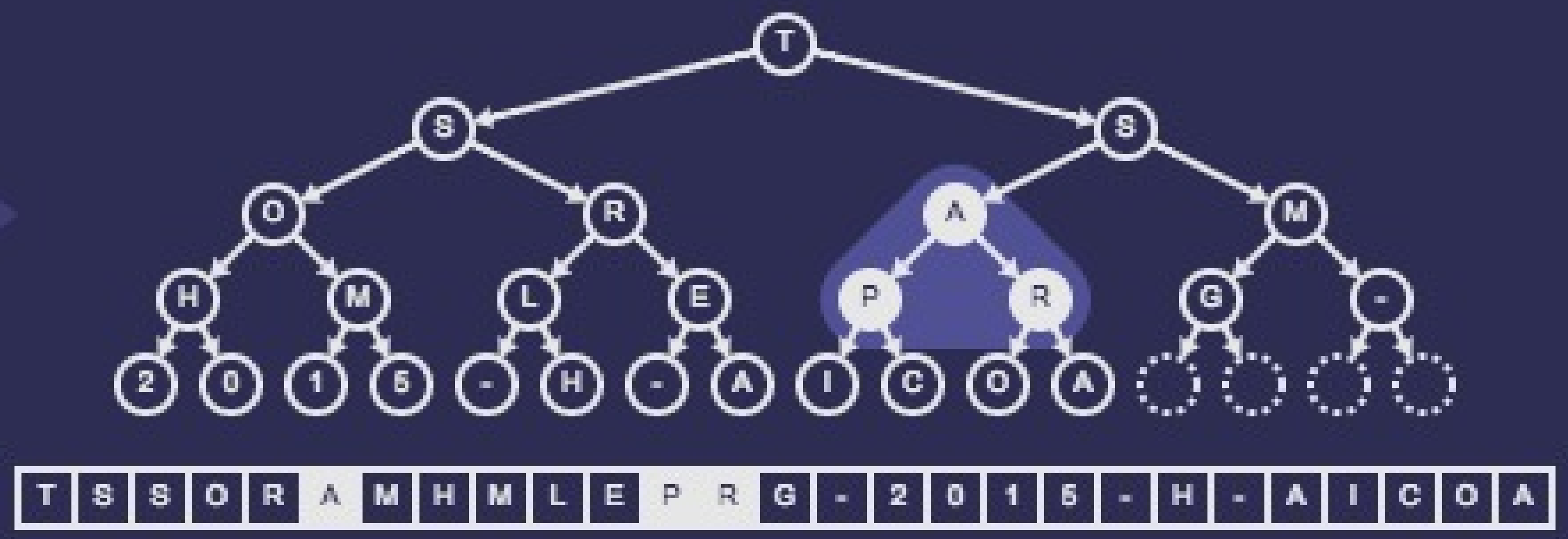
T

Step 7. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

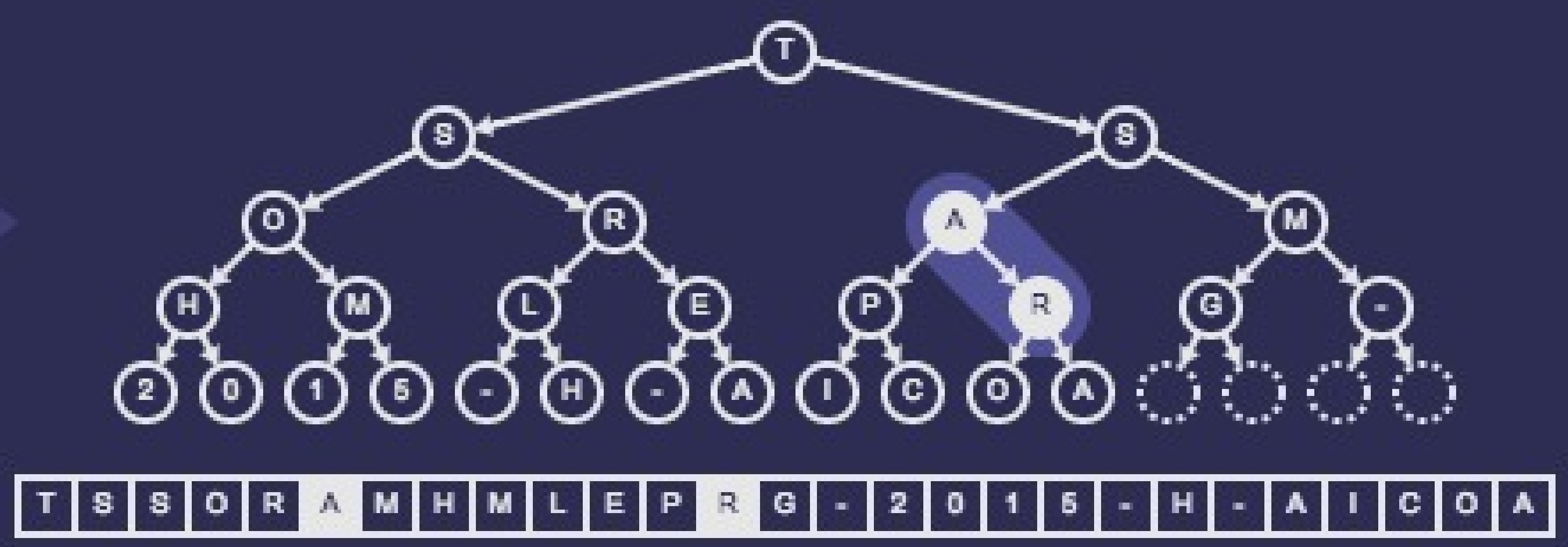
T

Step 7. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

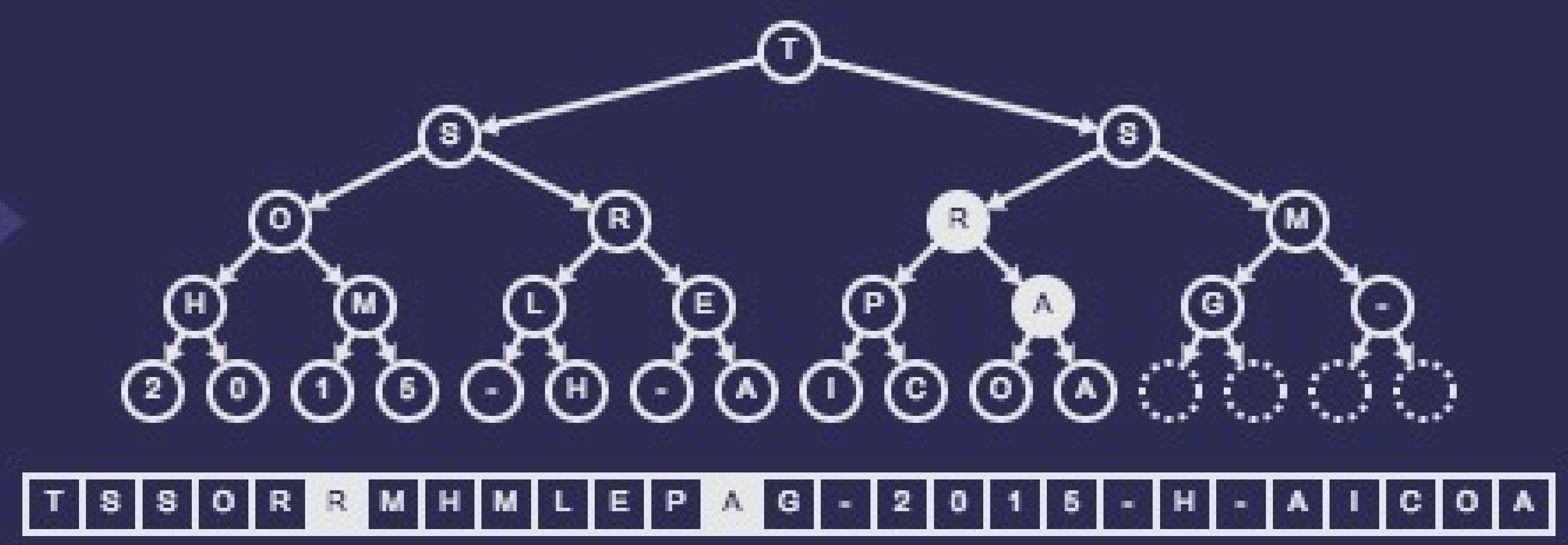
T

Step 8. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

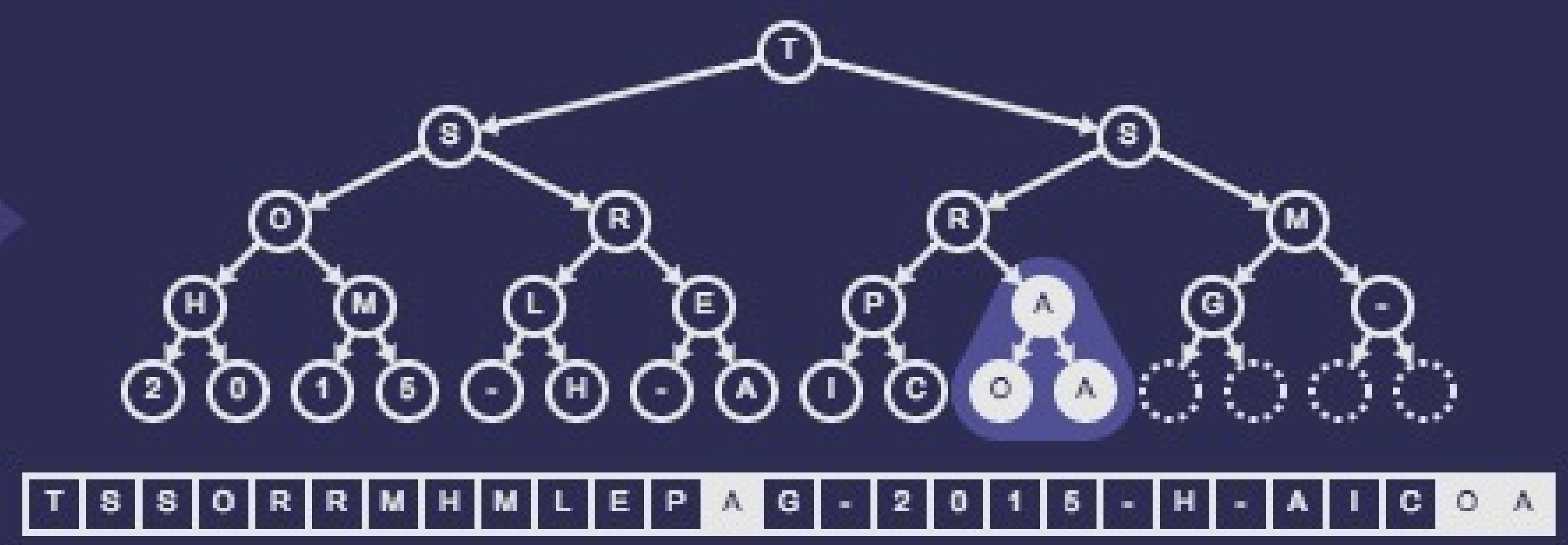
T

Step 8. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

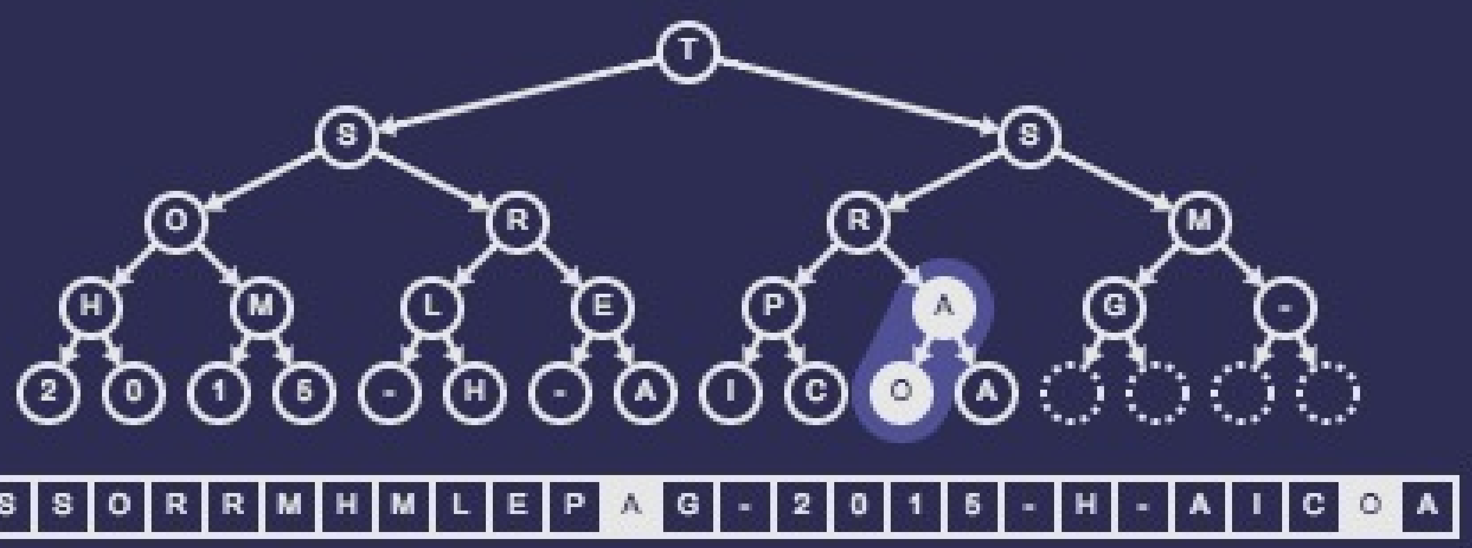
T

Step 8. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

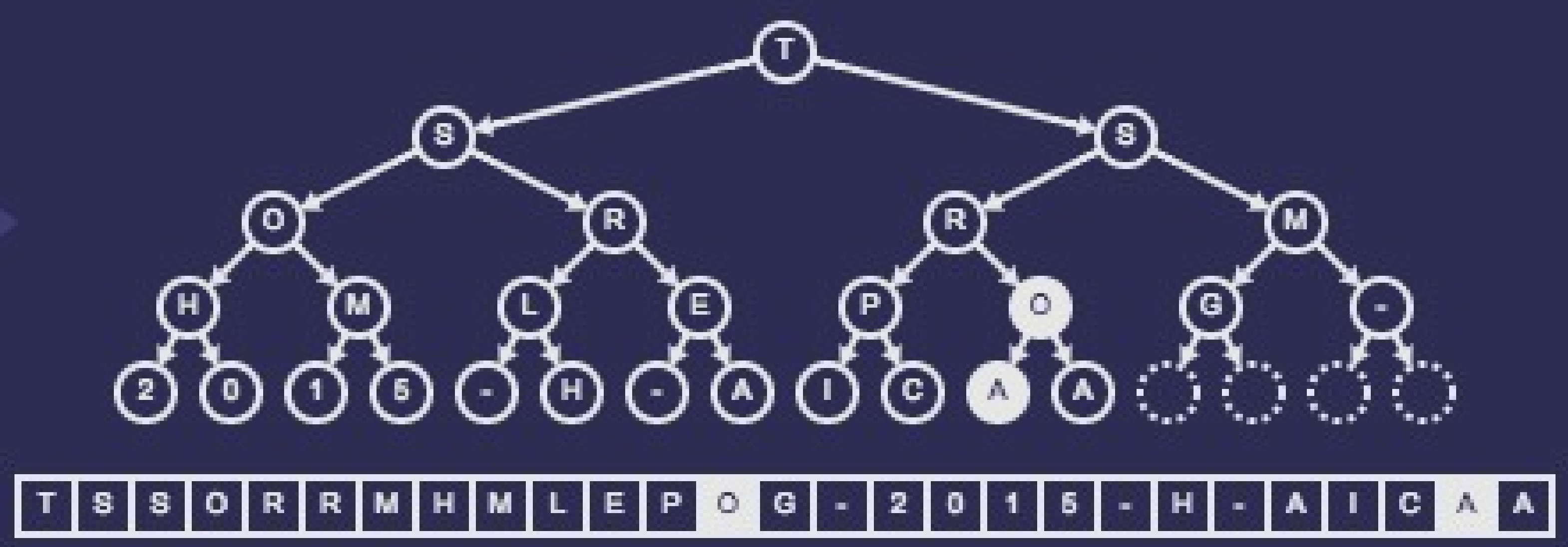
T

Step 9. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

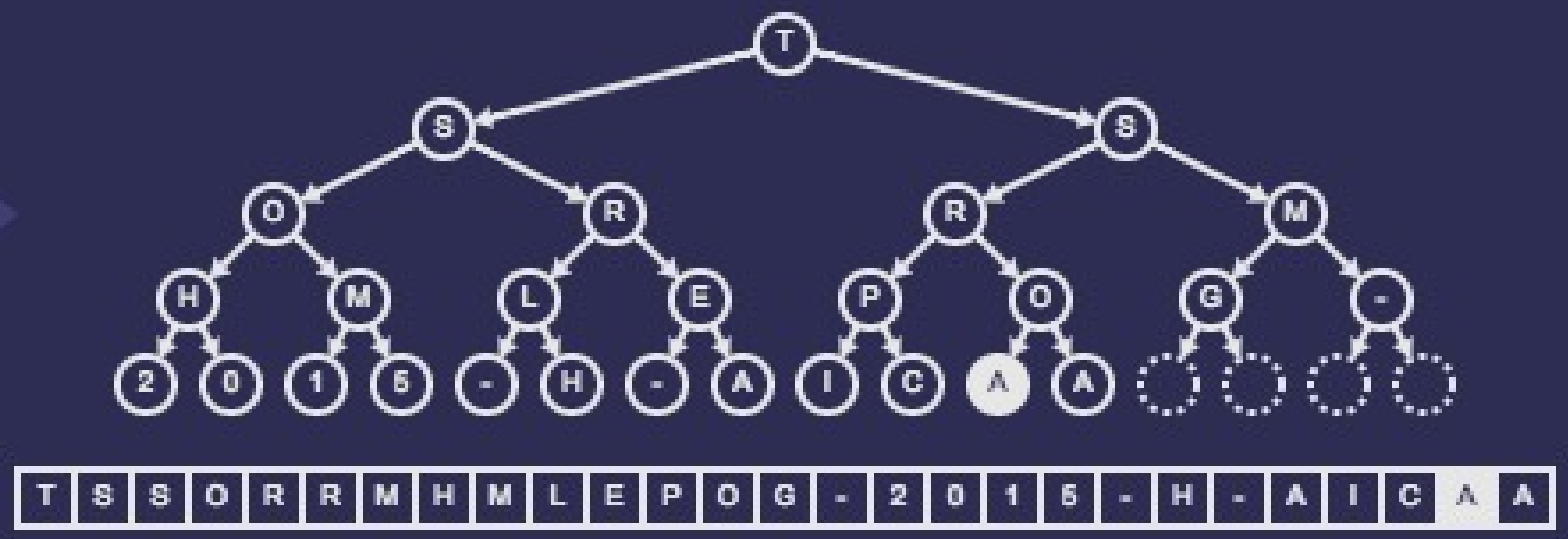
T

Step 9. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

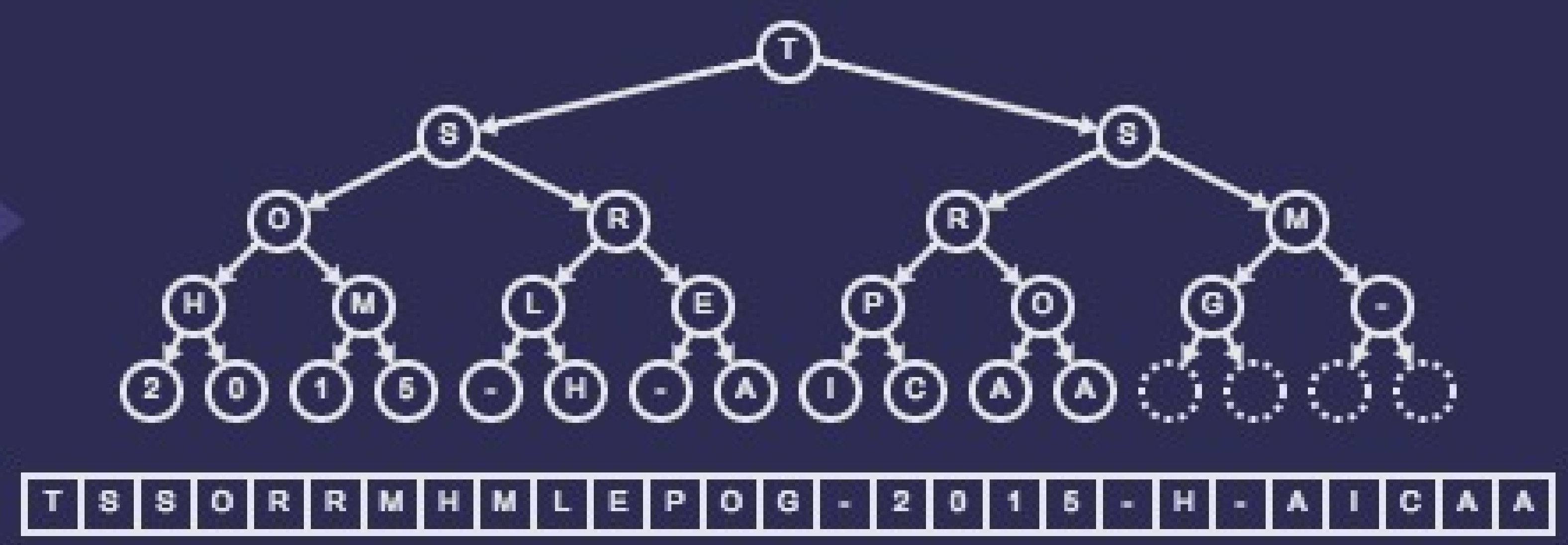
T

Step 9. It has no children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

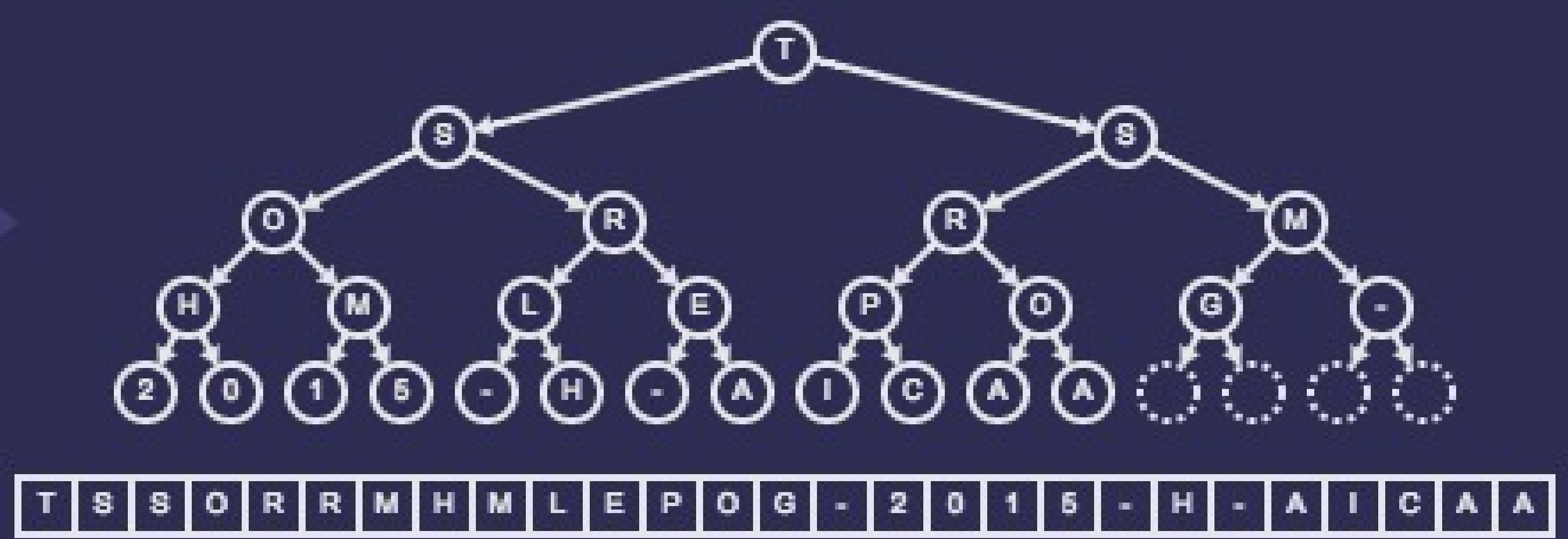
T

Step 9. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

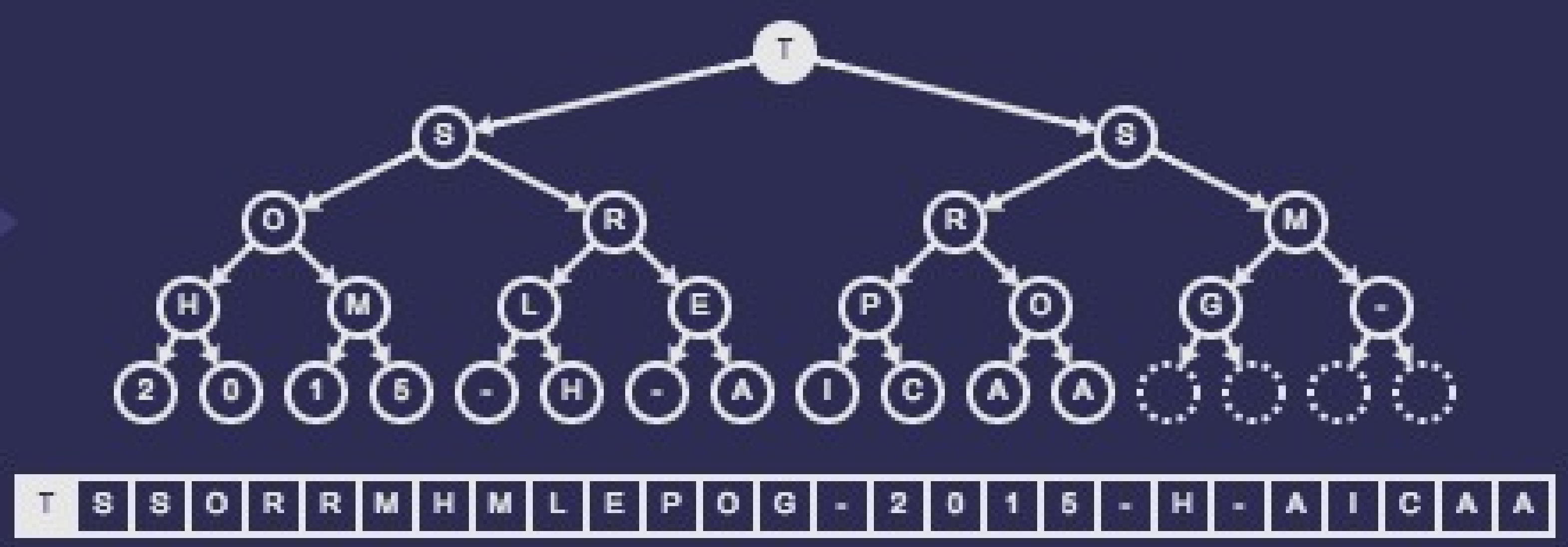
T

Removing the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

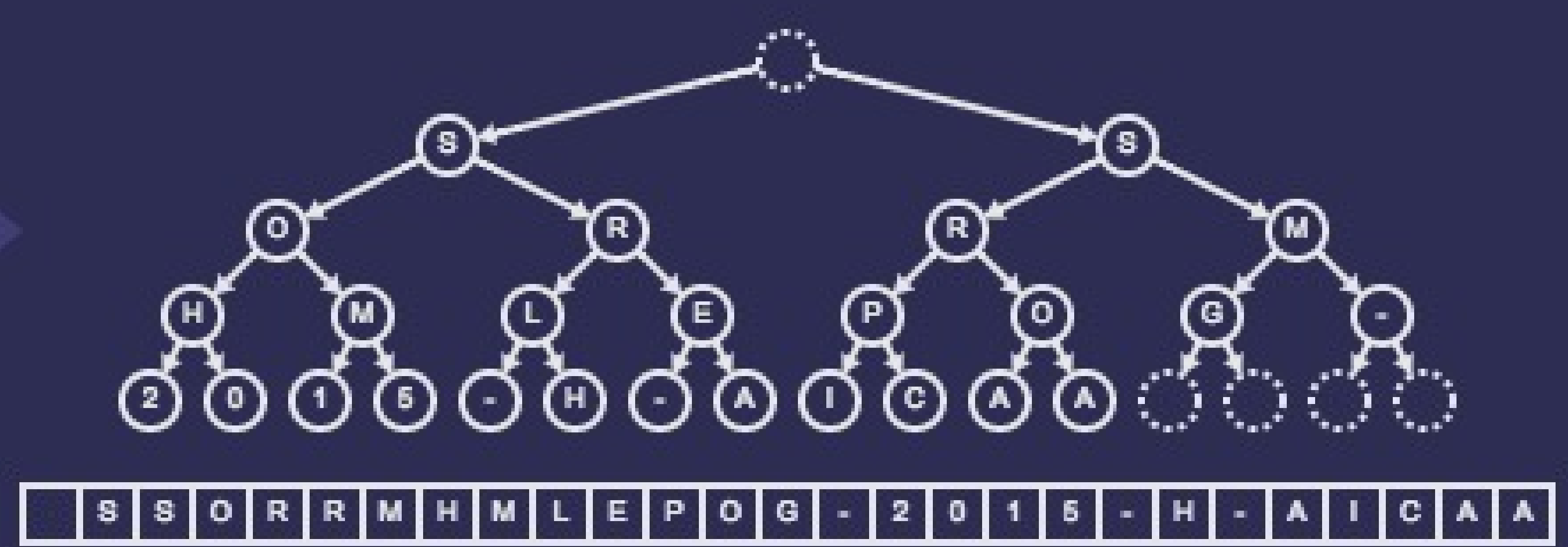
T

Step 1. Find the root of the heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

T

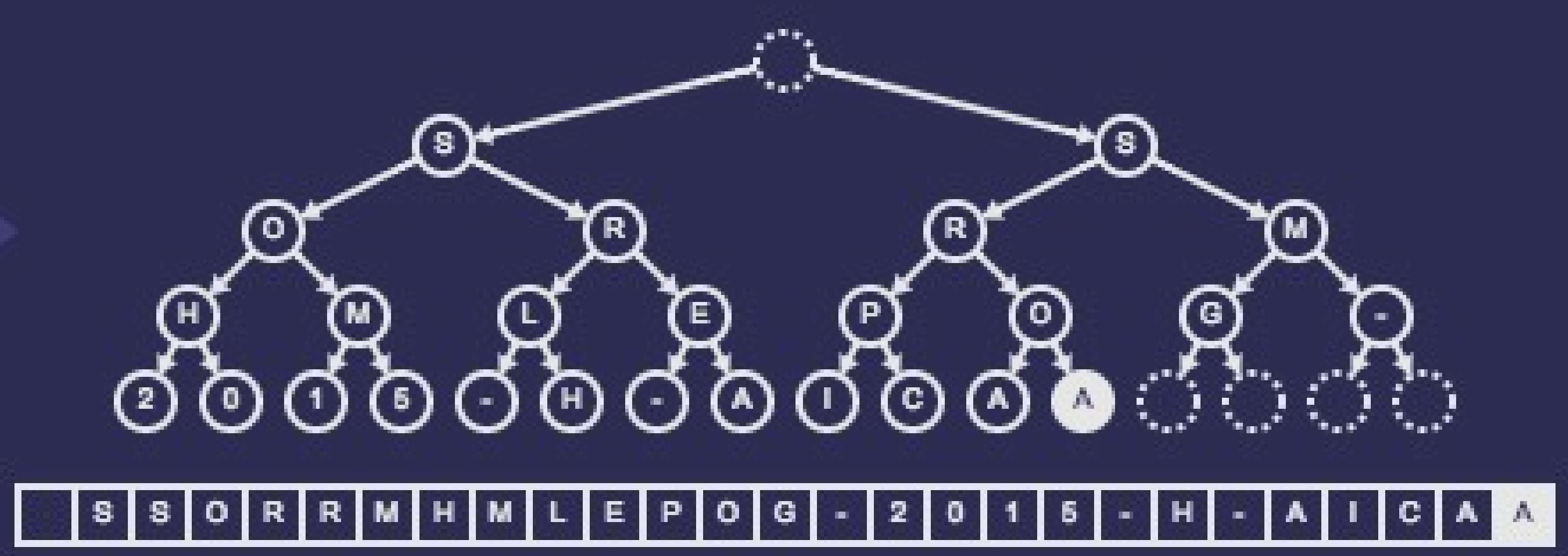
T

Step 2. Output the value of the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

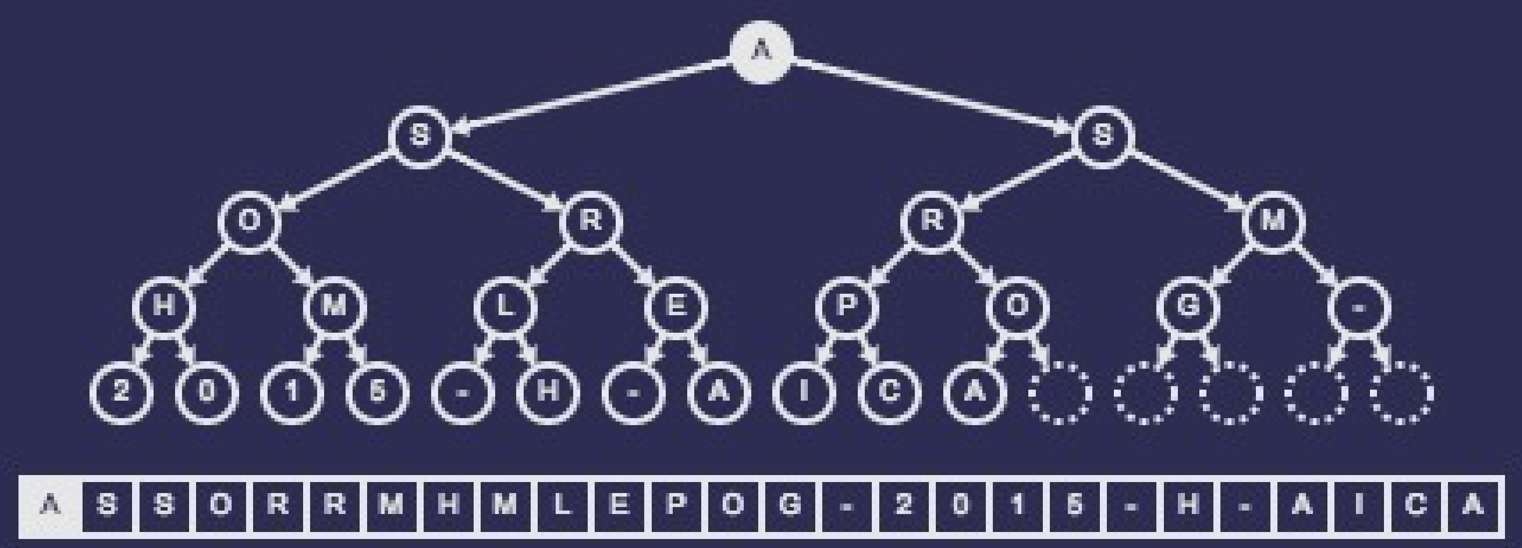
T, T

Step 3. Find the last node

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

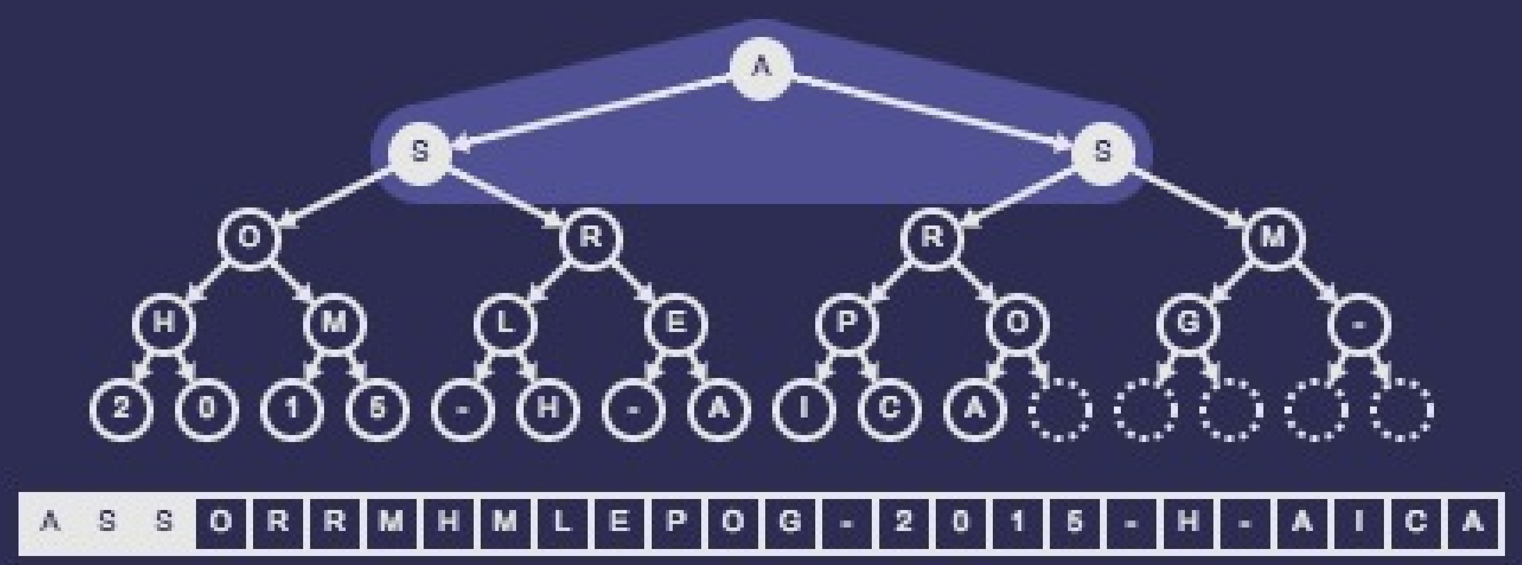
T, T

Step 4. Move the last node to the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

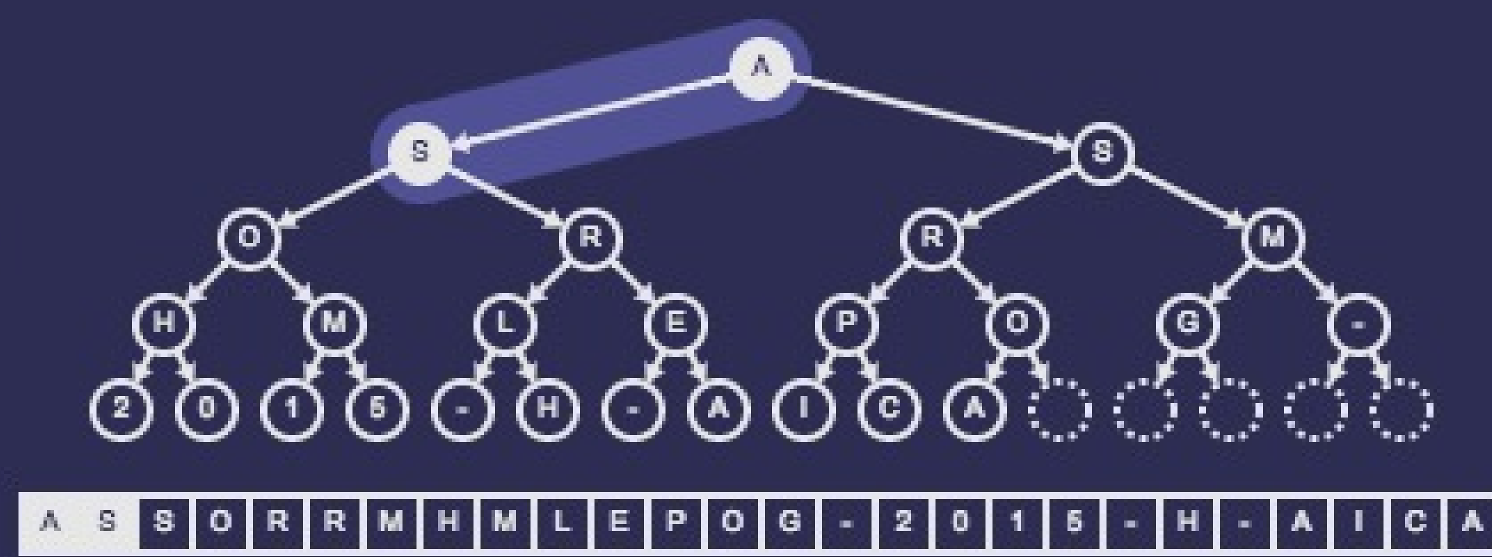
T, T

Step 5. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

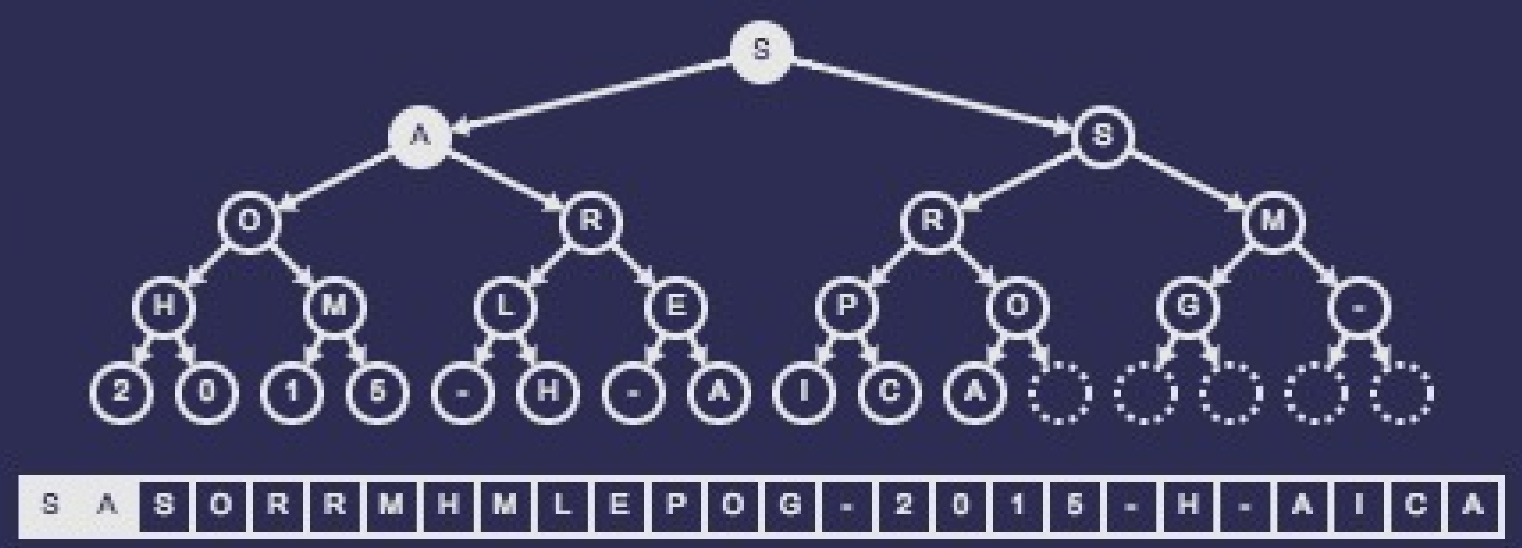
T, T

Step 6. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

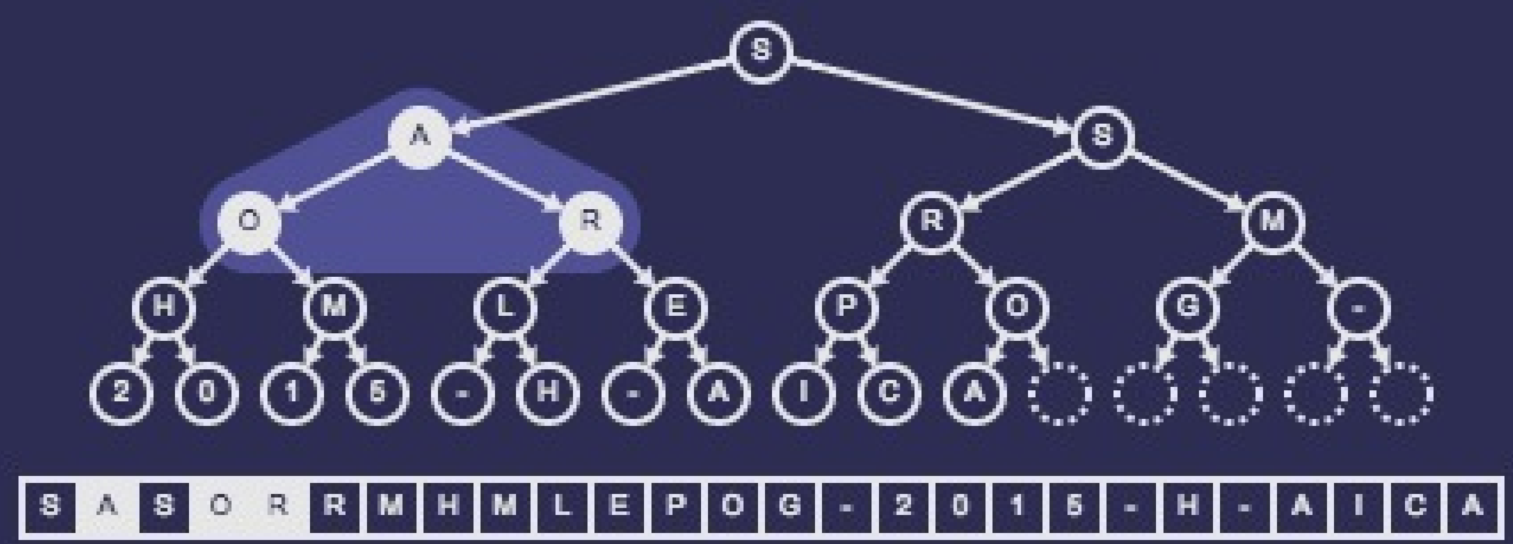
T, T

Step 6. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

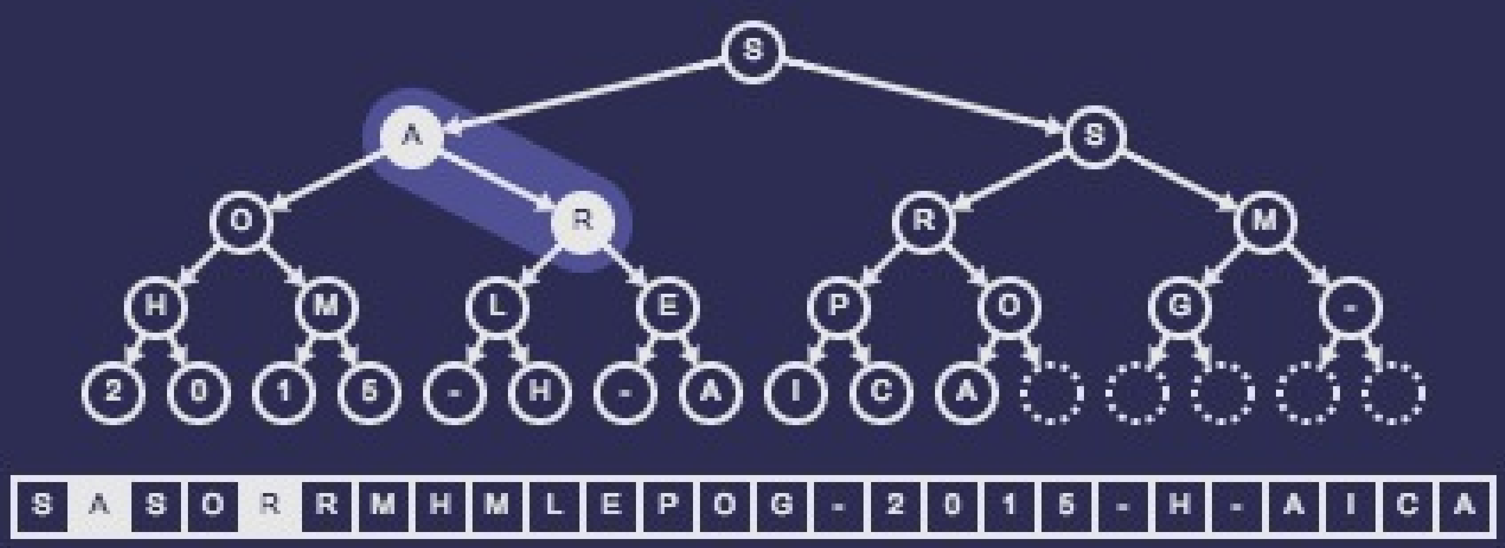
T, T

Step 6. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

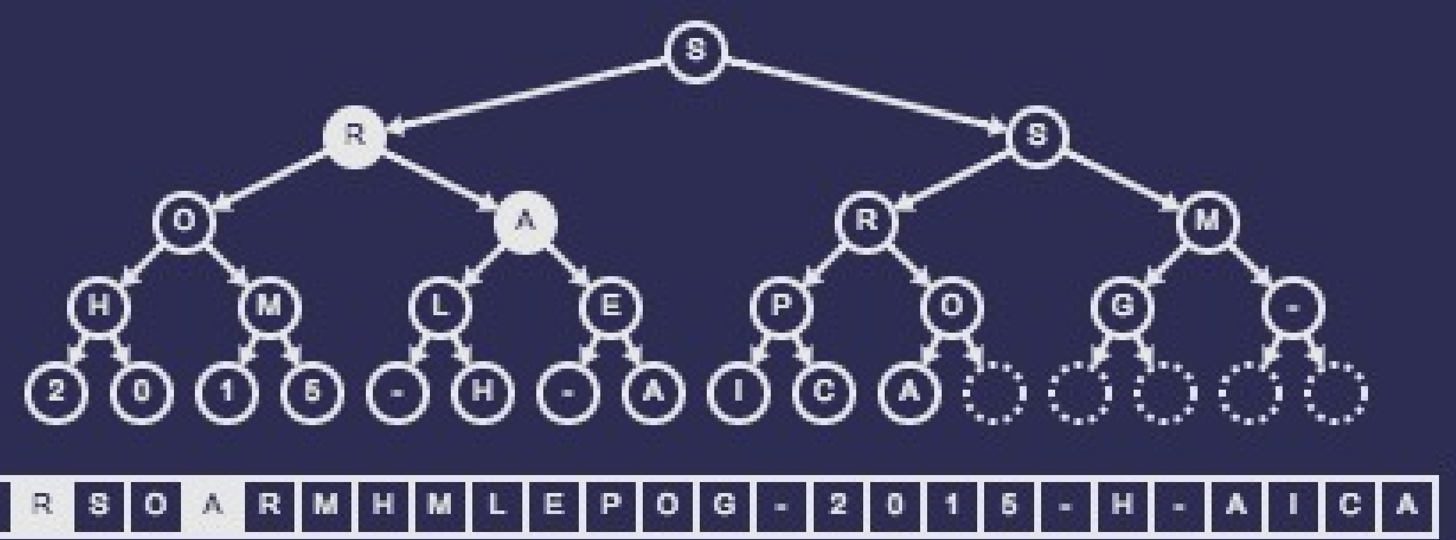
T, T

Step 7. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

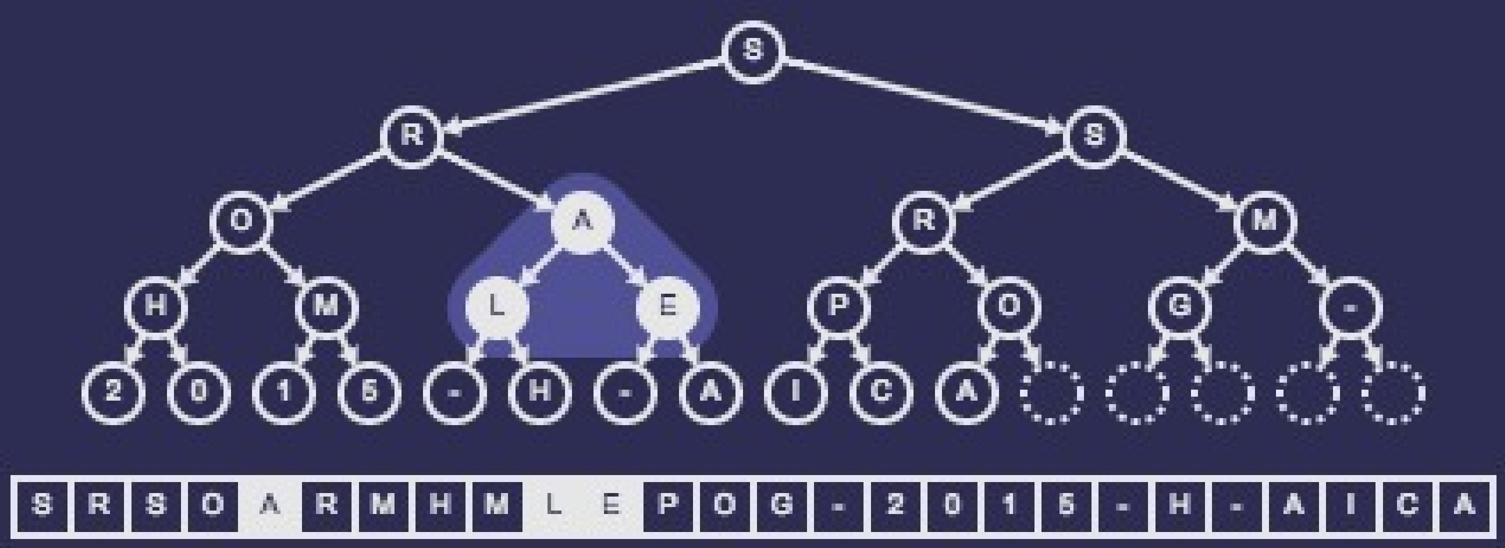
T, T

Step 7. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

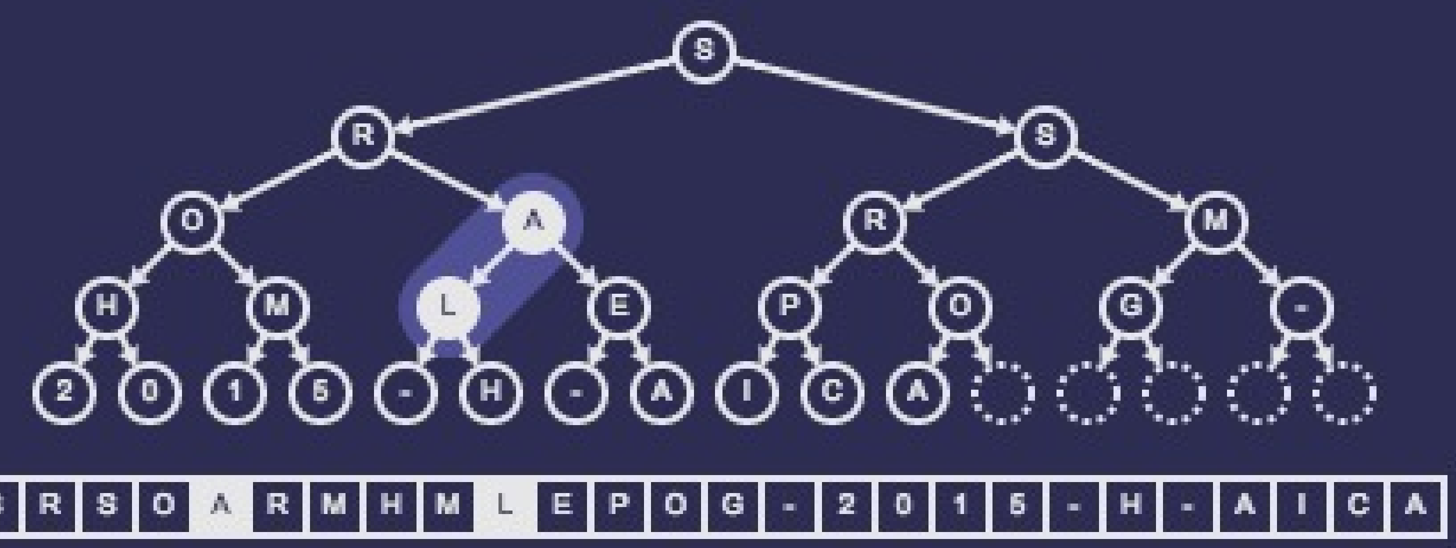
T, T

Step 7. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

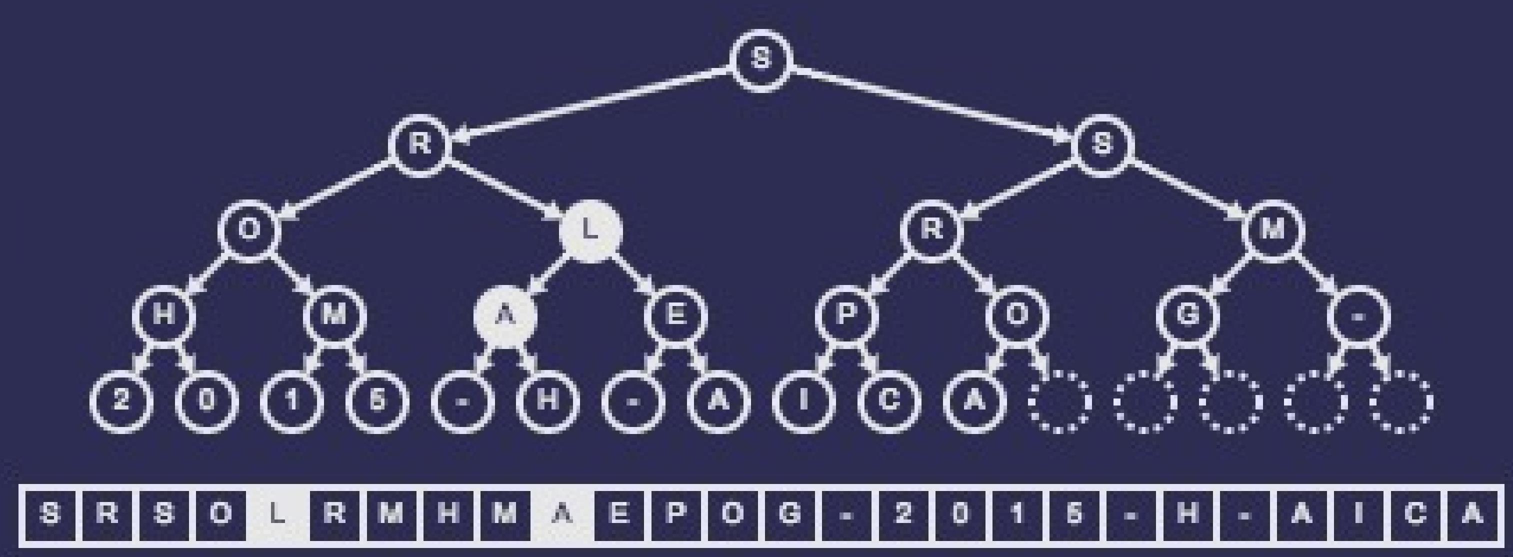
T, T

Step 8. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

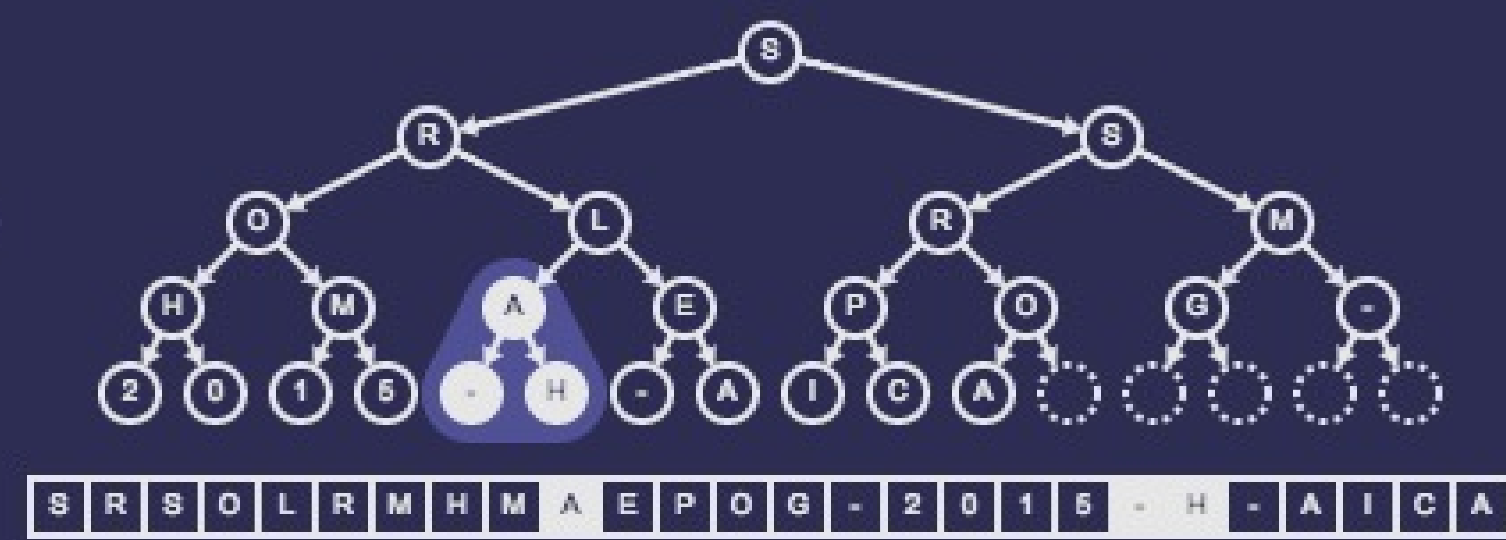
T, T

Step 8. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

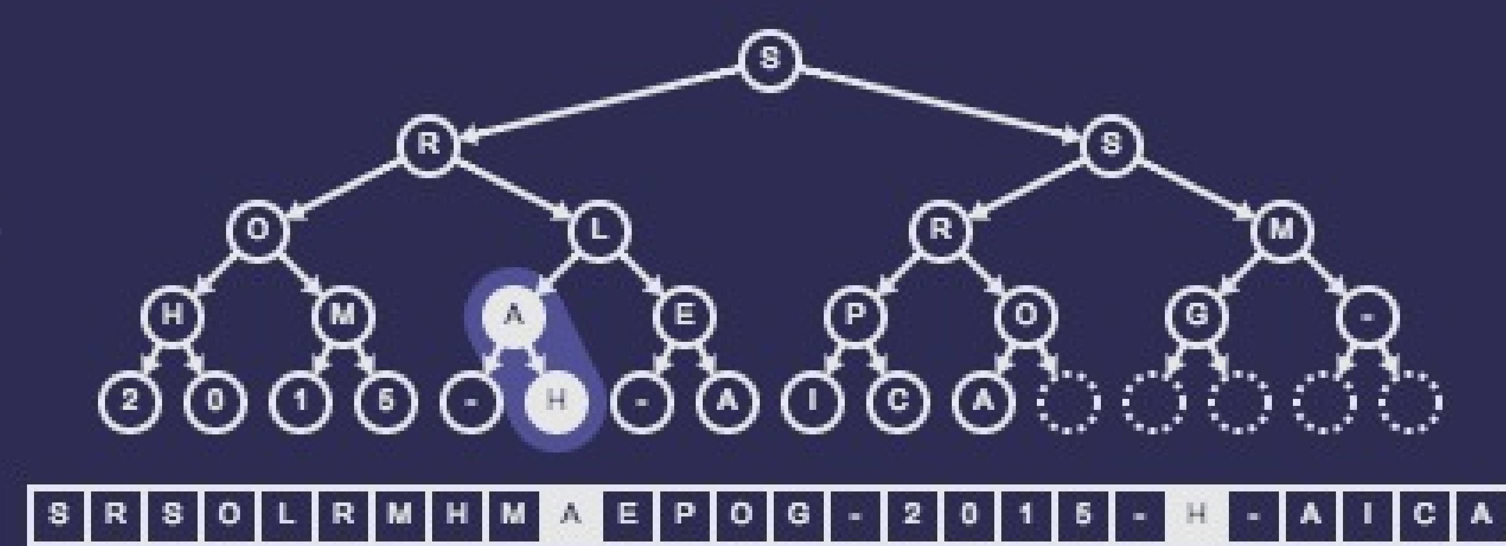
T, T

Step 8. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

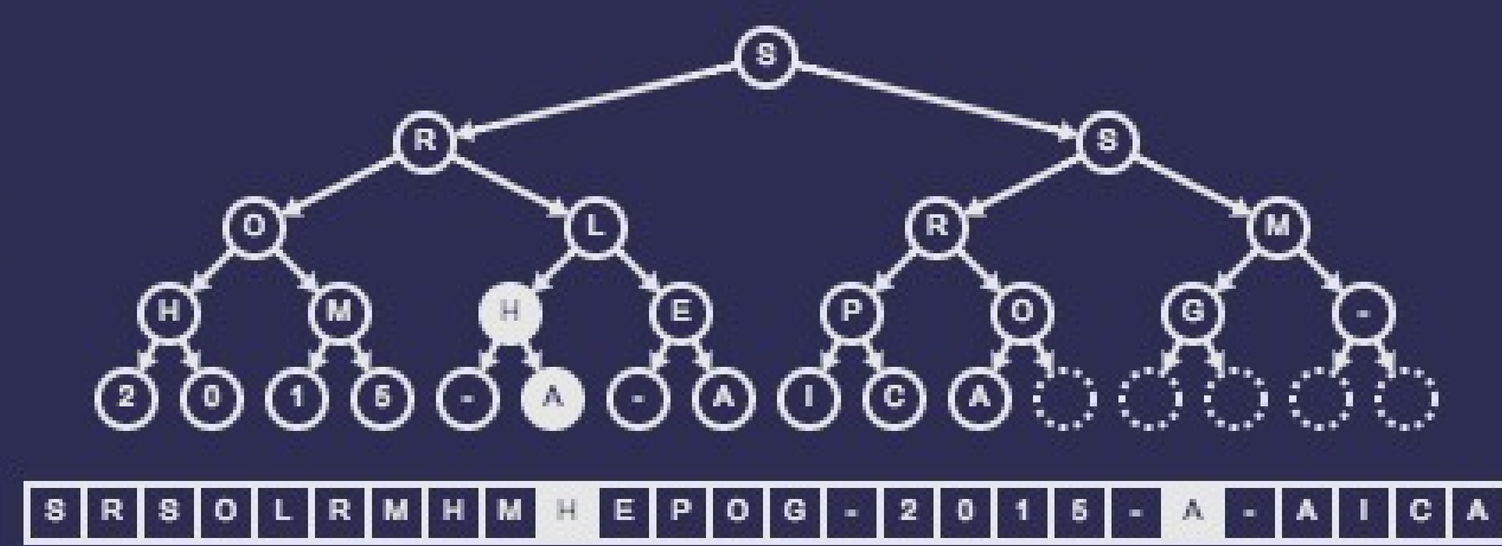
T, T

Step 9. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

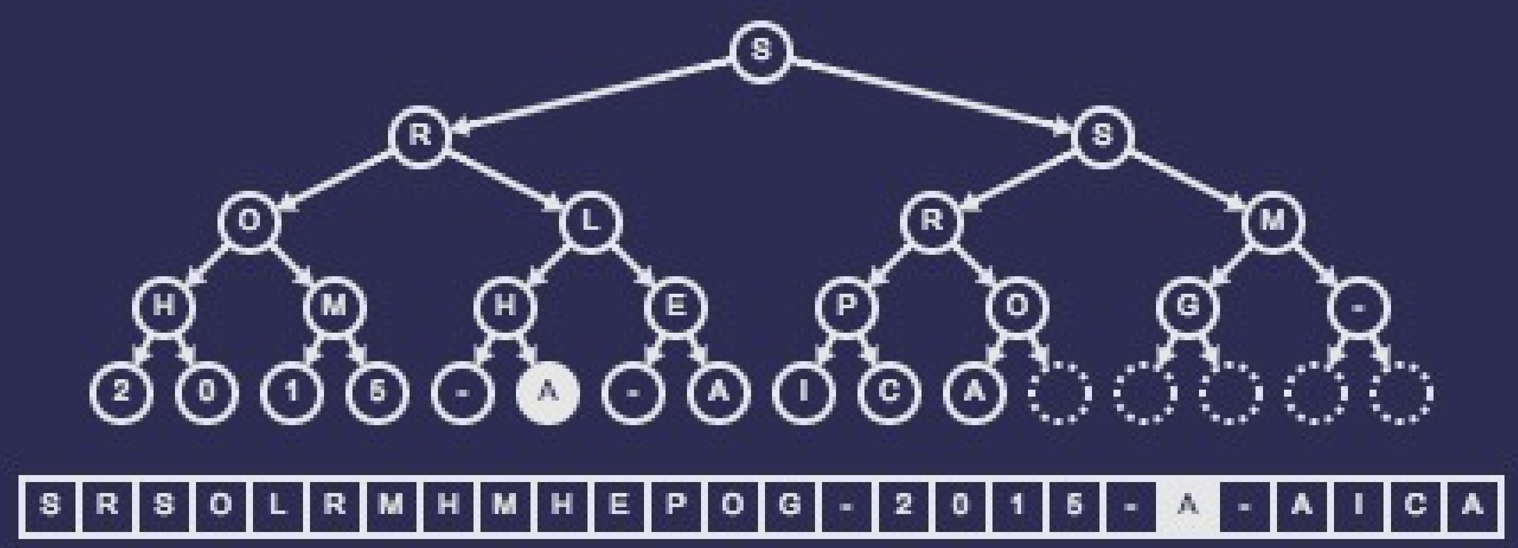
T, T

Step 9. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

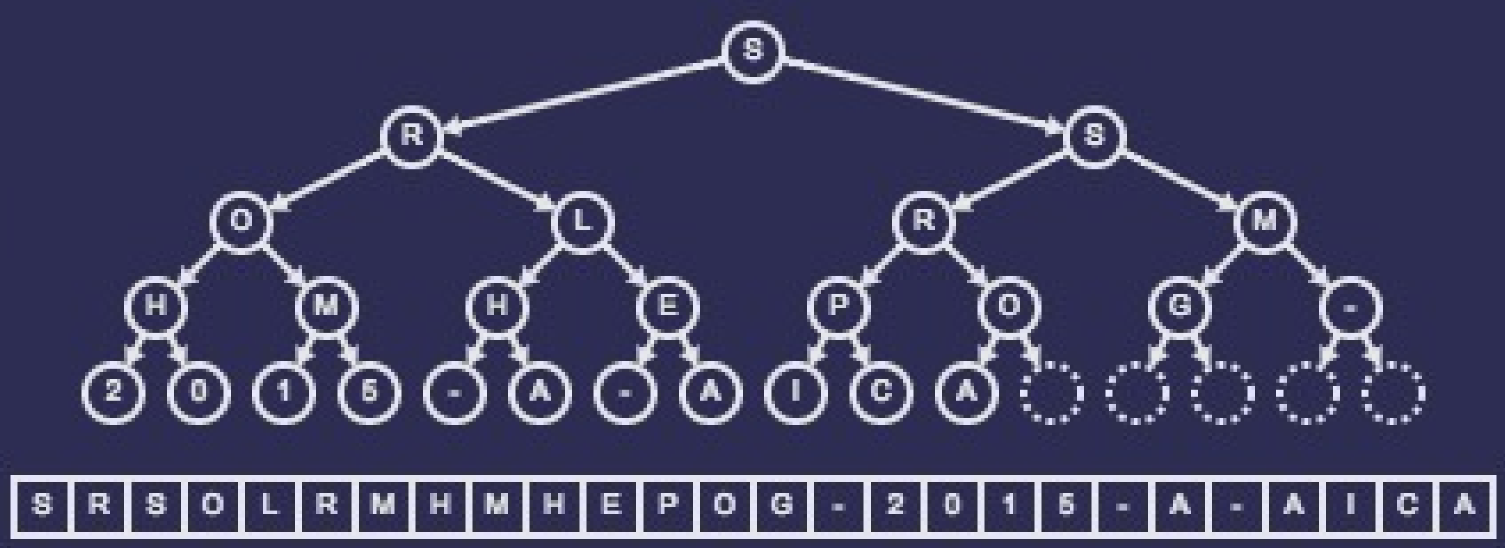
T, T

Step 9. It has no children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

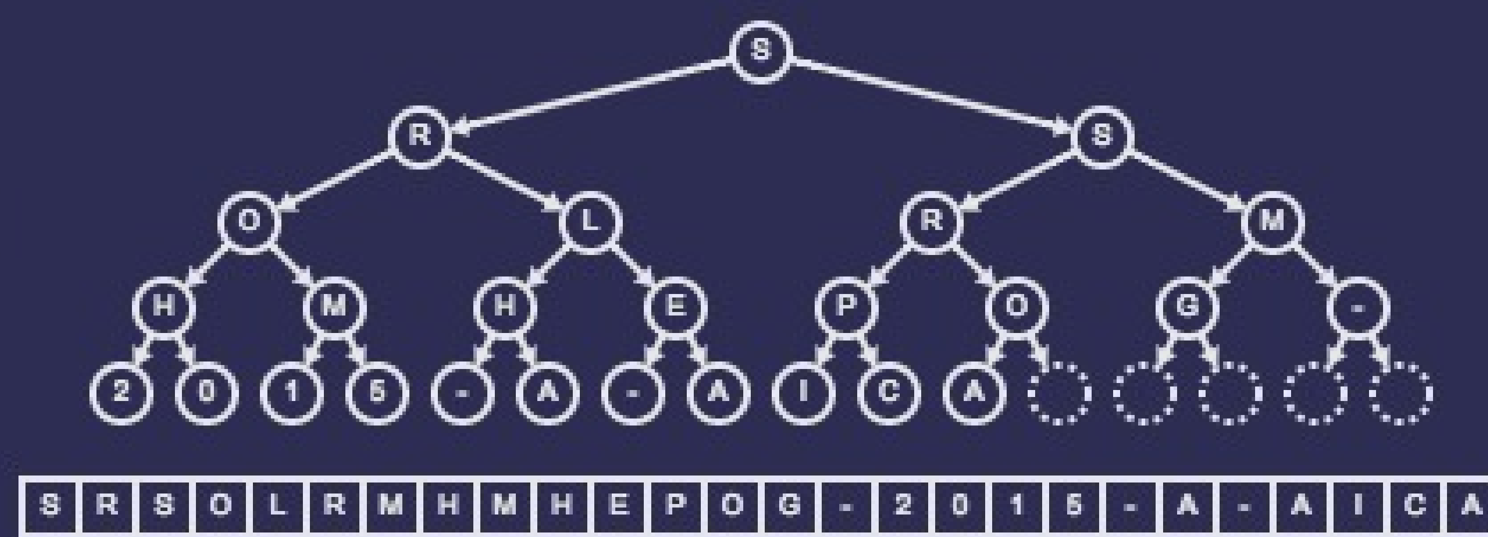
T, T

Step 9. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

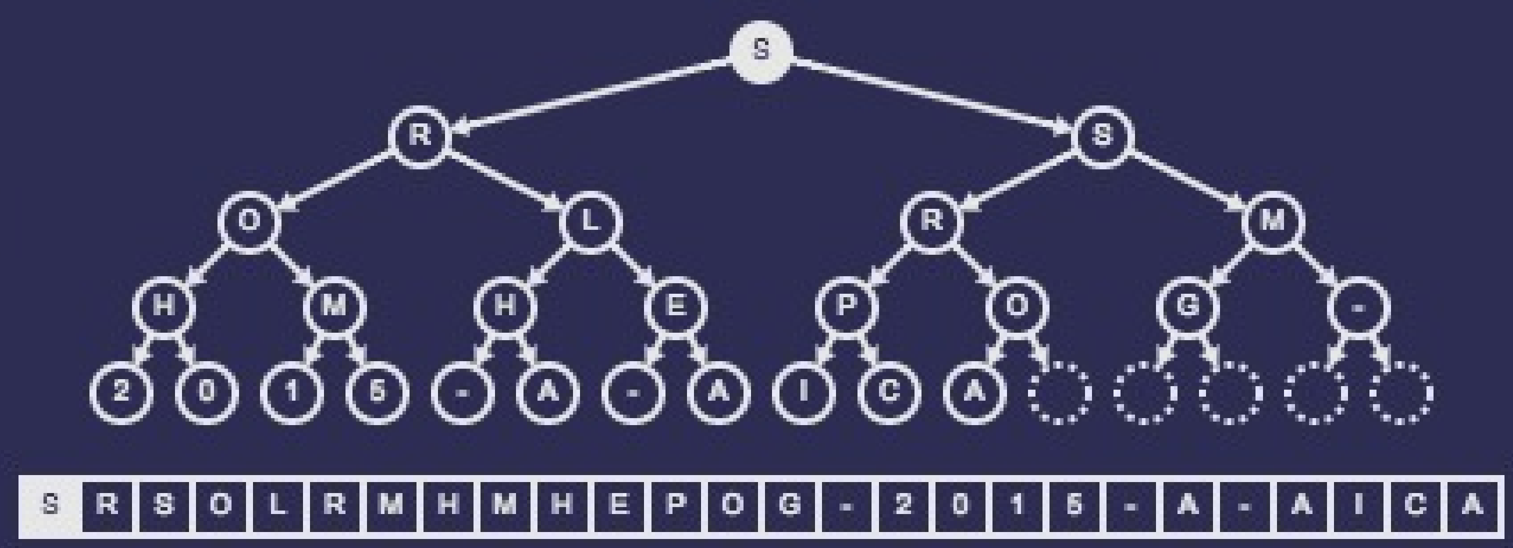
T, T

Removing the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

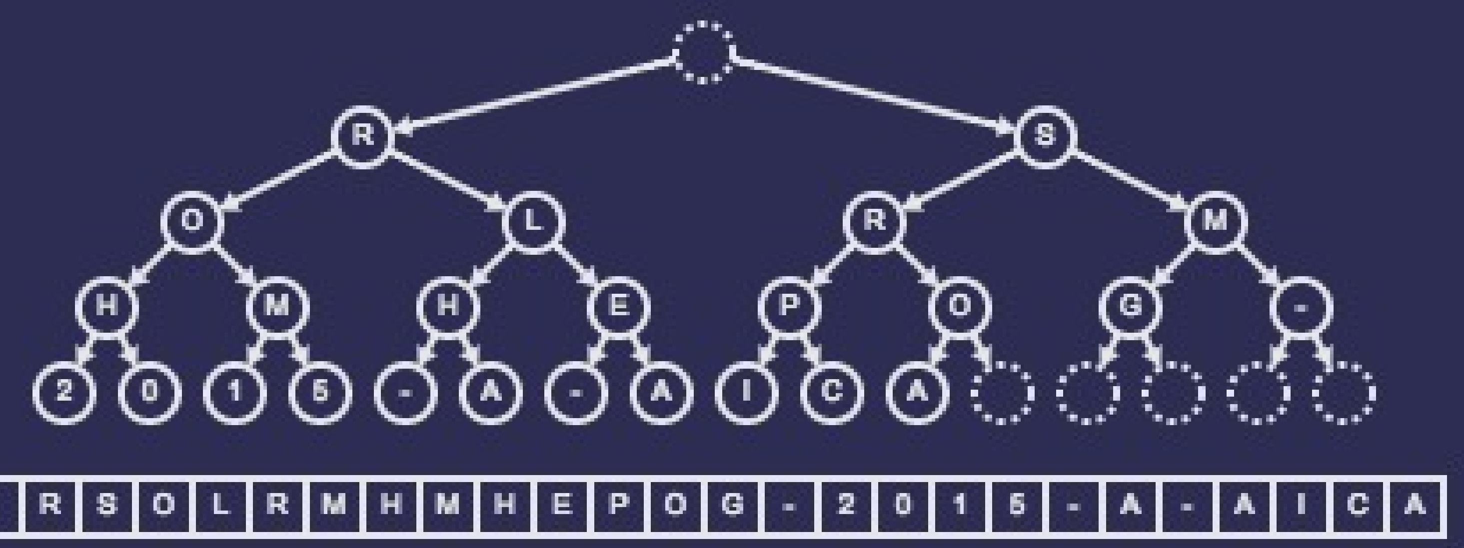
T, T

Step 1. Find the root of the heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

S

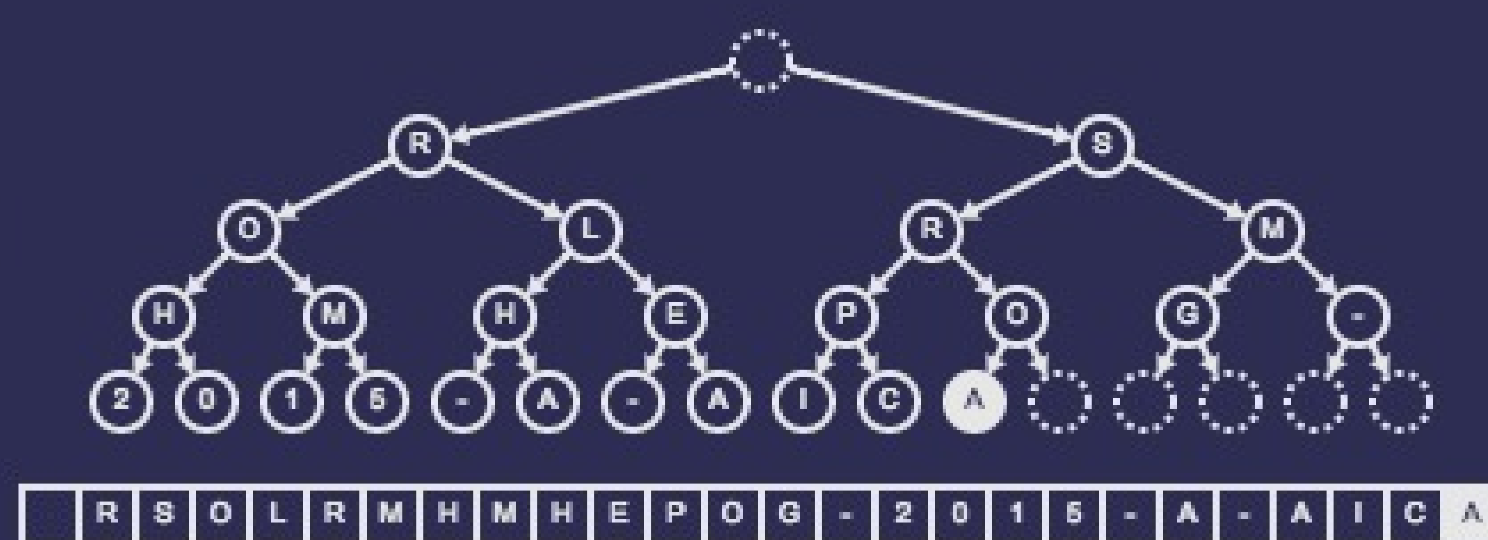
T, T

Step 2. Output the value of the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

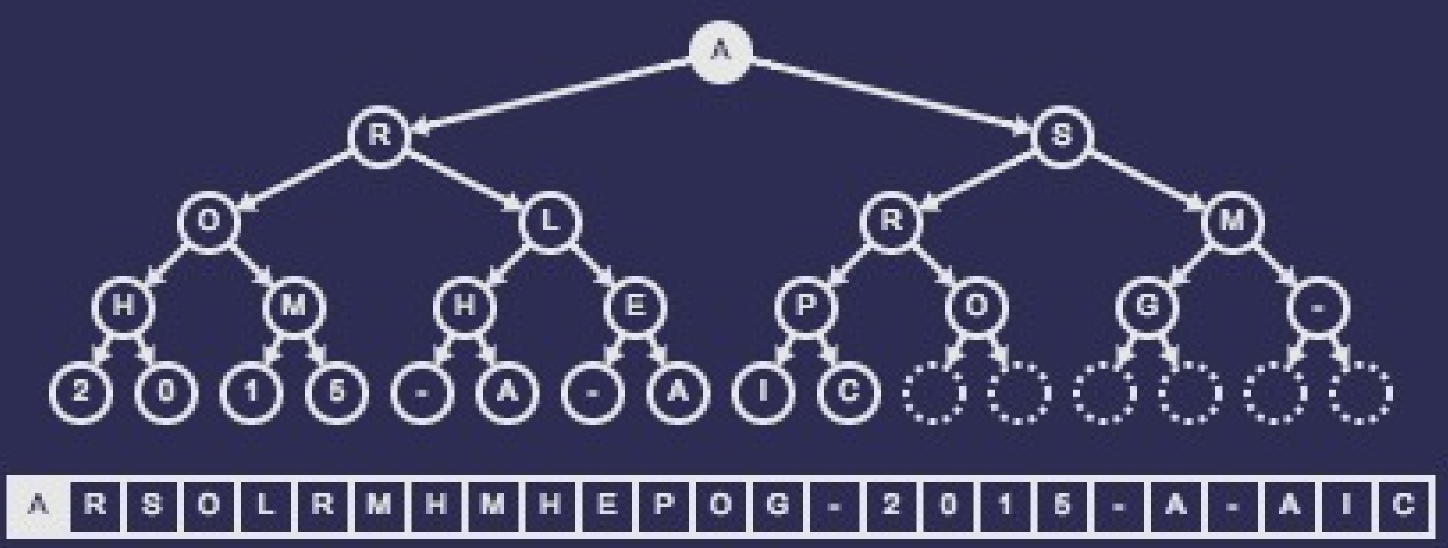
S, T,
T

Step 3. Find the last node

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

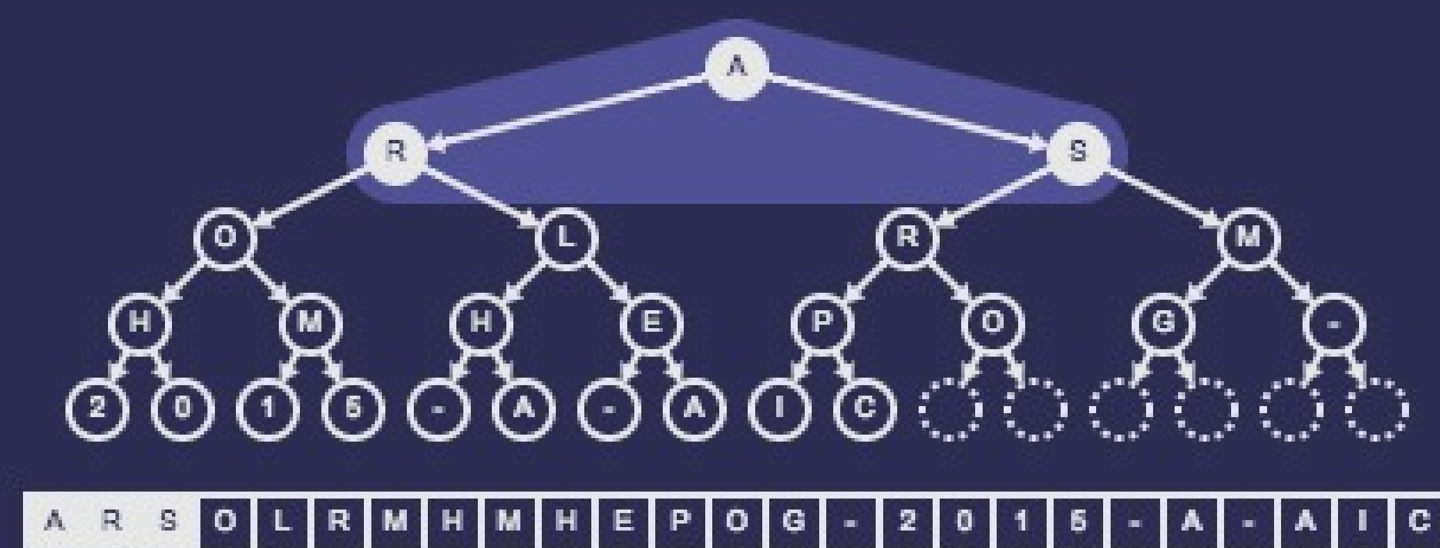
S, T,
T

Step 4. Move the last node to the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

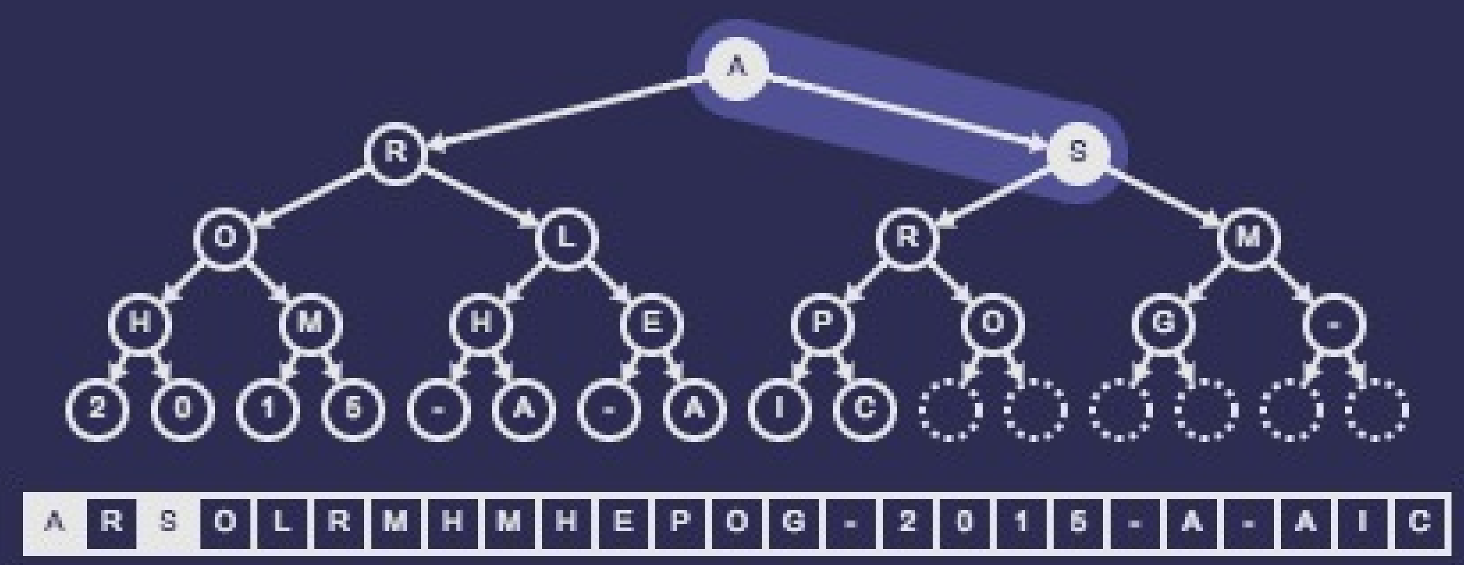
S, T,
T

Step 5. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

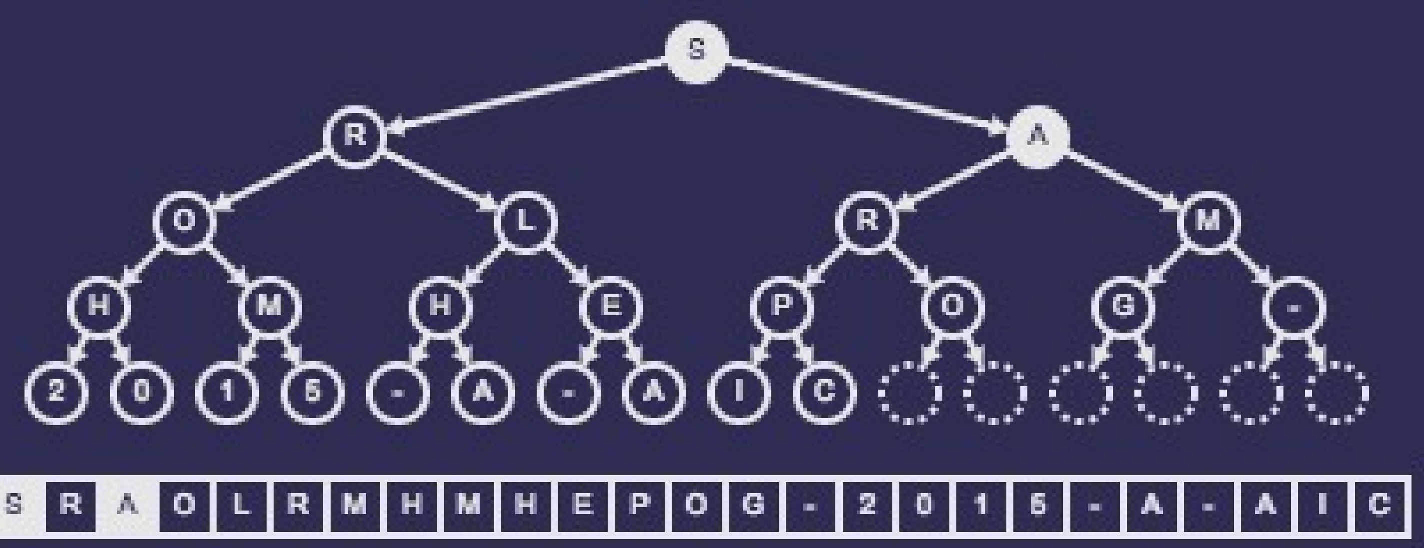
S, T,
T

Step 6. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

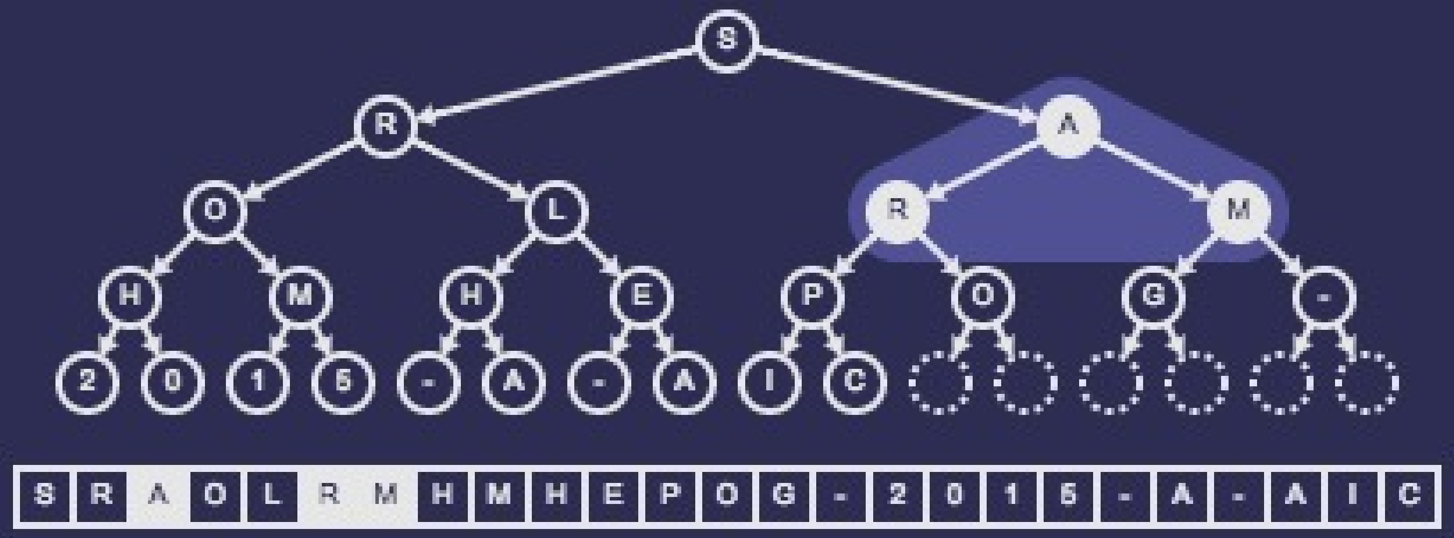
S, T,
T

Step 6. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

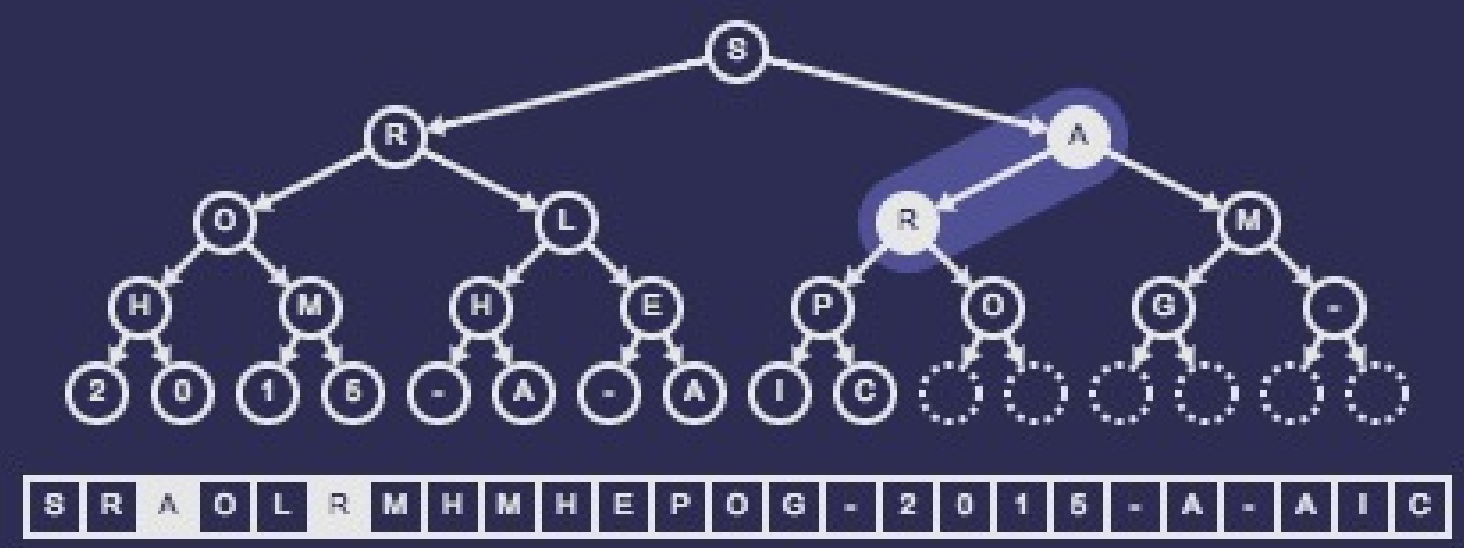
S, T,
T

Step 6. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

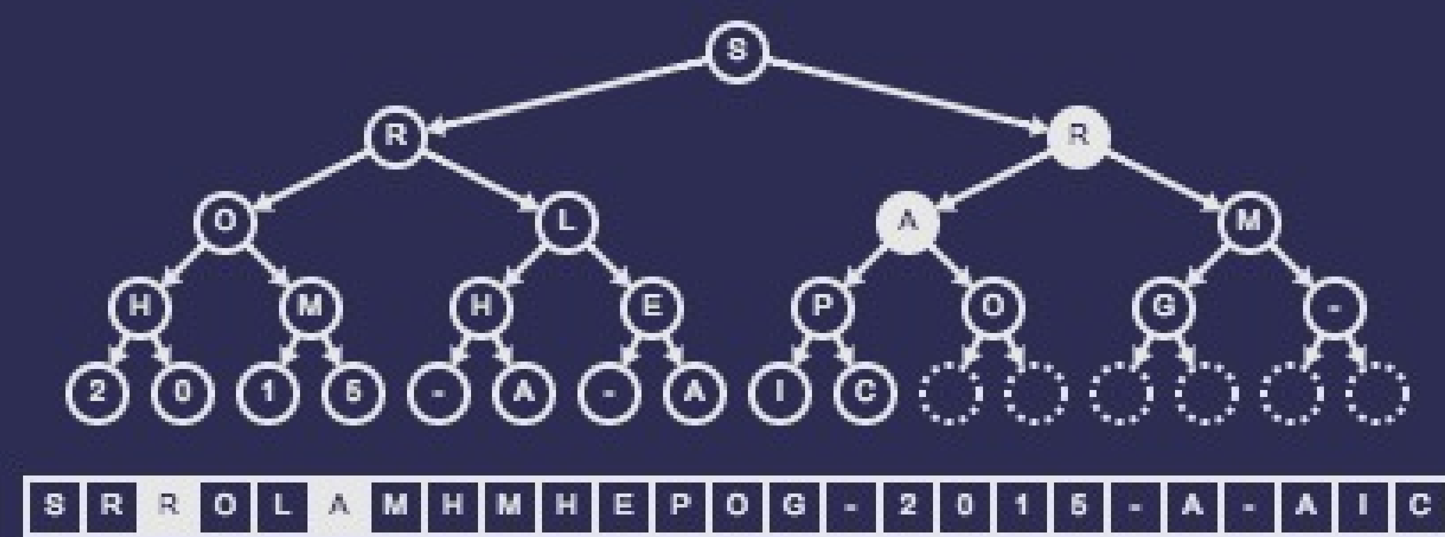
S, T,
T

Step 7. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

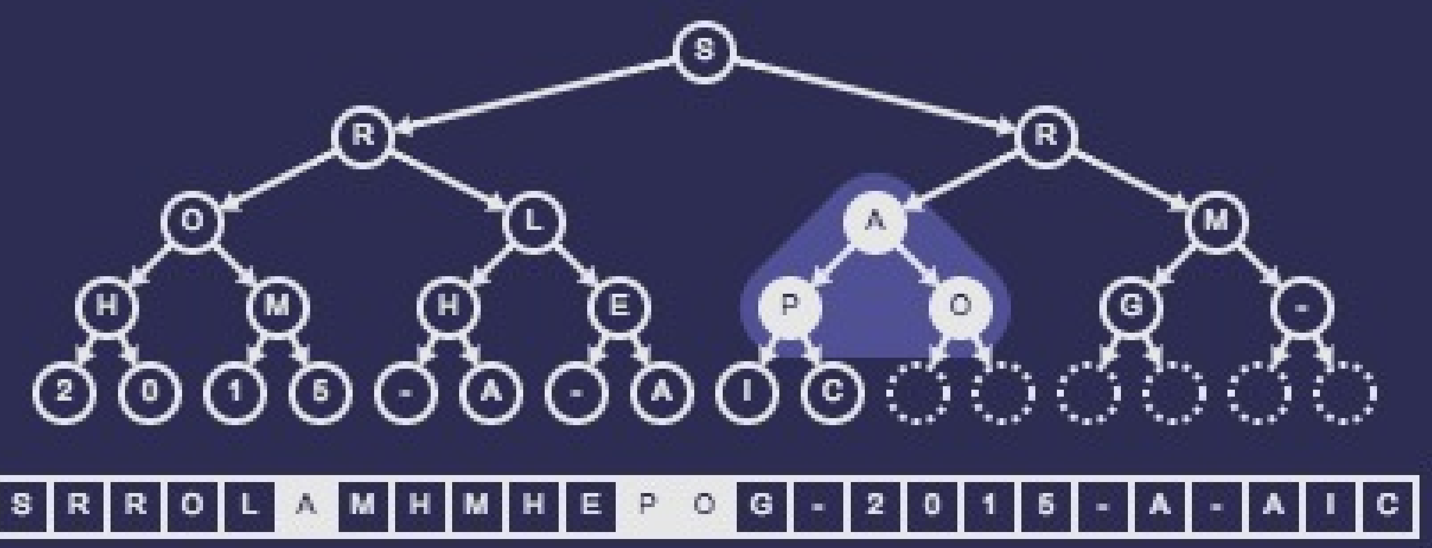
S, T,
T

Step 7. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

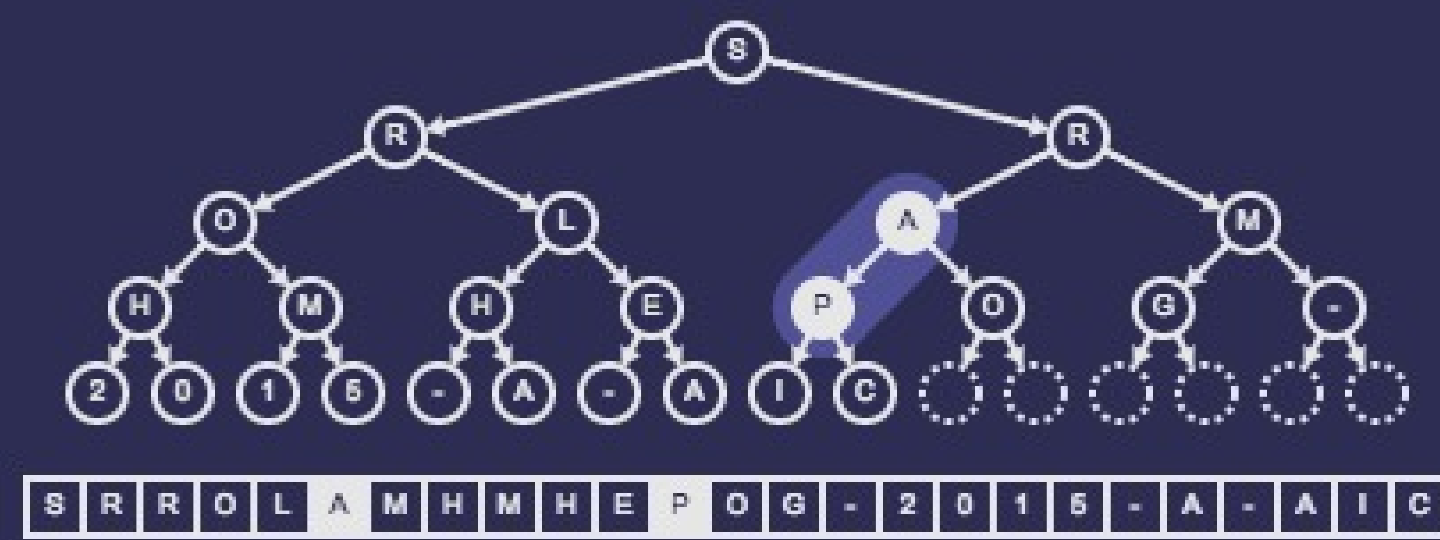
S, T,
T

Step 7. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

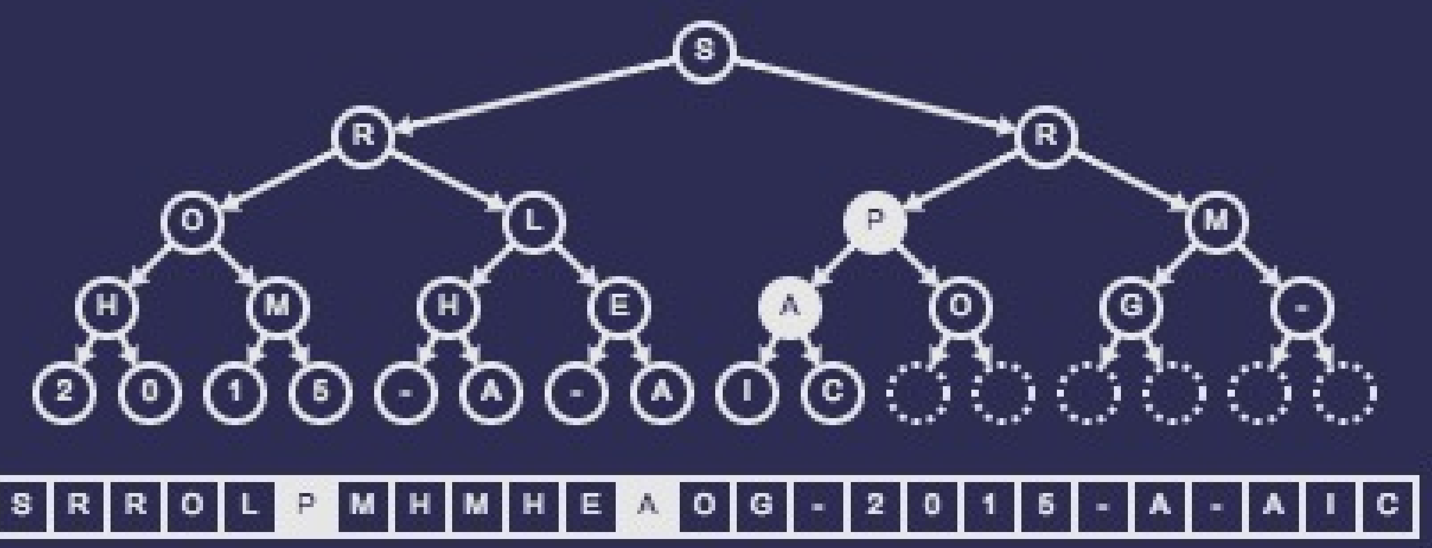
S, T,
T

Step 8. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

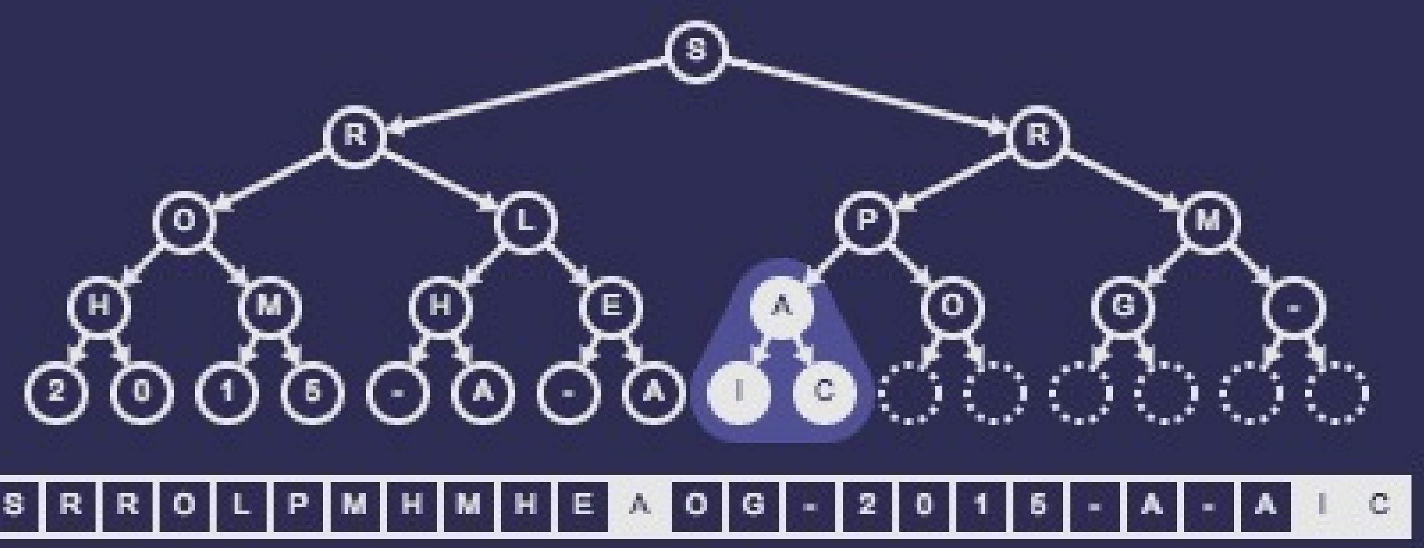
S, T,
T

Step 8. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

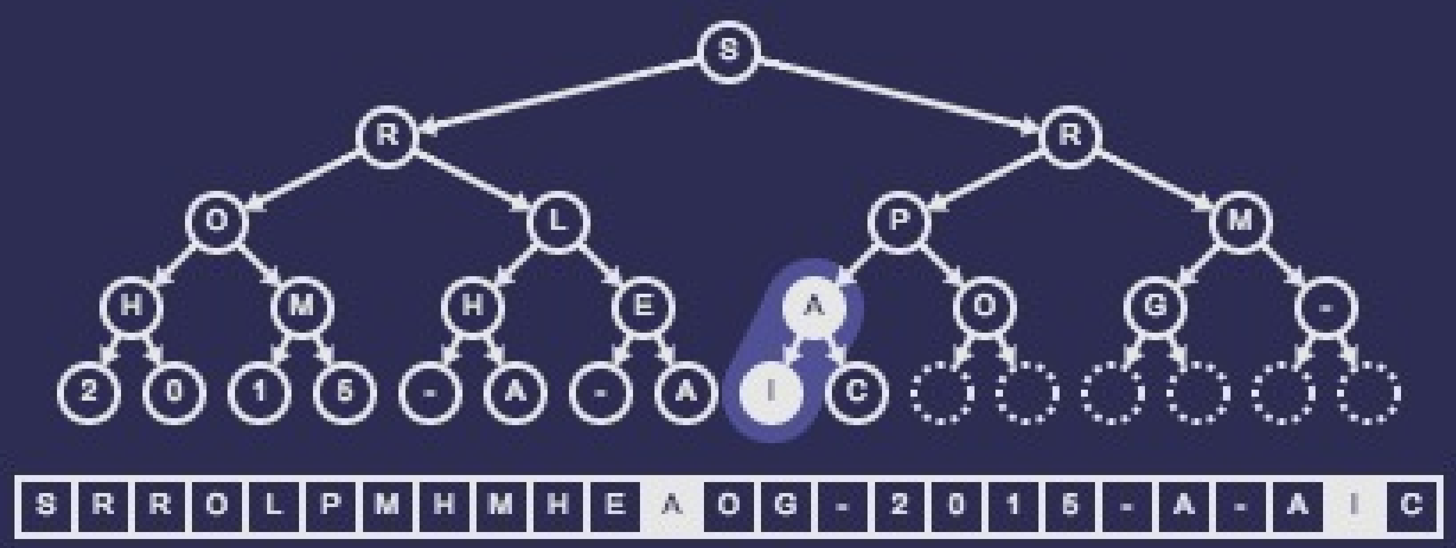
S, T,
T

Step 8. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

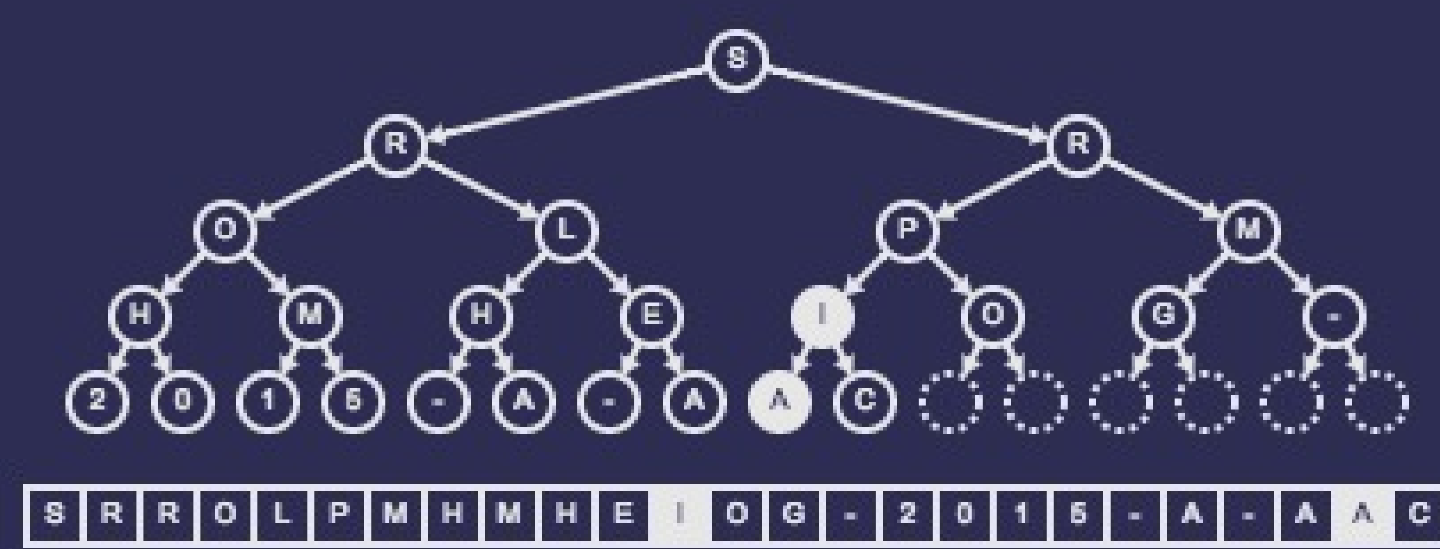
S, T,
T

Step 9. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

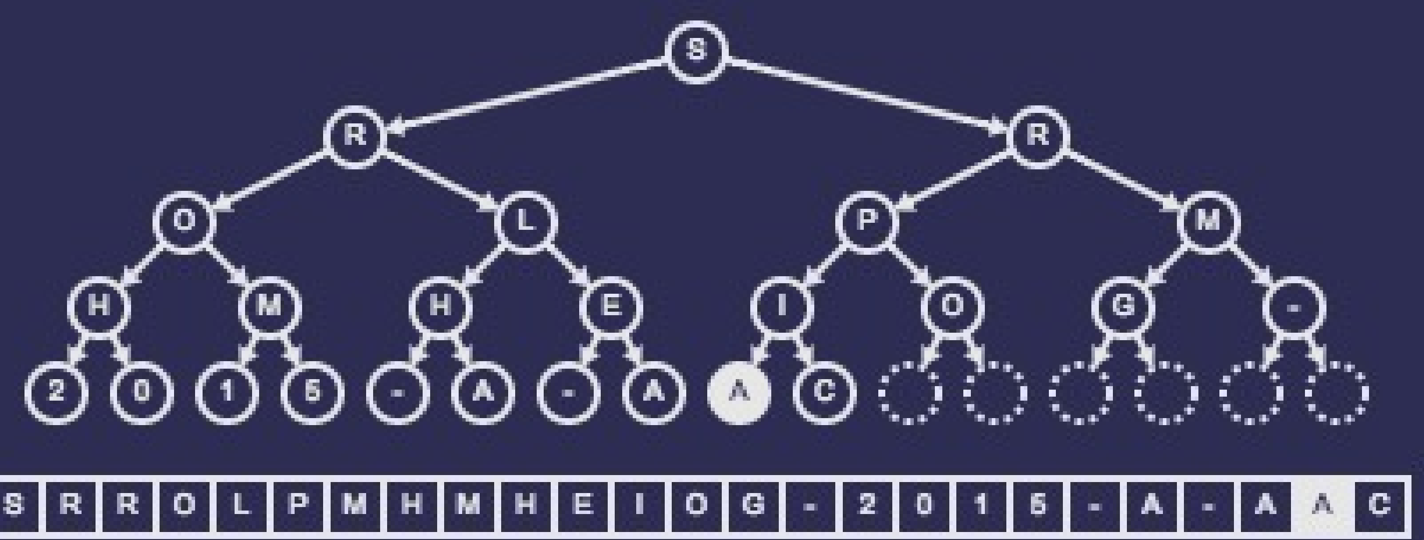
S, T,
T

Step 9. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

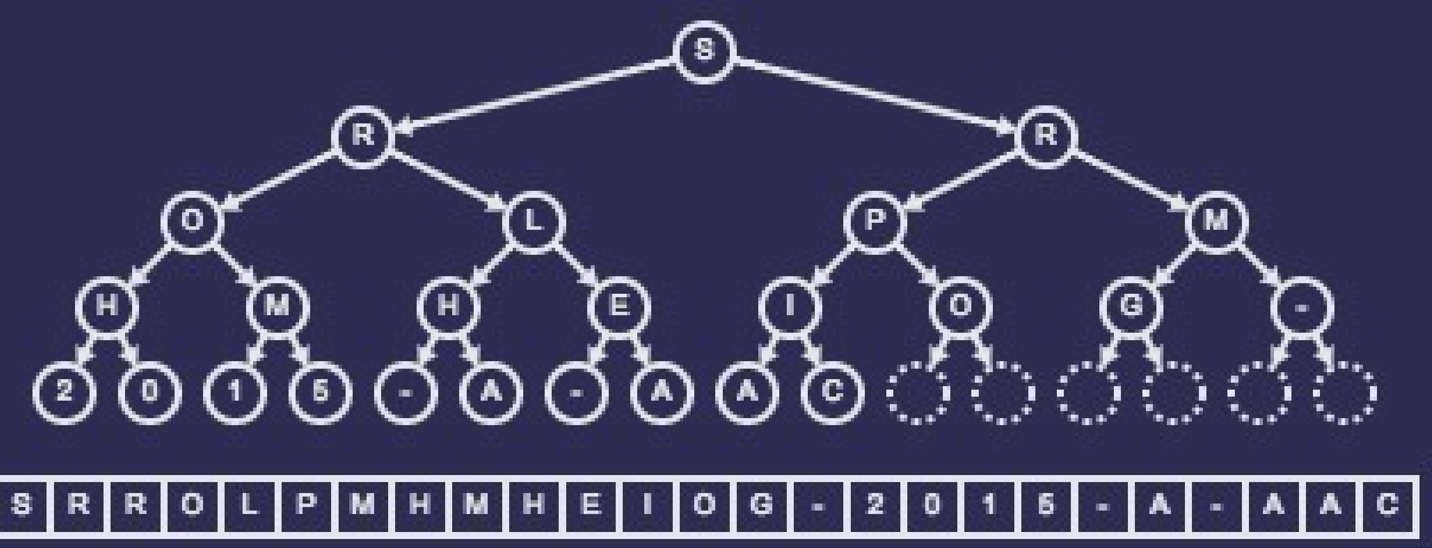
S, T,
T

Step 9. It has no children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

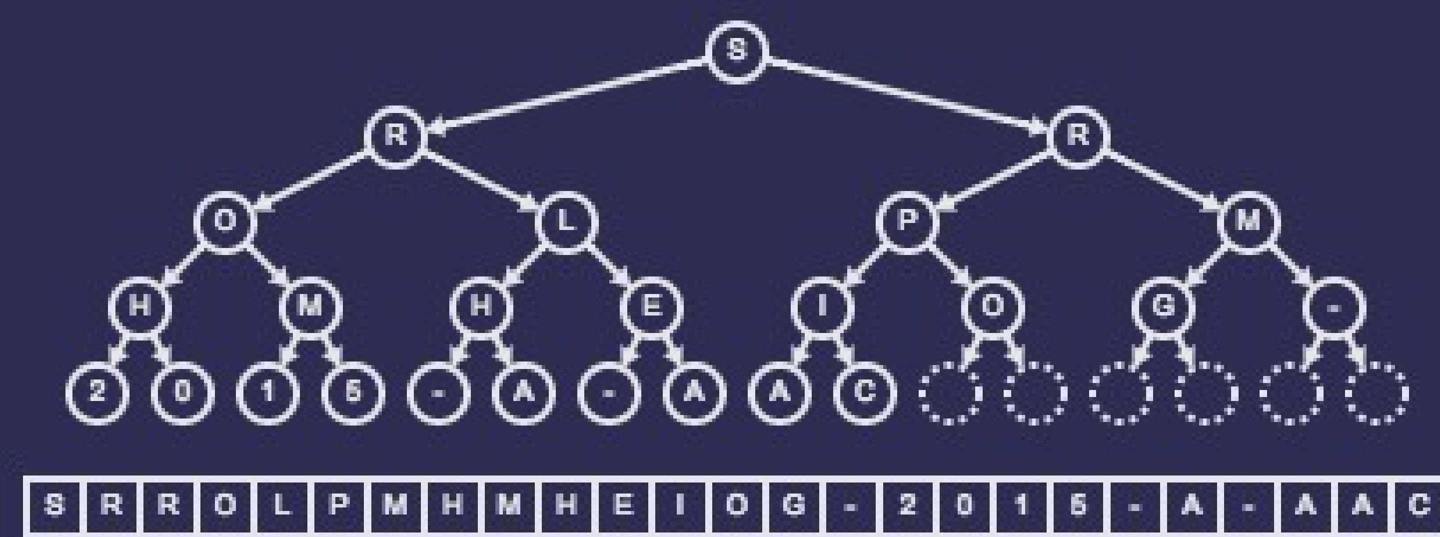
S, T,
T

Step 9. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

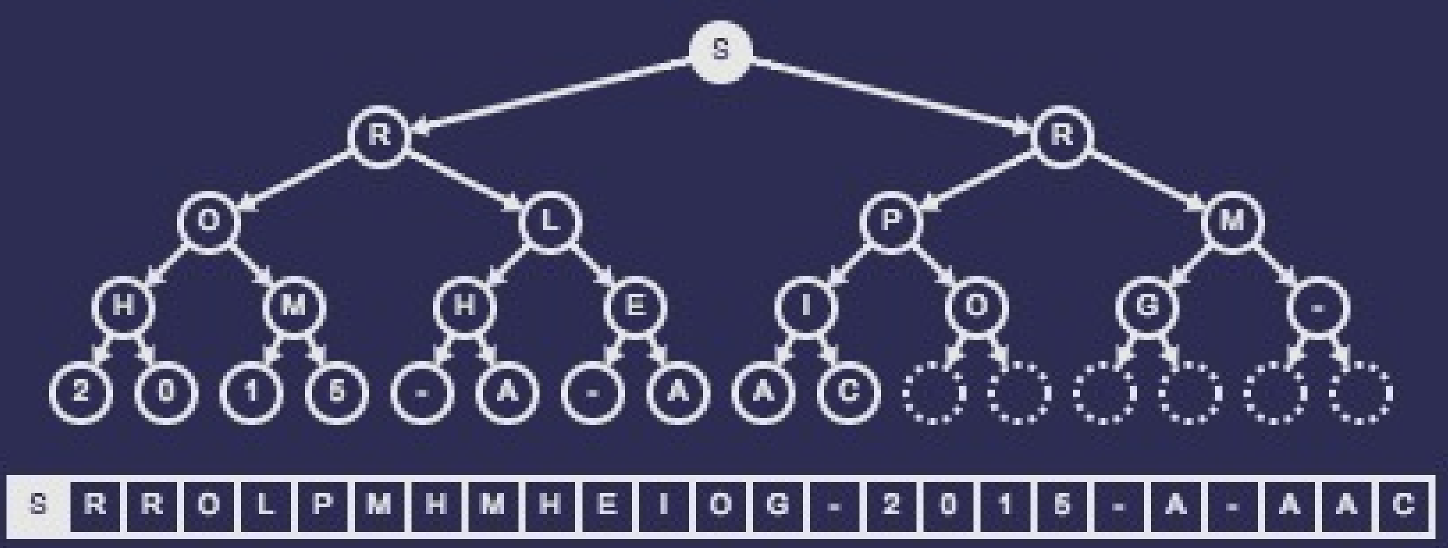
S, T,
T

Removing the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

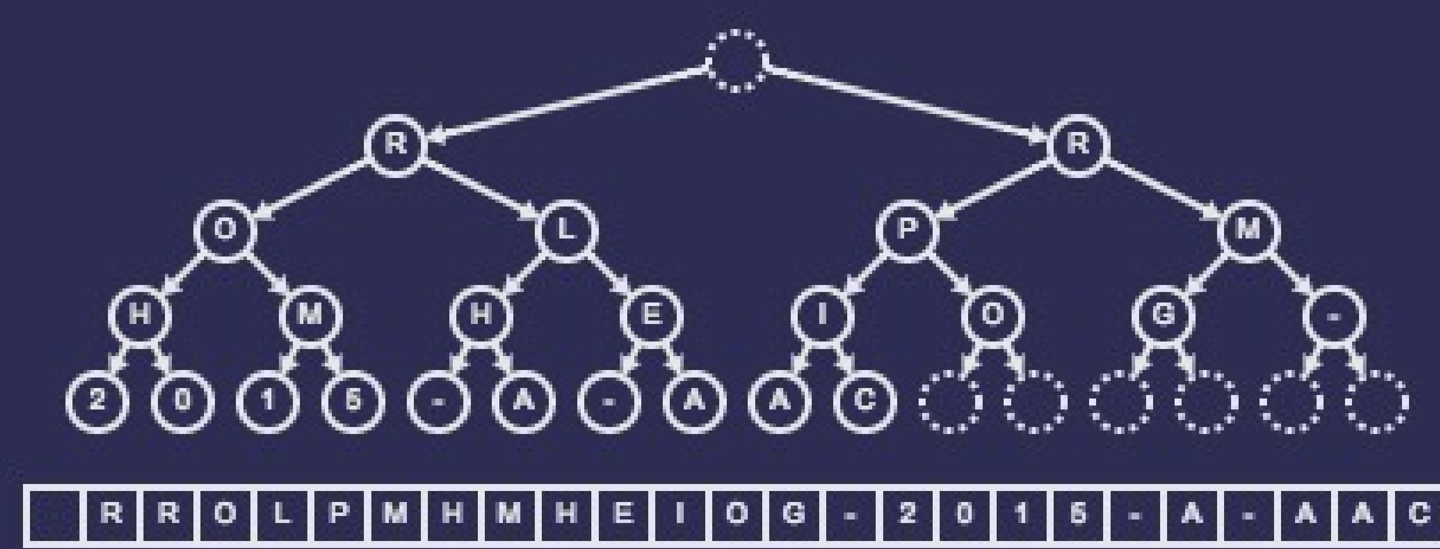
S, T,
T

Step 1. Find the root of the heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

S

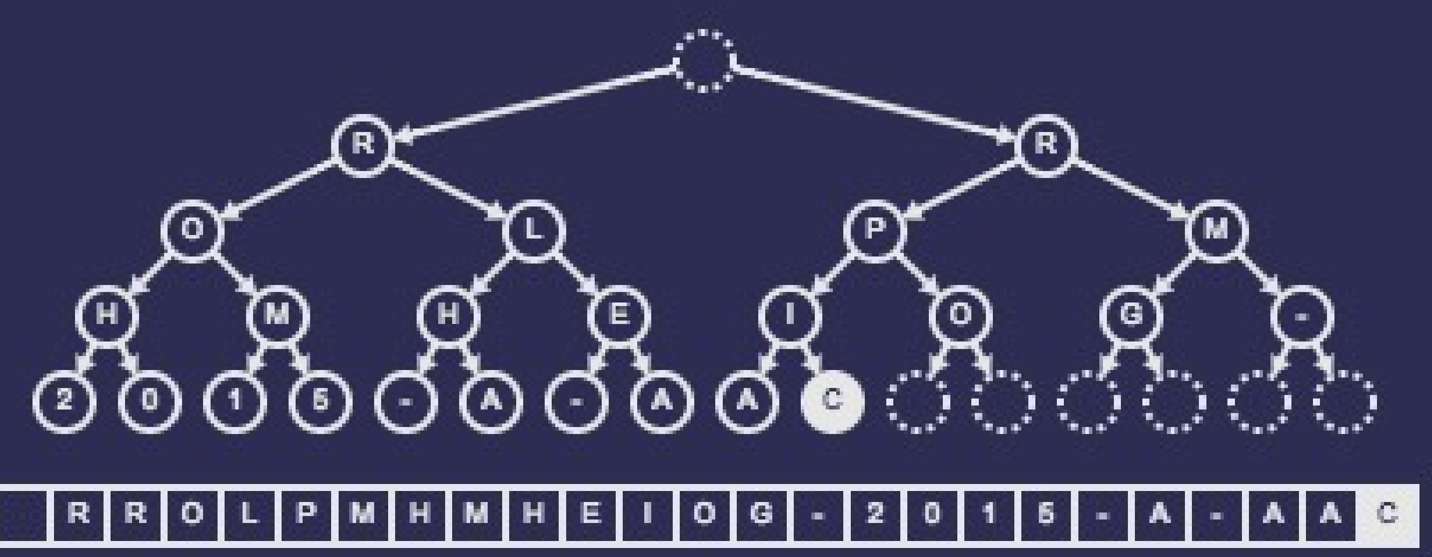
S, T,
T

Step 2. Output the value of the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

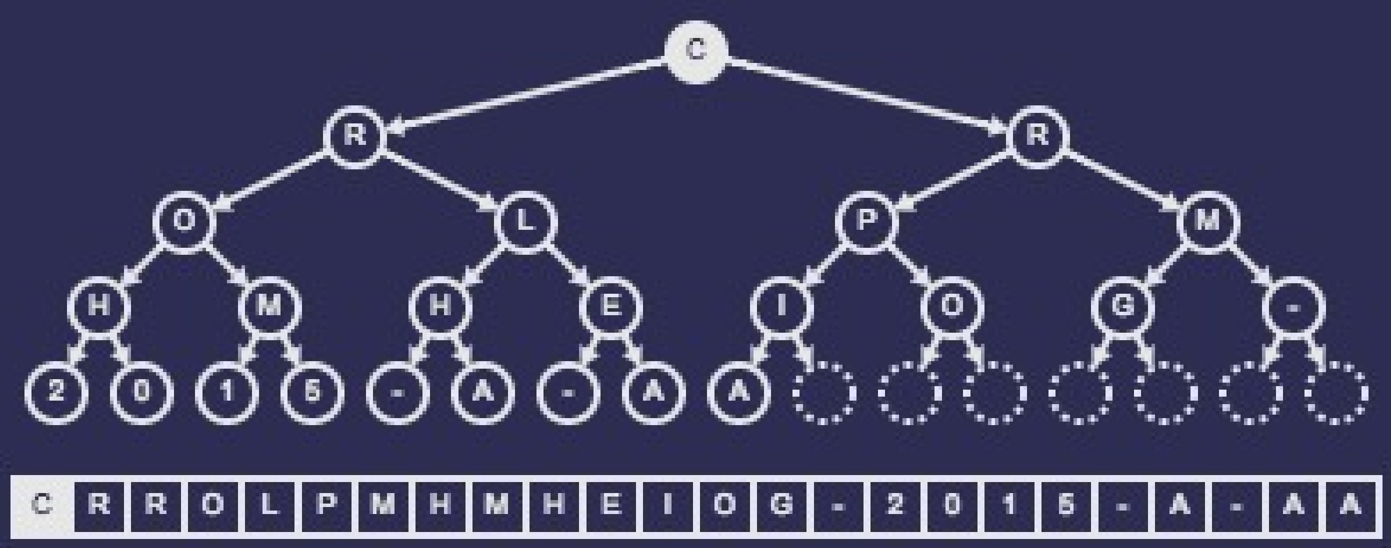
S, S,
T, T

Step 3. Find the last node

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

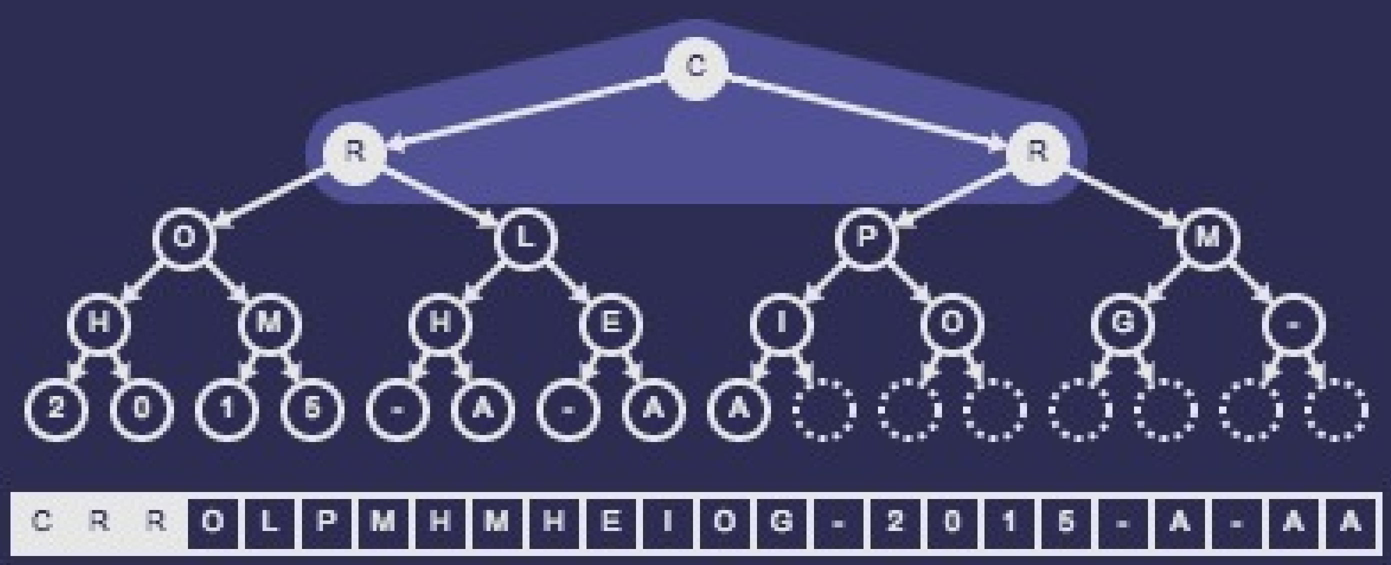
S, S,
T, T

Step 4. Move the last node to the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

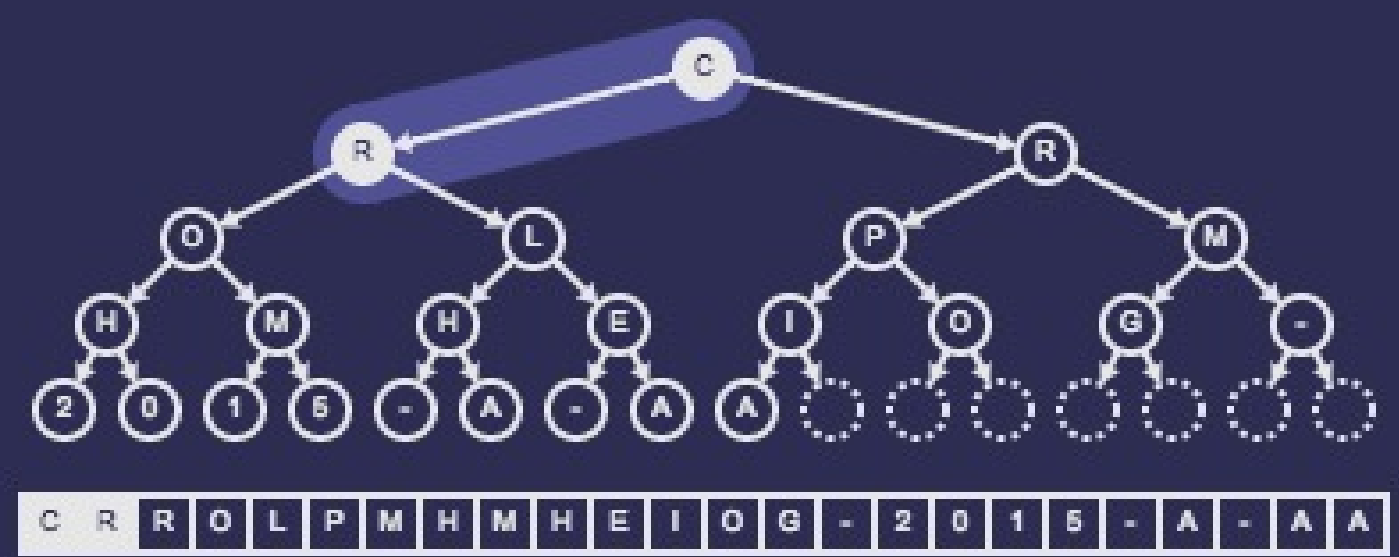
S, S,
T, T

Step 5. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

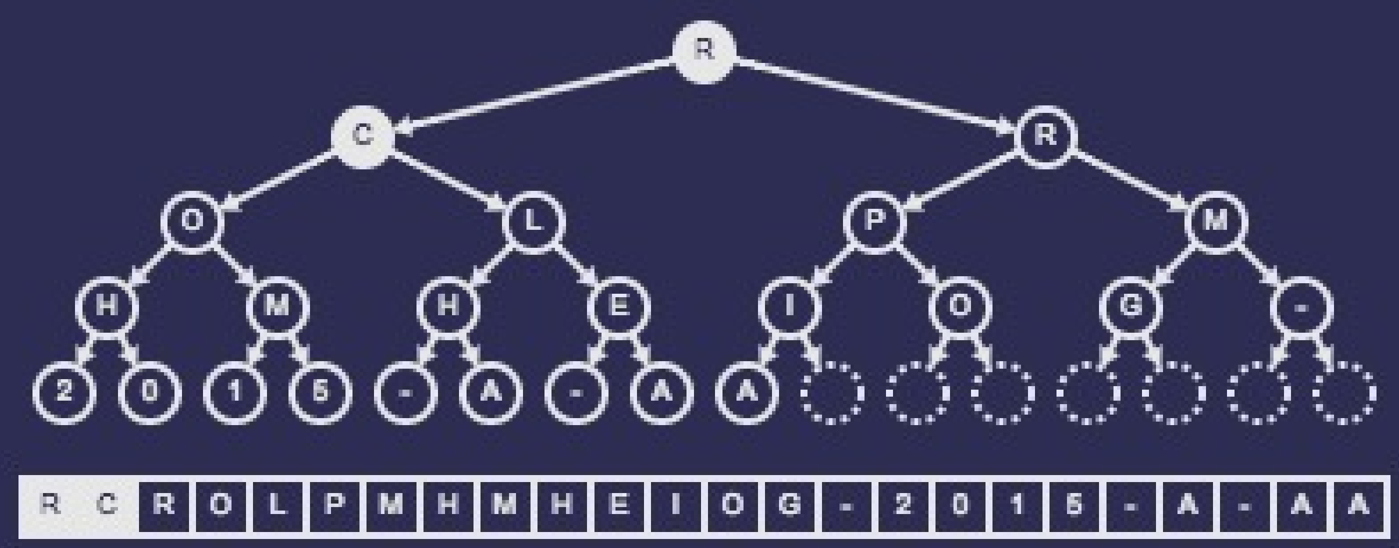
S, S,
T, T

Step 6. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

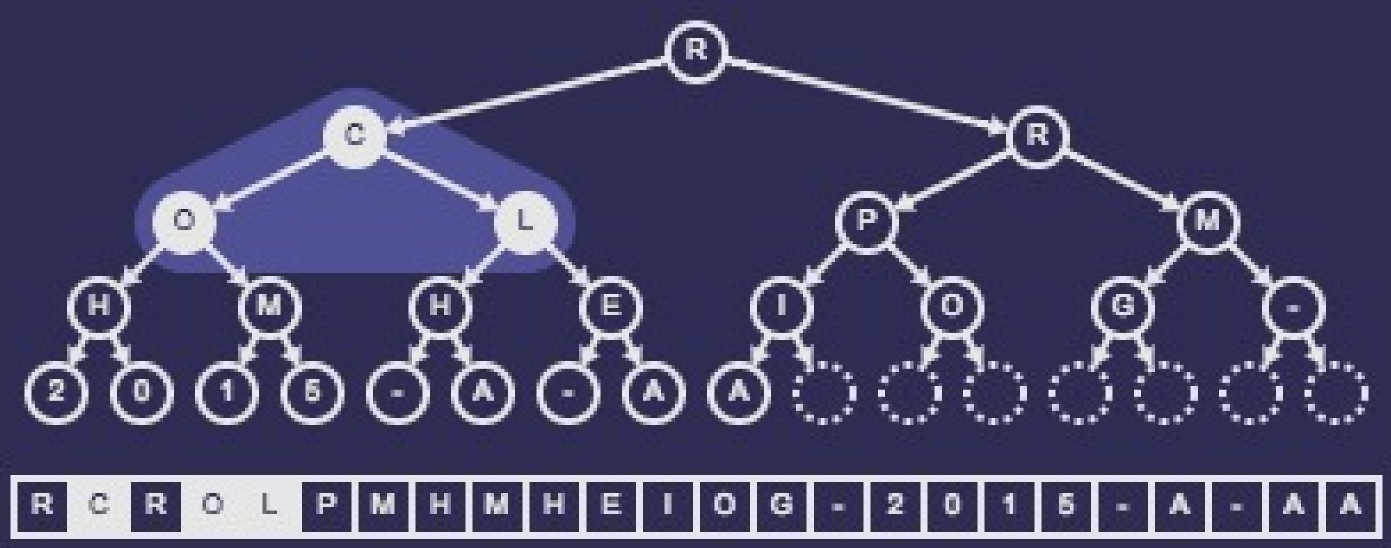
S, S,
T, T

Step 6. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

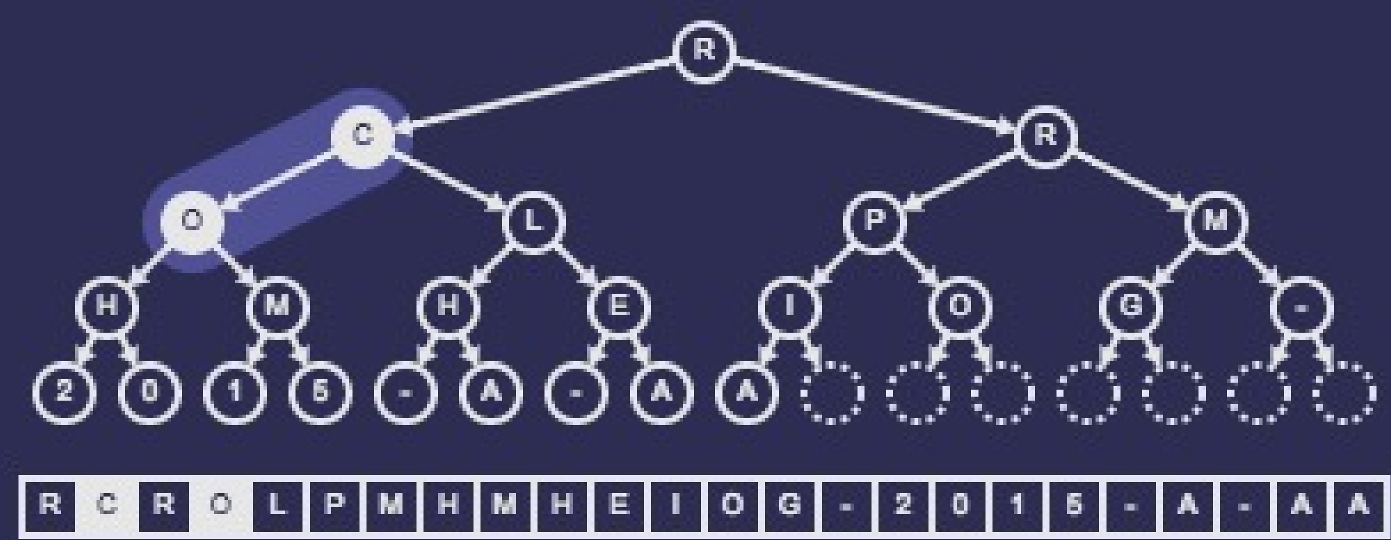
S, S,
T, T

Step 6. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

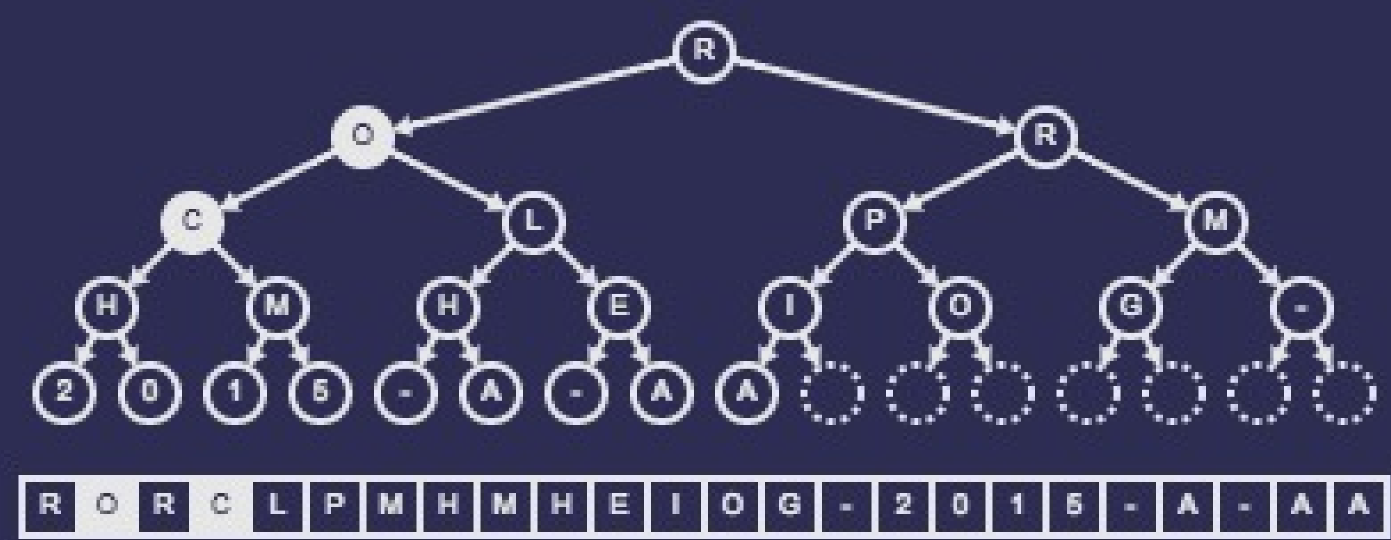
S, S,
T, T

Step 7. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

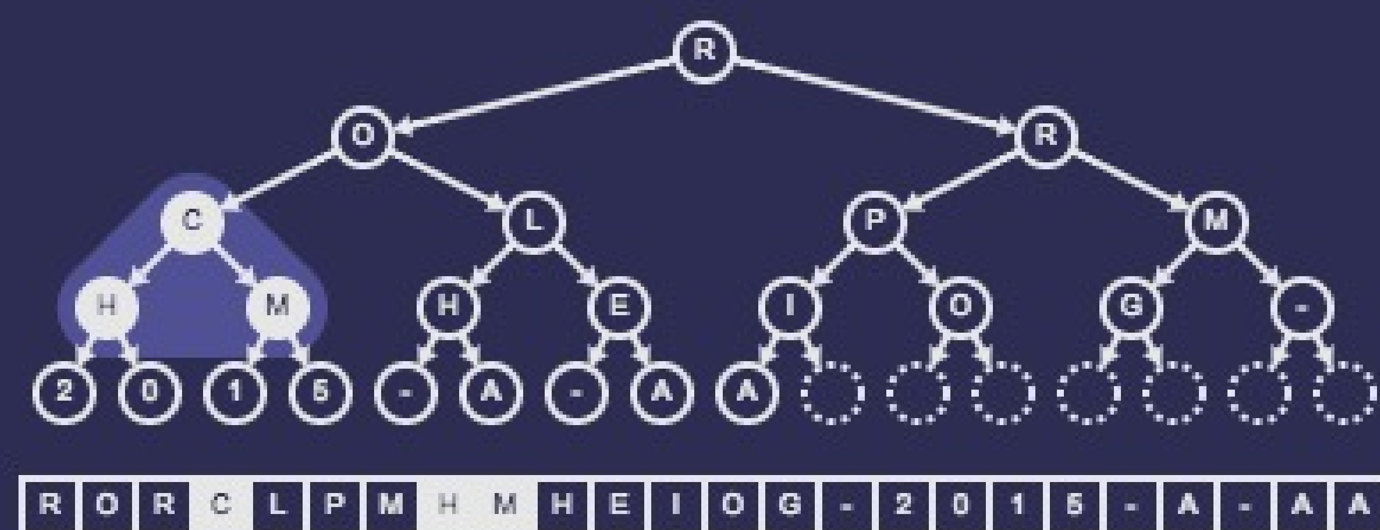
S, S,
T, T

Step 7. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

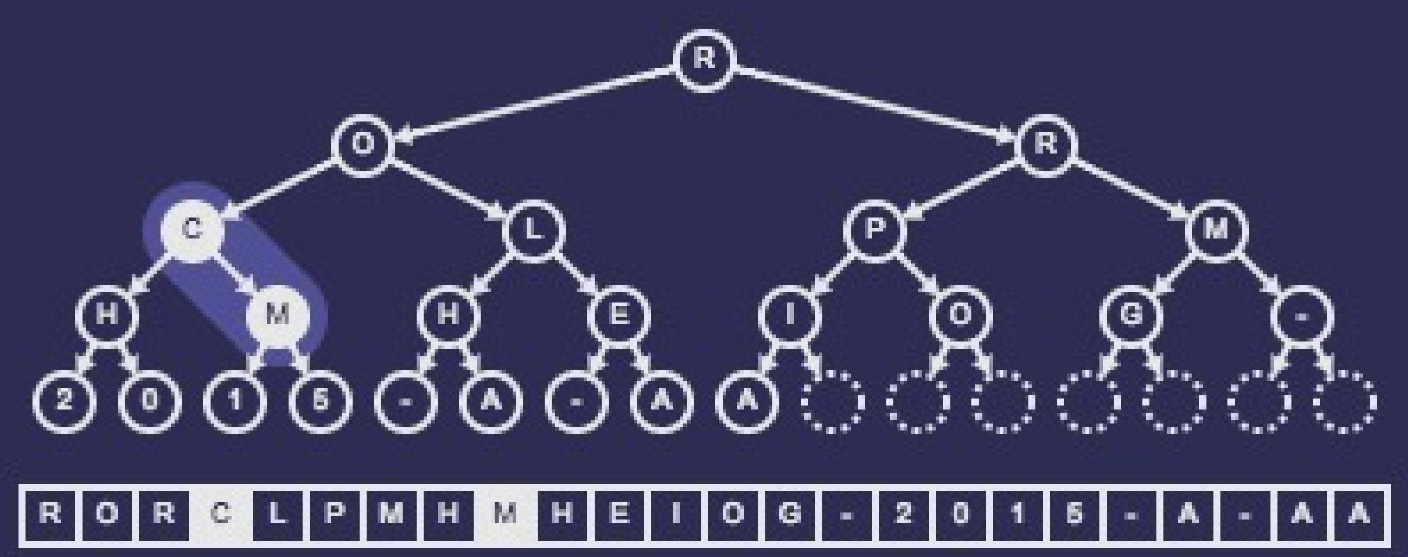
S, S,
T, T

Step 7. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

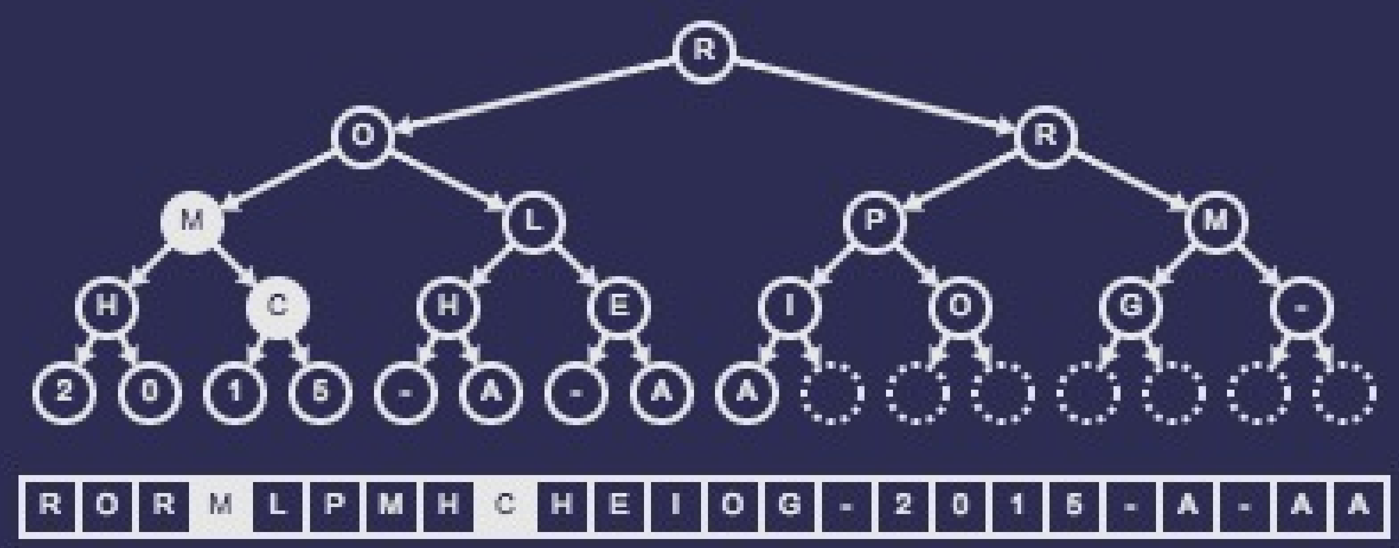
S, S,
T, T

Step 8. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

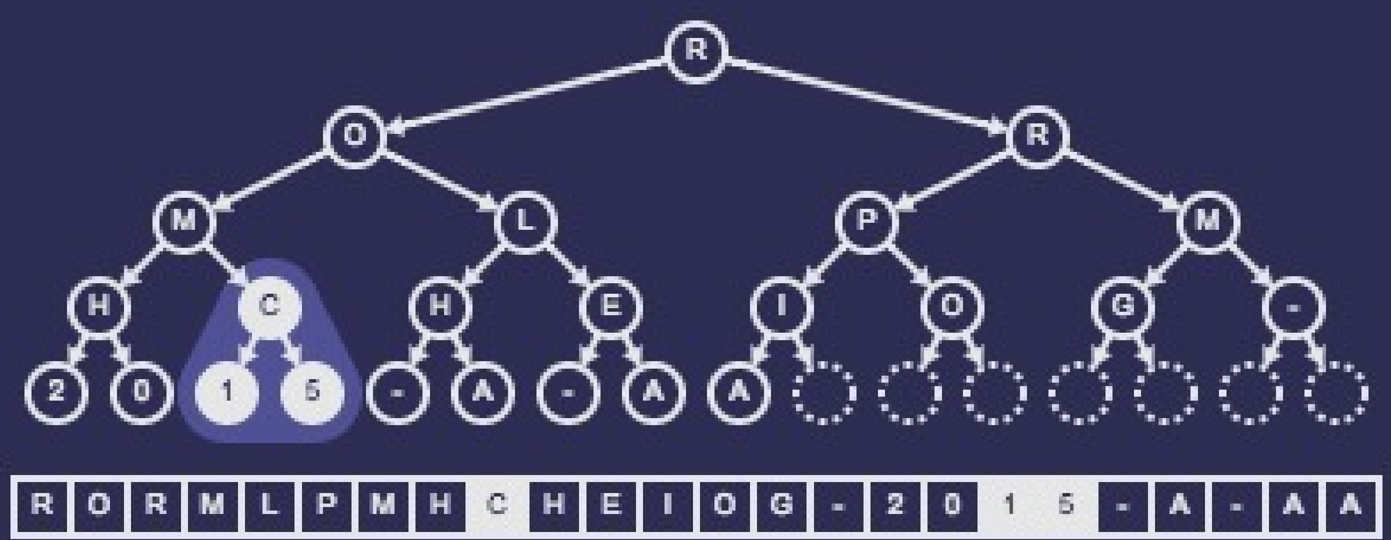
S, S,
T, T

Step 8. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

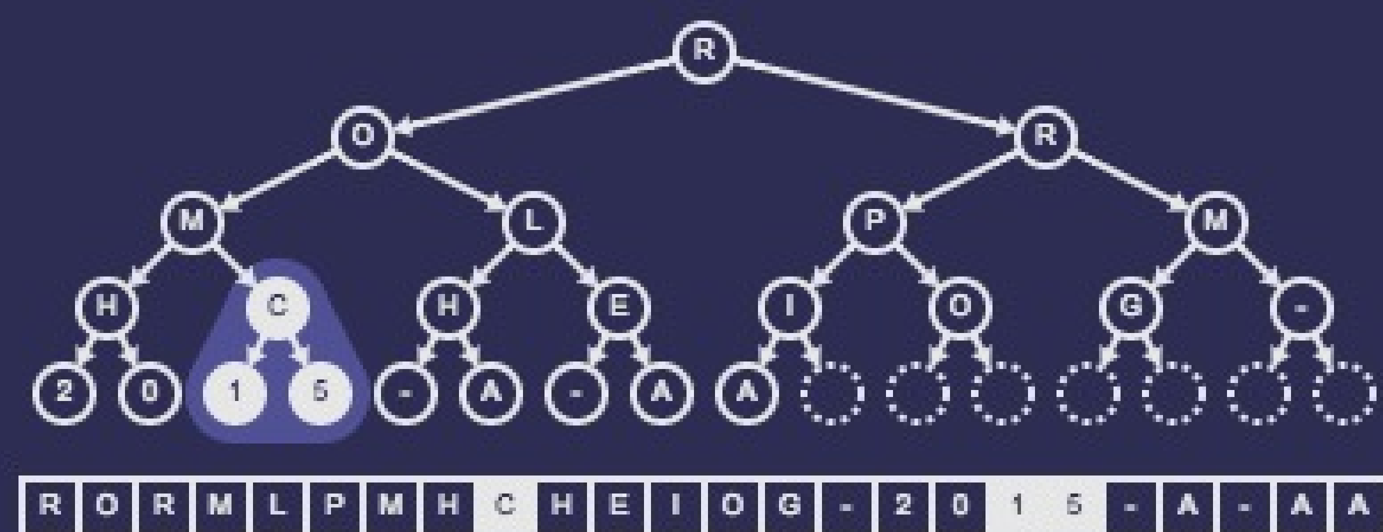
S, S,
T, T

Step 8. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

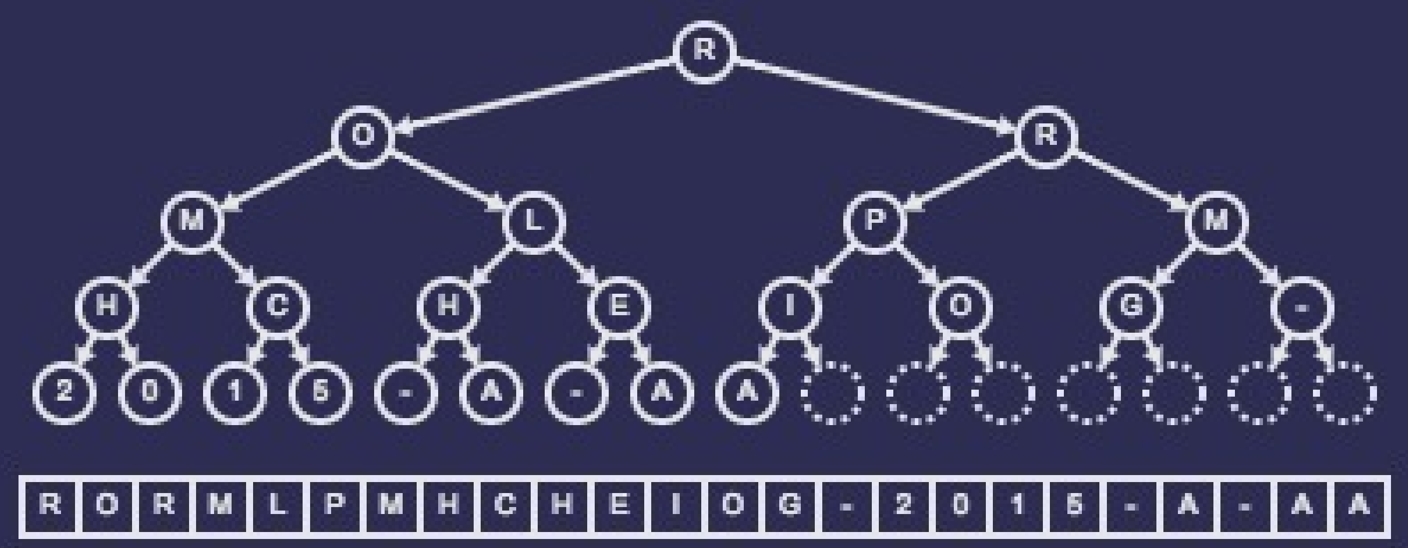
S, S,
T, T

Step 9. The elements are in the correct order

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

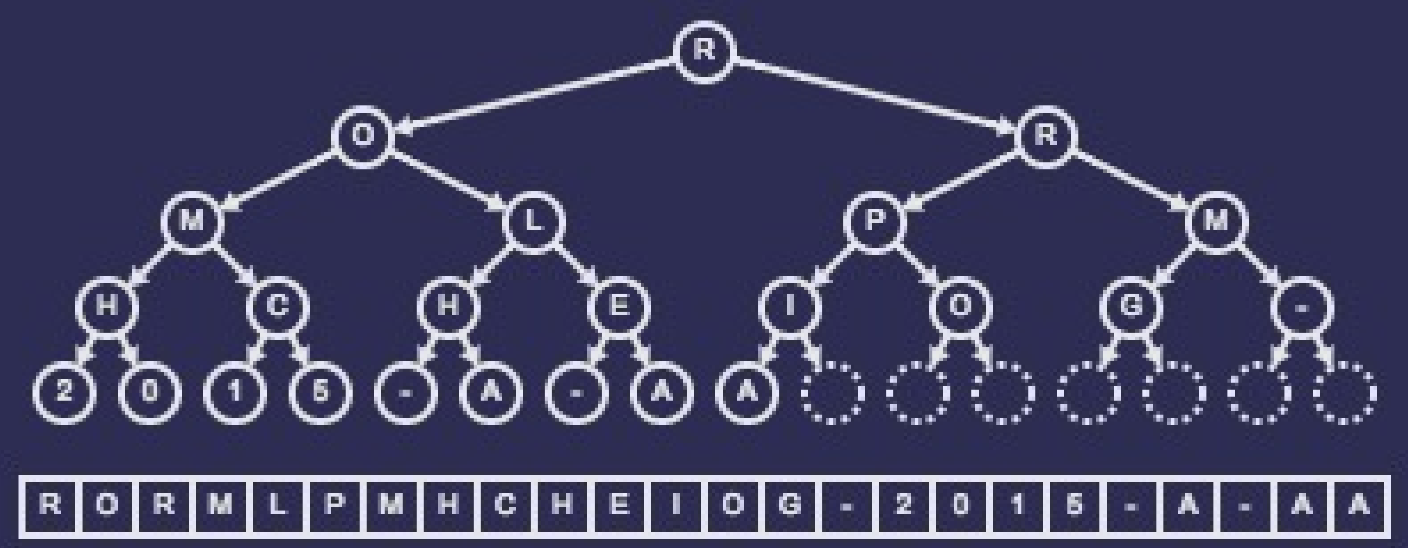
S, S,
T, T

Step 9. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

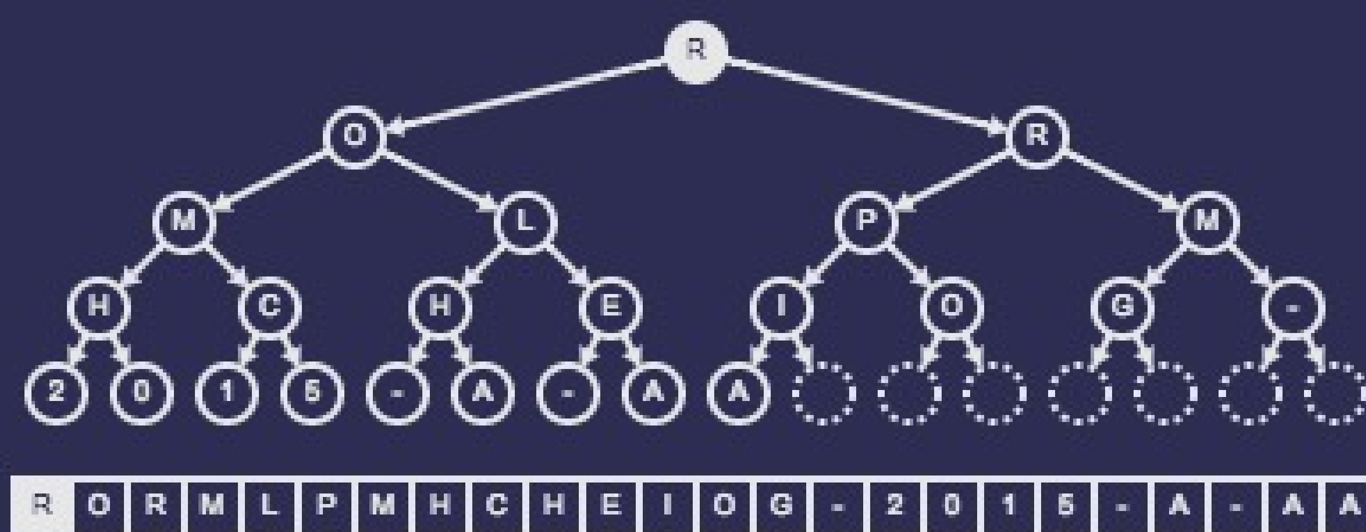
S, S,
T, T

Removing the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

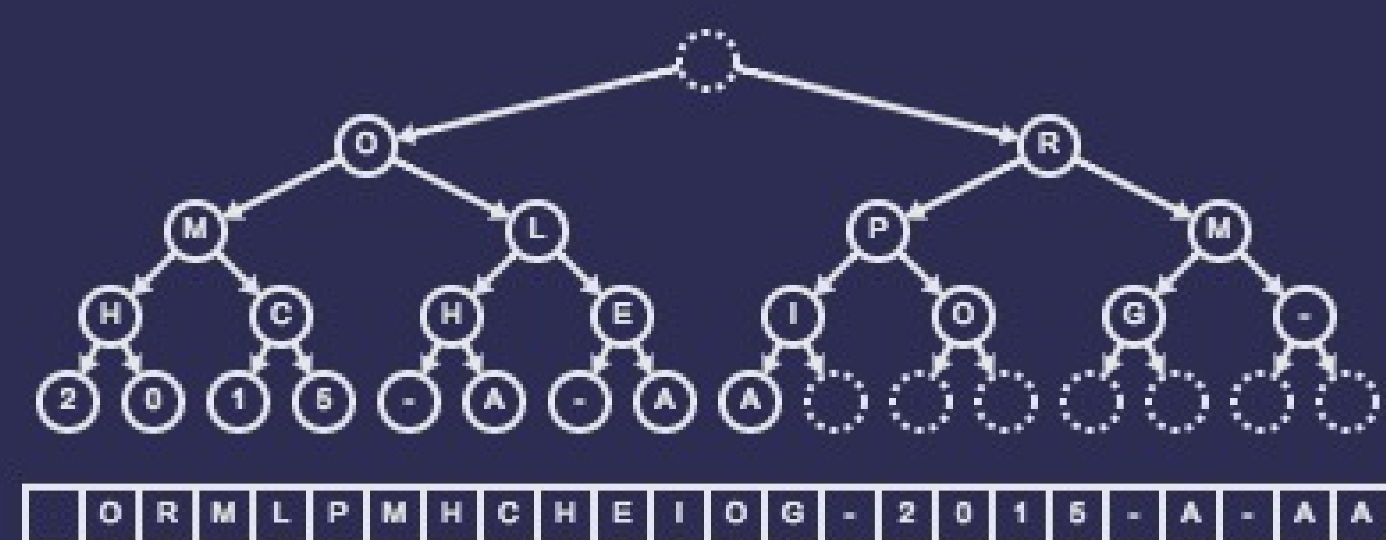
S, S,
T, T

Step 1. Find the root of the heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

R

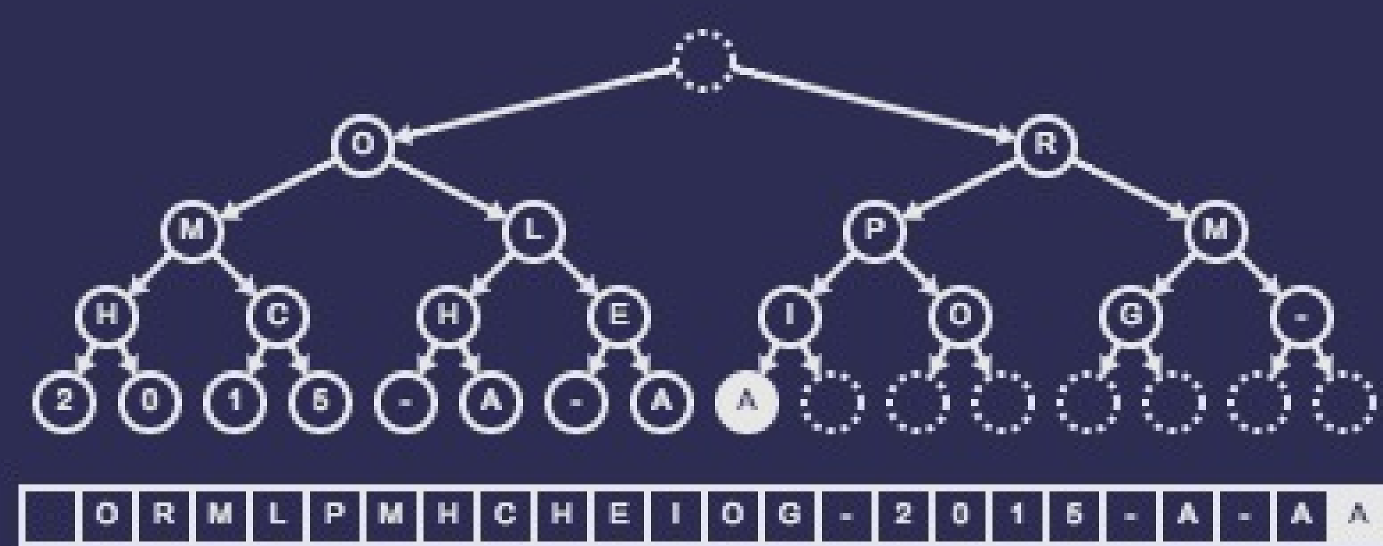
S, S,
T, T

Step 2. Output the value of the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

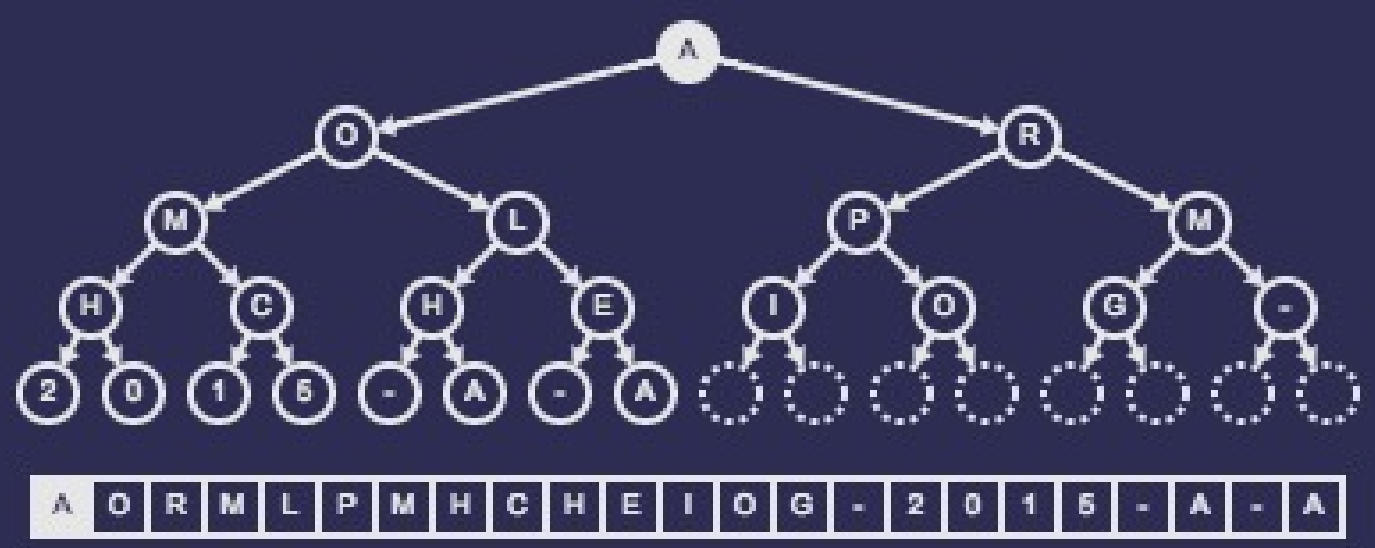
R, S,
S, T,
T

Step 3. Find the last node

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

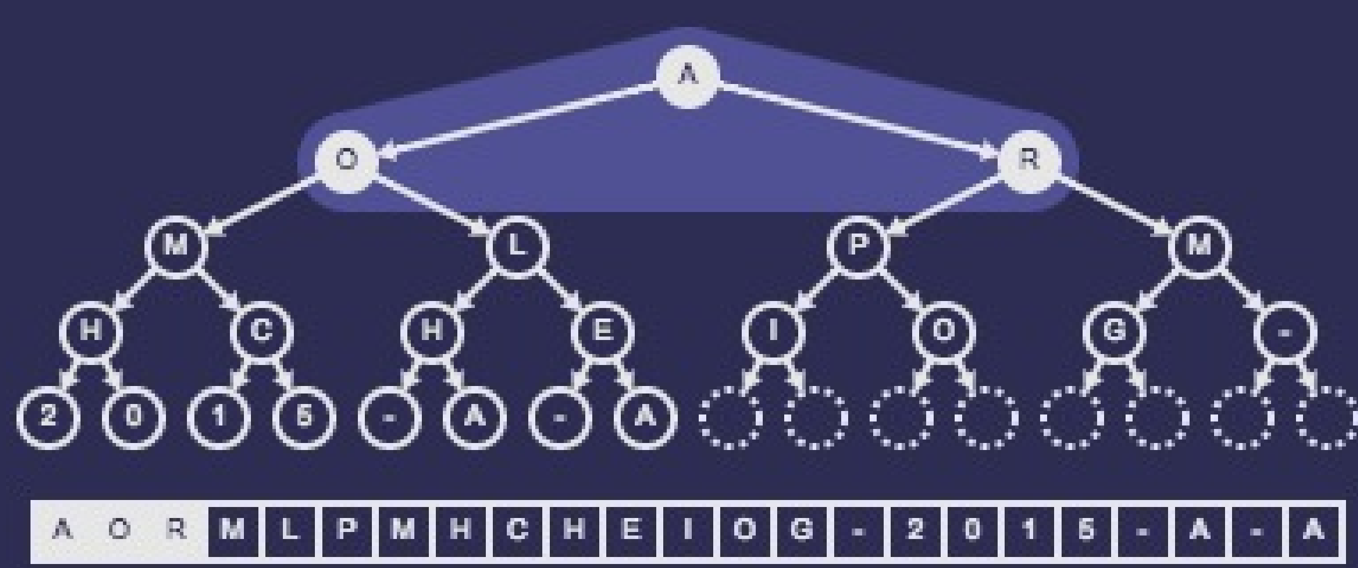
R, S,
S, T,
T

Step 4. Move the last node to the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

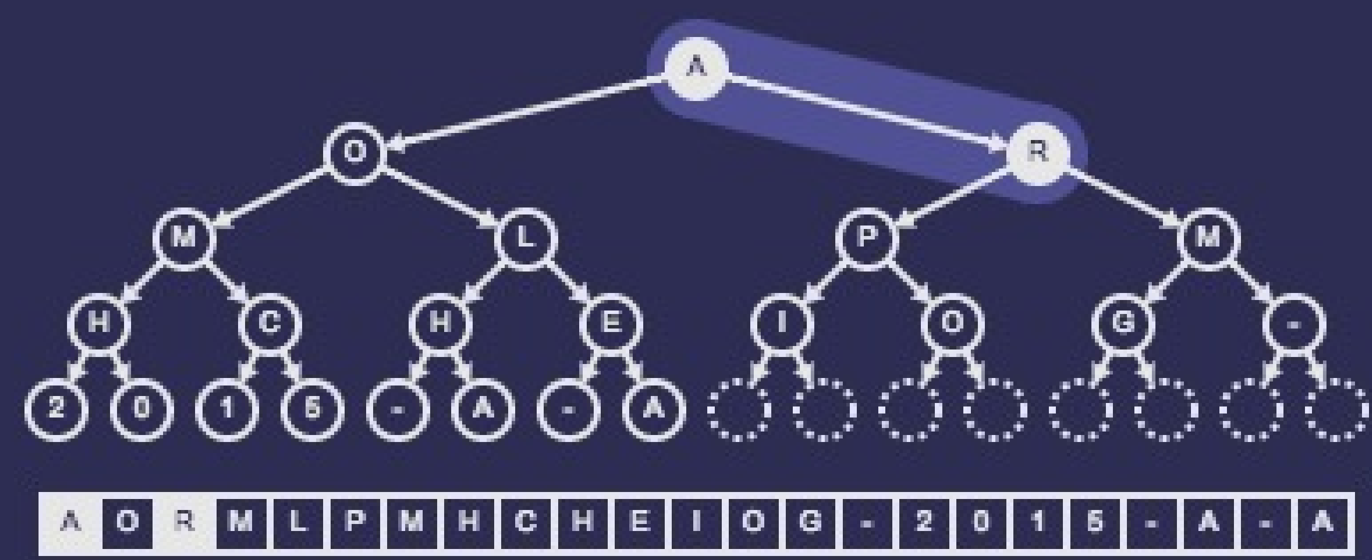
R, S,
S, T,
T

Step 5. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

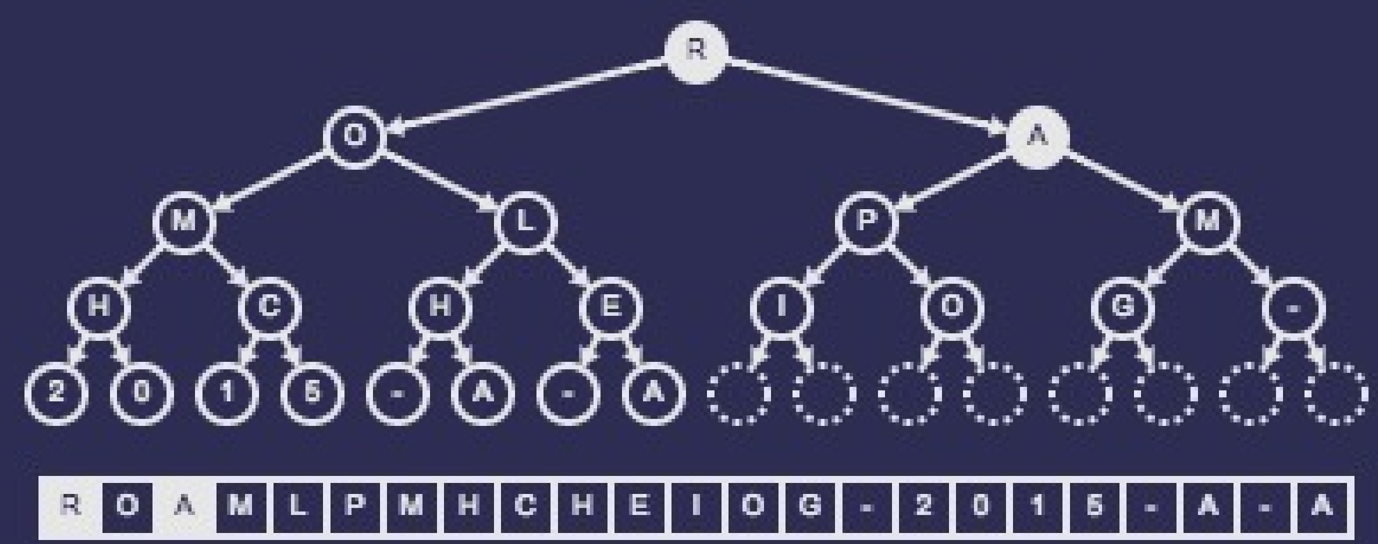
R, S,
S, T,
T

Step 6. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

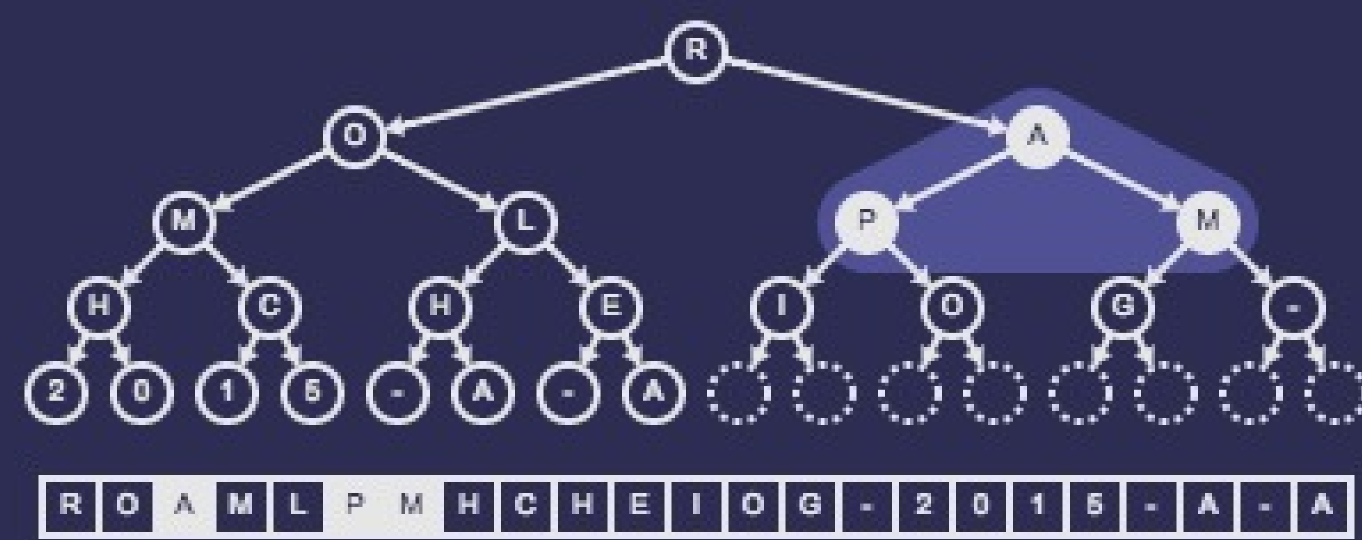
R, S,
S, T,
T

Step 6. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

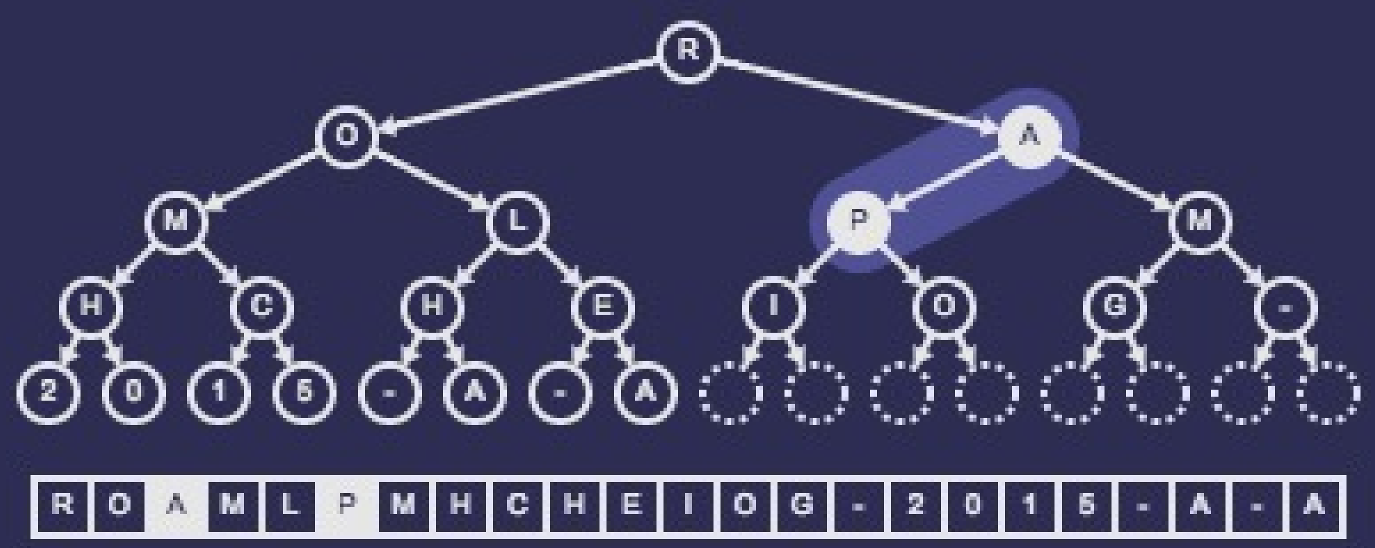
R, S,
S, T,
T

Step 6. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

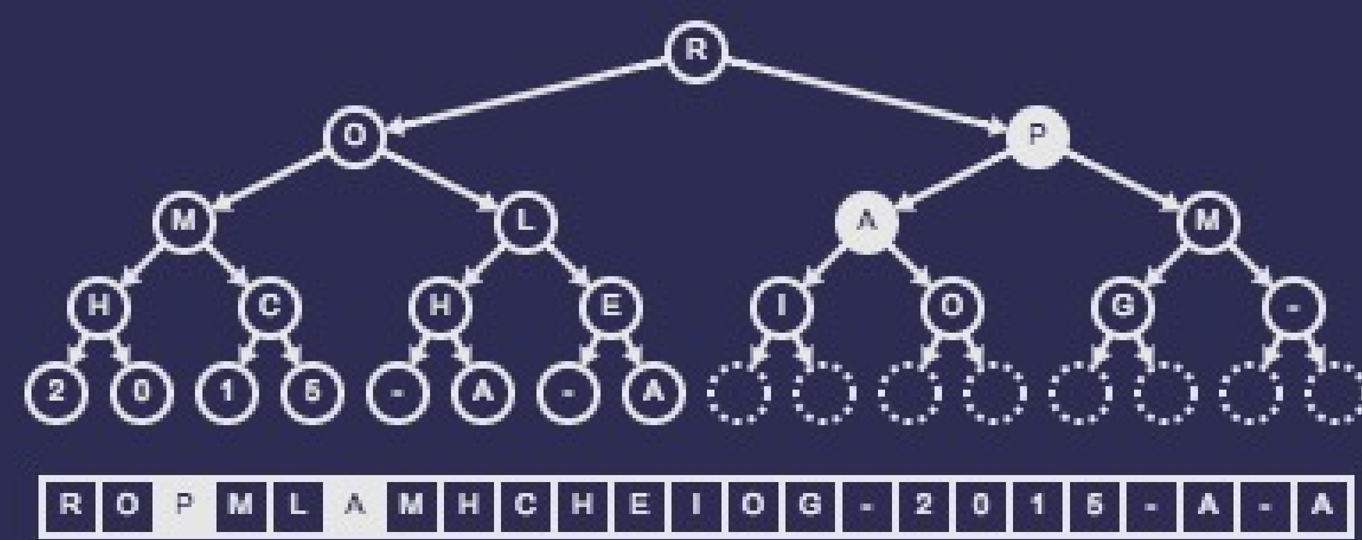
R, S,
S, T,
T

Step 7. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

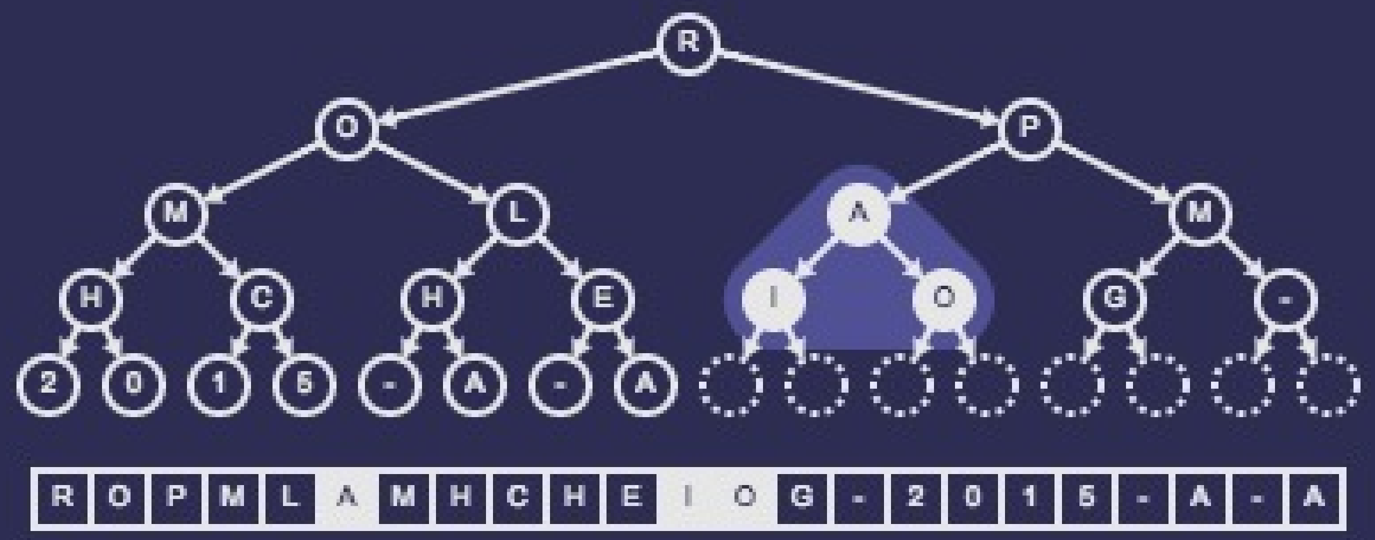
R, S,
S, T,
T

Step 7. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

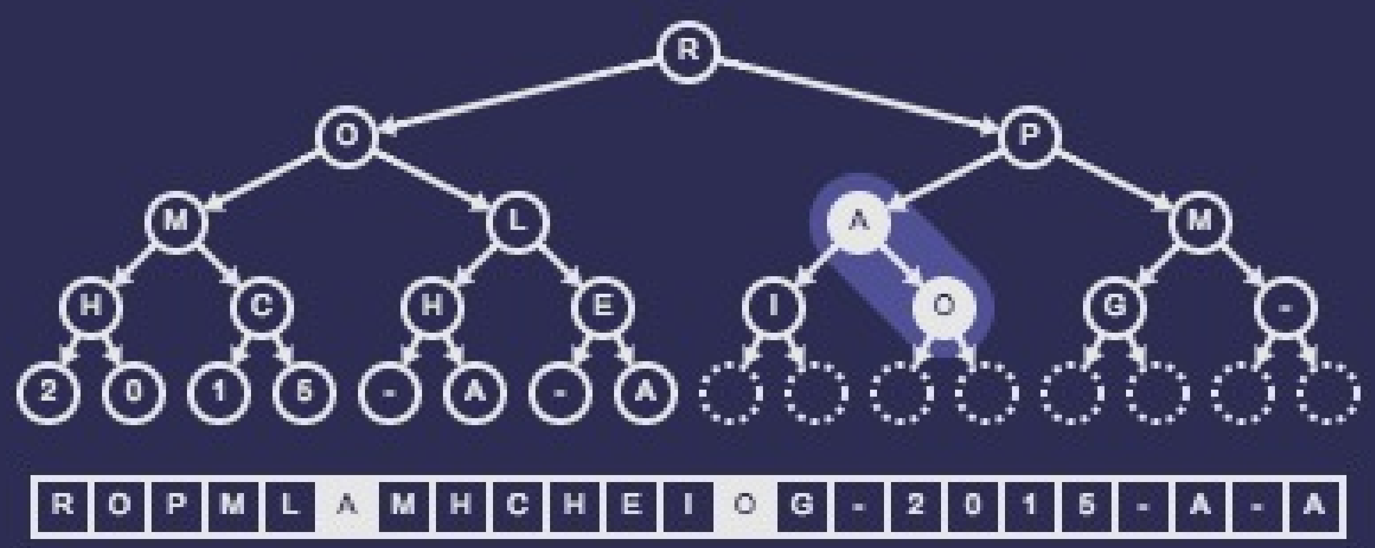
R, S,
S, T,
T

Step 7. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

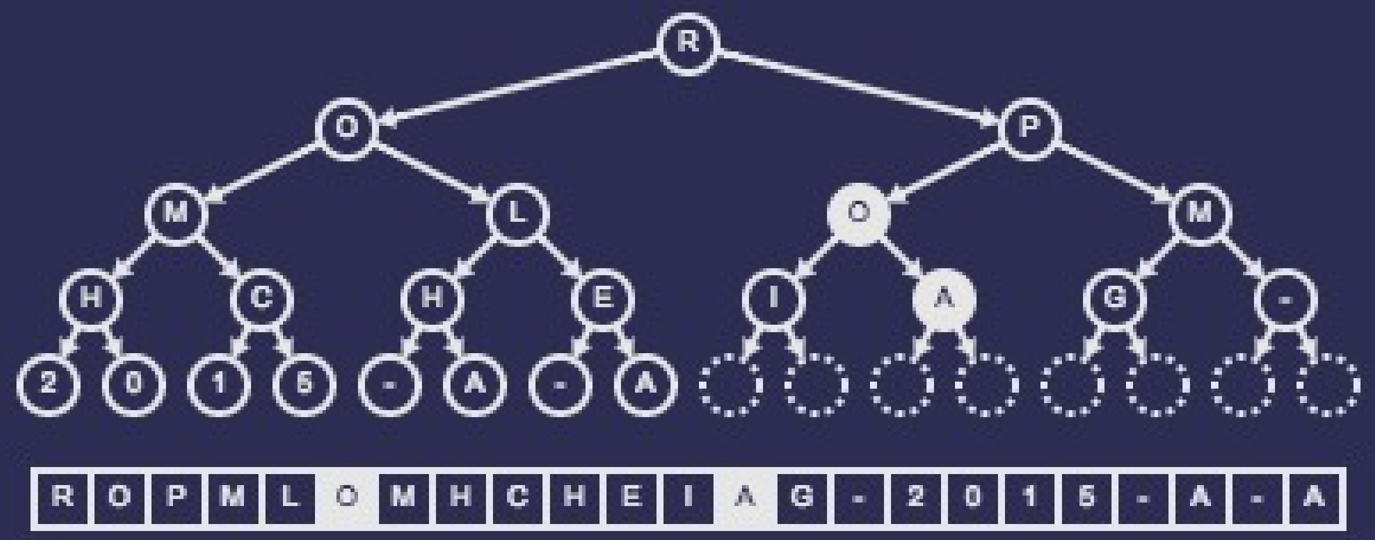
R, S,
S, T,
T

Step 8. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

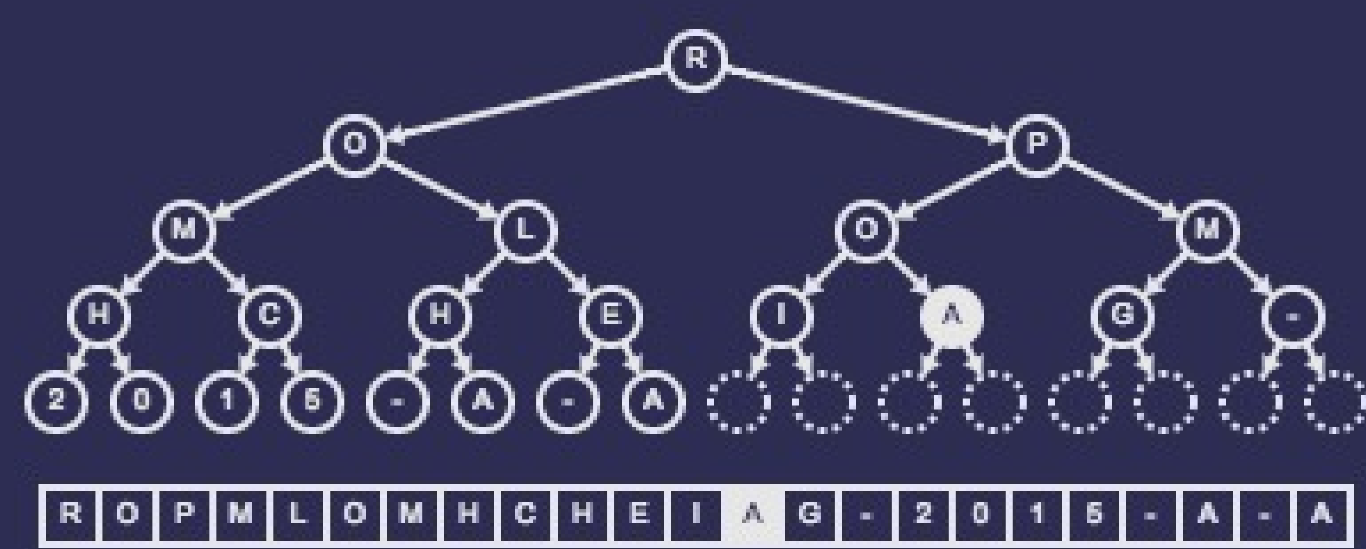
R, S,
S, T,
T

Step 8. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

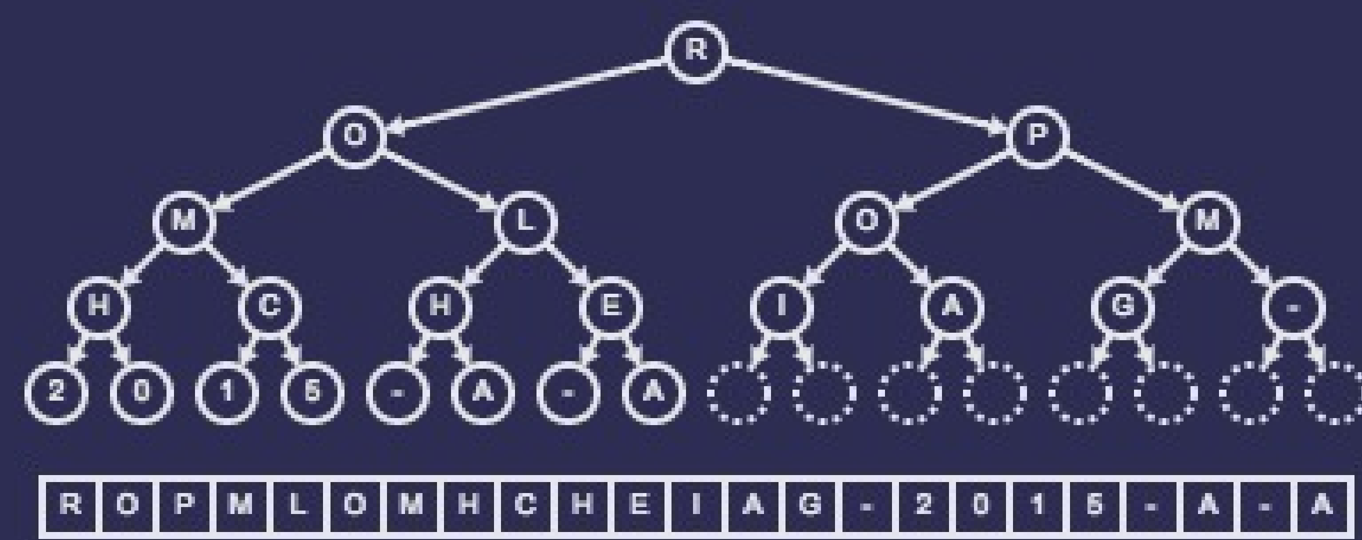
R, S,
S, T,
T

Step 8. It has no children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

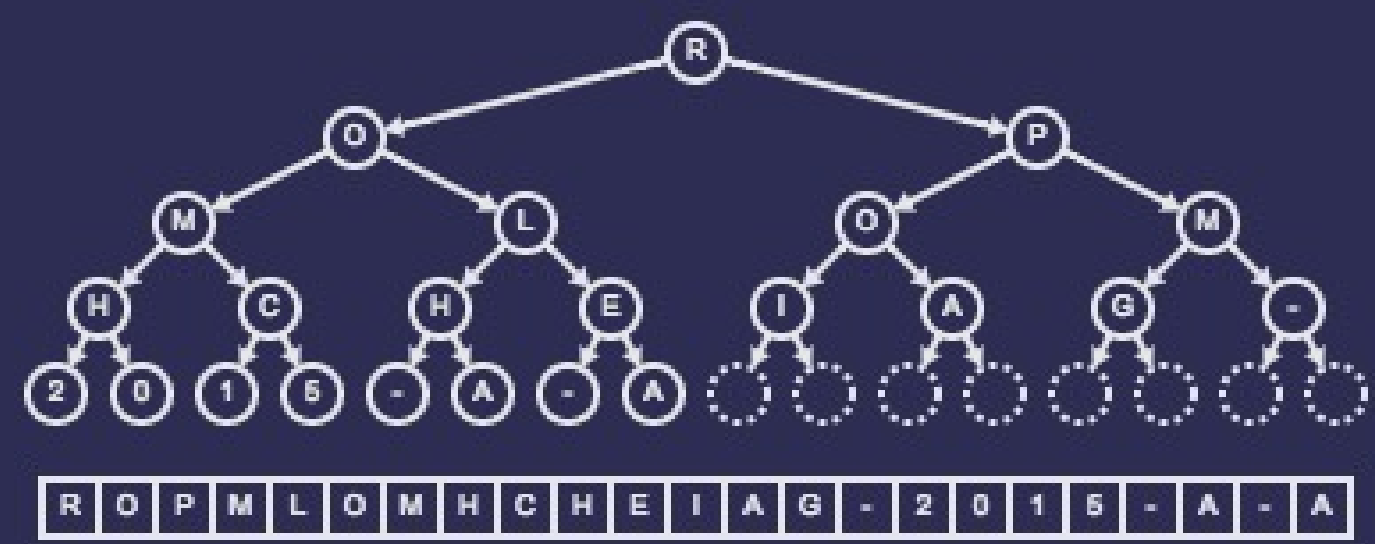
R, S,
S, T,
T

Step 8. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

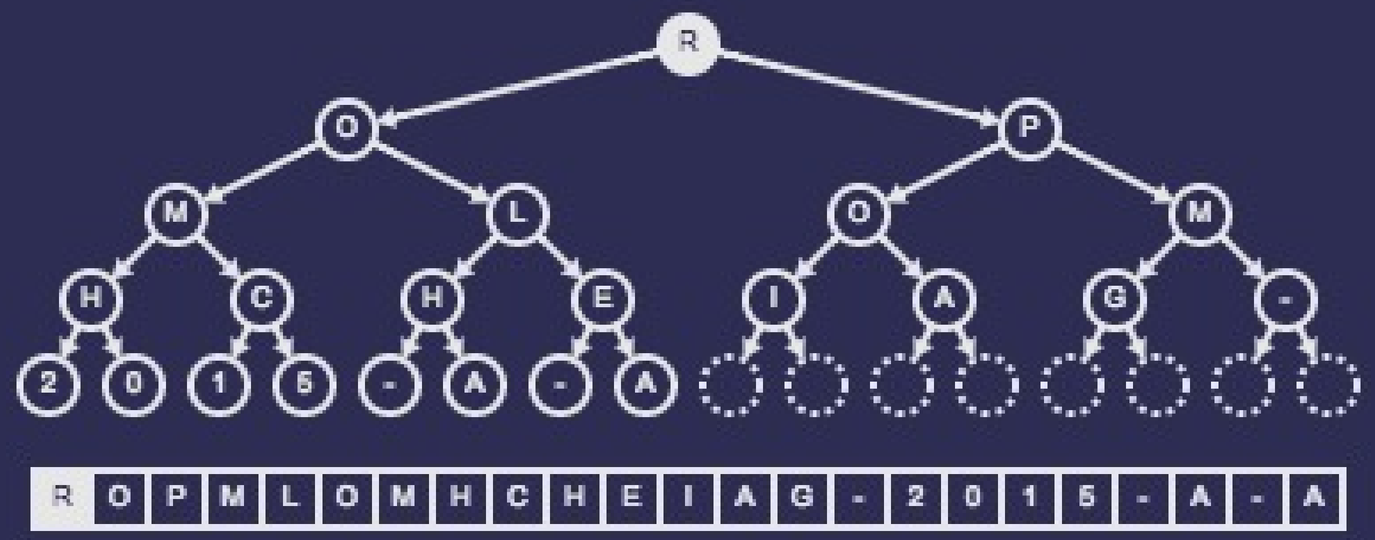
R, S,
S, T,
T

Removing the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

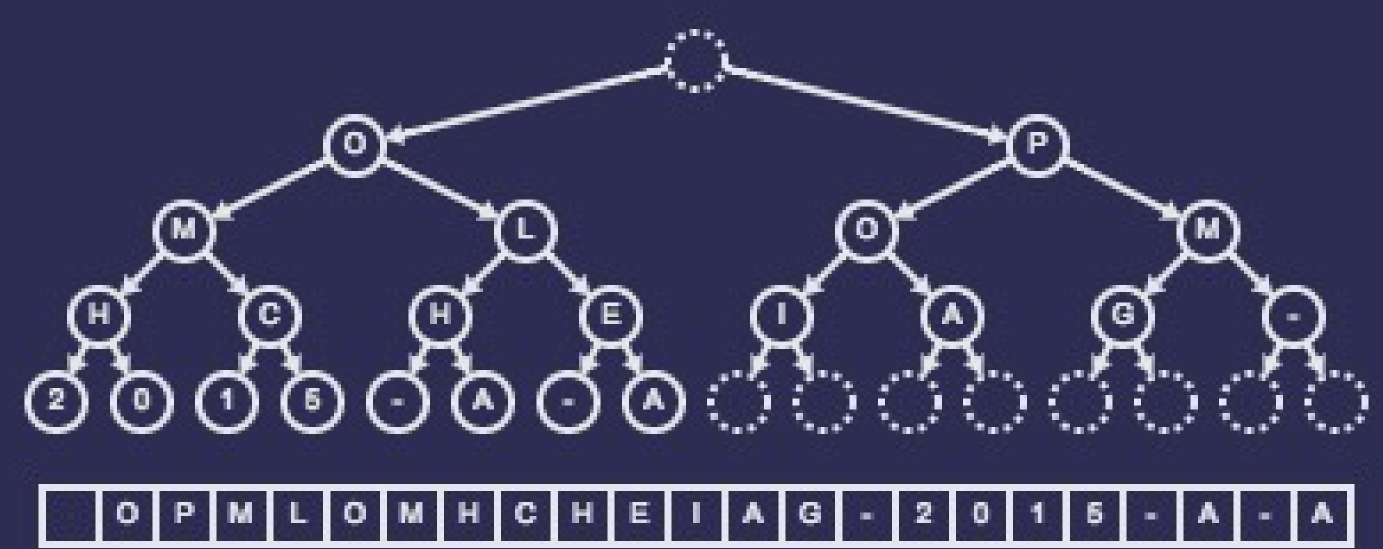
R, S,
S, T,
T

Step 1. Find the root of the heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

R

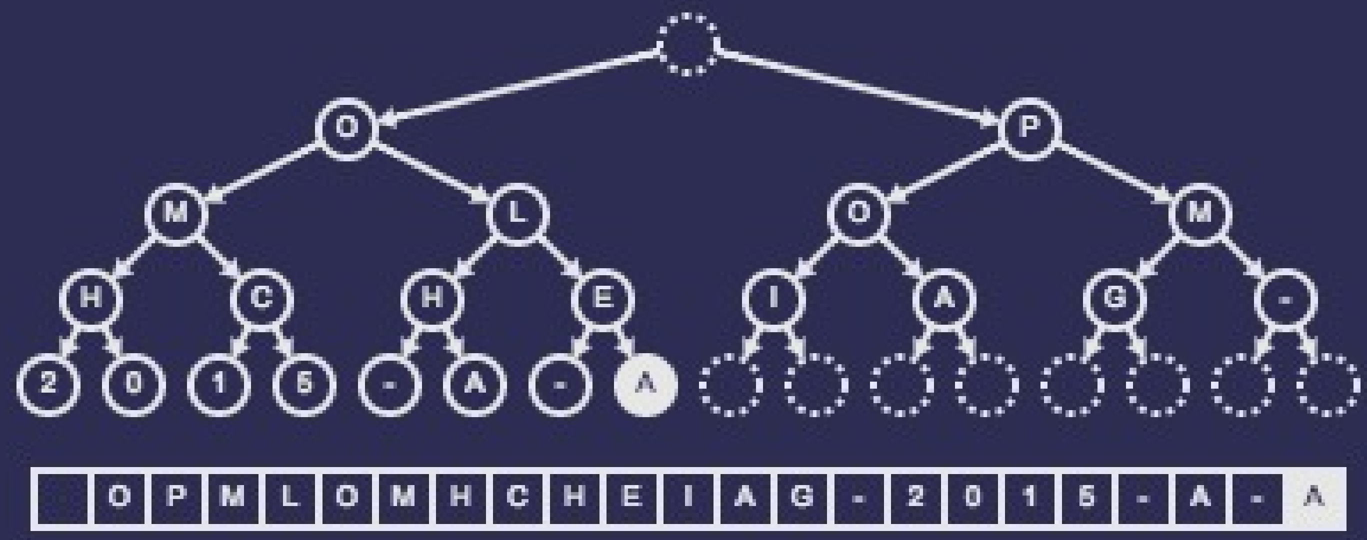
R, S,
S, T,
T

Step 2. Output the value of the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

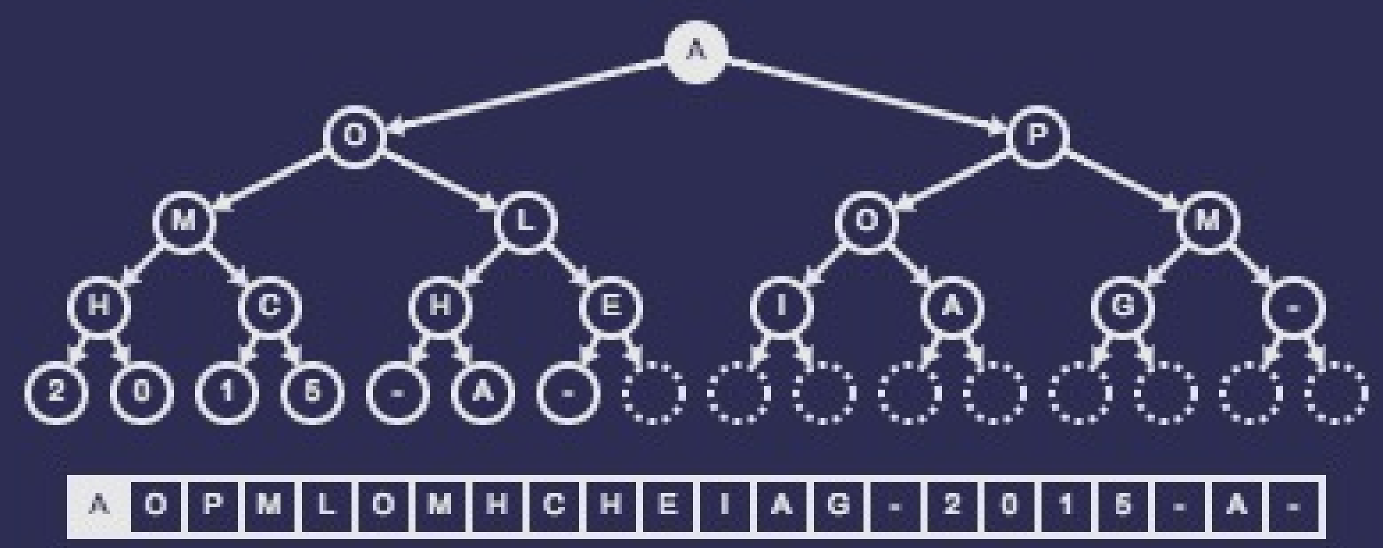
R, R,
S, S,
T, T

Step 3. Find the last node

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

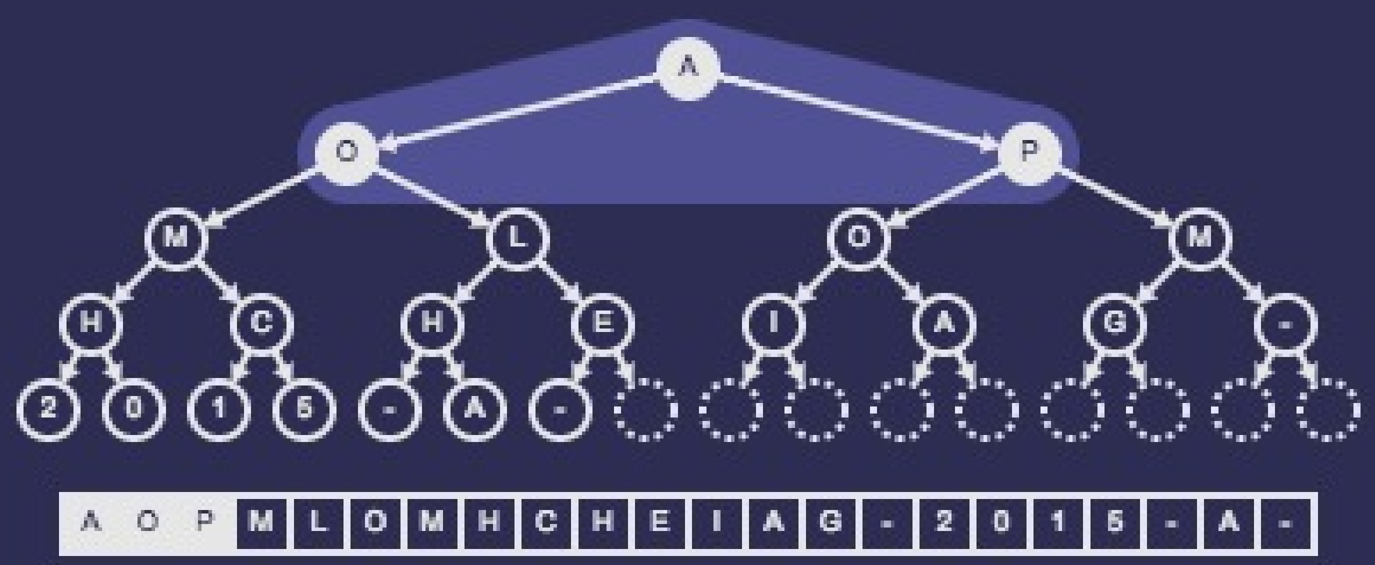
R, R,
S, S,
T, T

Step 4. Move the last node to the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

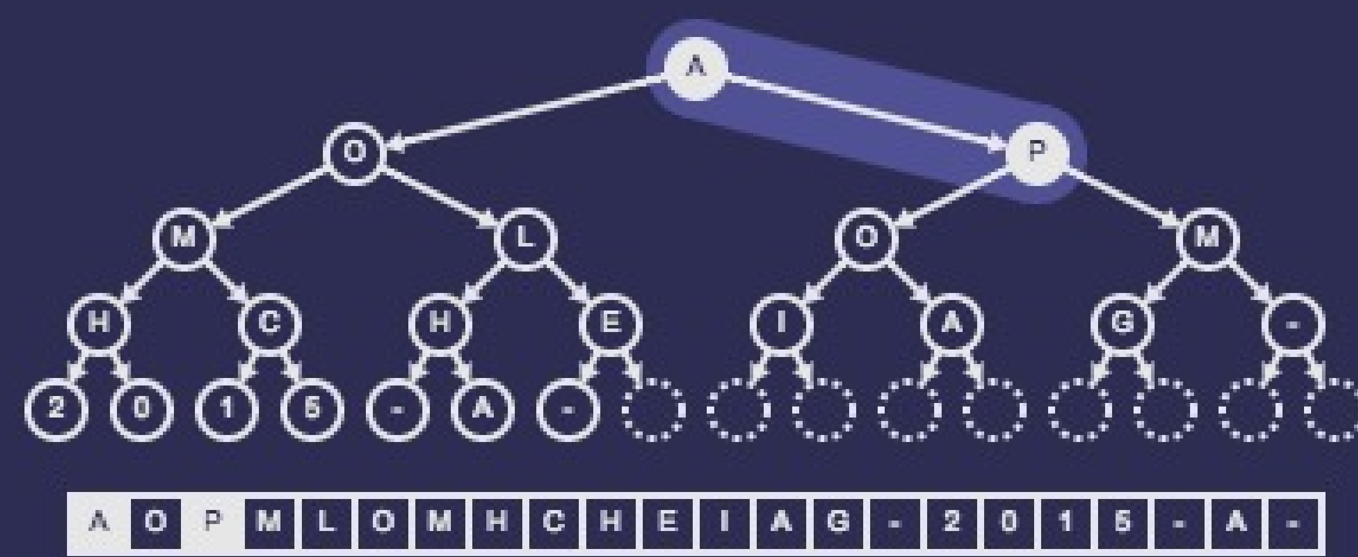
R, R,
S, S,
T, T

Step 5. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

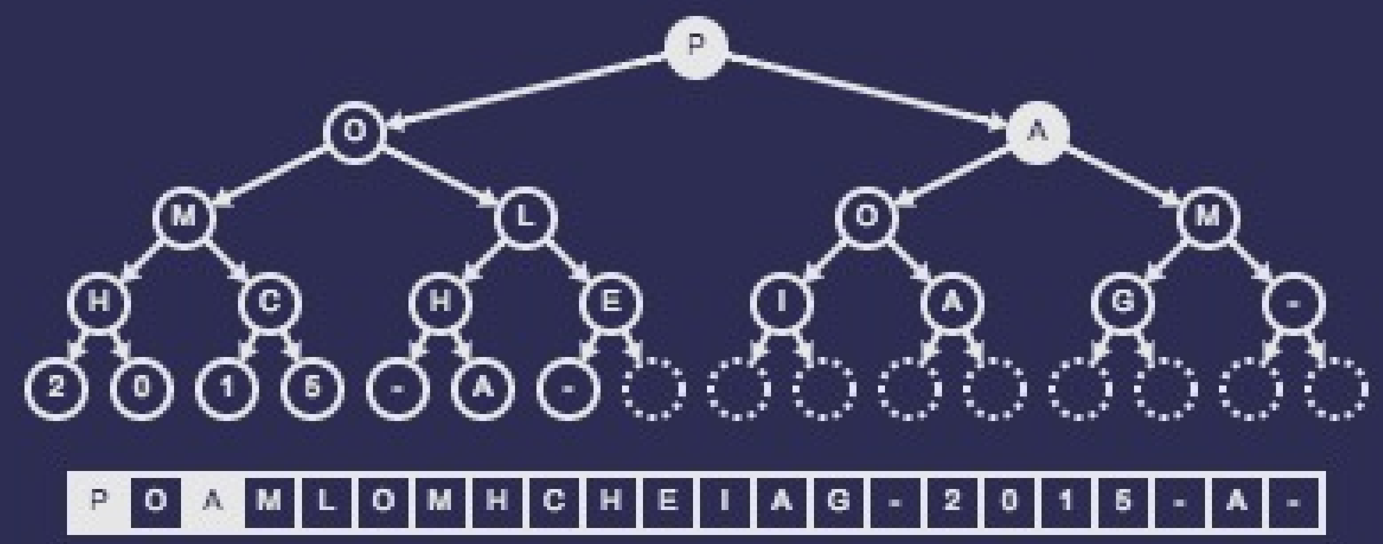
R, R,
S, S,
T, T

Step 6. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

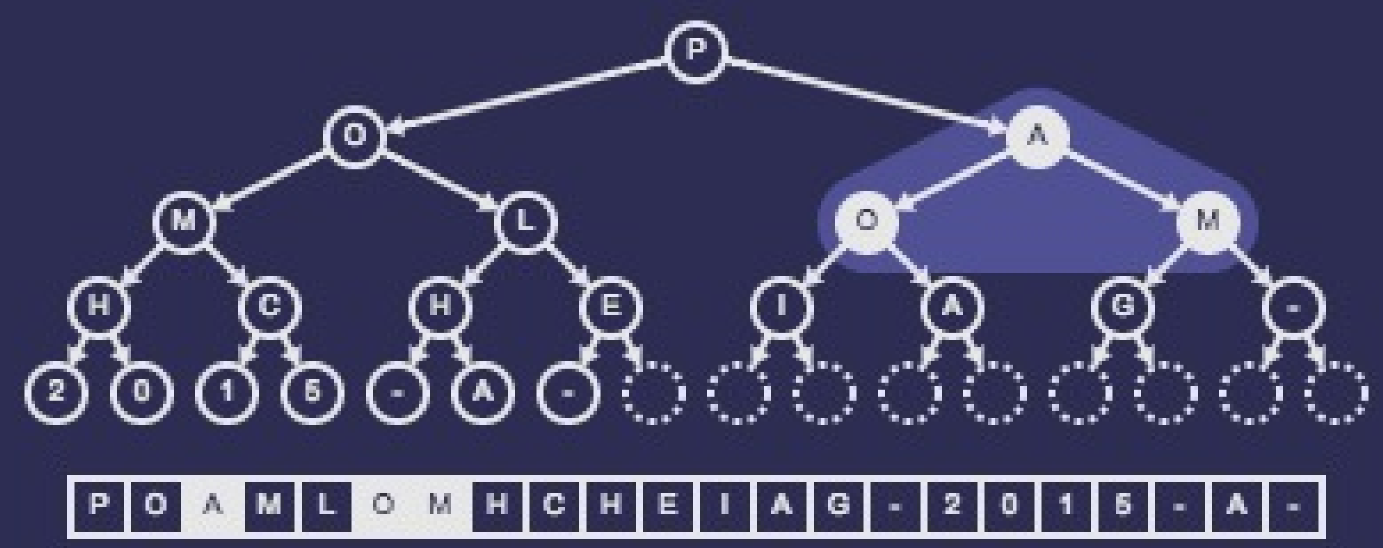
R, R,
S, S,
T, T

Step 6. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

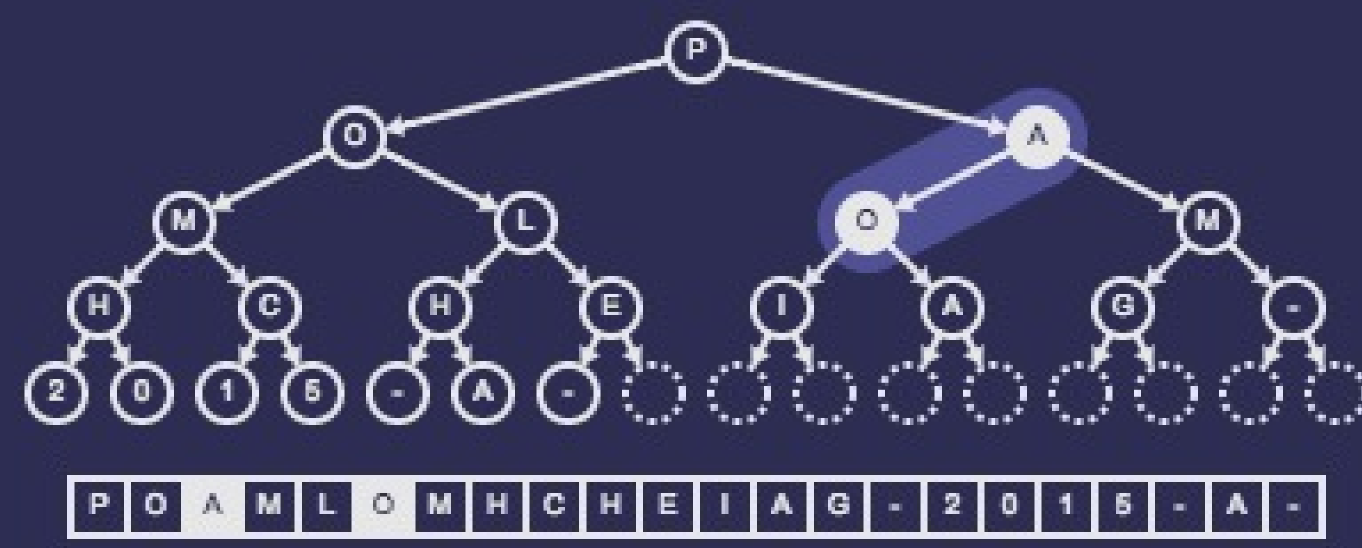
R, R,
S, S,
T, T

Step 6. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

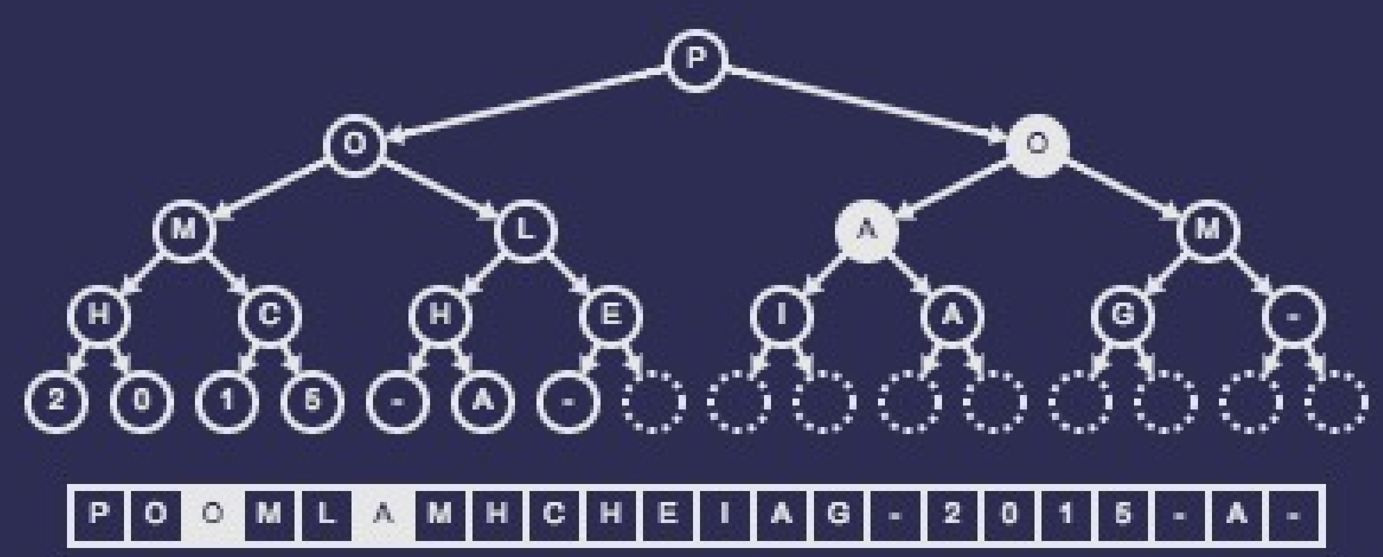
R, R,
S, S,
T, T

Step 7. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

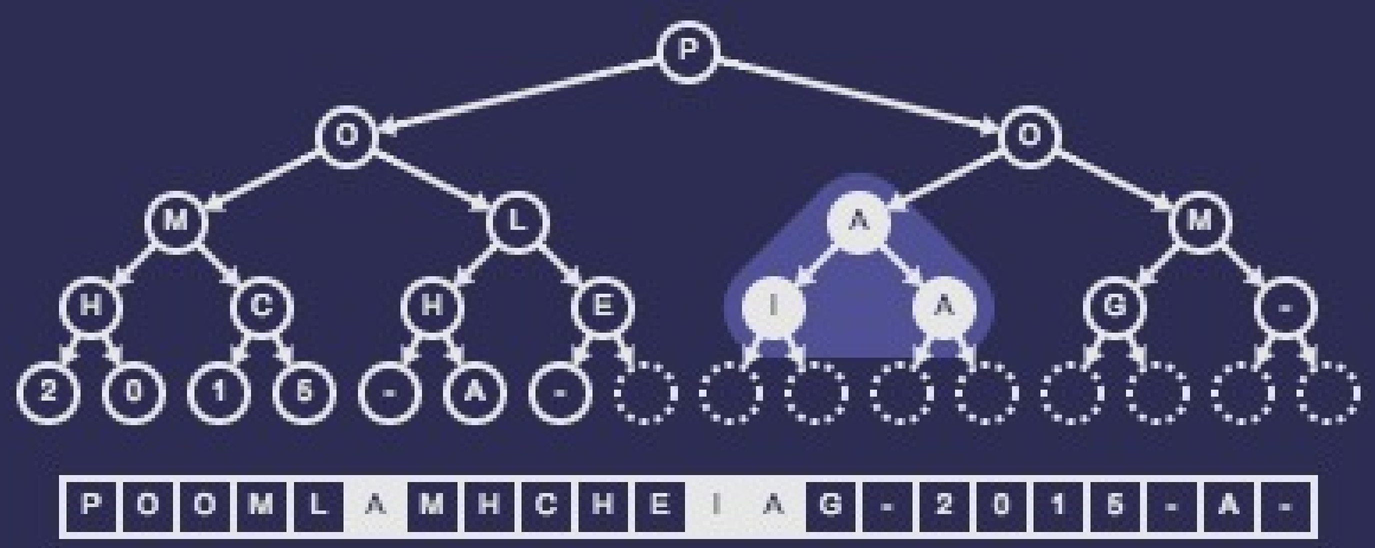
R, R,
S, S,
T, T

Step 7. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

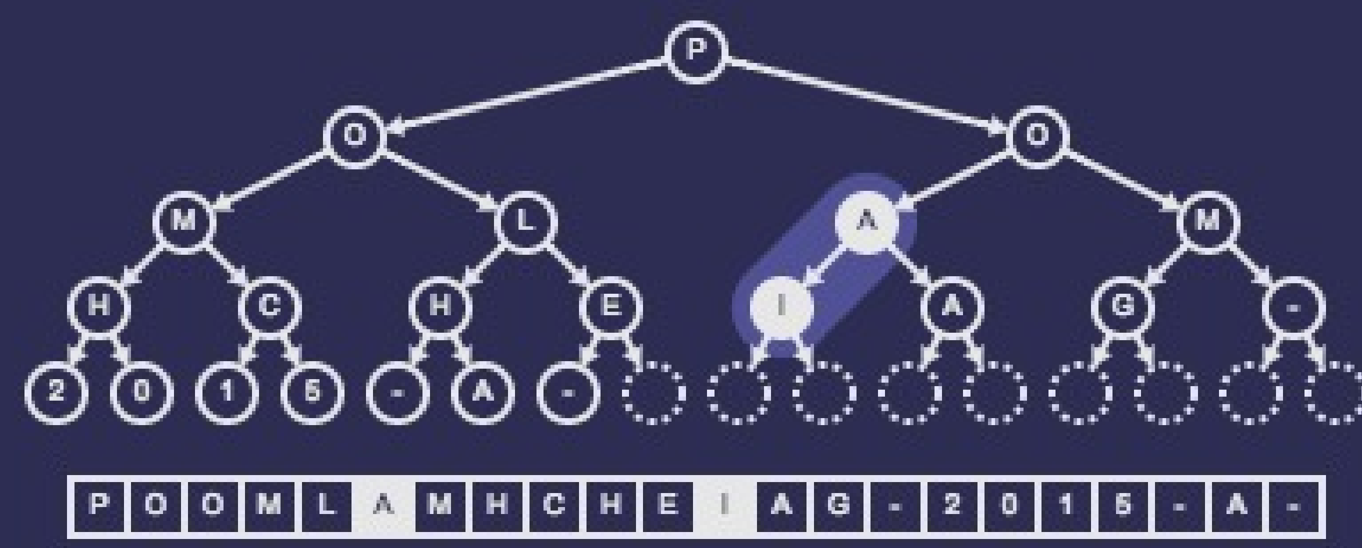
R, R,
S, S,
T, T

Step 7. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

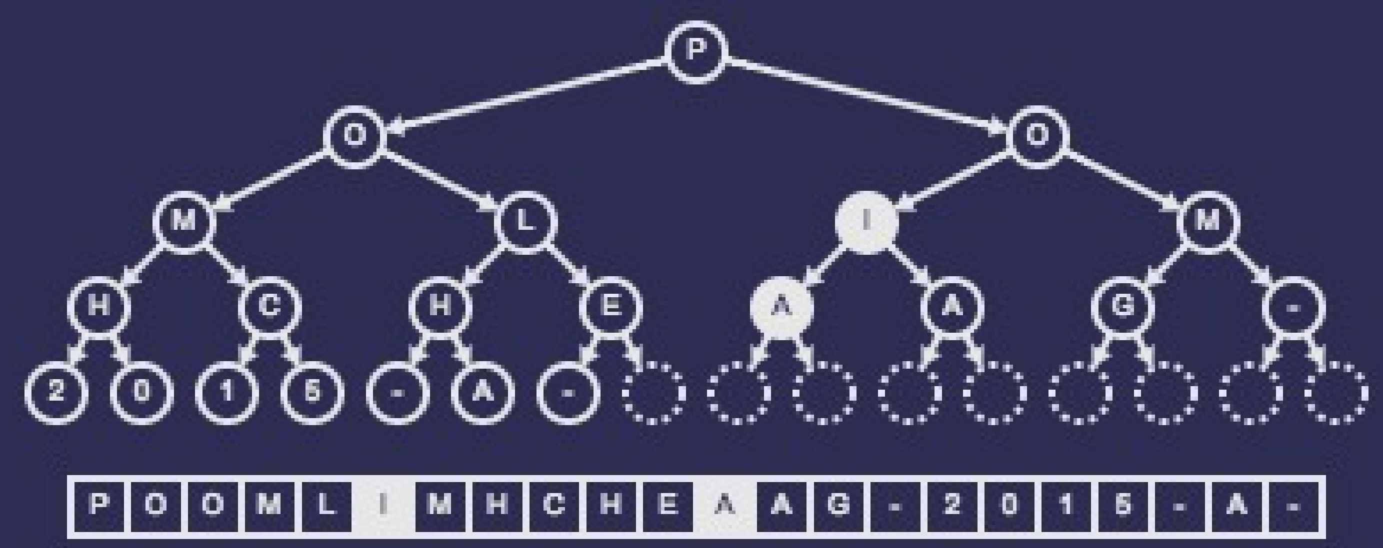
R, R,
S, S,
T, T

Step 8. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

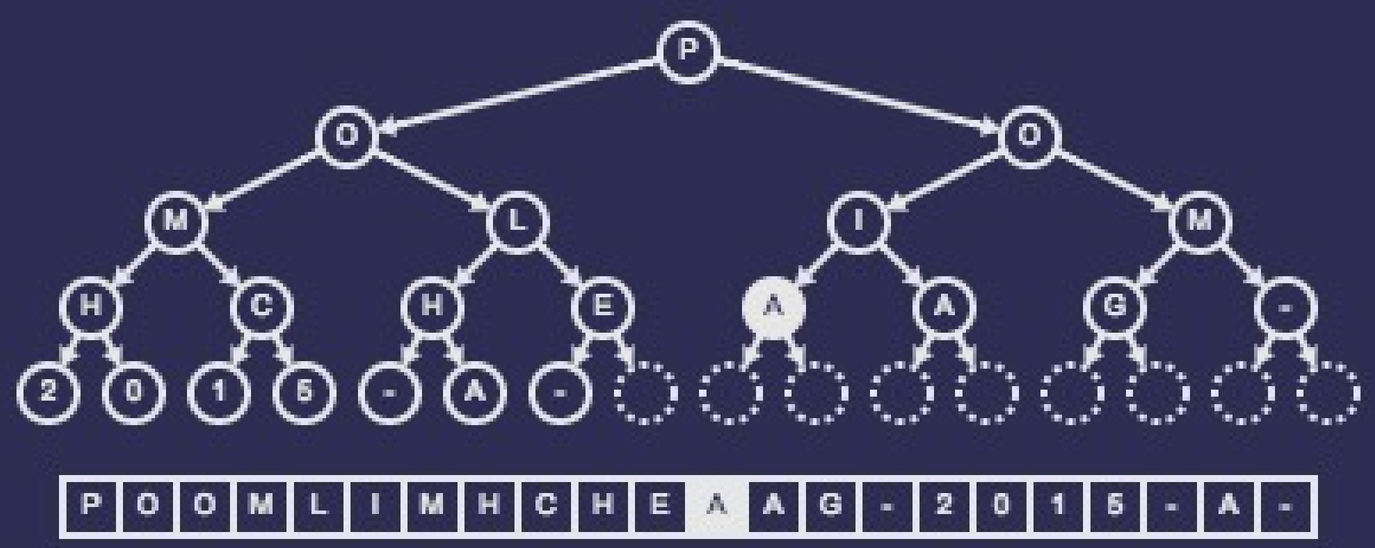
R, R,
S, S,
T, T

Step 8. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



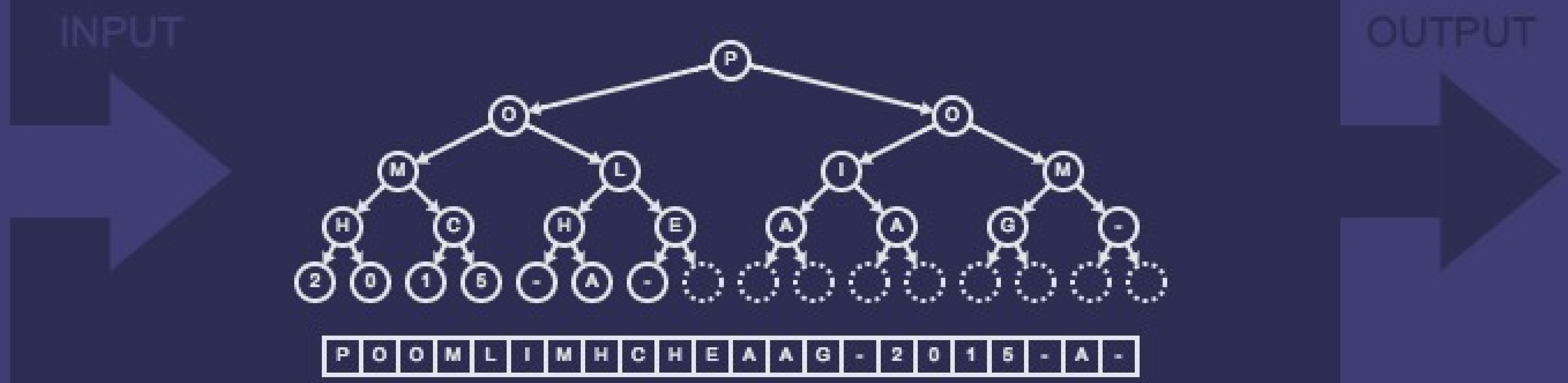
OUTPUT

R, R,
S, S,
T, T

Step 8. It has no children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T



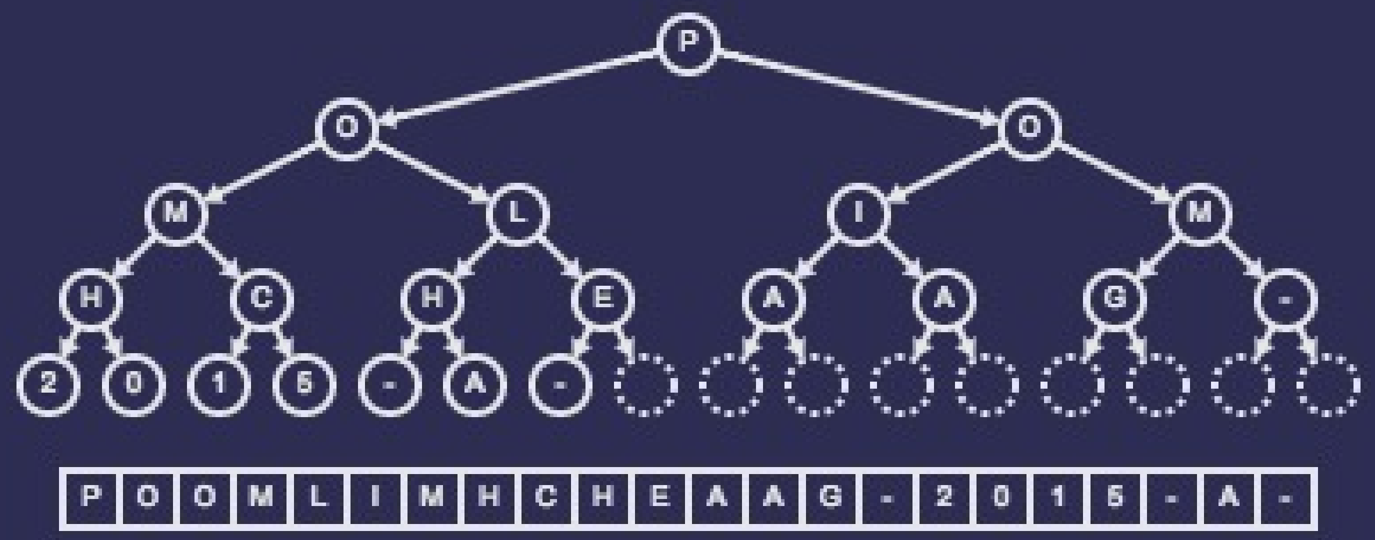
R, R,
S, S,
T, T

Step 8. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

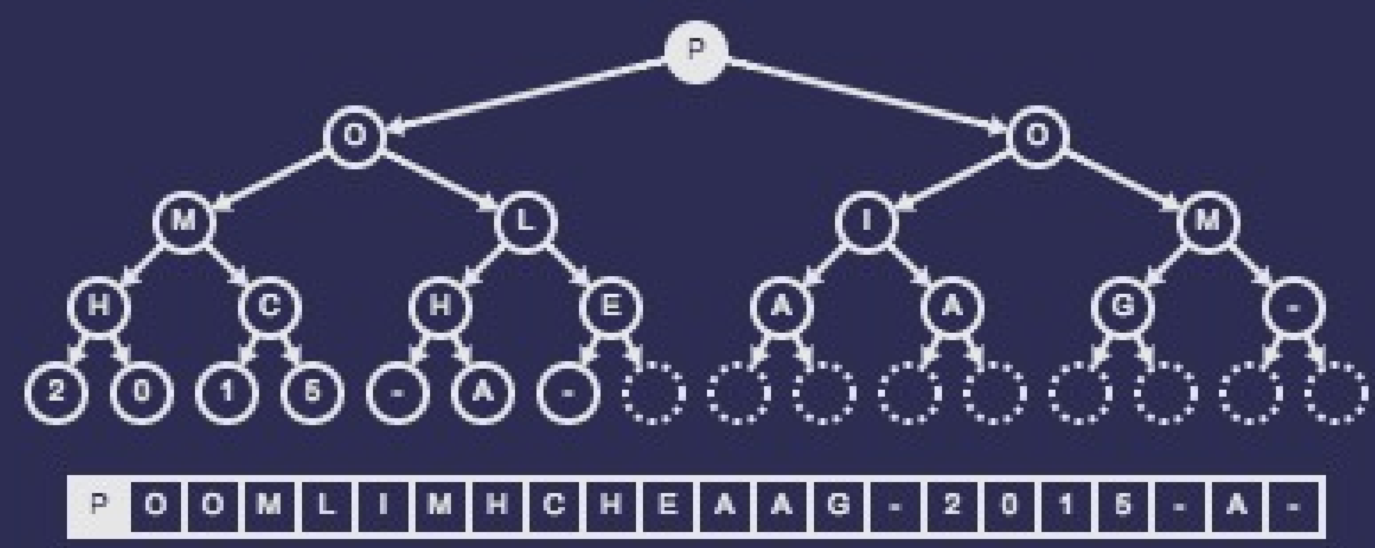
R, R,
S, S,
T, T

Removing the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

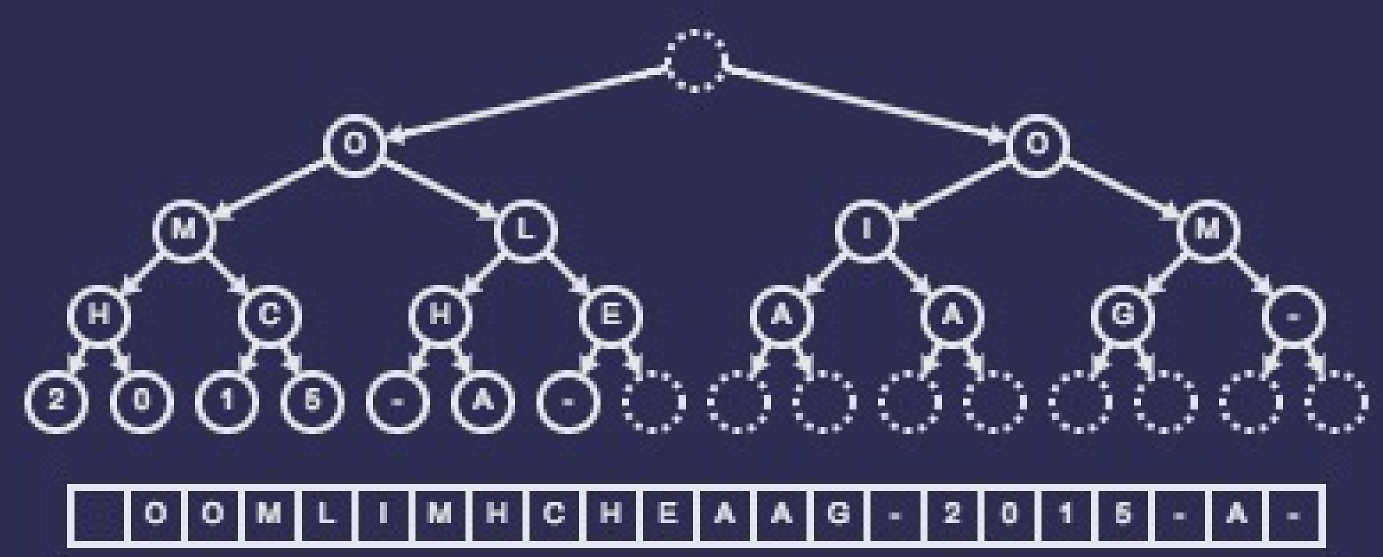
R, R,
S, S,
T, T

Step 1. Find the root of the heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

P

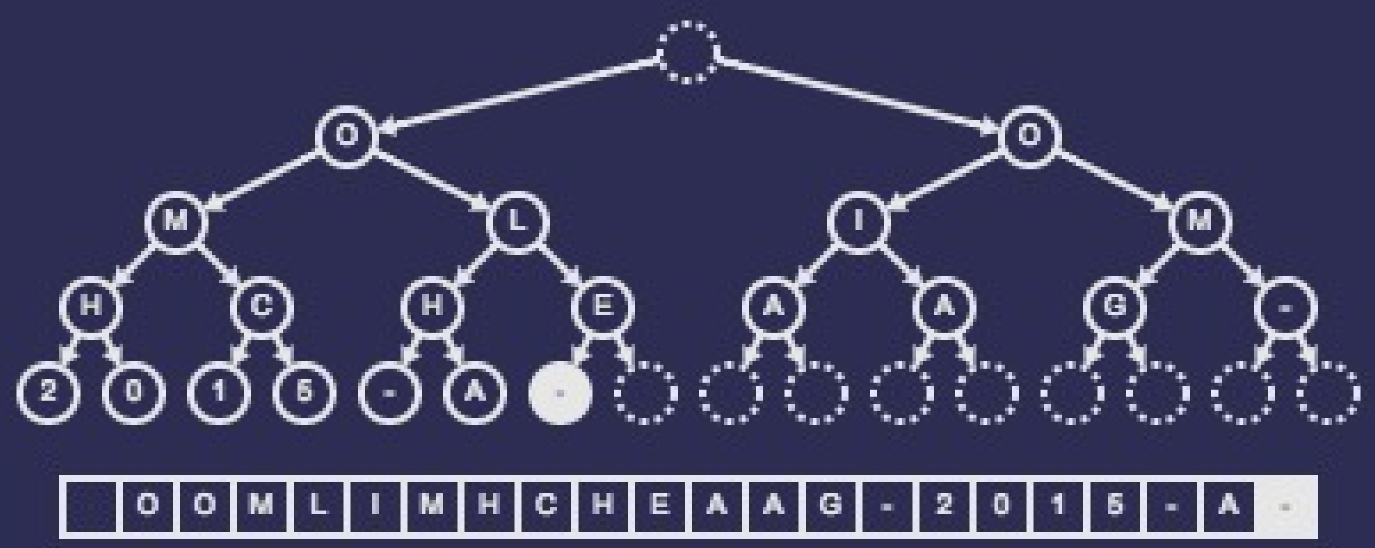
R, R,
S, S,
T, T

Step 2. Output the value of the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

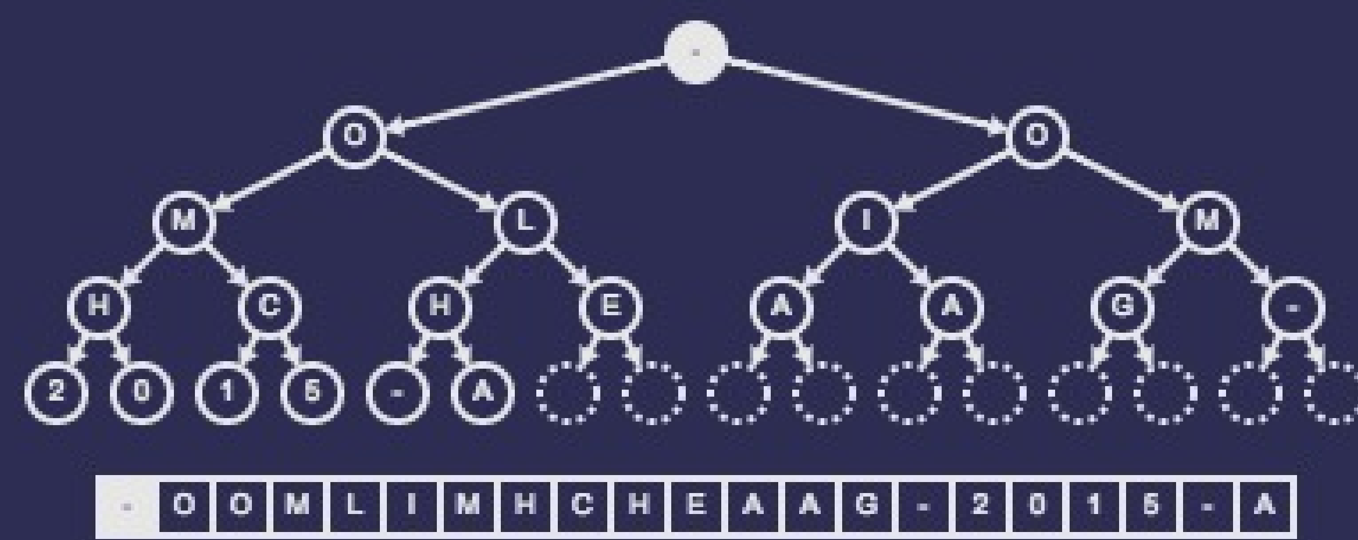
P, R,
R, S,
S, T,
T

Step 3. Find the last node

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

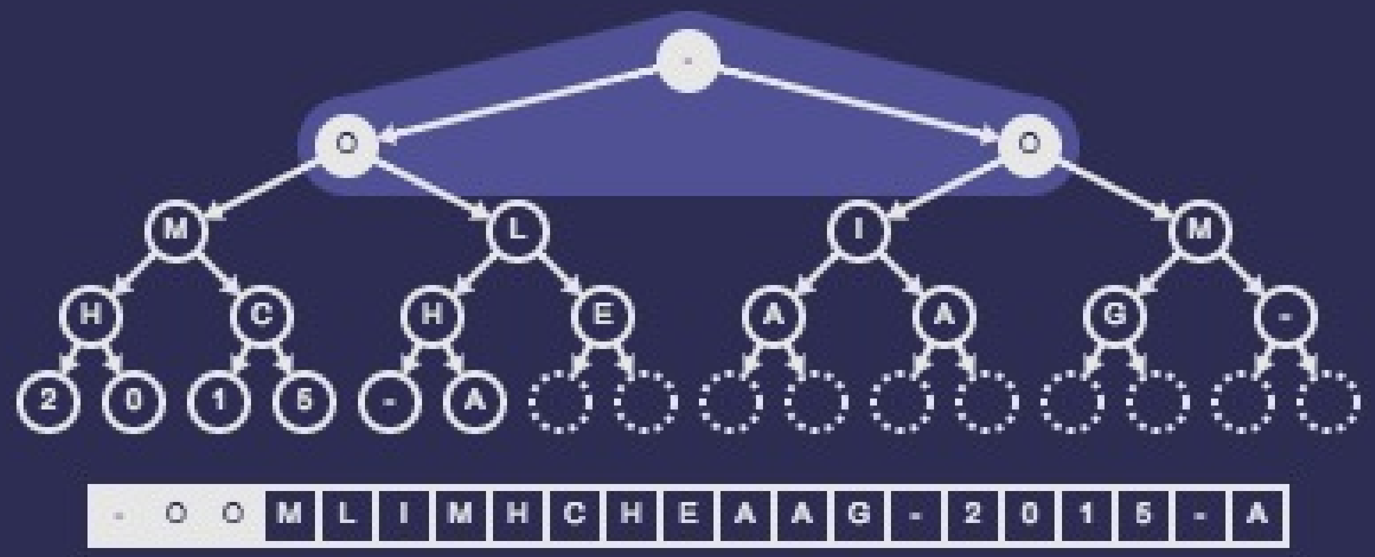
P, R,
R, S,
S, T,
T

Step 4. Move the last node to the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

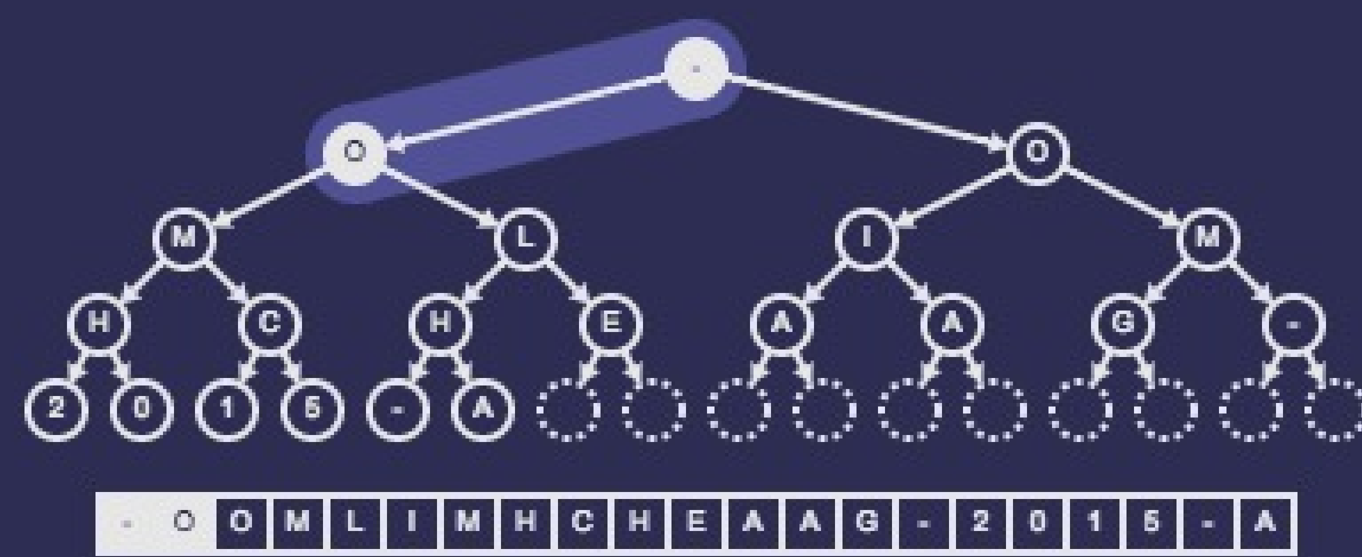
P, R,
R, S,
S, T,
T

Step 5. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

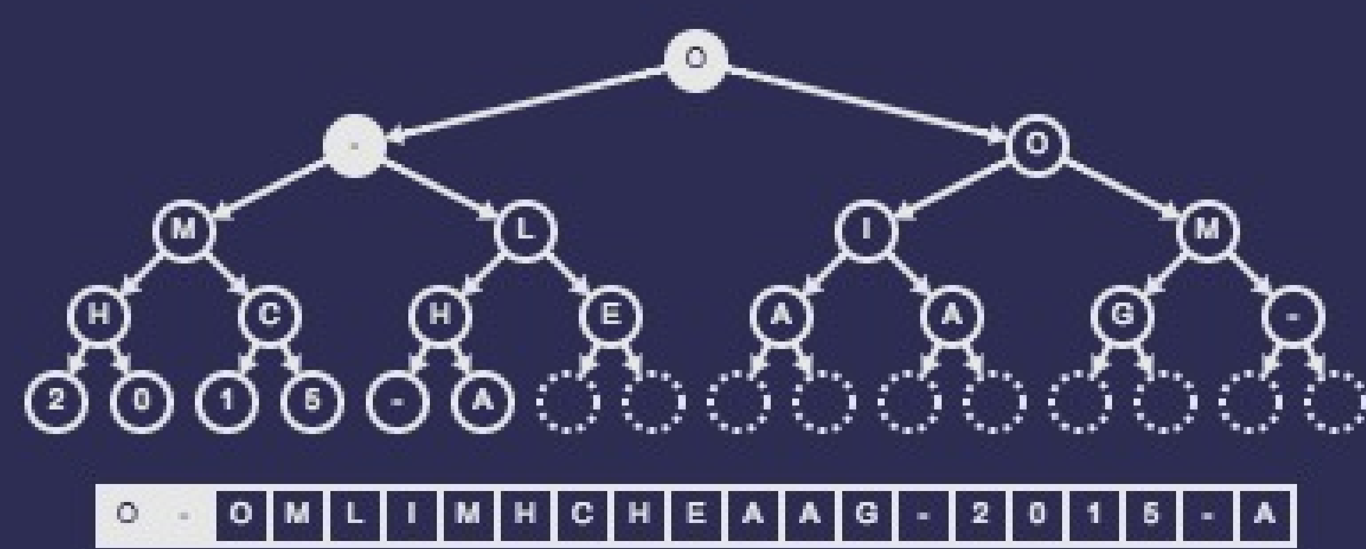
P, R,
R, S,
S, T,
T

Step 6. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

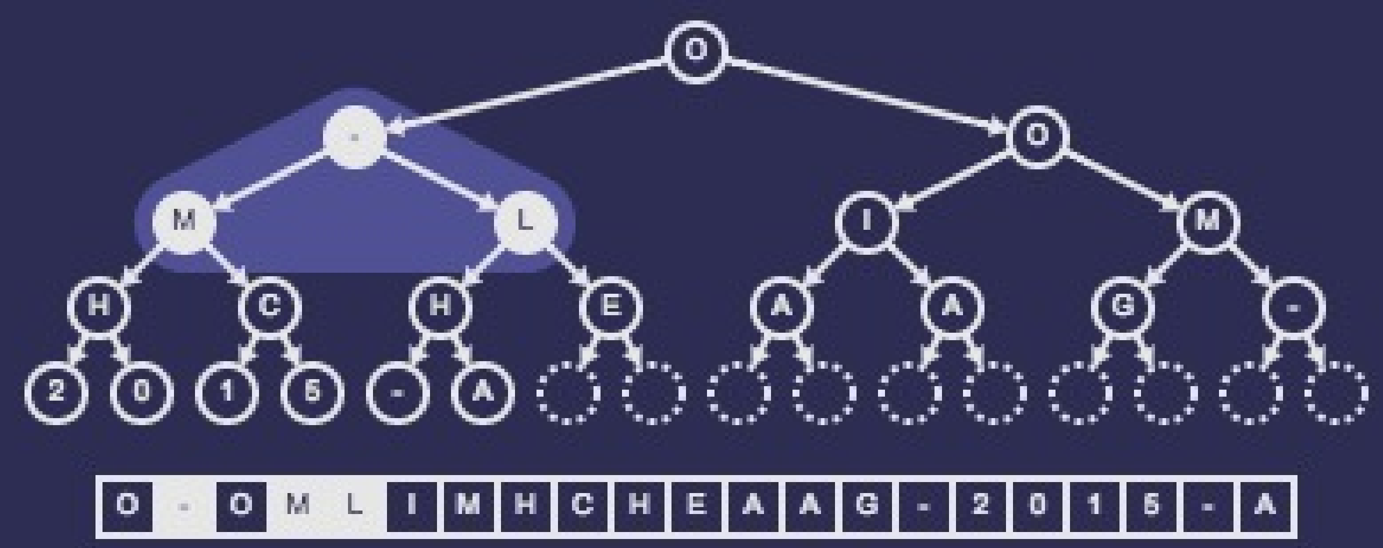
P, R,
R, S,
S, T,
T

Step 6. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

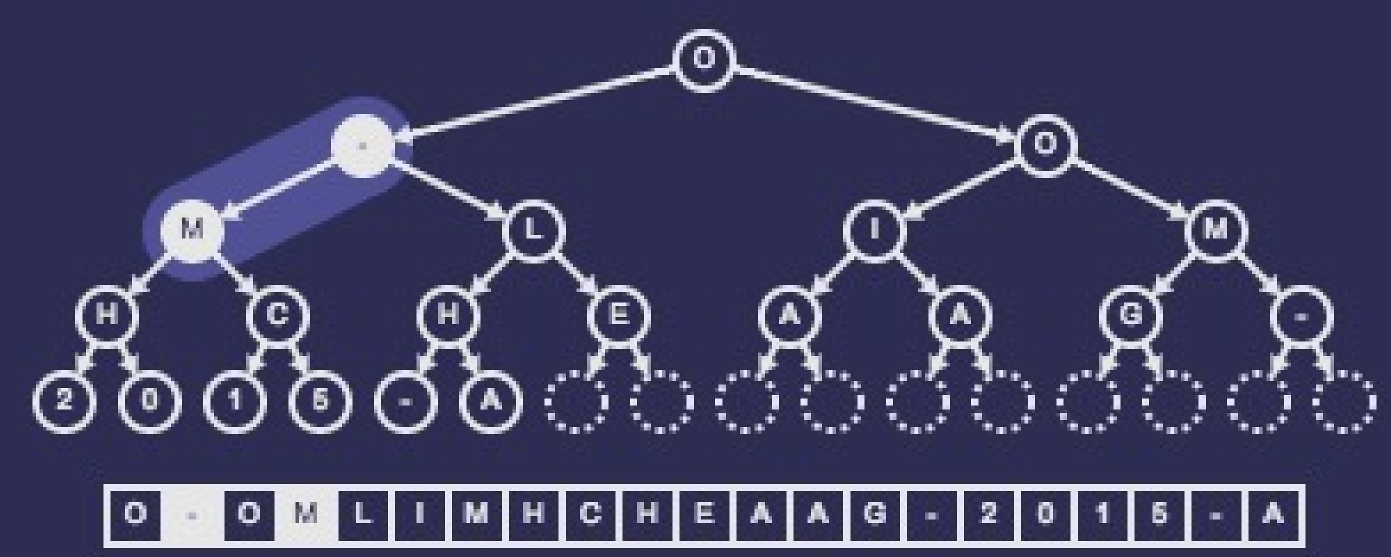
P, R,
R, S,
S, T,
T

Step 6. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

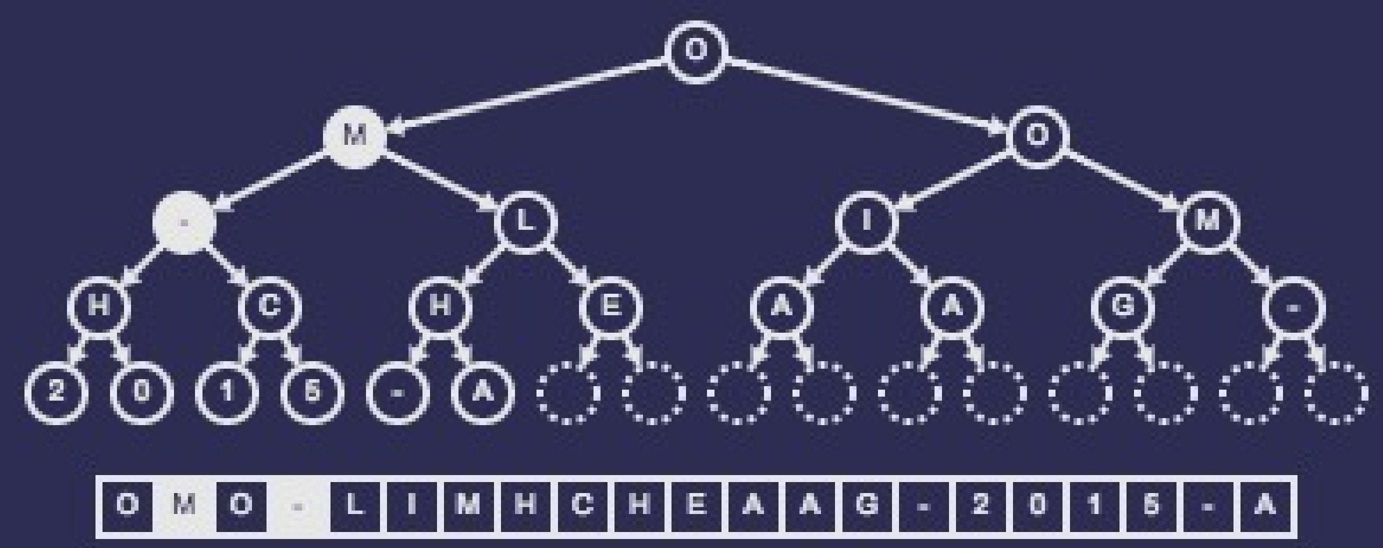
P, R,
R, S,
S, T,
T

Step 7. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

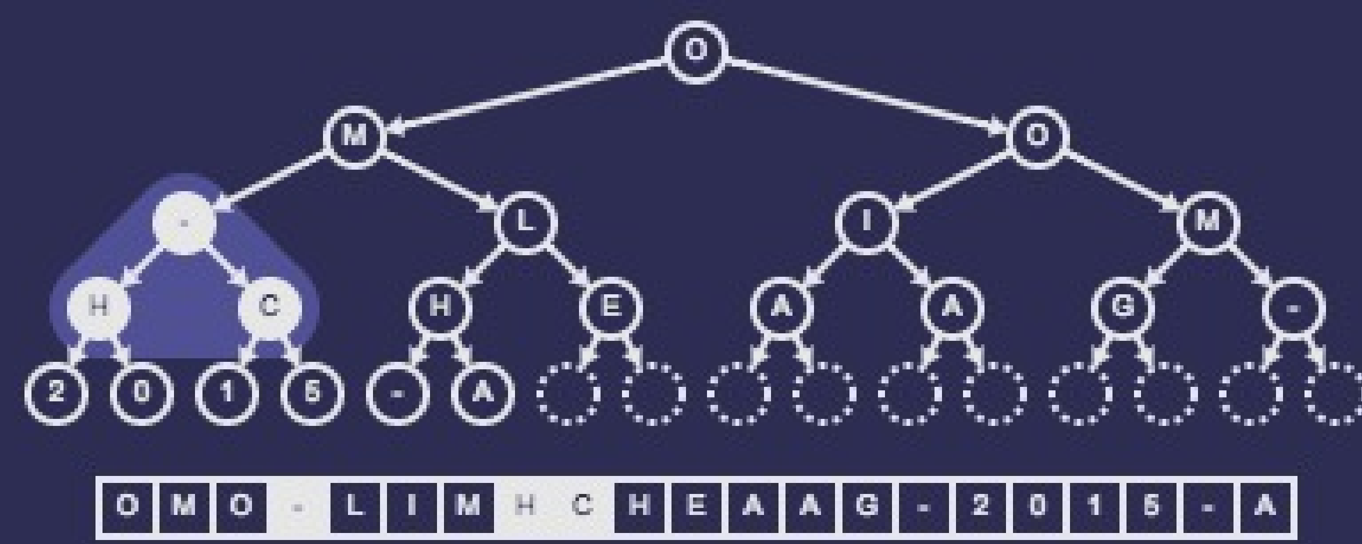
P, R,
R, S,
S, T,
T

Step 7. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

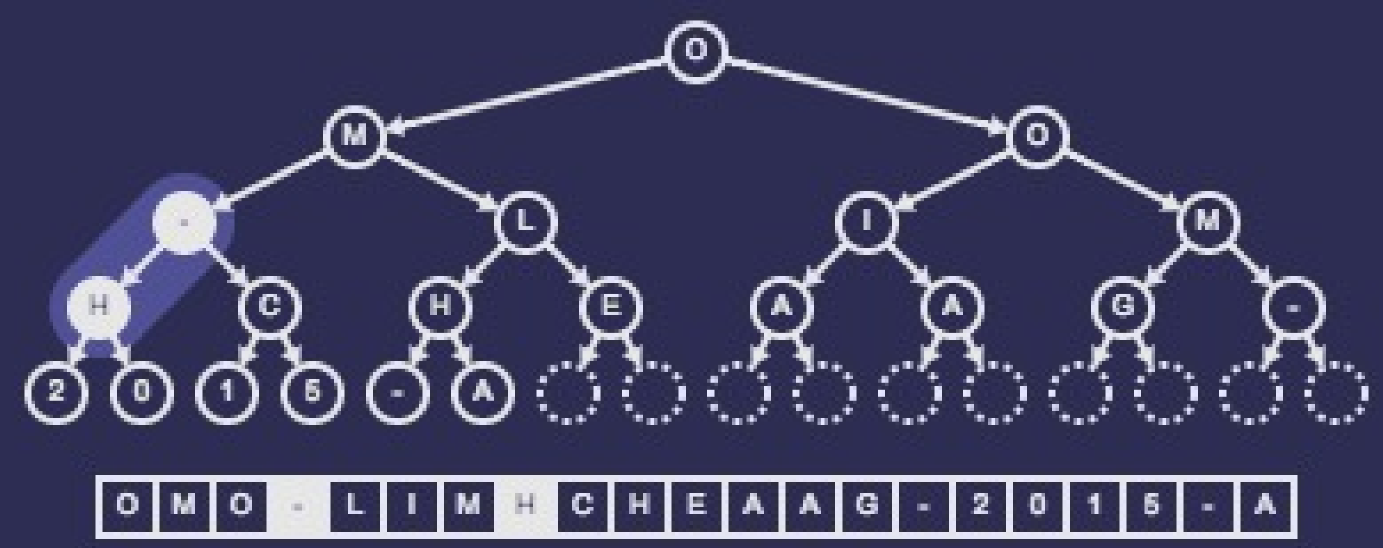
P, R,
R, S,
S, T,
T

Step 7. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

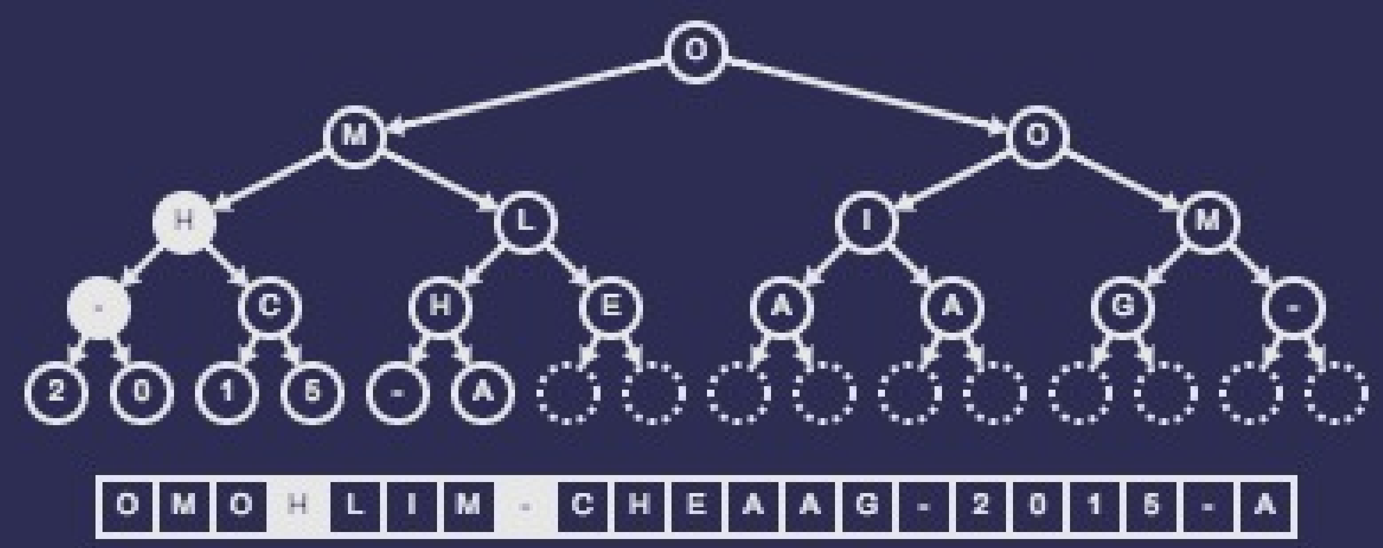
P, R,
R, S,
S, T,
T

Step 8. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

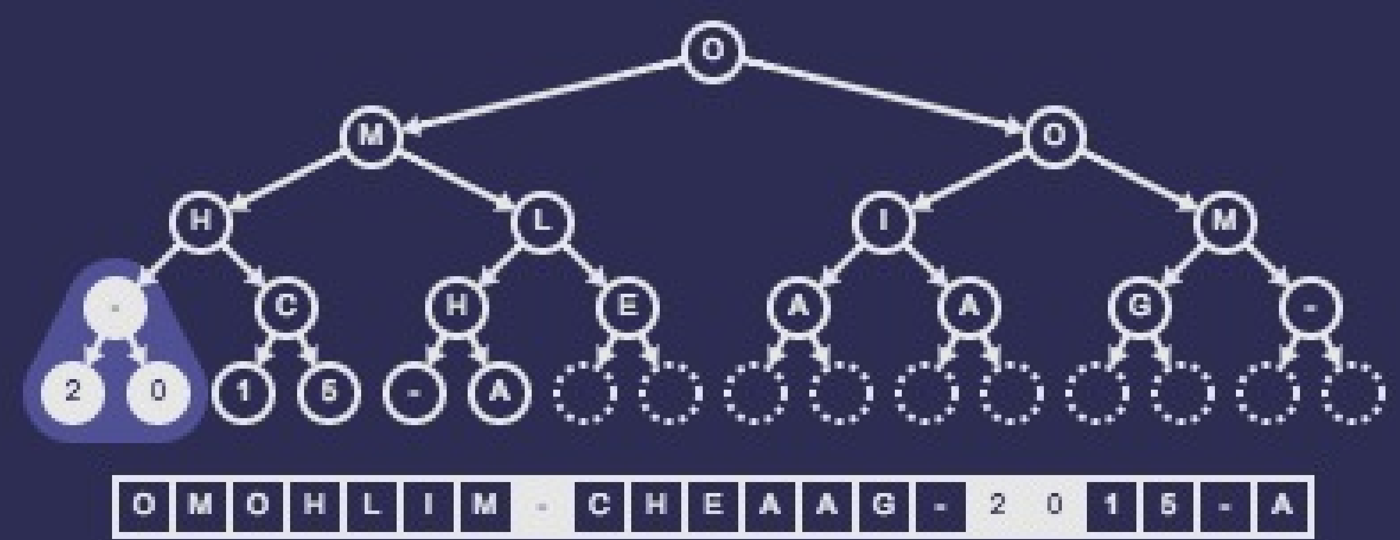
P, R,
R, S,
S, T,
T

Step 8. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

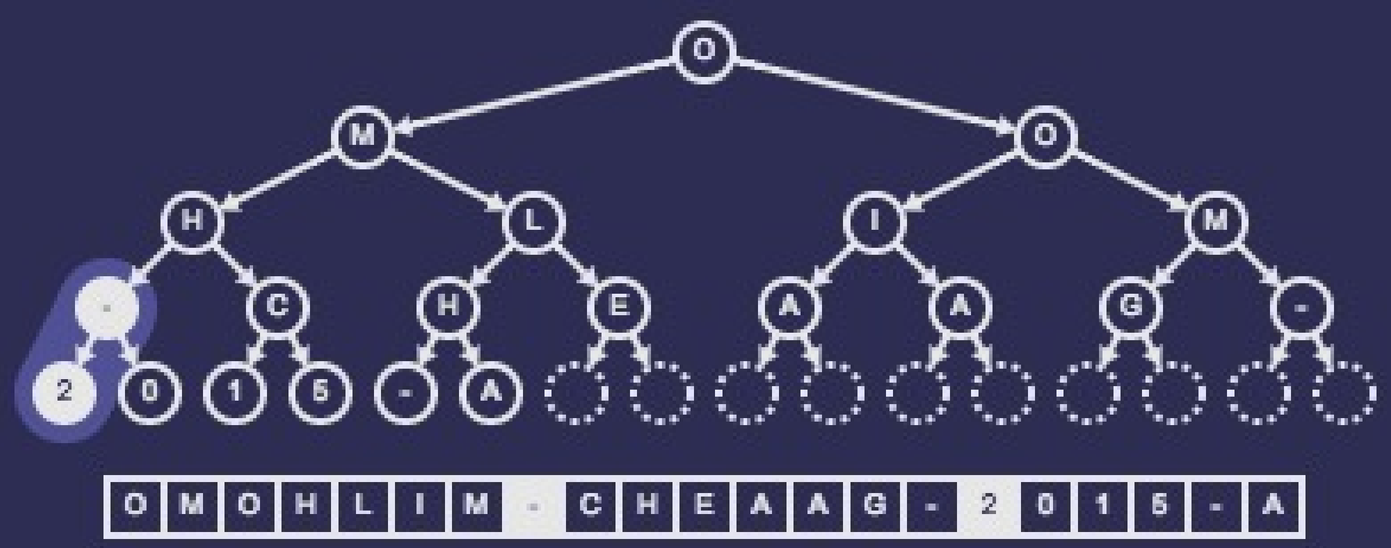
P, R,
R, S,
S, T,
T

Step 8. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

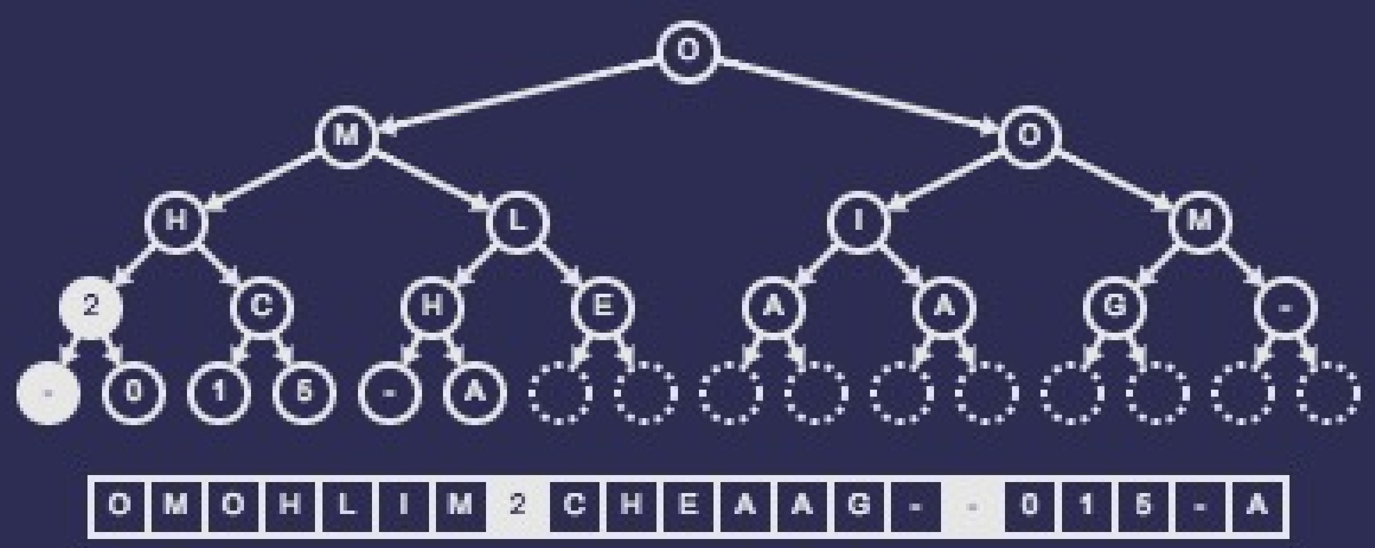
P, R,
R, S,
S, T,
T

Step 9. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

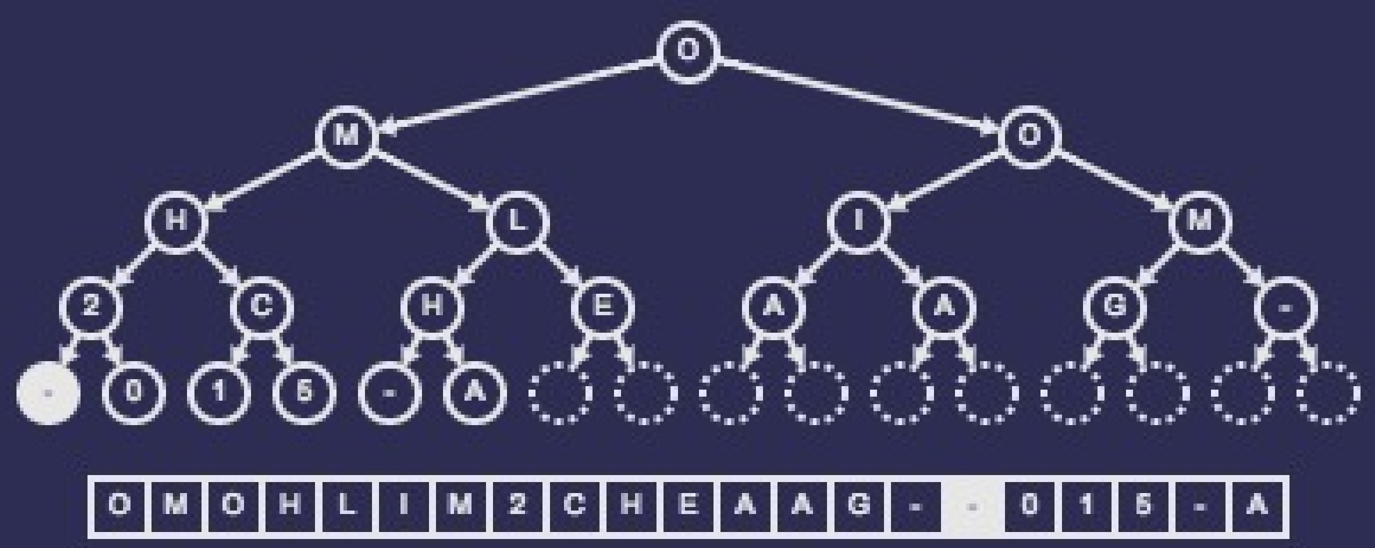
P, R,
R, S,
S, T,
T

Step 9. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

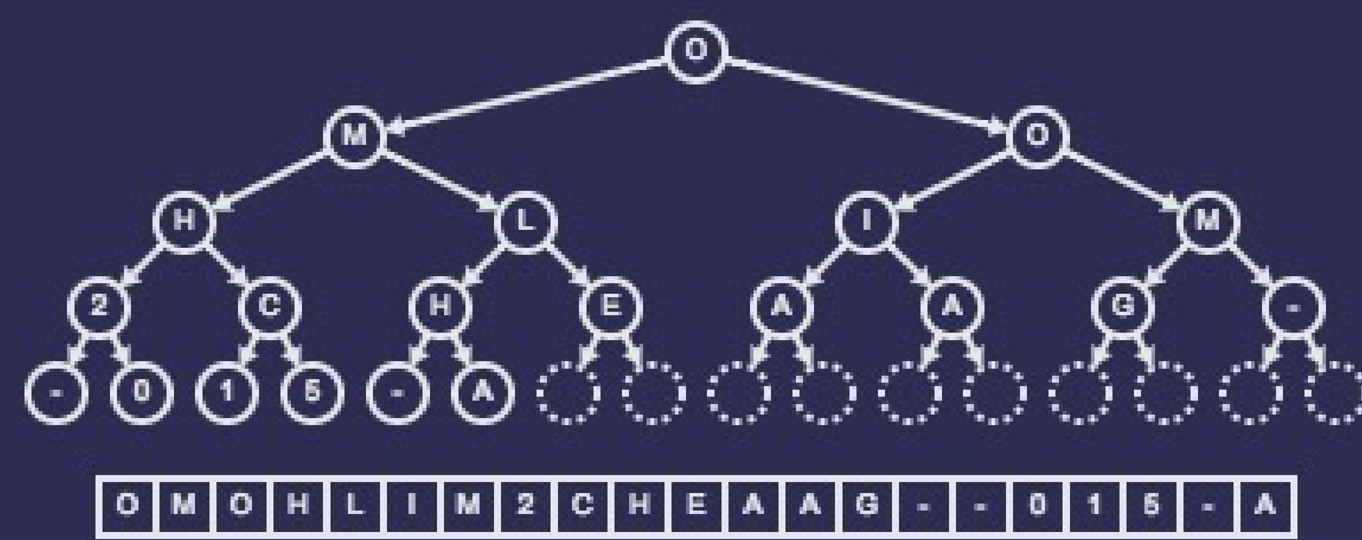
P, R,
R, S,
S, T,
T

Step 9. It has no children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

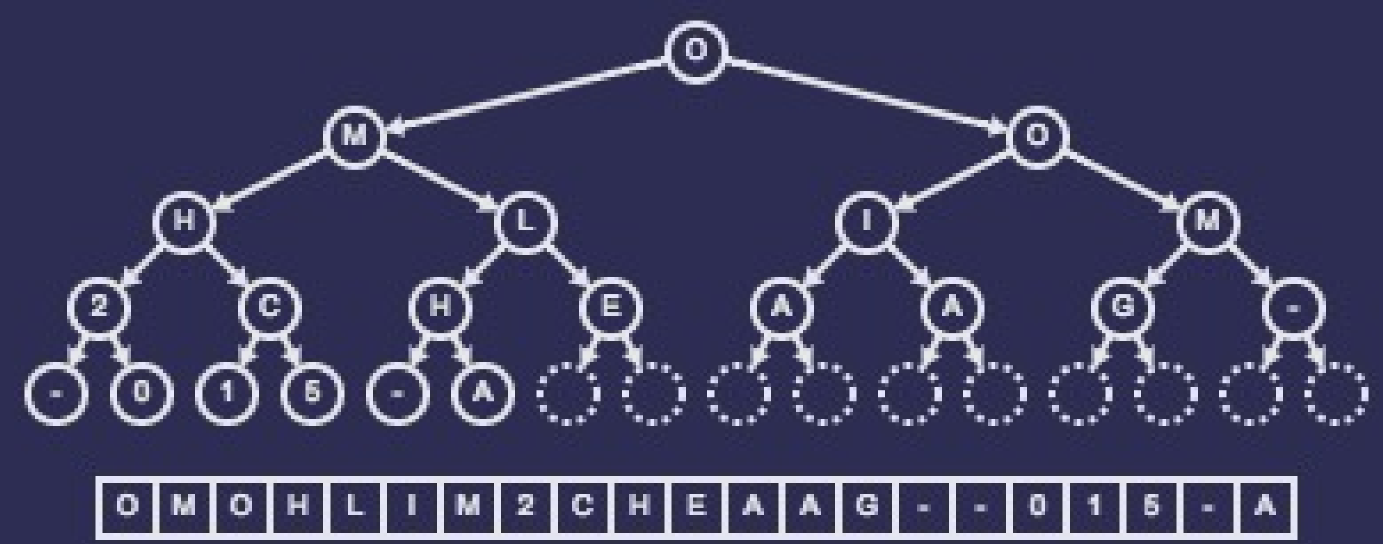
P, R,
R, S,
S, T,
T

Step 9. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

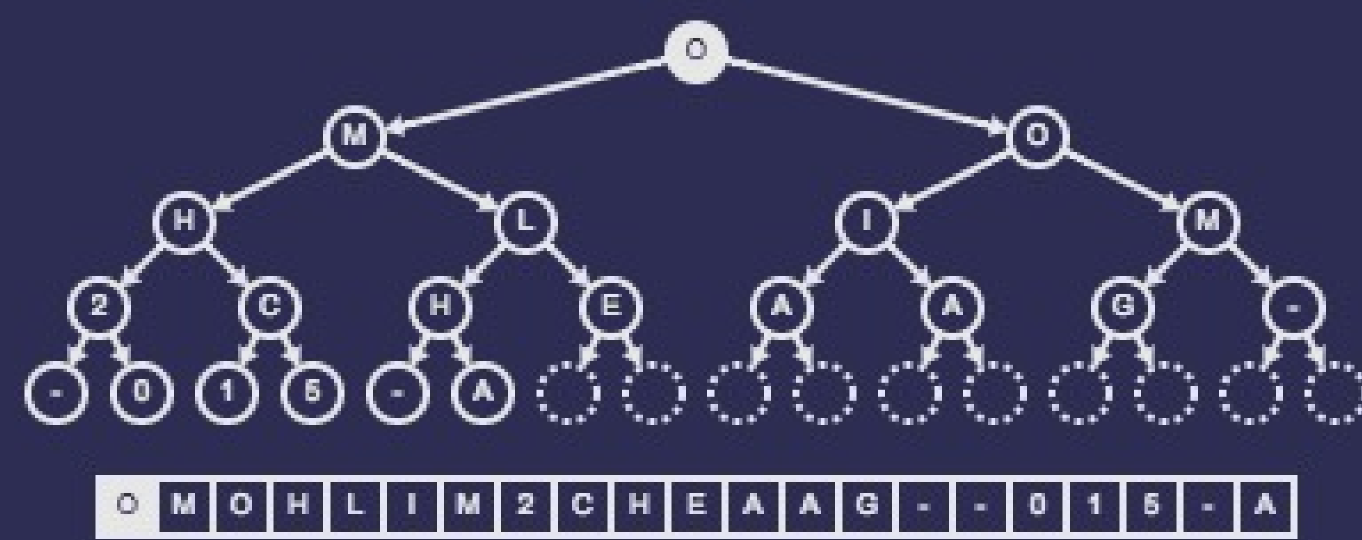
P, R,
R, S,
S, T,
T

Removing the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

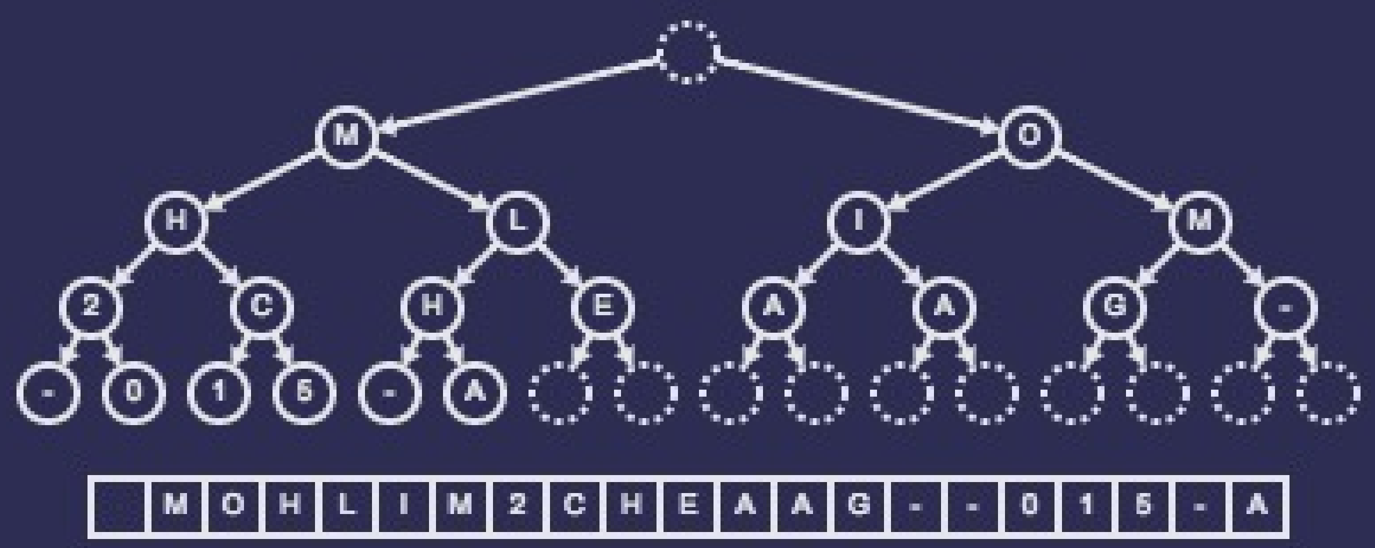
P, R,
R, S,
S, T,
T

Step 1. Find the root of the heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

O

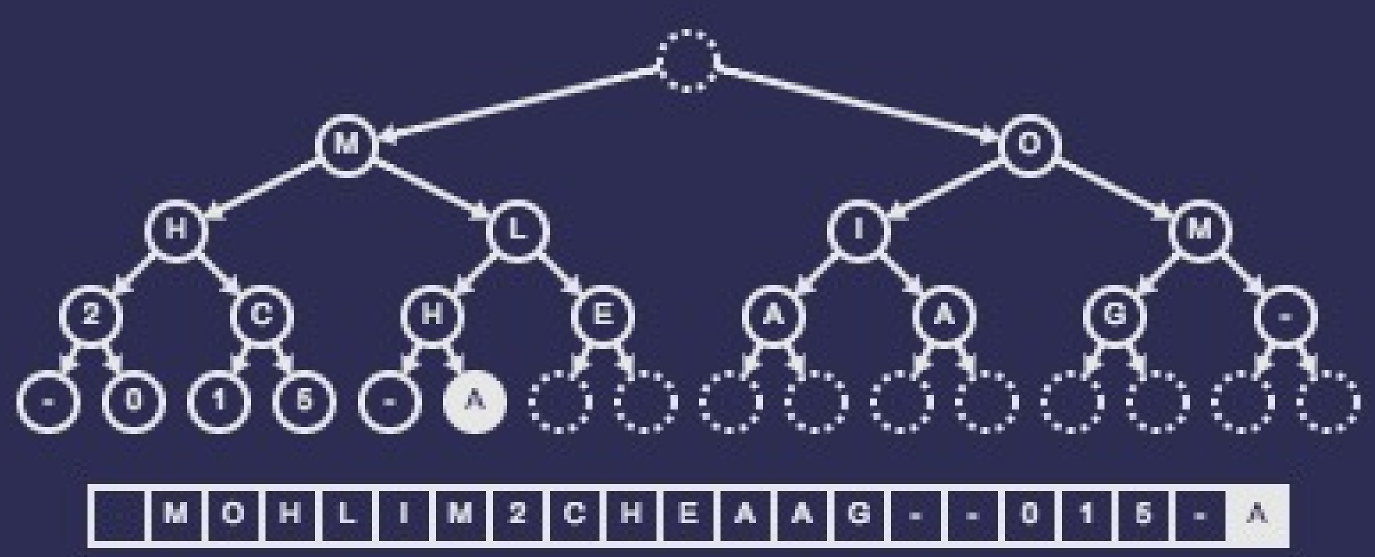
P, R,
R, S,
S, T,
T

Step 2. Output the value of the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

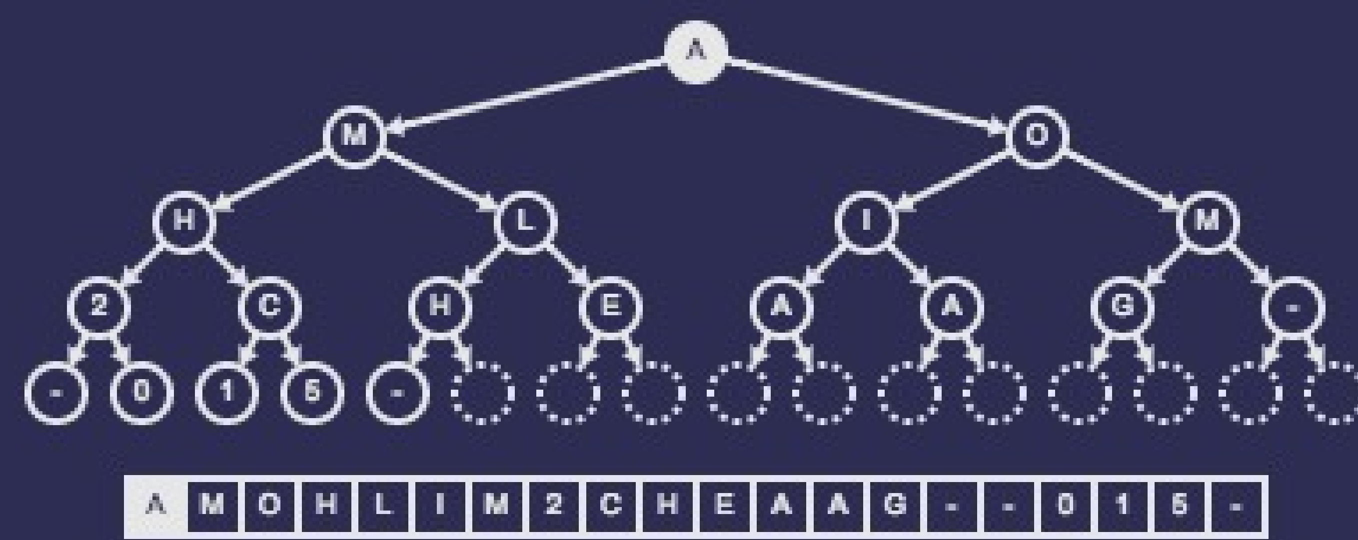
O, P,
R, R,
S, S,
T, T

Step 3. Find the last node

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

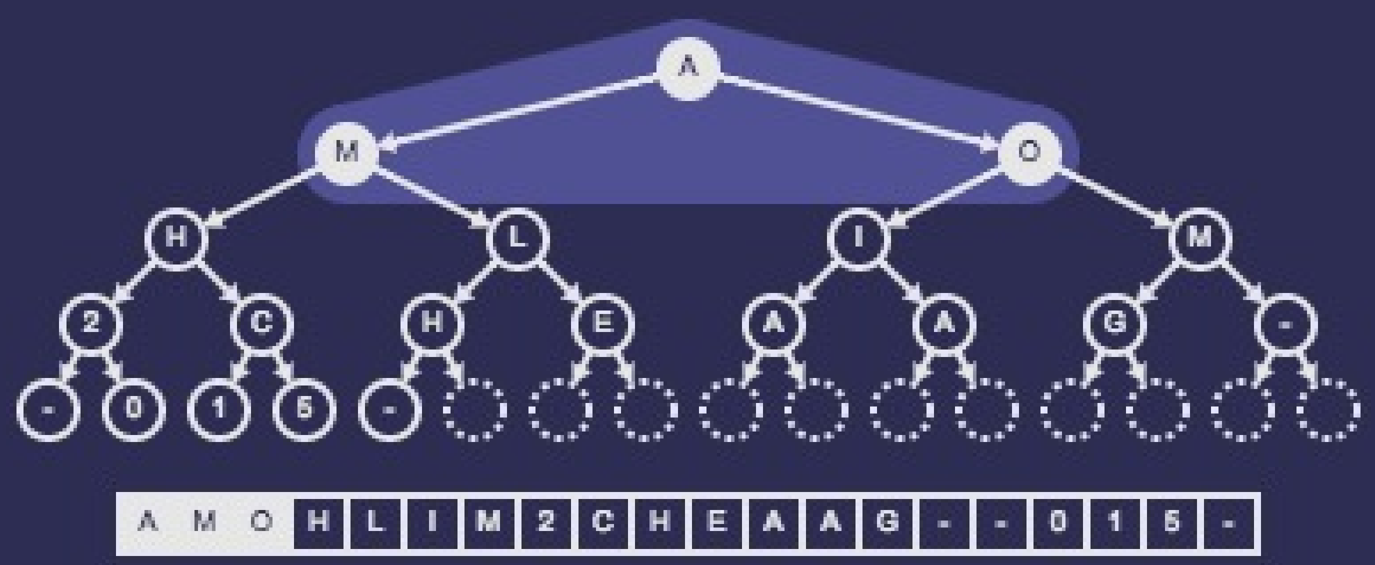
O, P,
R, R,
S, S,
T, T

Step 4. Move the last node to the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

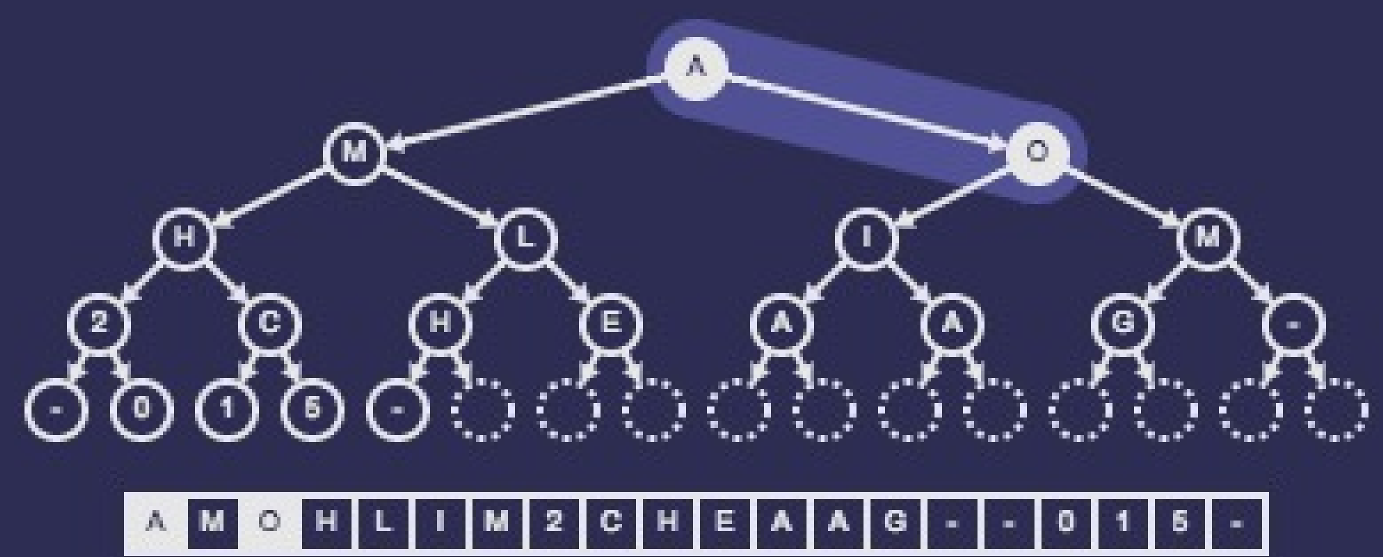
O, P,
R, R,
S, S,
T, T

Step 5. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

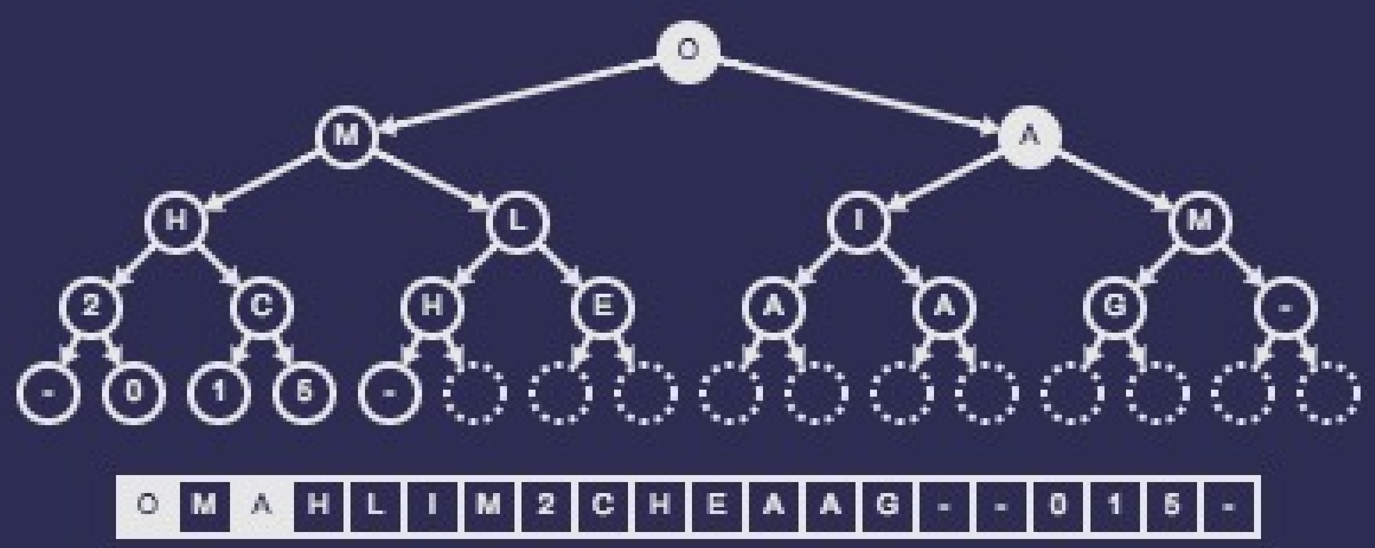
O, P,
R, R,
S, S,
T, T

Step 6. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

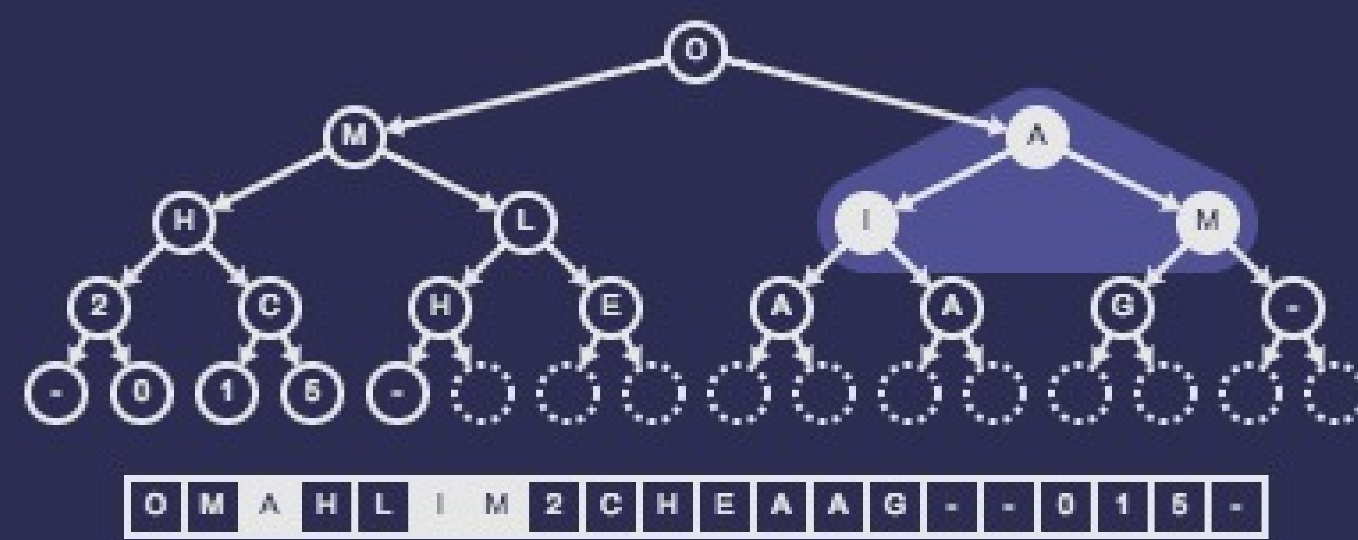
O, P,
R, R,
S, S,
T, T

Step 6. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

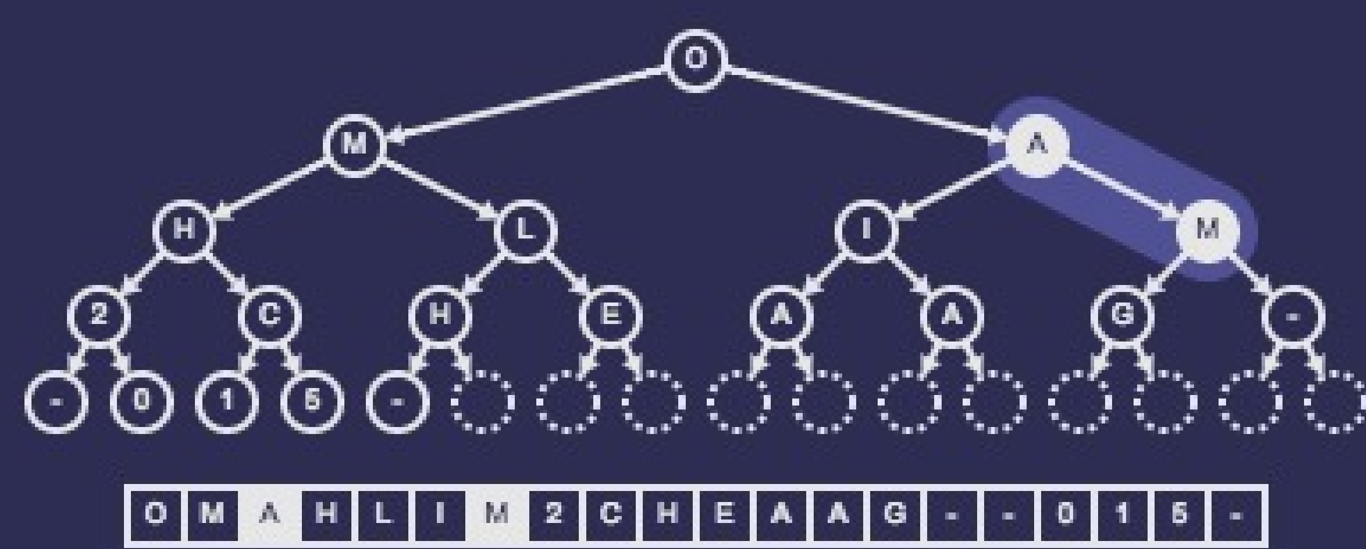
O, P,
R, R,
S, S,
T, T

Step 6. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

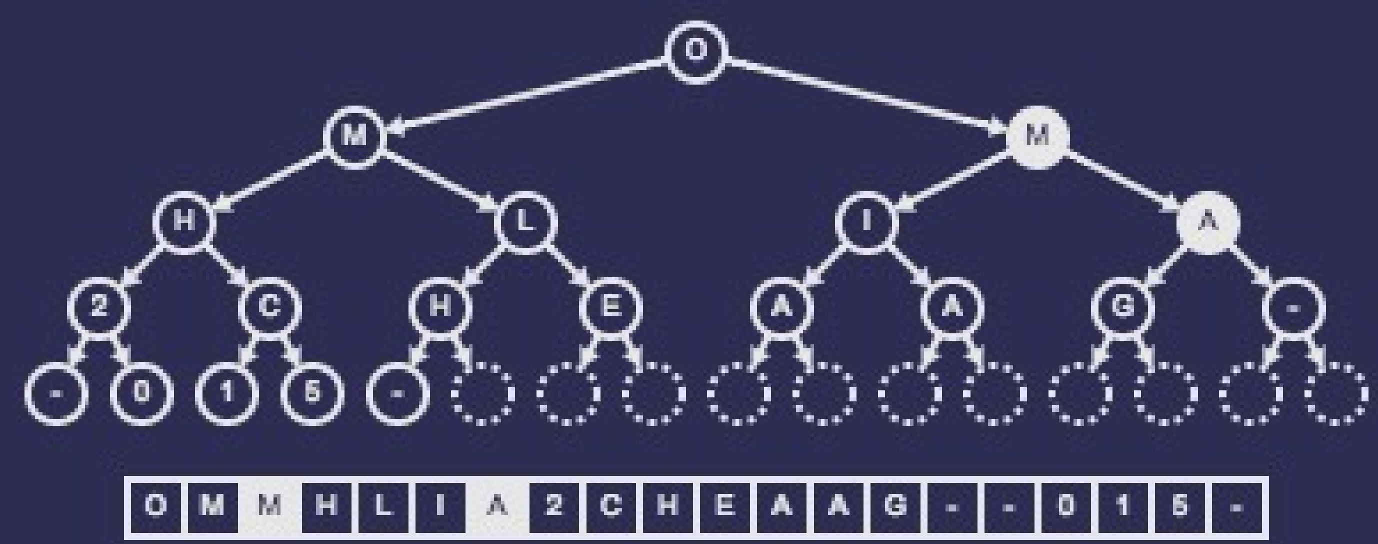
O, P,
R, R,
S, S,
T, T

Step 7. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

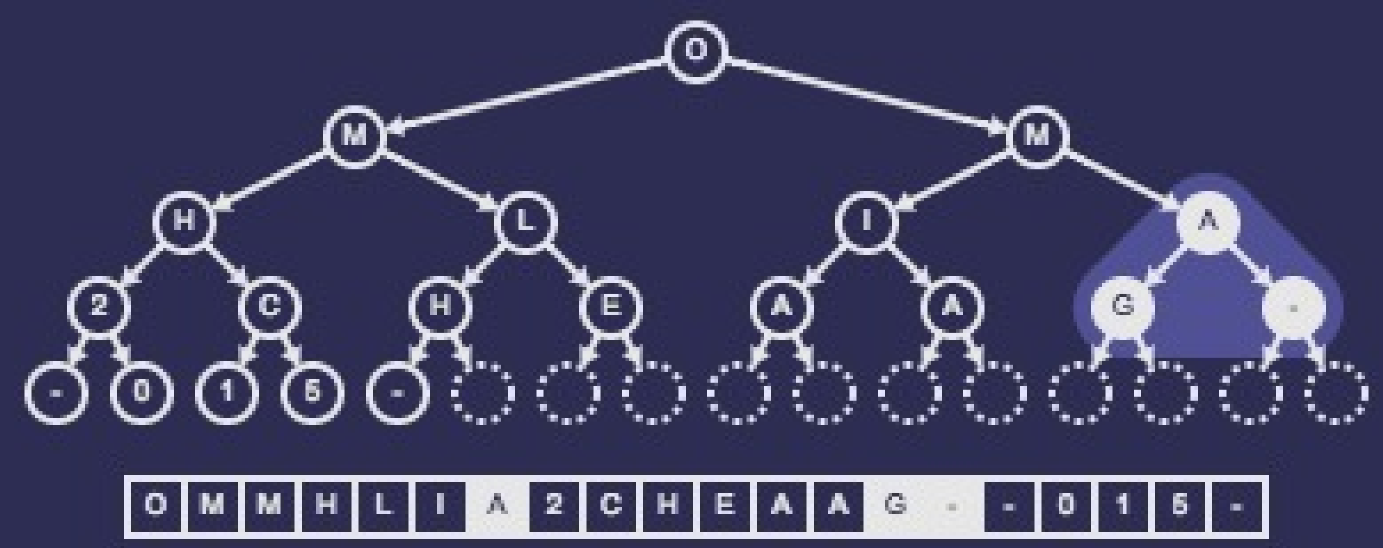
O, P,
R, R,
S, S,
T, T

Step 7. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

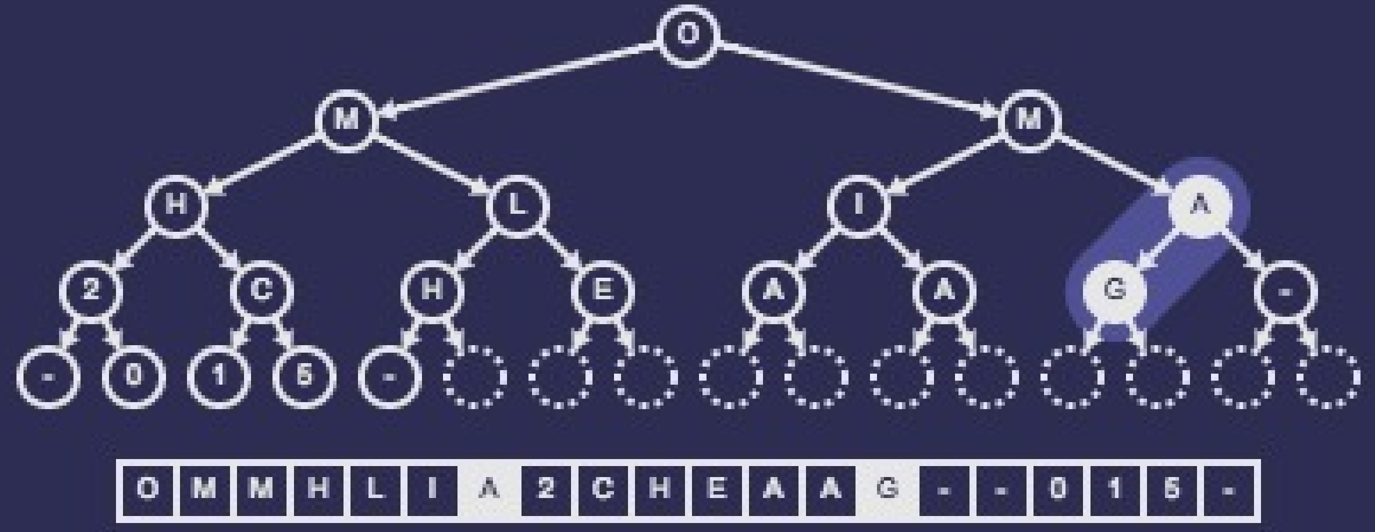
O, P,
R, R,
S, S,
T, T

Step 7. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

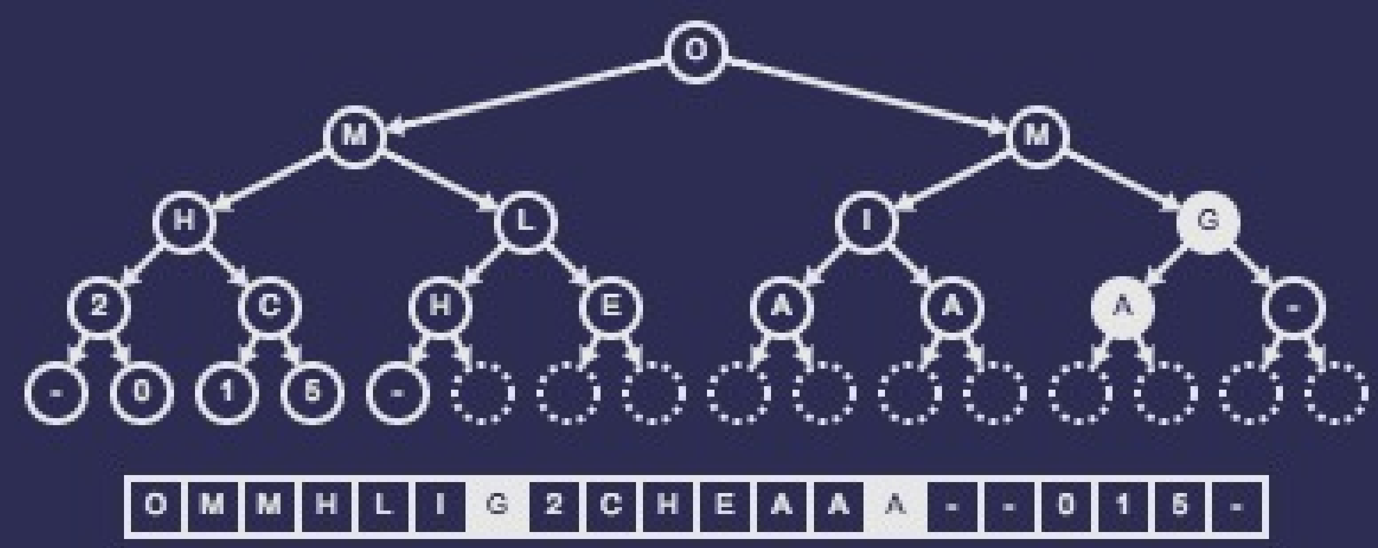
O, P,
R, R,
S, S,
T, T

Step 8. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

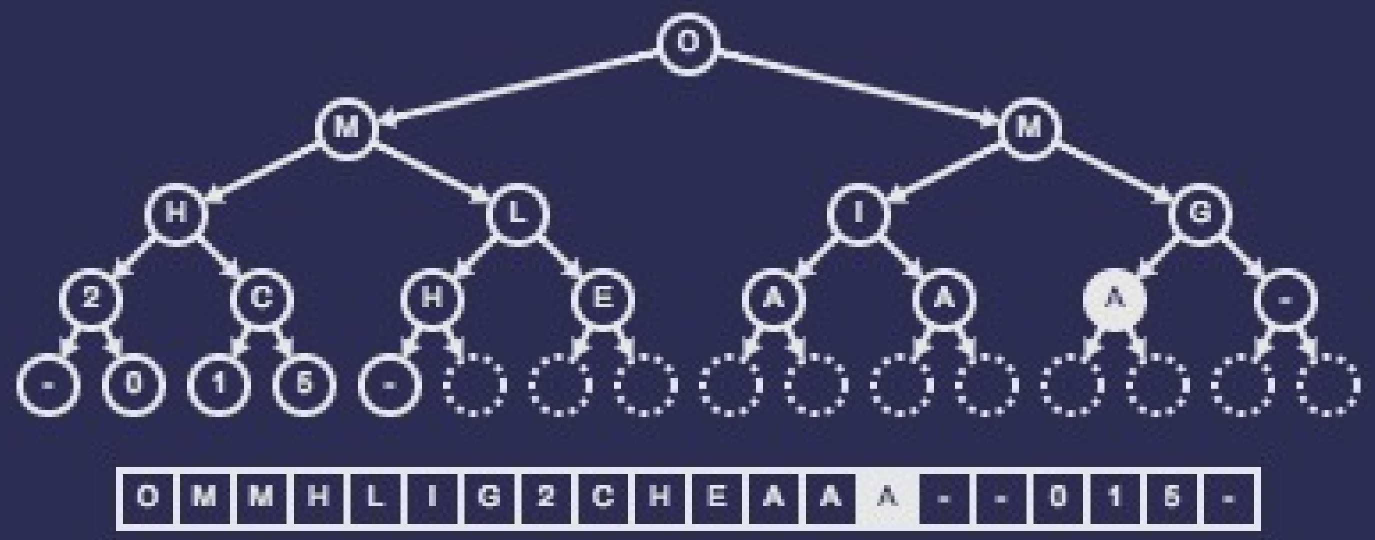
O, P,
R, R,
S, S,
T, T

Step 8. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

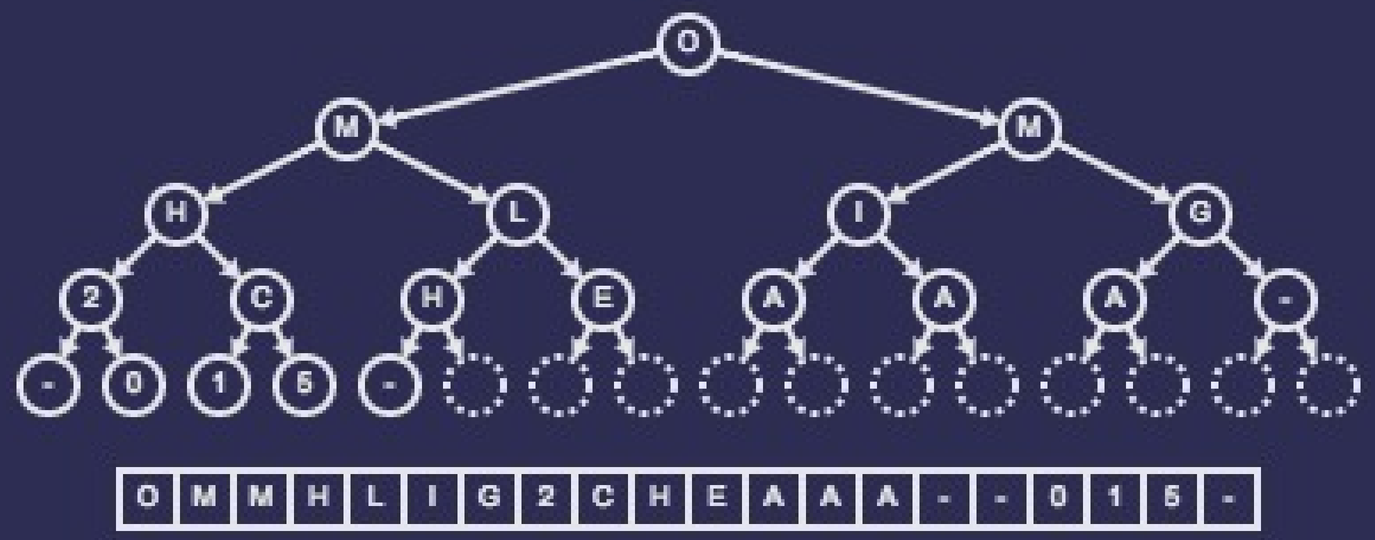
O, P,
R, R,
S, S,
T, T

Step 8. It has no children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

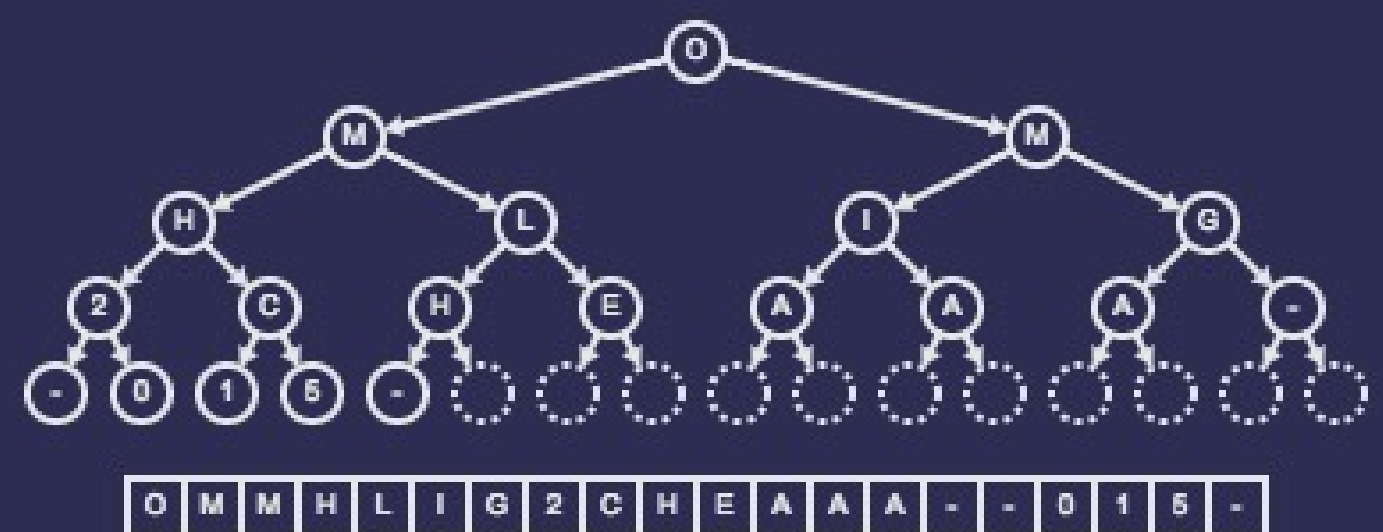
O, P,
R, R,
S, S,
T, T

Step 8. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

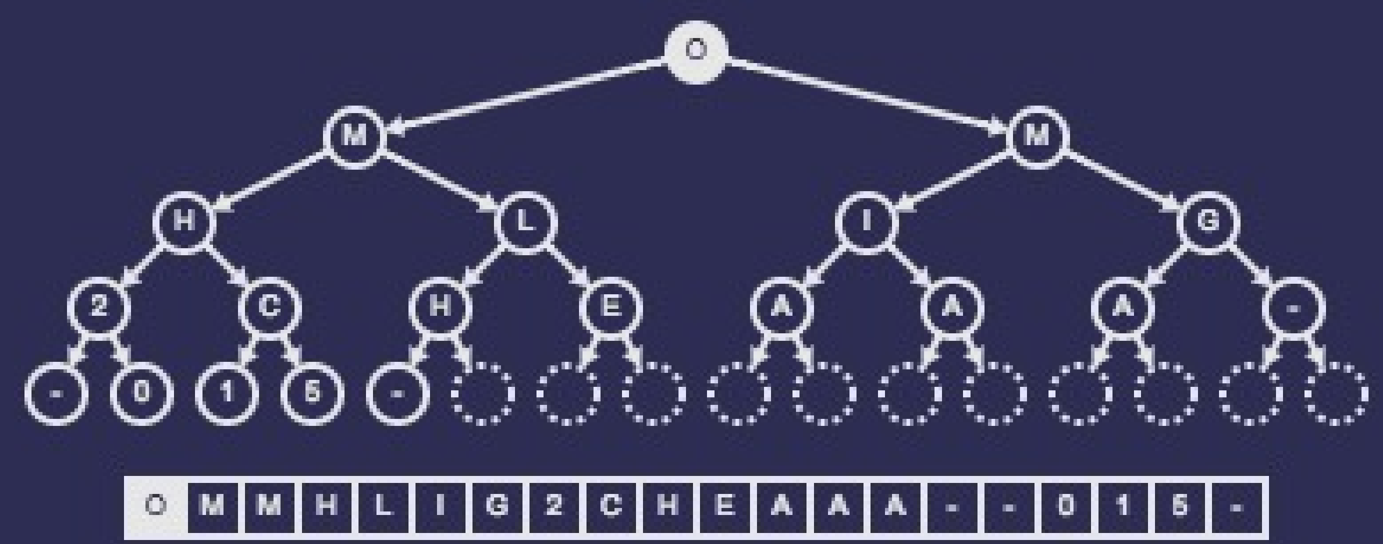
O, P,
R, R,
S, S,
T, T

Removing the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

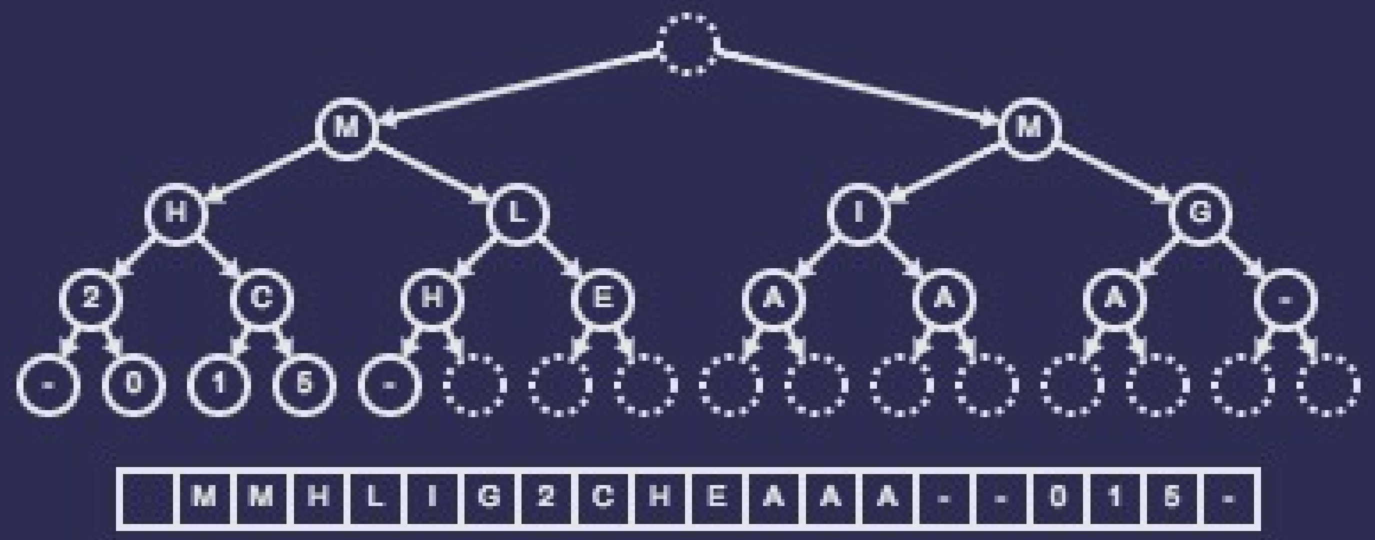
O, P,
R, R,
S, S,
T, T

Step 1. Find the root of the heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

O

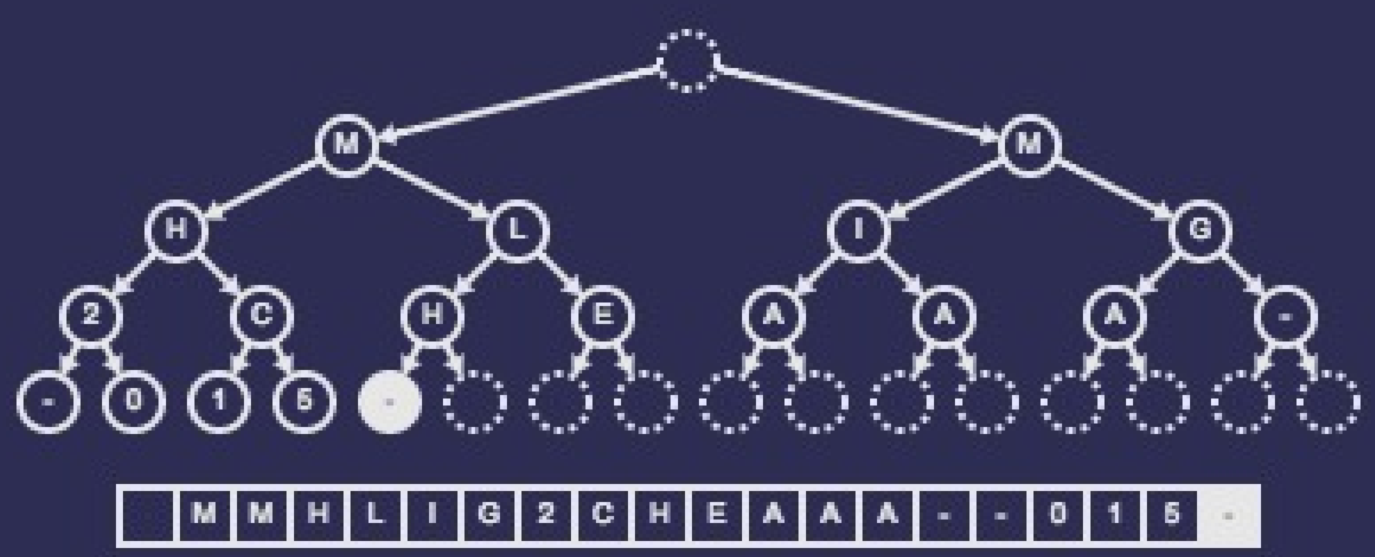
O, P,
R, R,
S, S,
T, T

Step 2. Output the value of the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

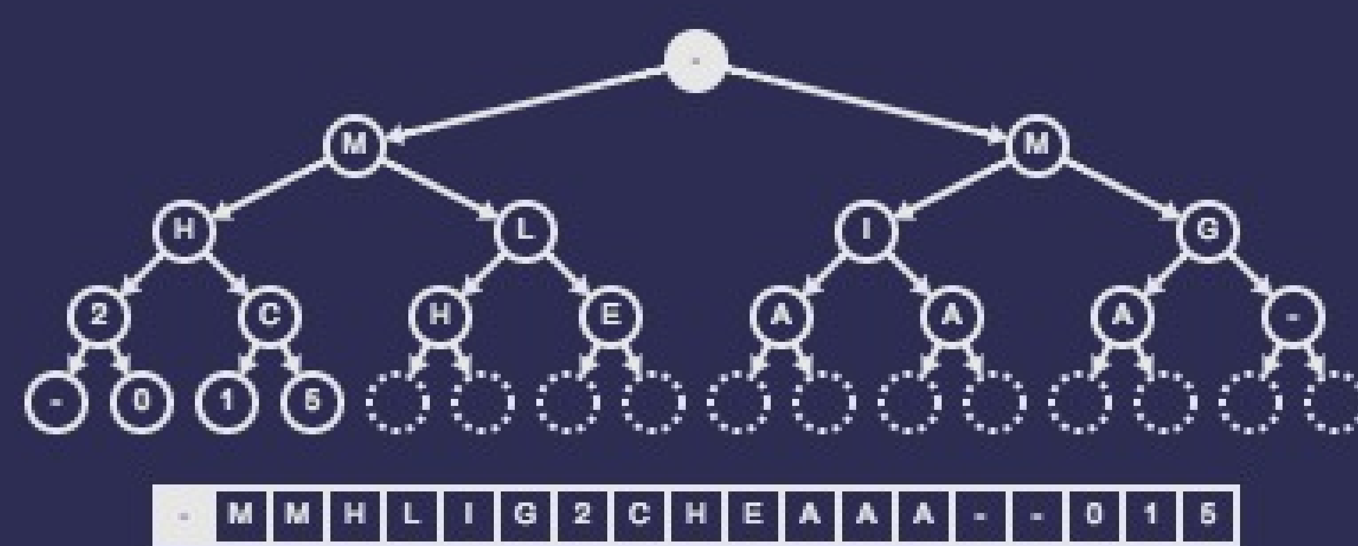
O, O,
P, R,
R, S,
S, T,
T

Step 3. Find the last node

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

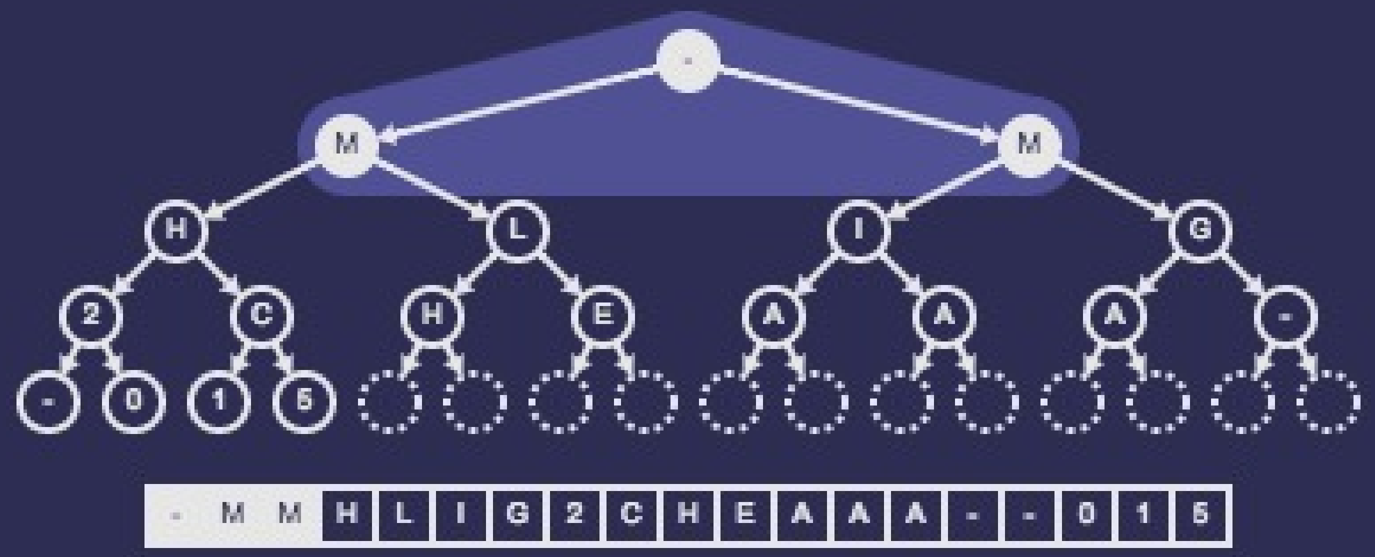
O, O,
P, R,
R, S,
S, T,
T

Step 4. Move the last node to the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

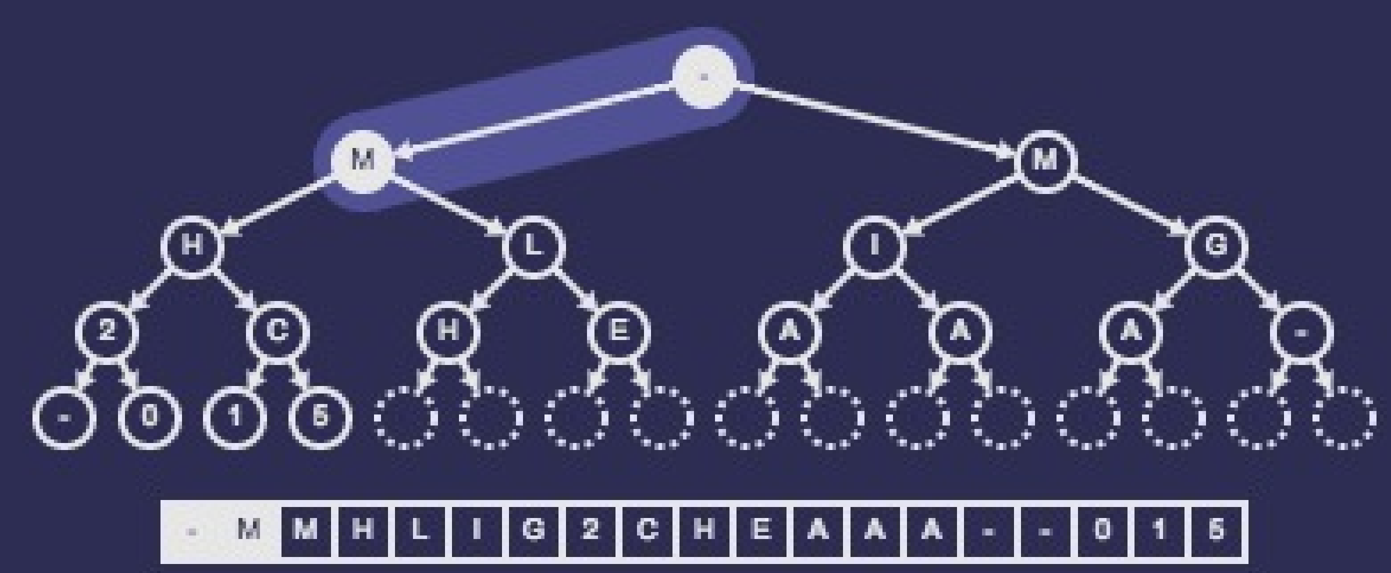
O, O,
P, R,
R, S,
S, T,
T

Step 5. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

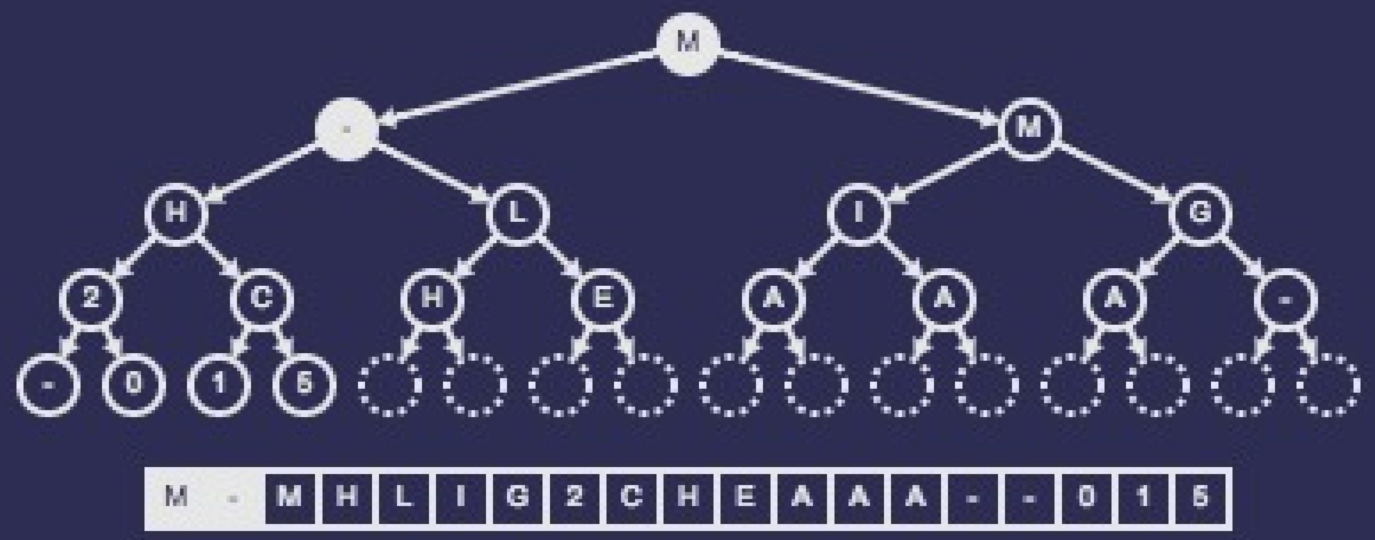
O, O,
P, R,
R, S,
S, T,
T

Step 6. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

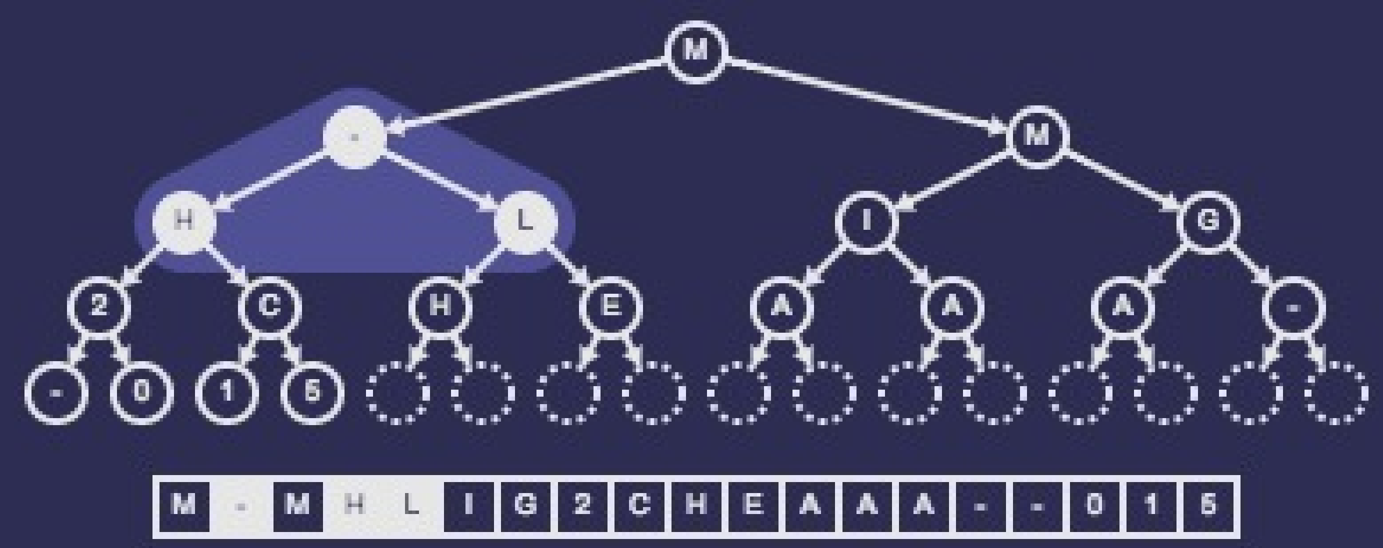
O, O,
P, R,
R, S,
S, T,
T

Step 6. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

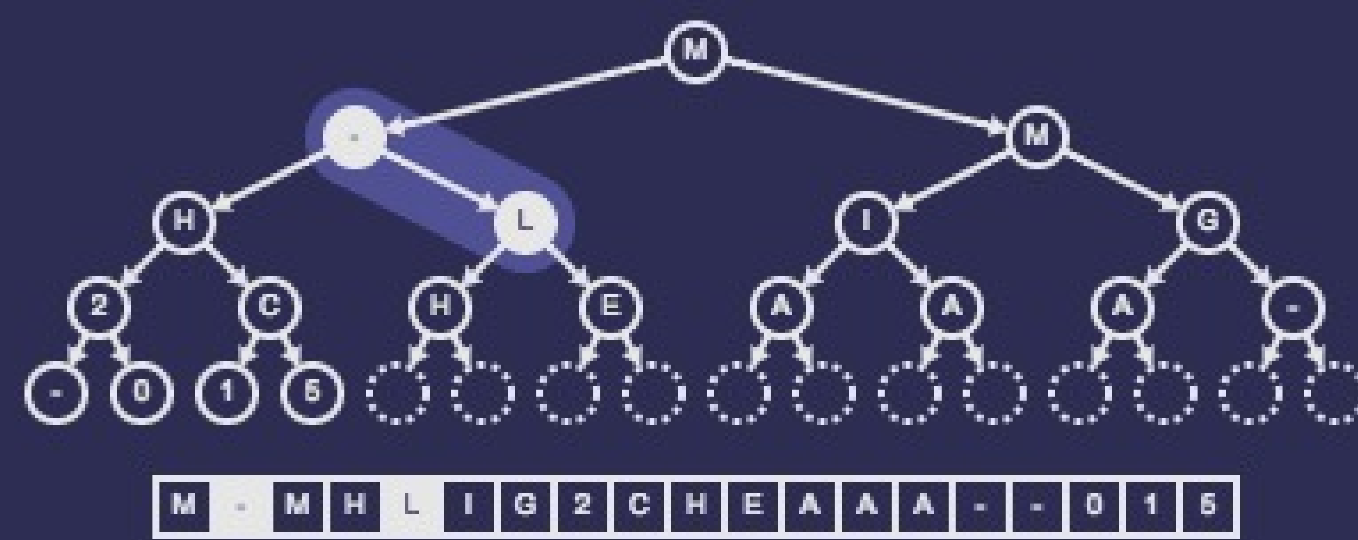
O, O,
P, R,
R, S,
S, T,
T

Step 6. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

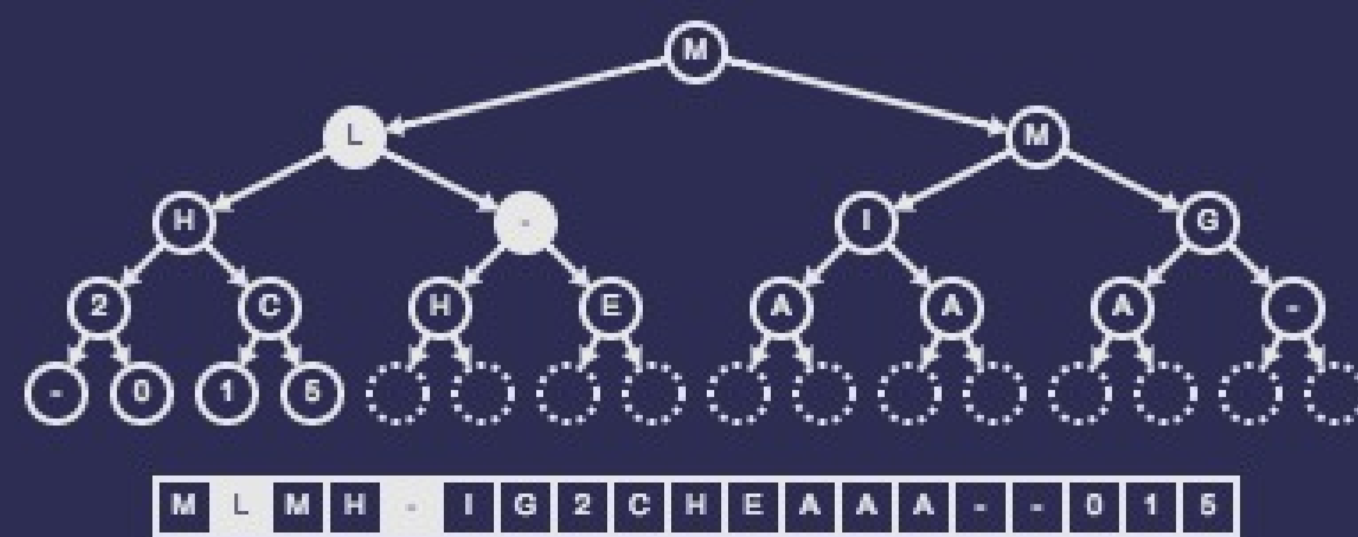
O, O,
P, R,
R, S,
S, T,
T

Step 7. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

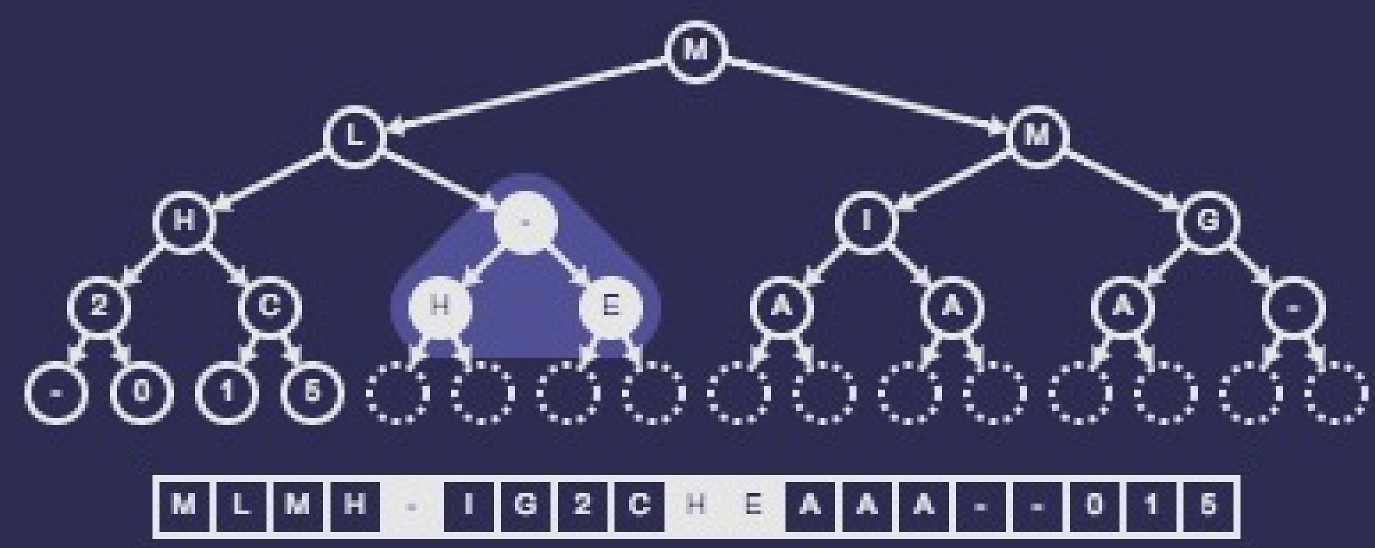
O, O,
P, R,
R, S,
S, T,
T

Step 7. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

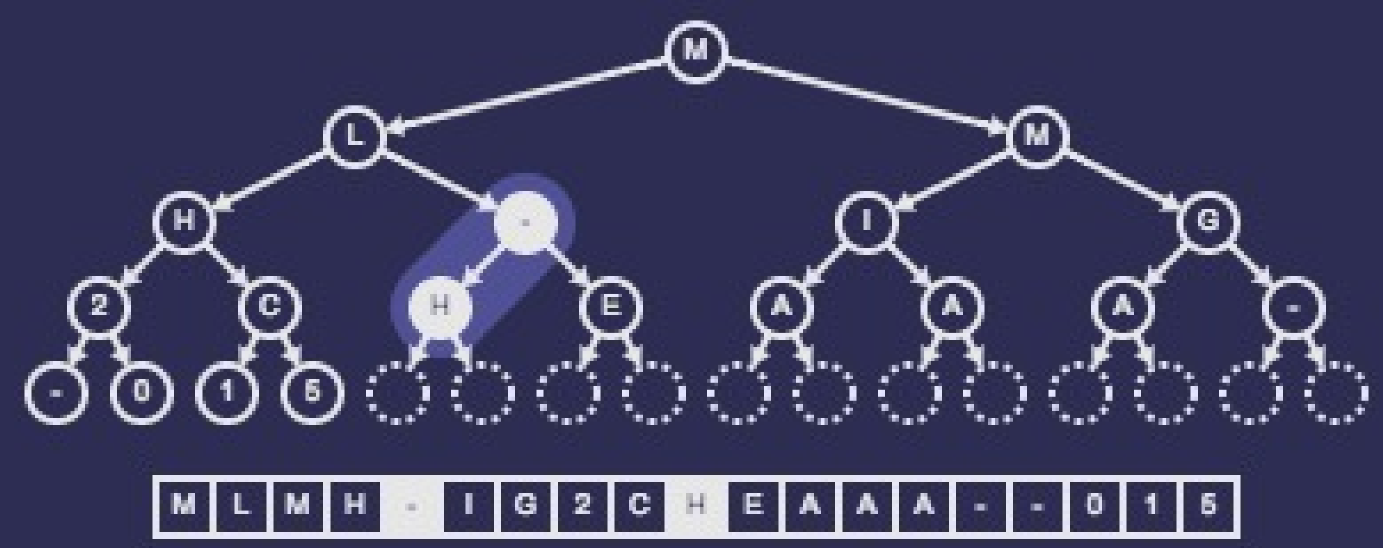
O, O,
P, R,
R, S,
S, T,
T

Step 7. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

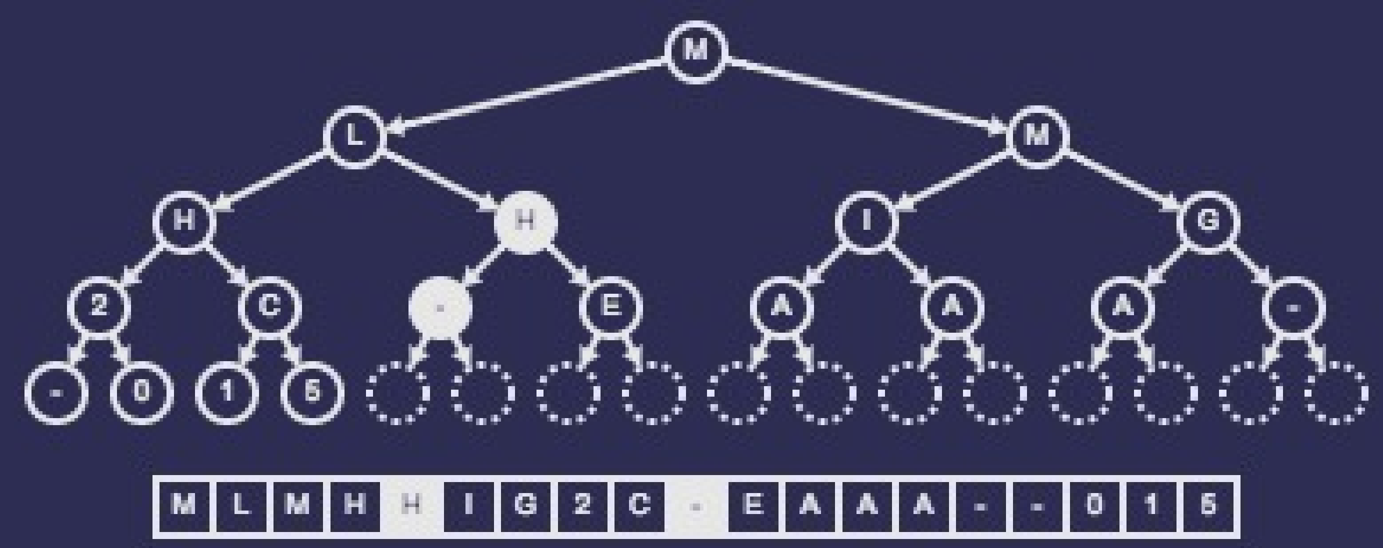
O, O,
P, R,
R, S,
S, T,
T

Step 8. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

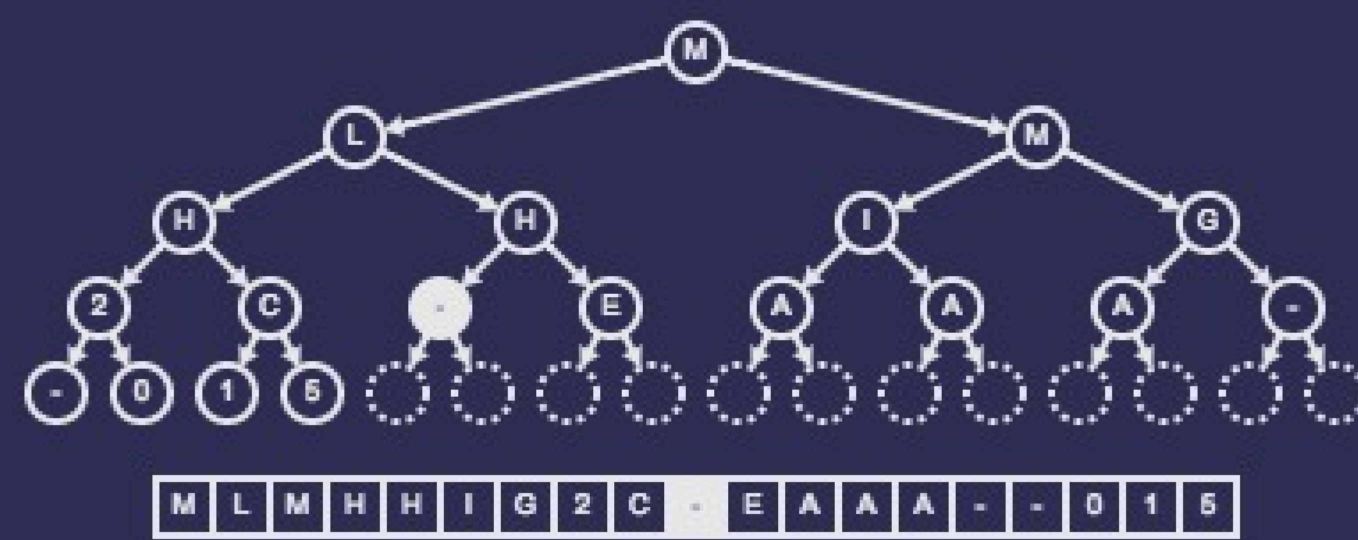
O, O,
P, R,
R, S,
S, T,
T

Step 8. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

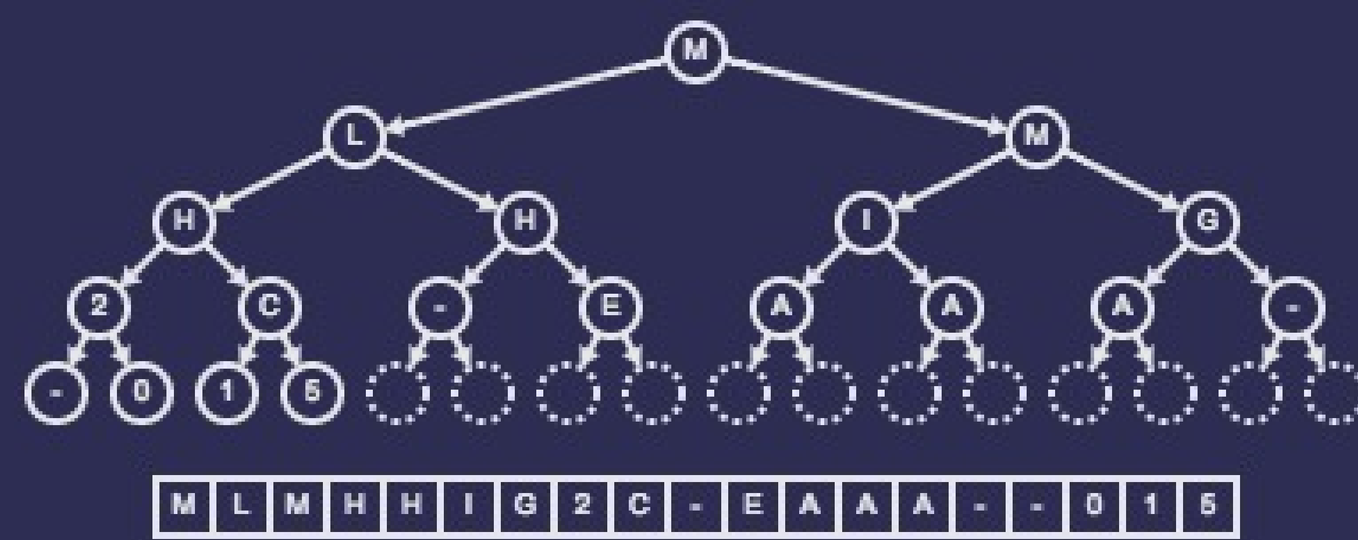
O, O,
P, R,
R, S,
S, T,
T

Step 8. It has no children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

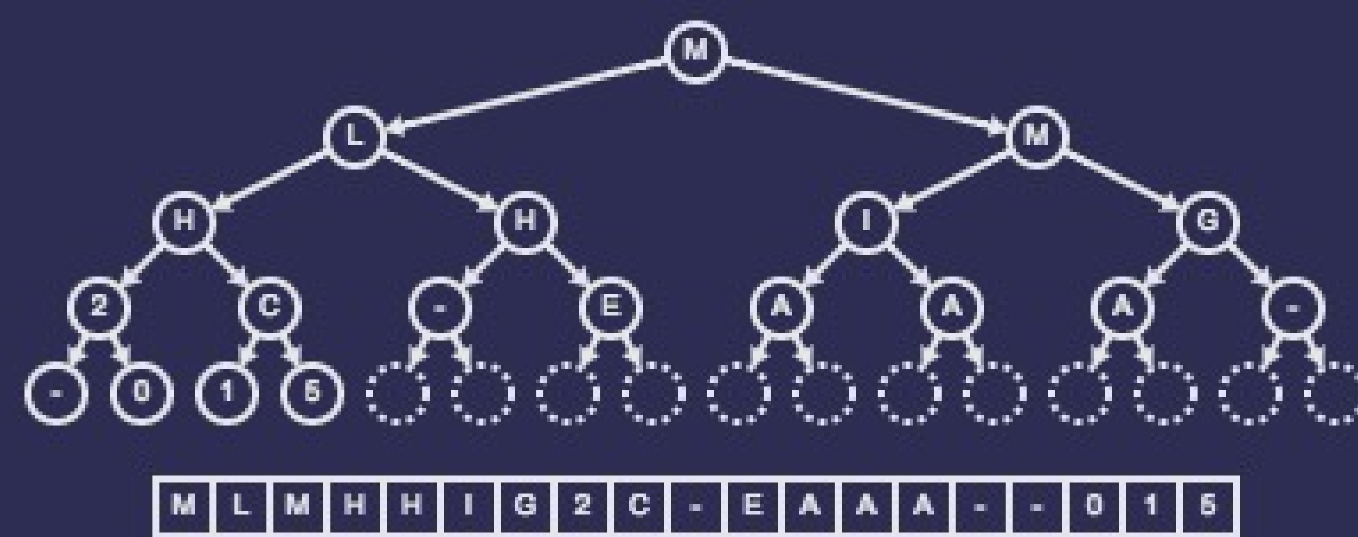
O, O,
P, R,
R, S,
S, T,
T

Step 8. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

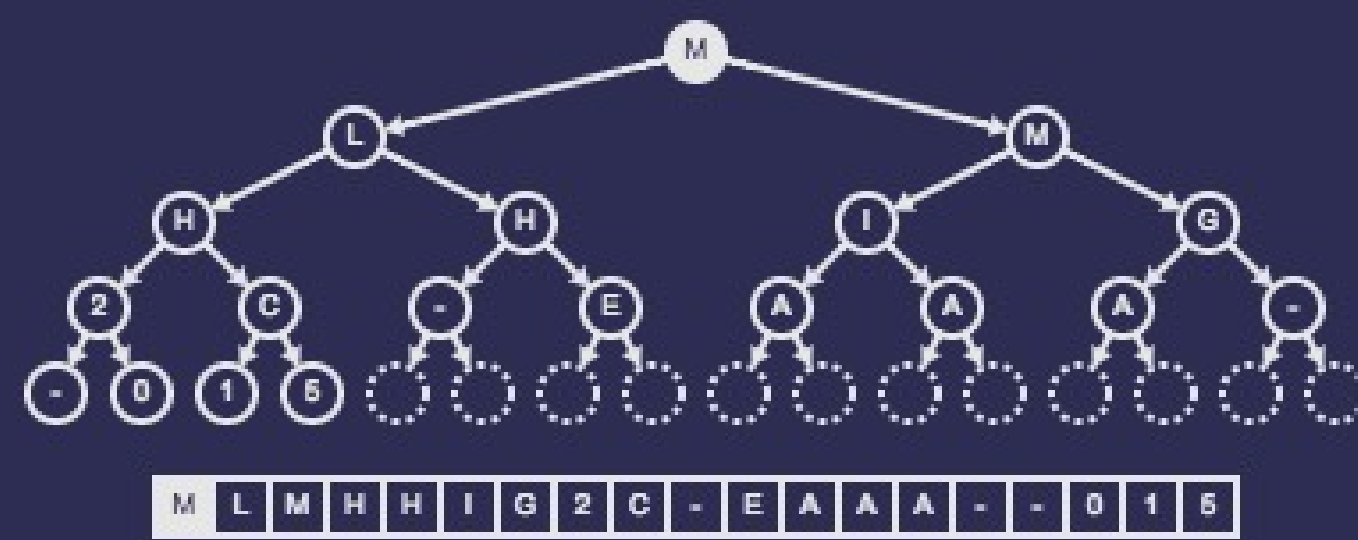
O, O,
P, R,
R, S,
S, T,
T

Removing the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

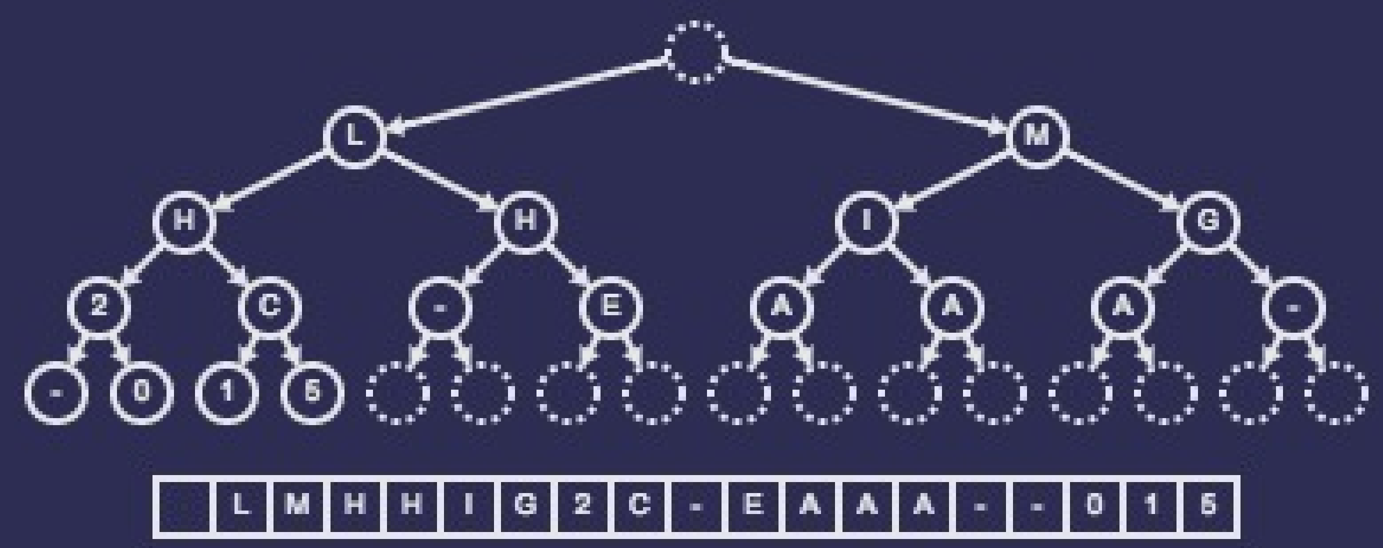
O, O,
P, R,
R, S,
S, T,
T

Step 1. Find the root of the heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

M

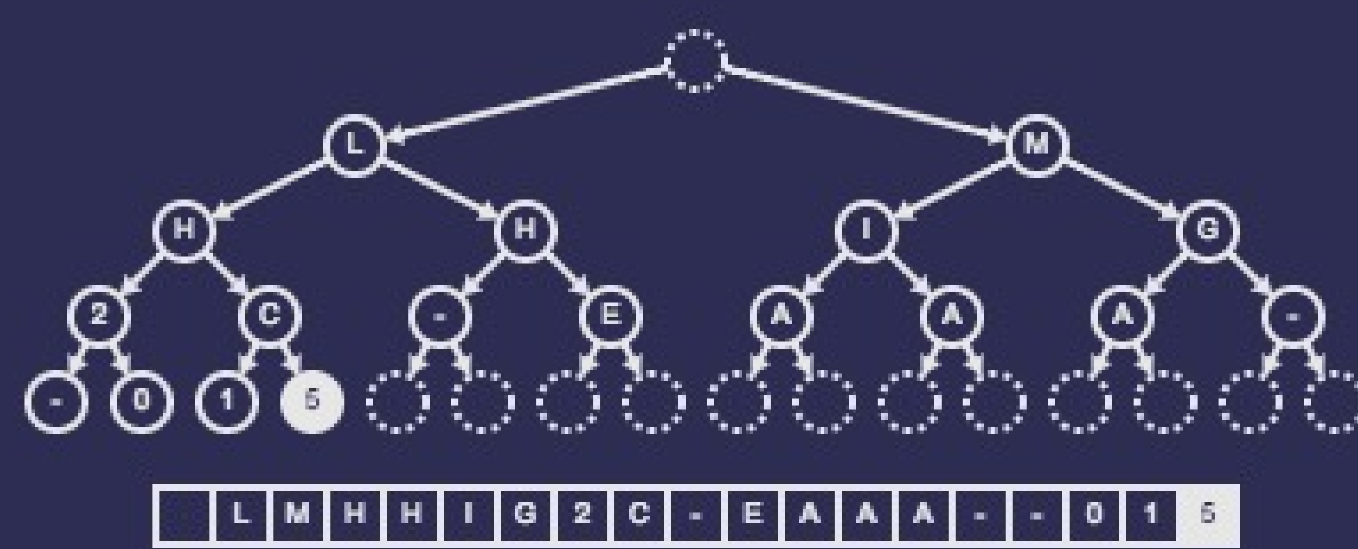
O, O,
P, R,
R, S,
S, T,
T

Step 2. Output the value of the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

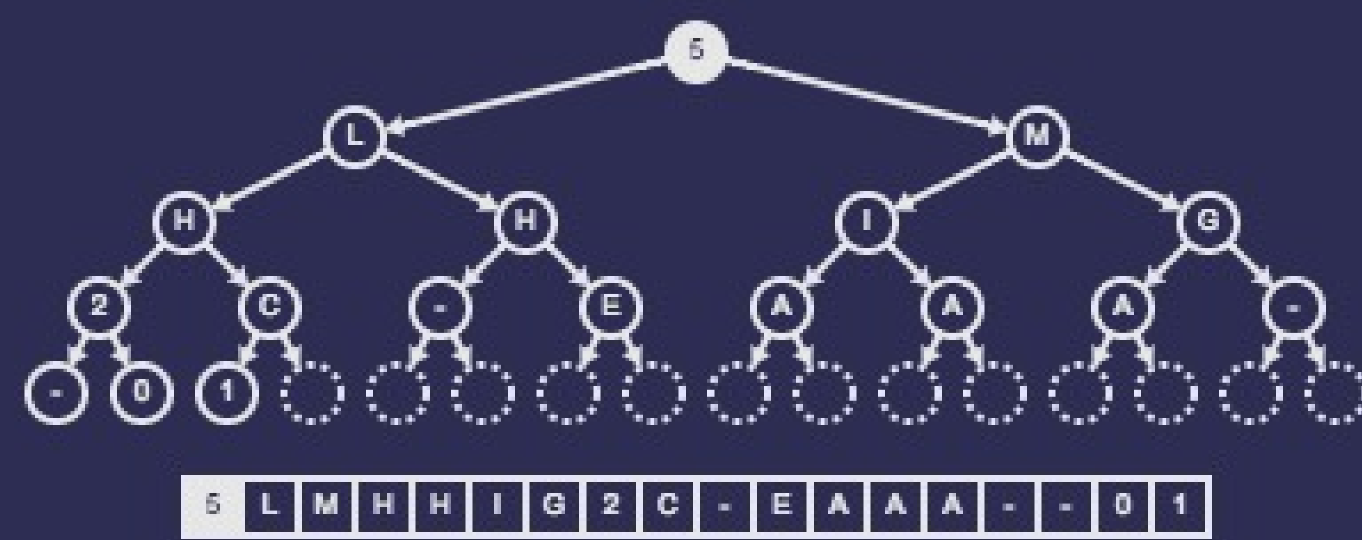
M, O,
O, P,
R, R,
S, S,
T, T

Step 3. Find the last node

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

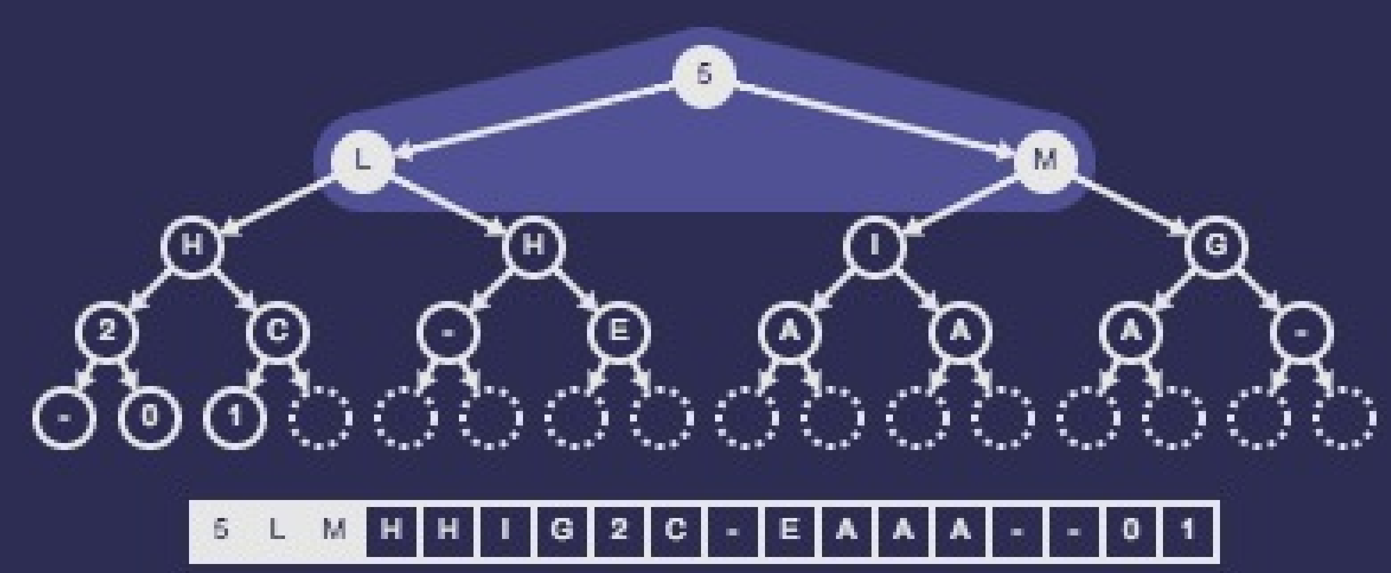
M, O,
O, P,
R, R,
S, S,
T, T

Step 4. Move the last node to the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

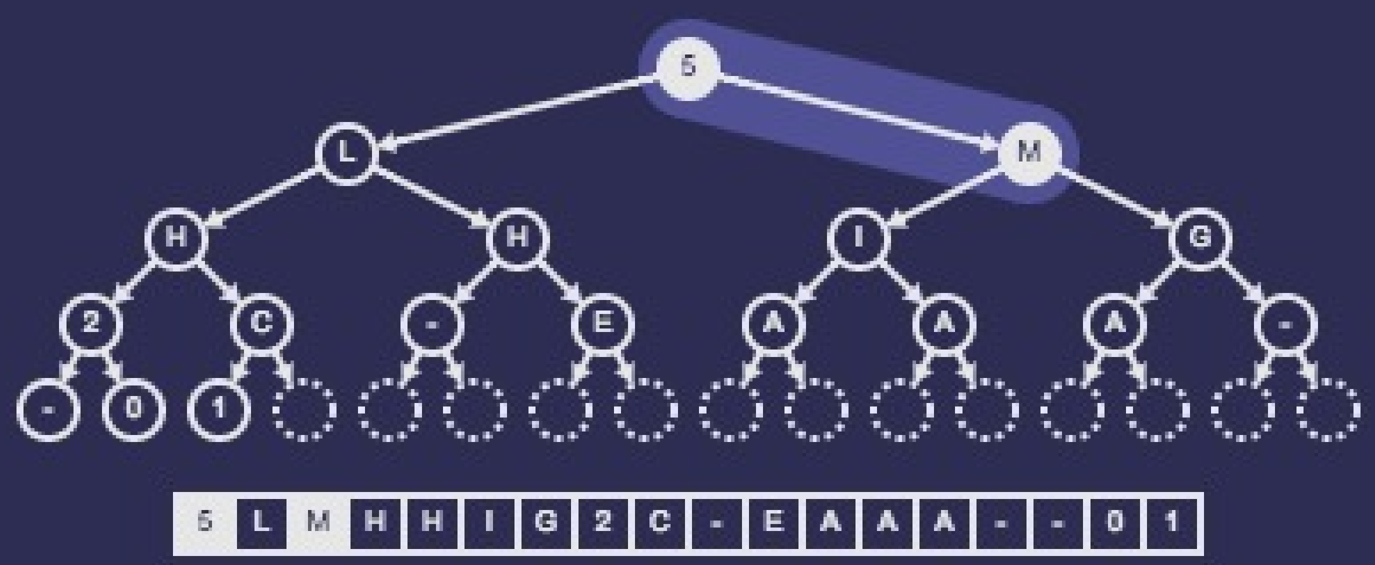
M, O,
O, P,
R, R,
S, S,
T, T

Step 5. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

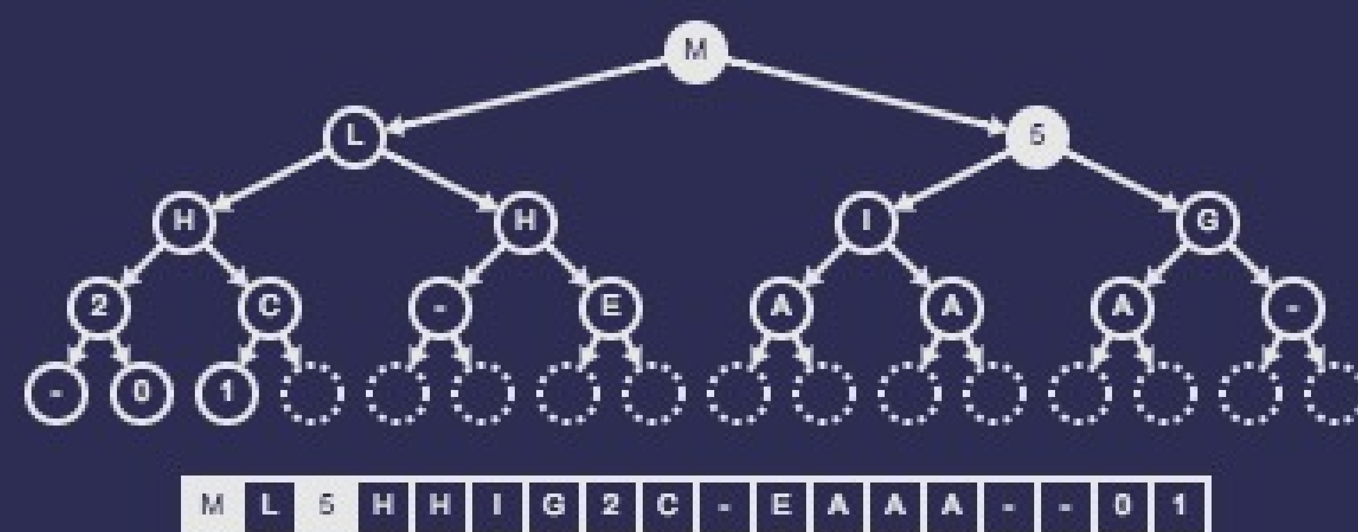
M, O,
O, P,
R, R,
S, S,
T, T

Step 6. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

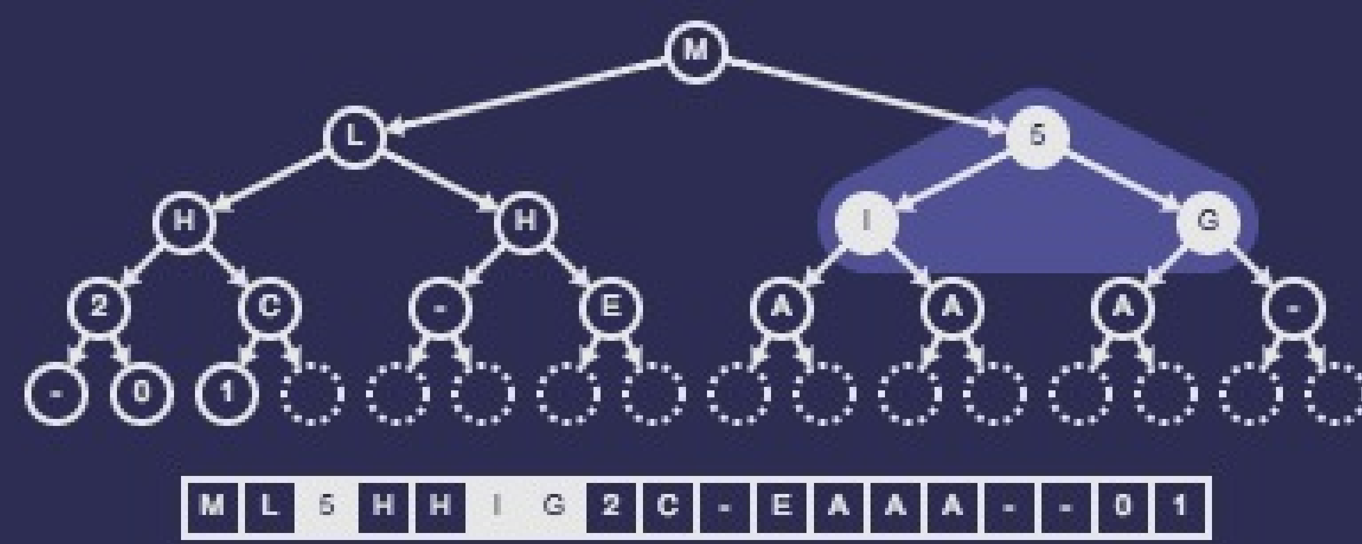
M, O,
O, P,
R, R,
S, S,
T, T

Step 6. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

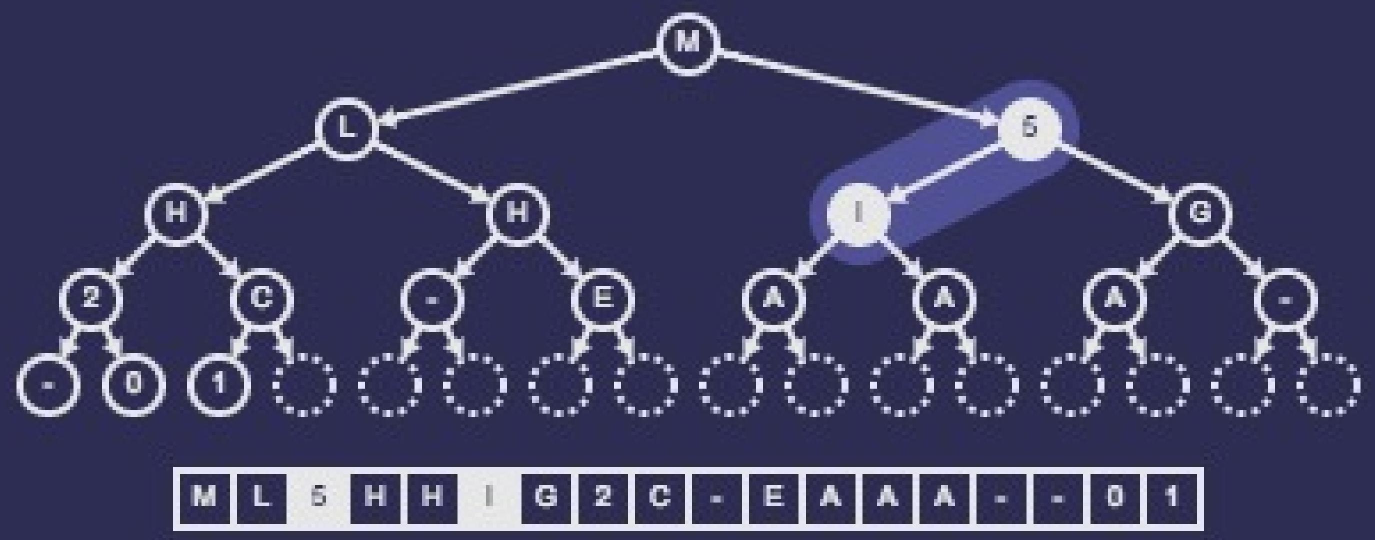
M, O,
O, P,
R, R,
S, S,
T, T

Step 6. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

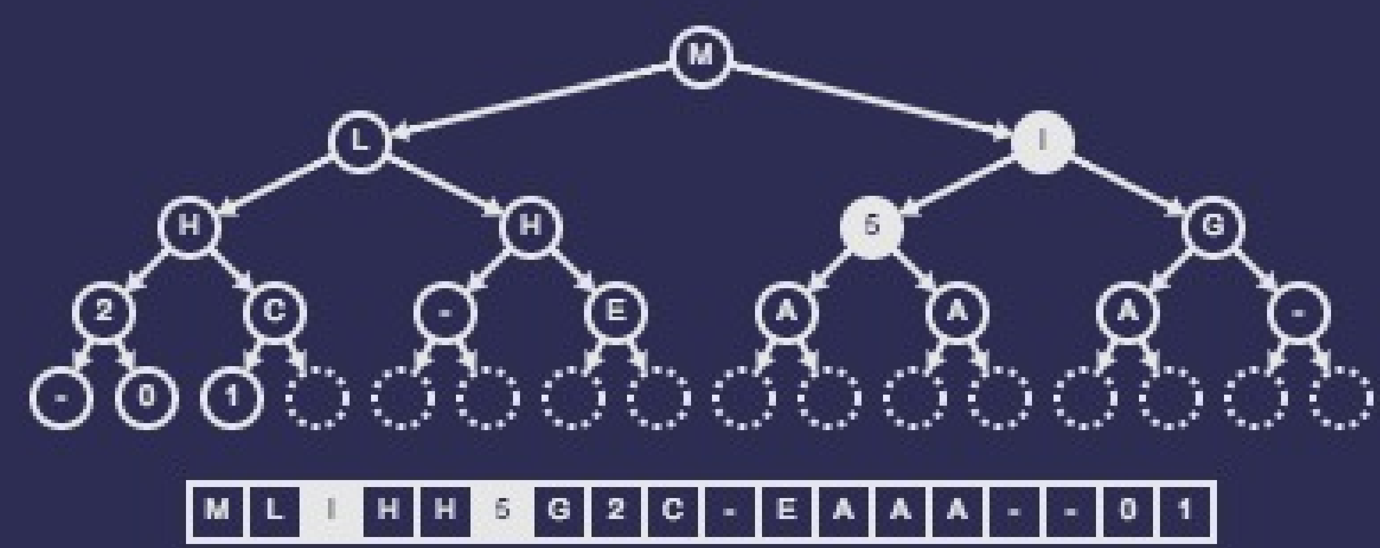
M, O,
O, P,
R, R,
S, S,
T, T

Step 7. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

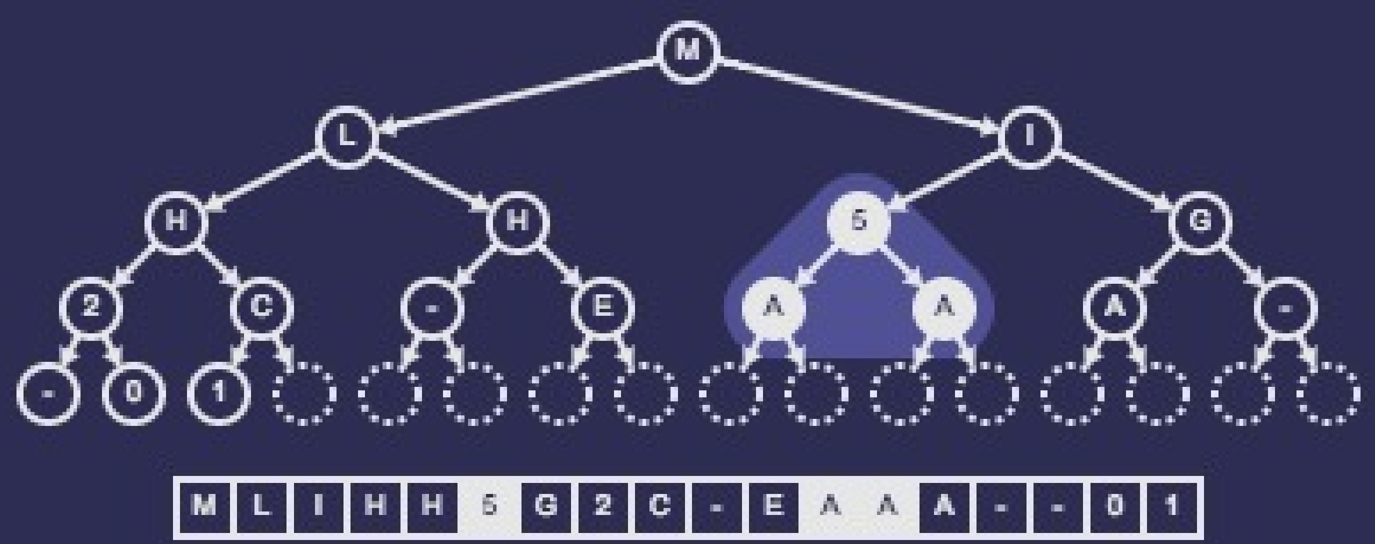
M, O,
O, P,
R, R,
S, S,
T, T

Step 7. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

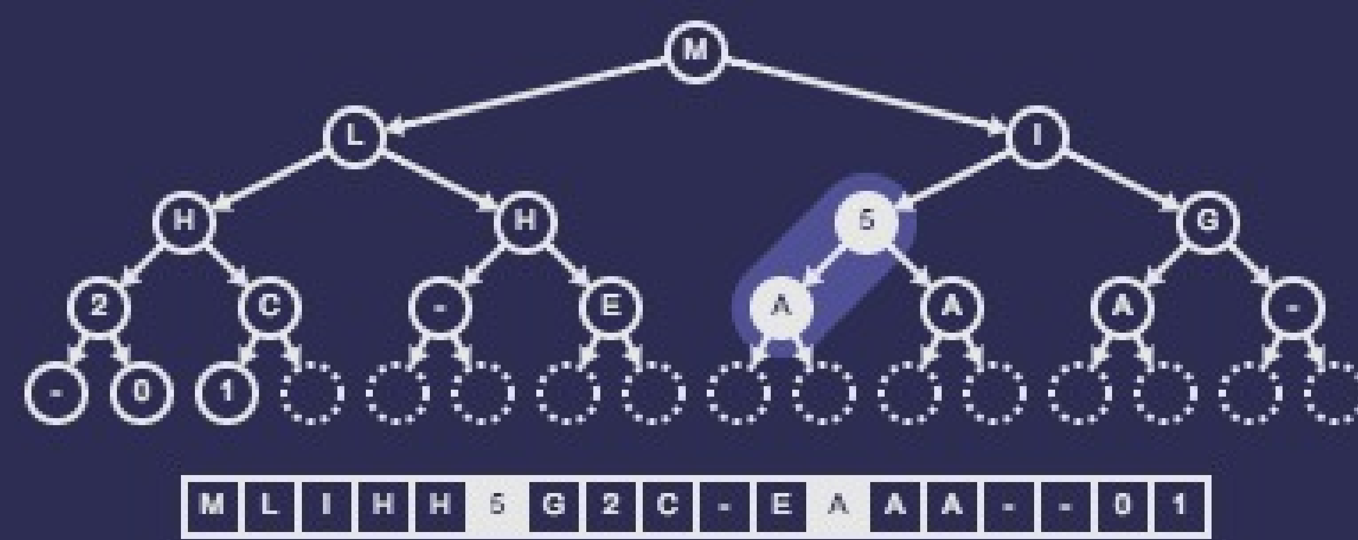
M, O,
O, P,
R, R,
S, S,
T, T

Step 7. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

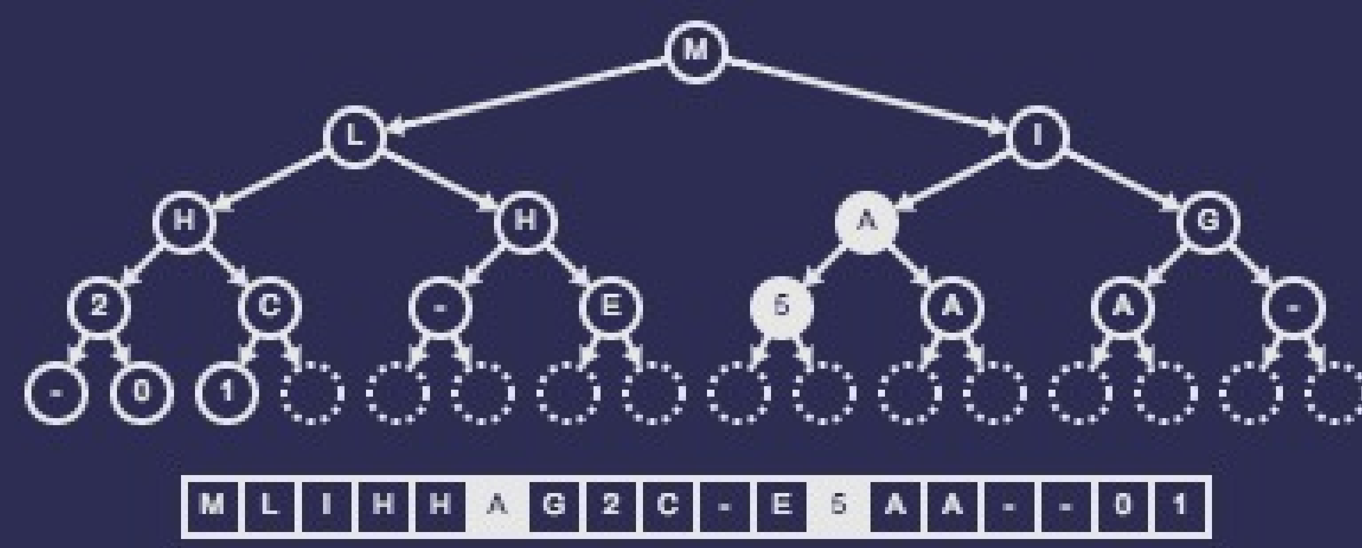
M, O,
O, P,
R, R,
S, S,
T, T

Step 8. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

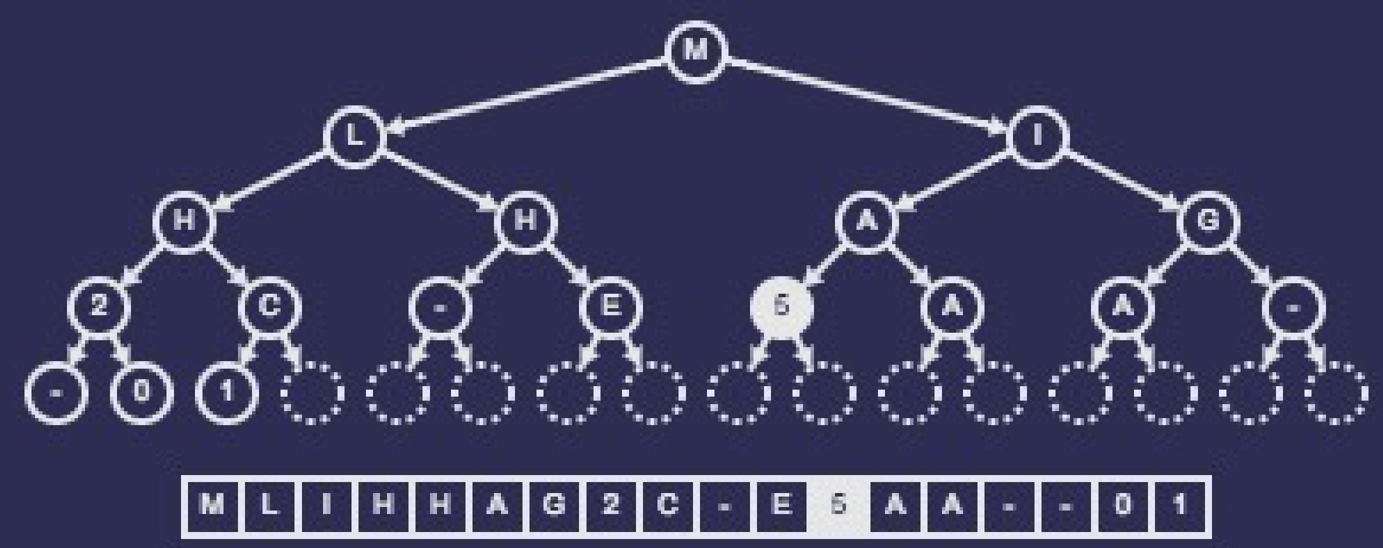
M, O,
O, P,
R, R,
S, S,
T, T

Step 8. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

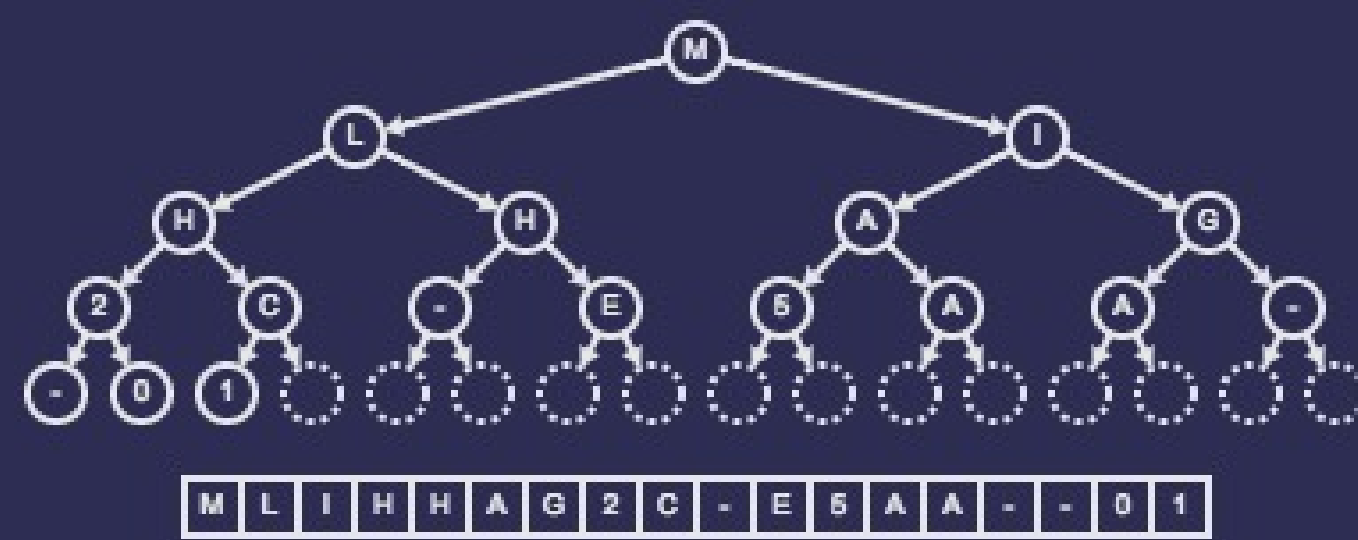
M, O,
O, P,
R, R,
S, S,
T, T

Step 8. It has no children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

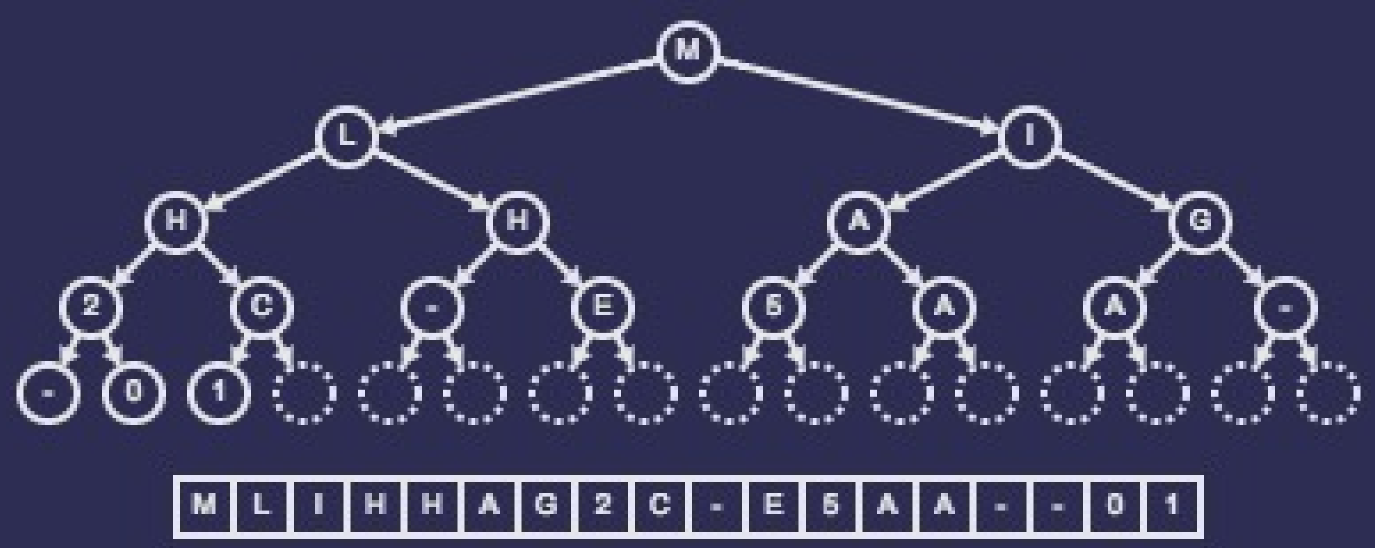
M, O,
O, P,
R, R,
S, S,
T, T

Step 8. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

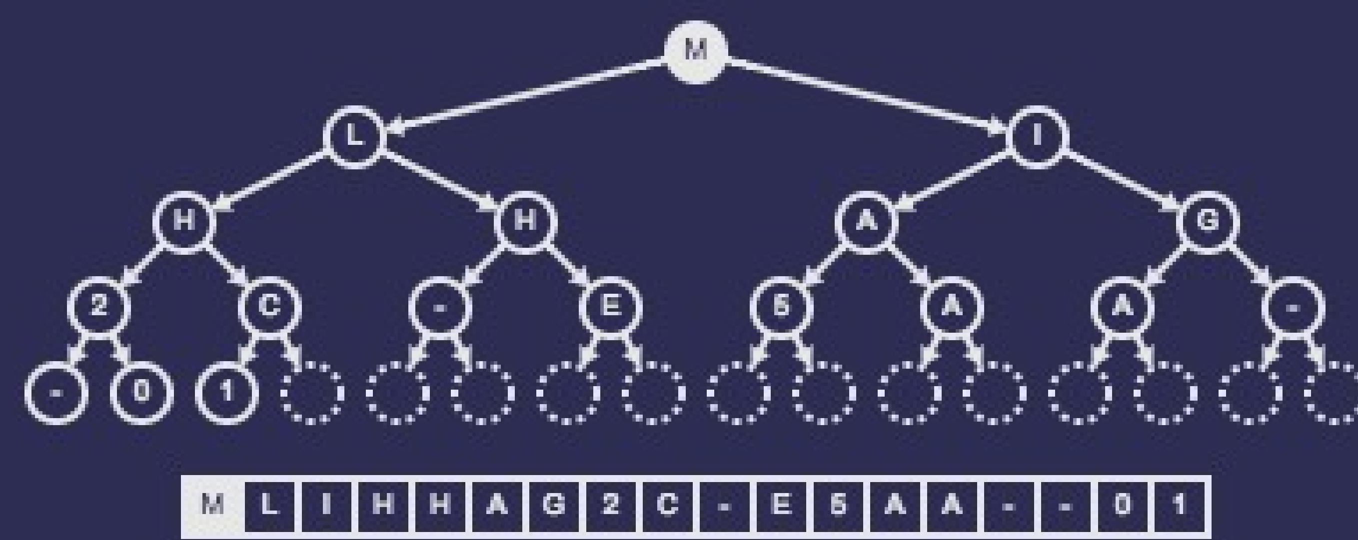
M, O,
O, P,
R, R,
S, S,
T, T

Removing the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

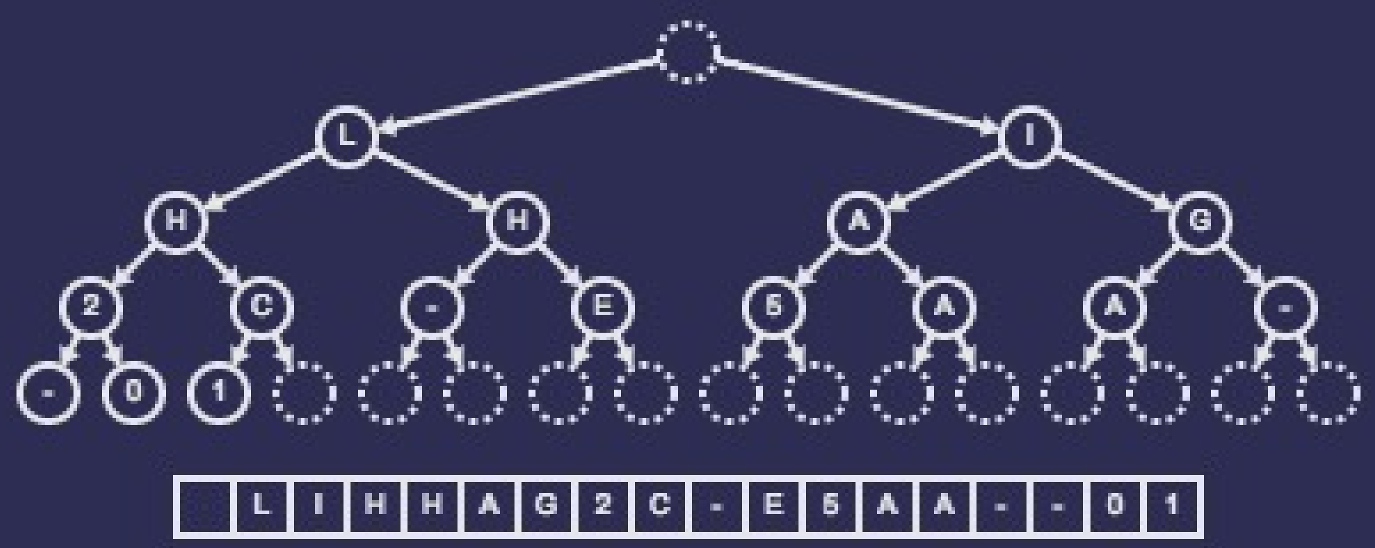
M, O,
O, P,
R, R,
S, S,
T, T

Step 1. Find the root of the heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

M

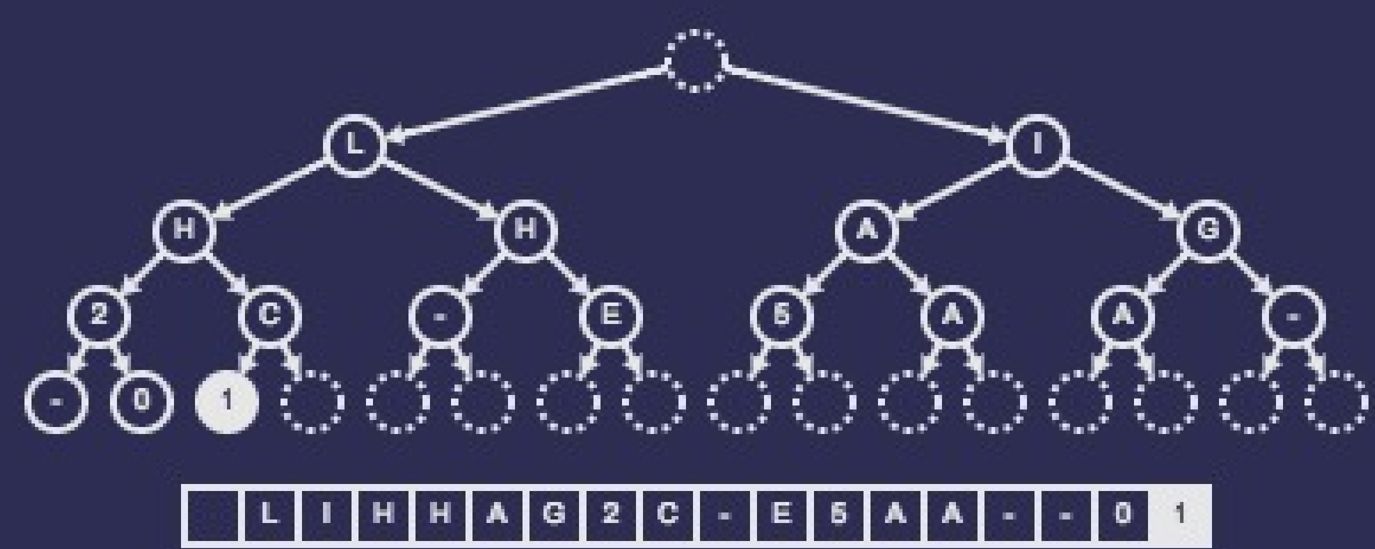
M, O,
O, P,
R, R,
S, S,
T, T

Step 2. Output the value of the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

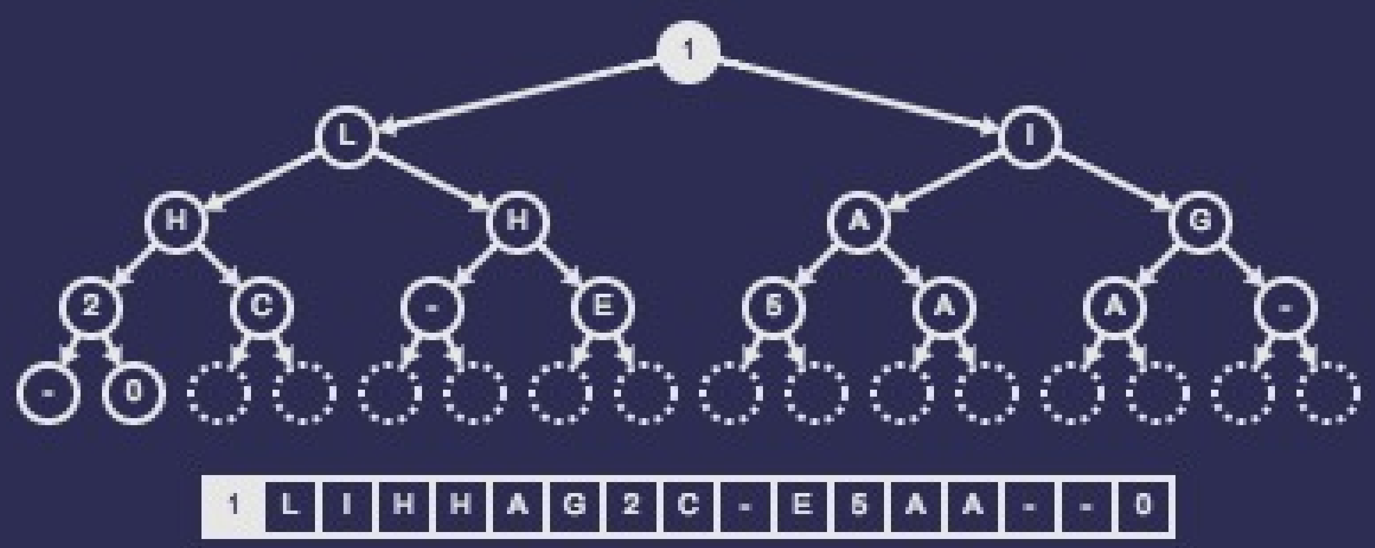
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 3. Find the last node

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

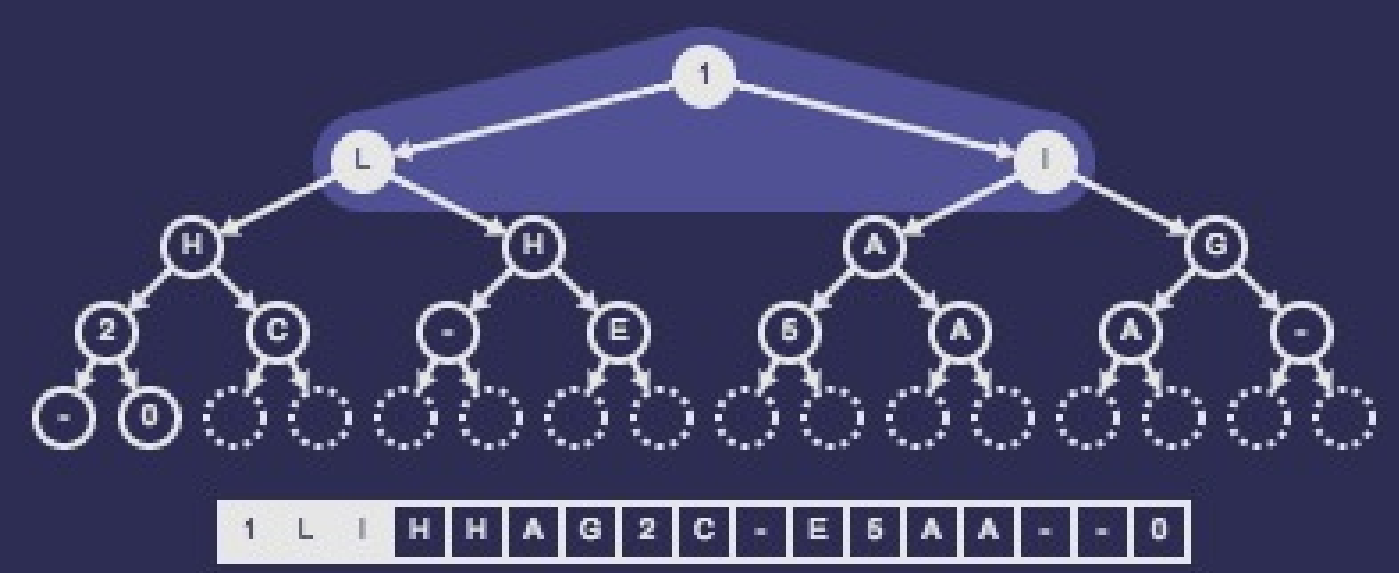
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 4. Move the last node to the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

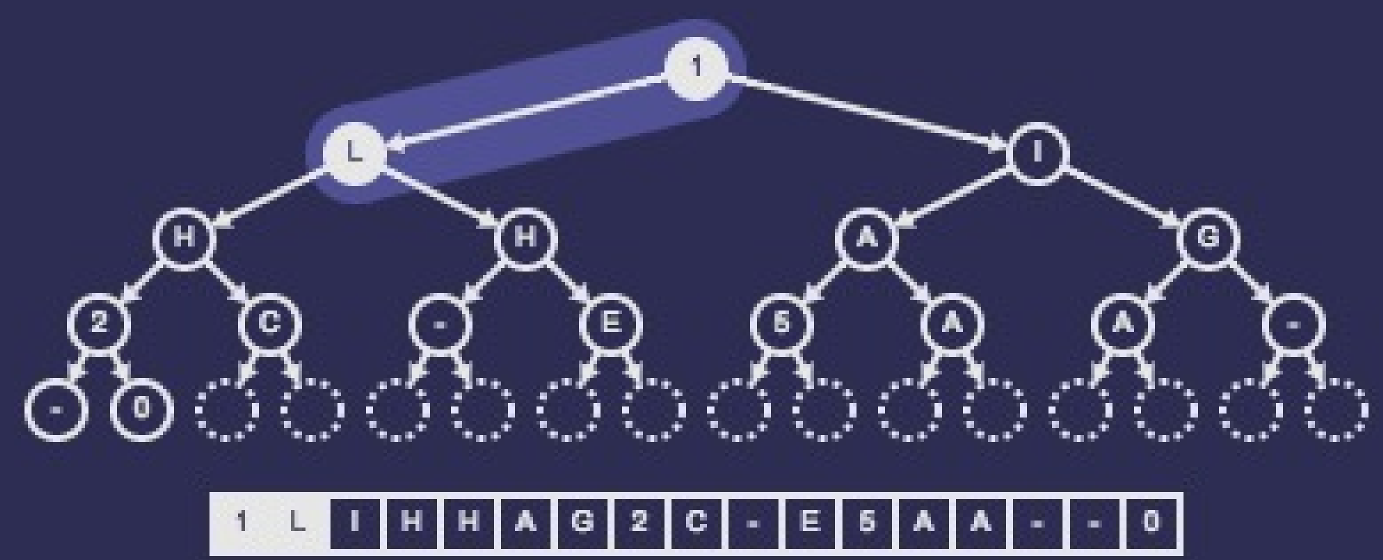
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 5. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

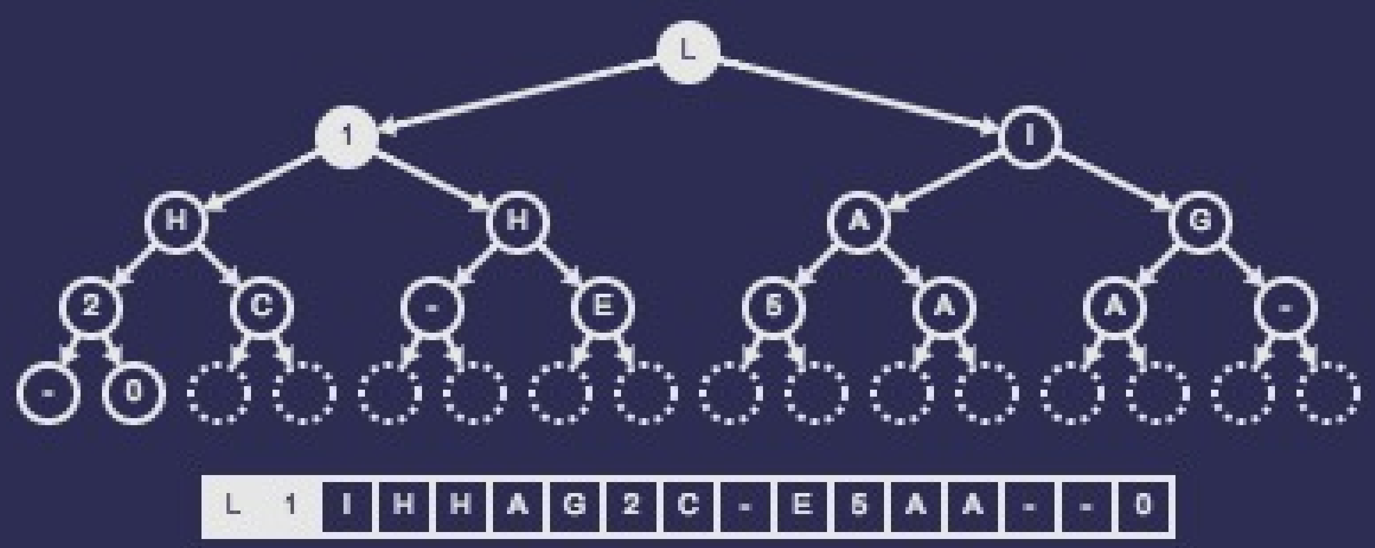
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 6. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

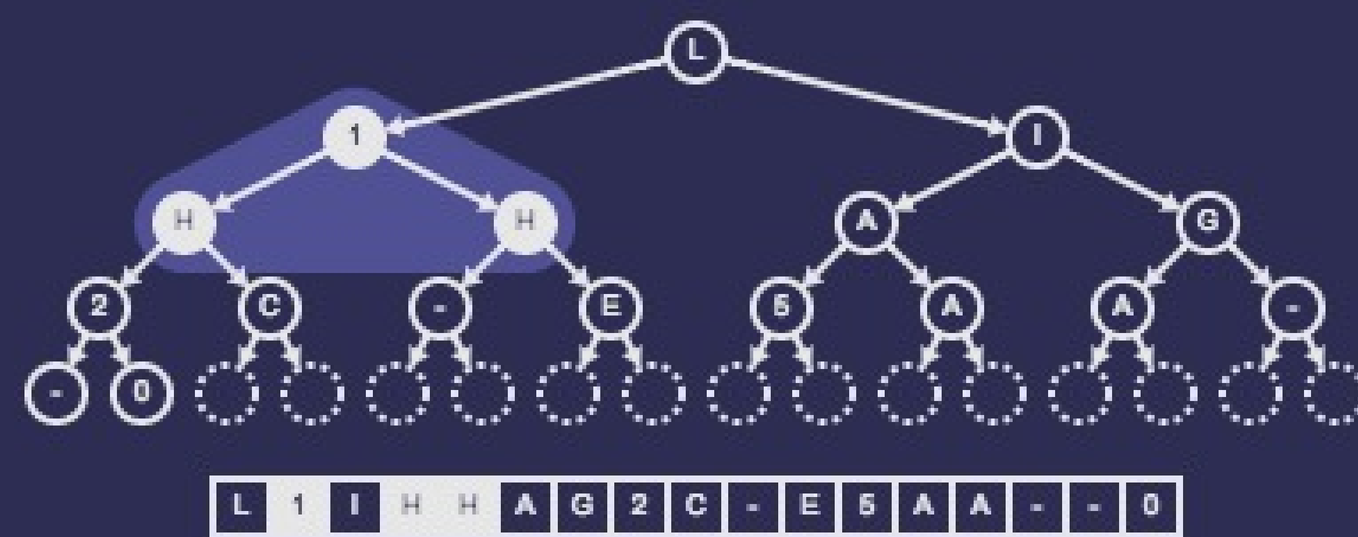
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 6. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

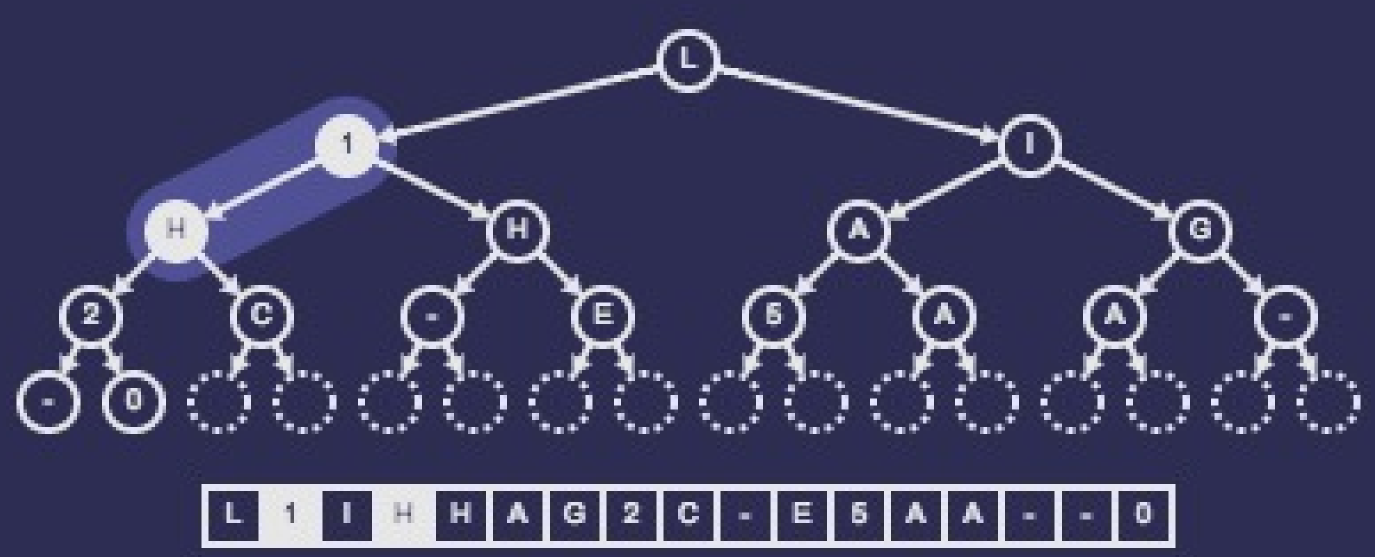
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 6. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

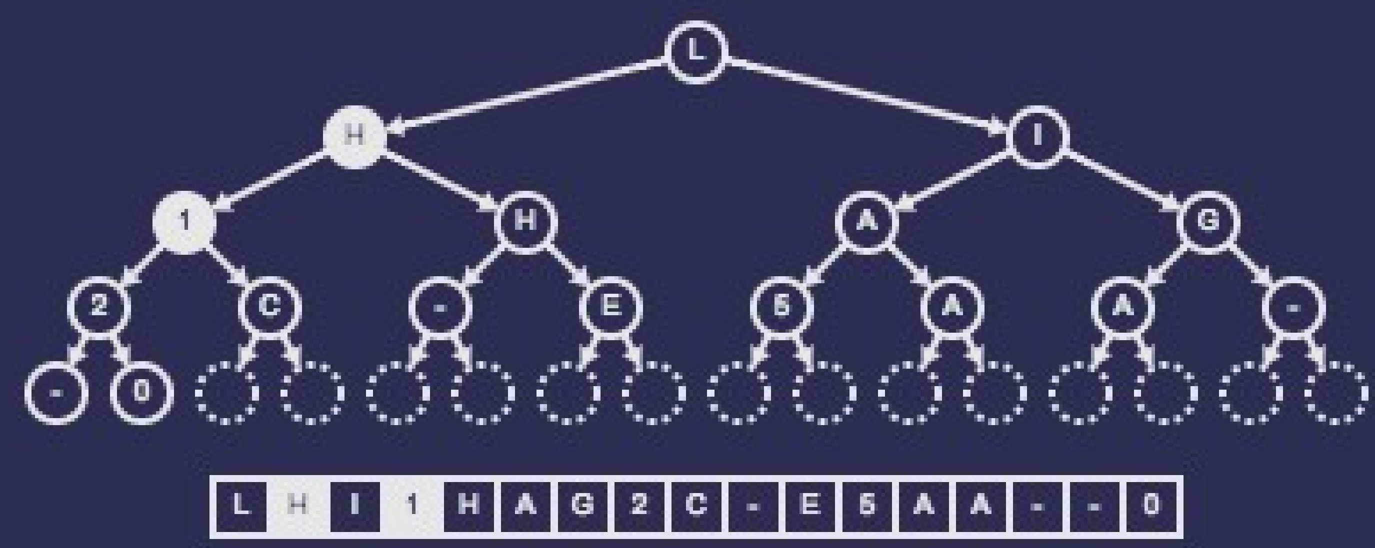
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 7. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

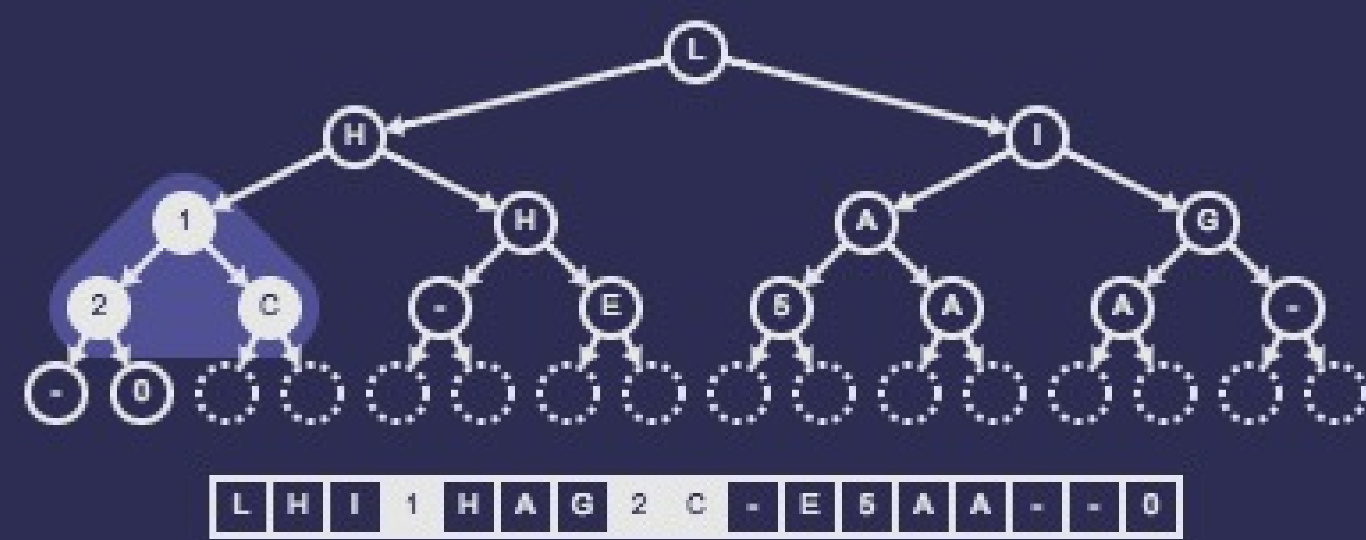
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 7. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

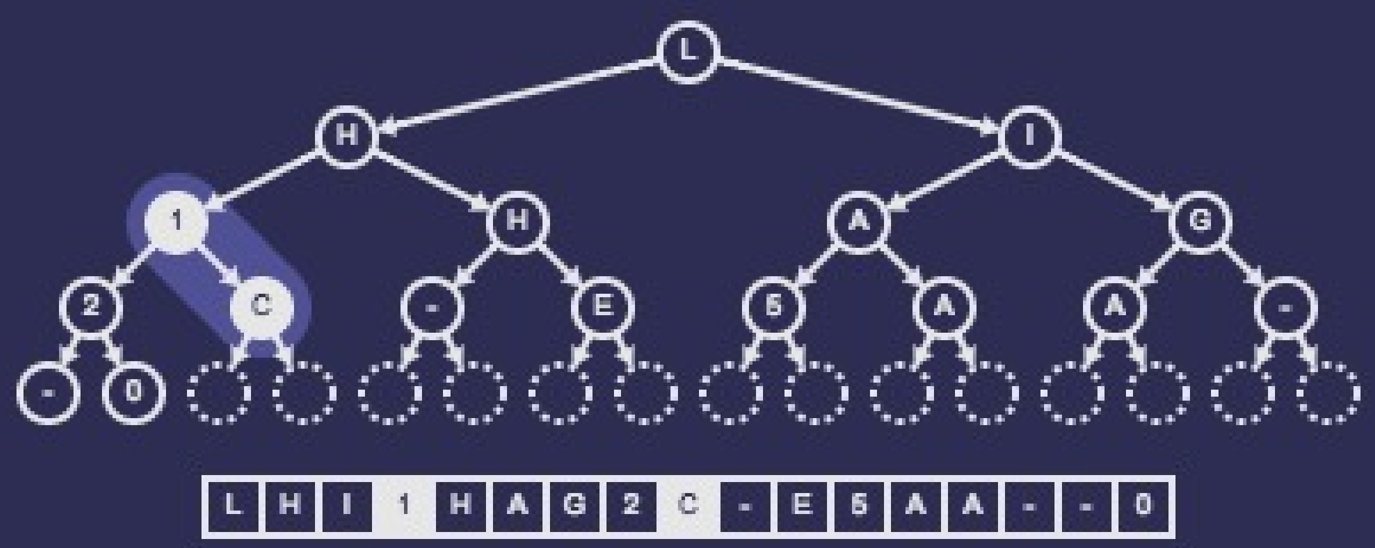
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 7. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

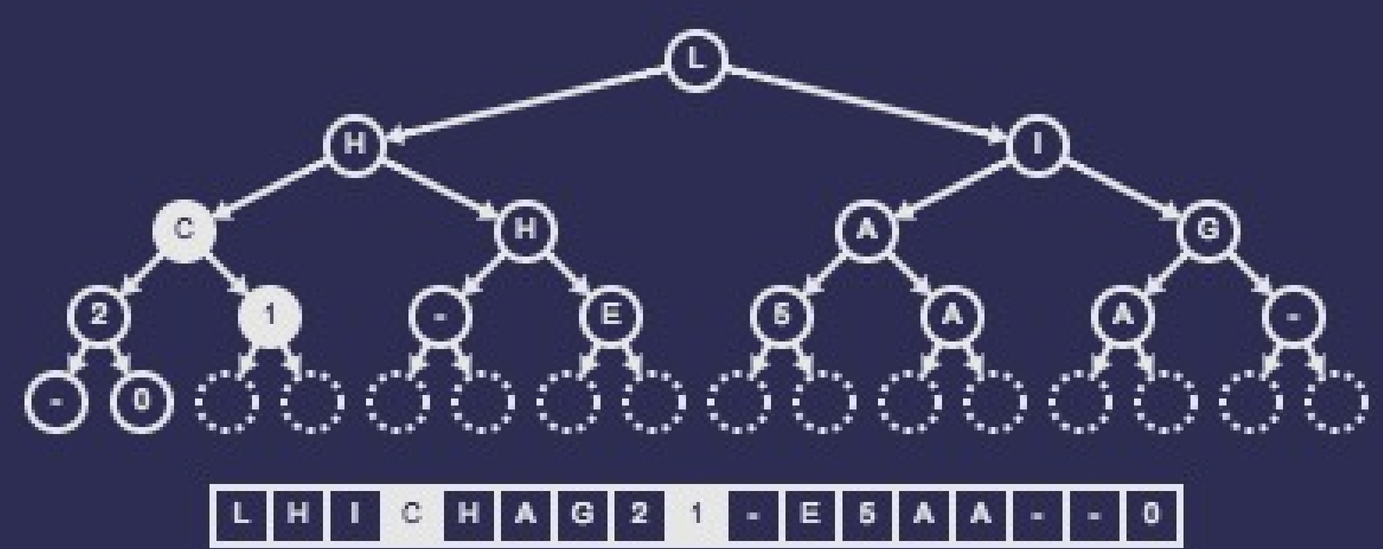
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 8. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

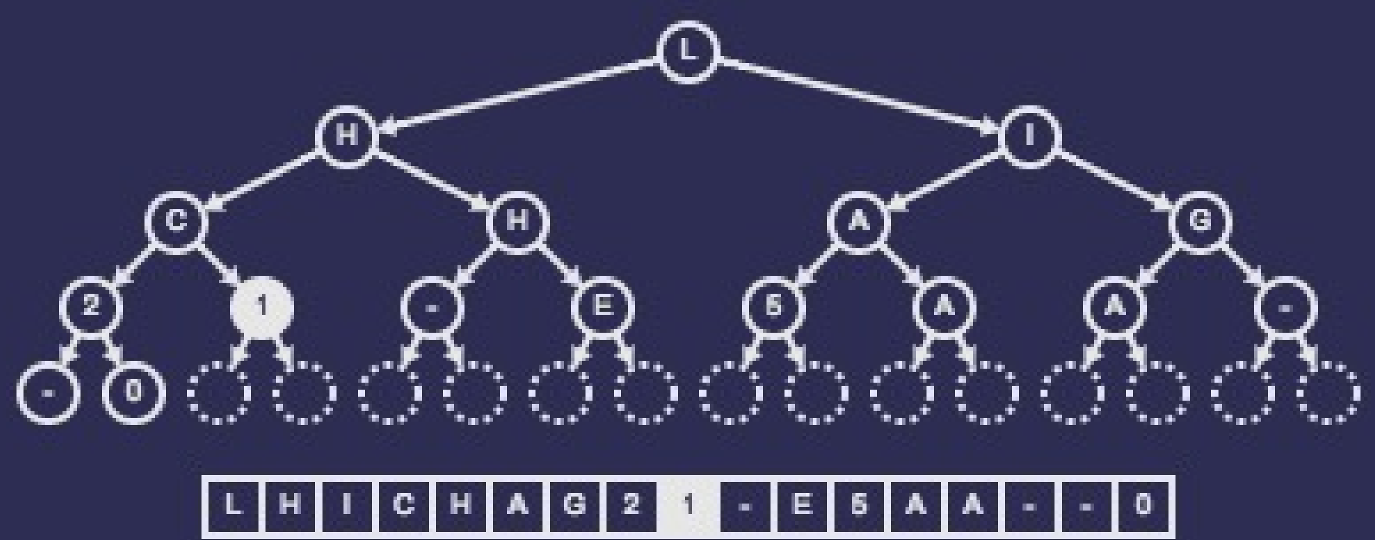
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 8. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

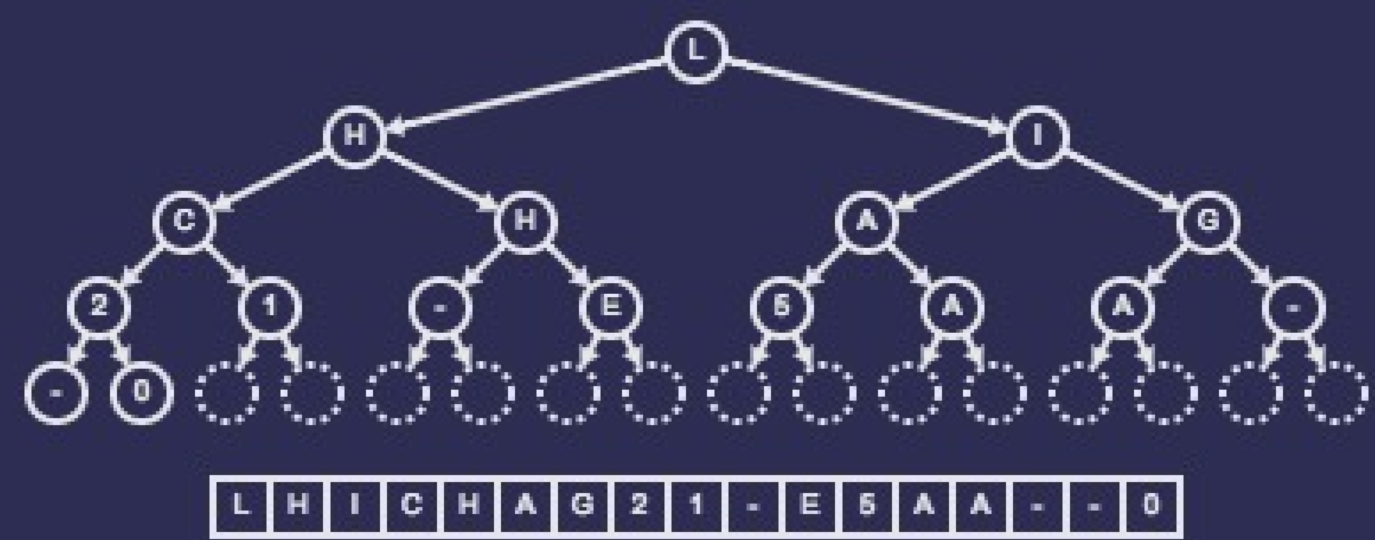
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 8. It has no children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

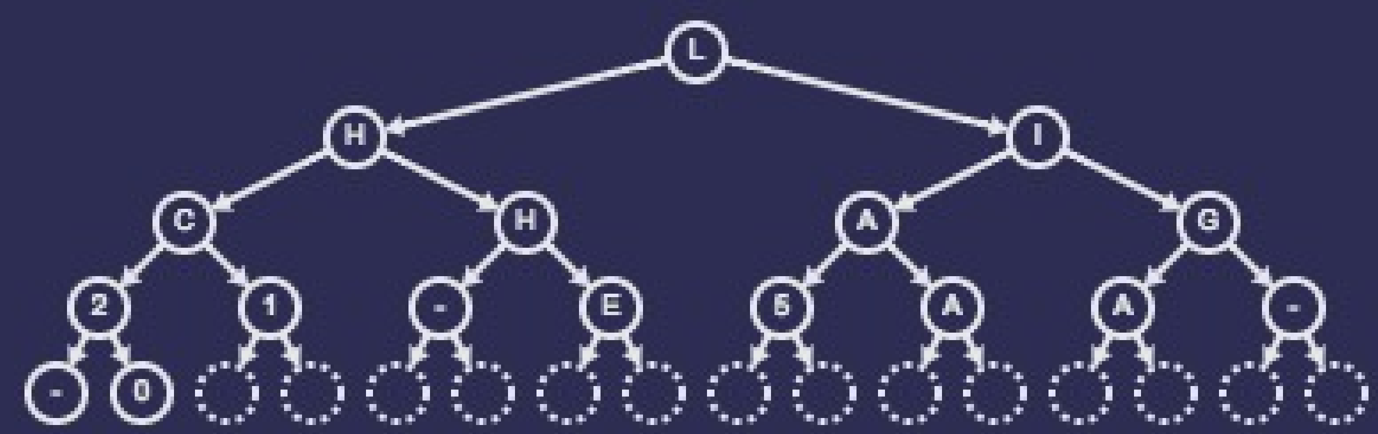
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 8. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



L	H	I	C	H	A	G	2	1	-	E	5	A	A	-	-	0

OUTPUT

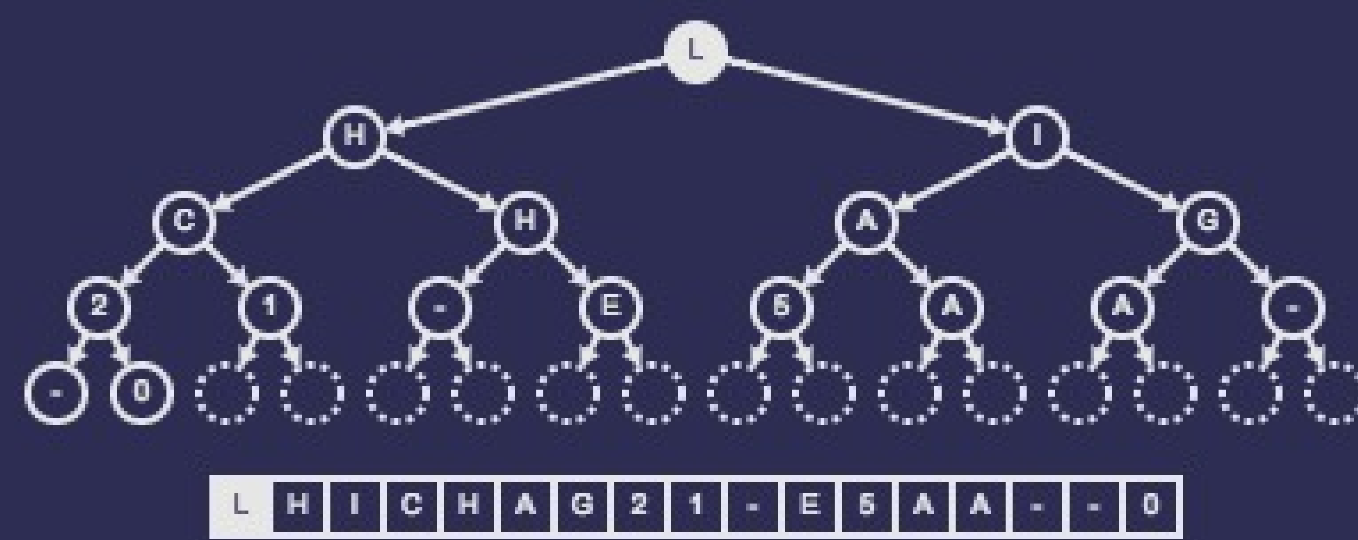
M, M,
O, O,
P, R,
R, S,
S, T,
T

Removing the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

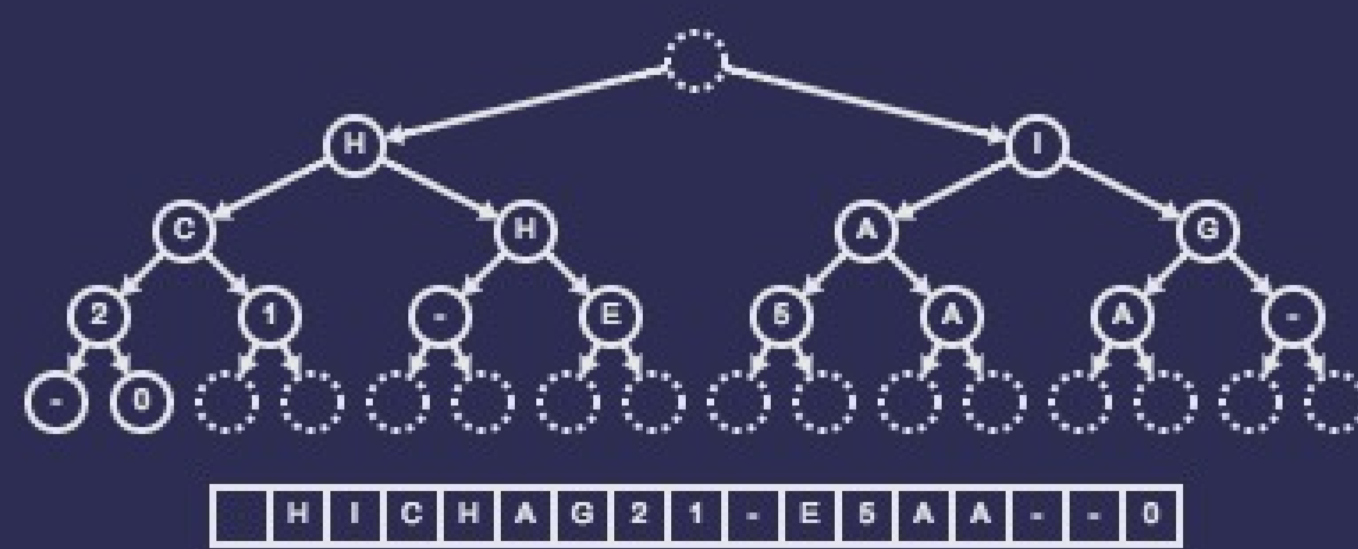
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 1. Find the root of the heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

L

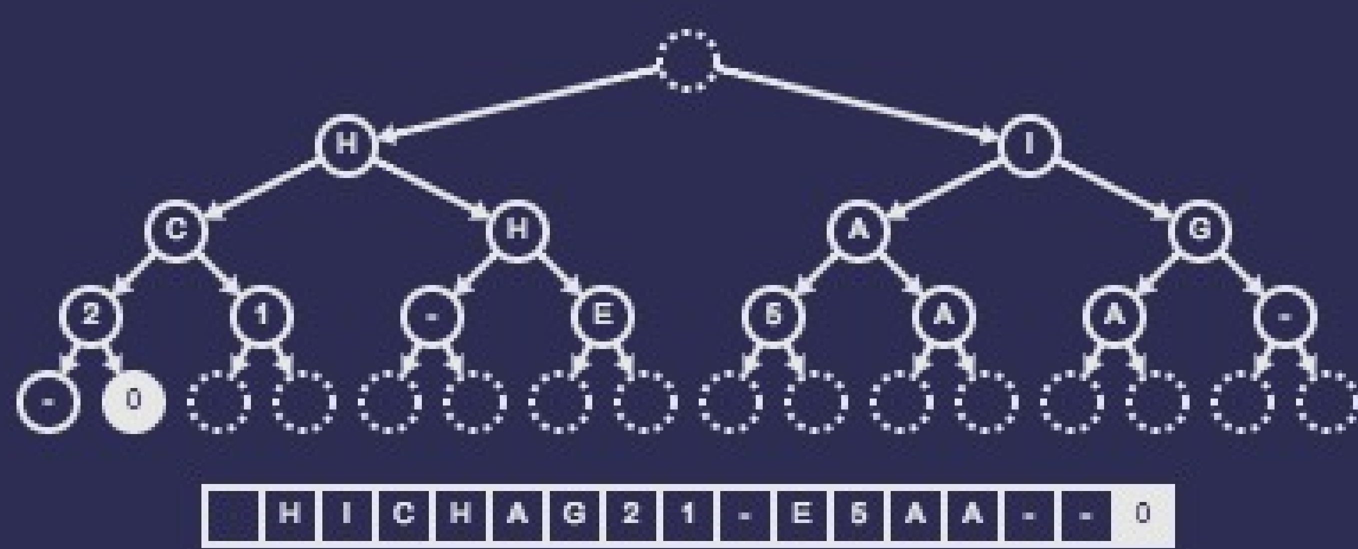
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 2. Output the value of the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

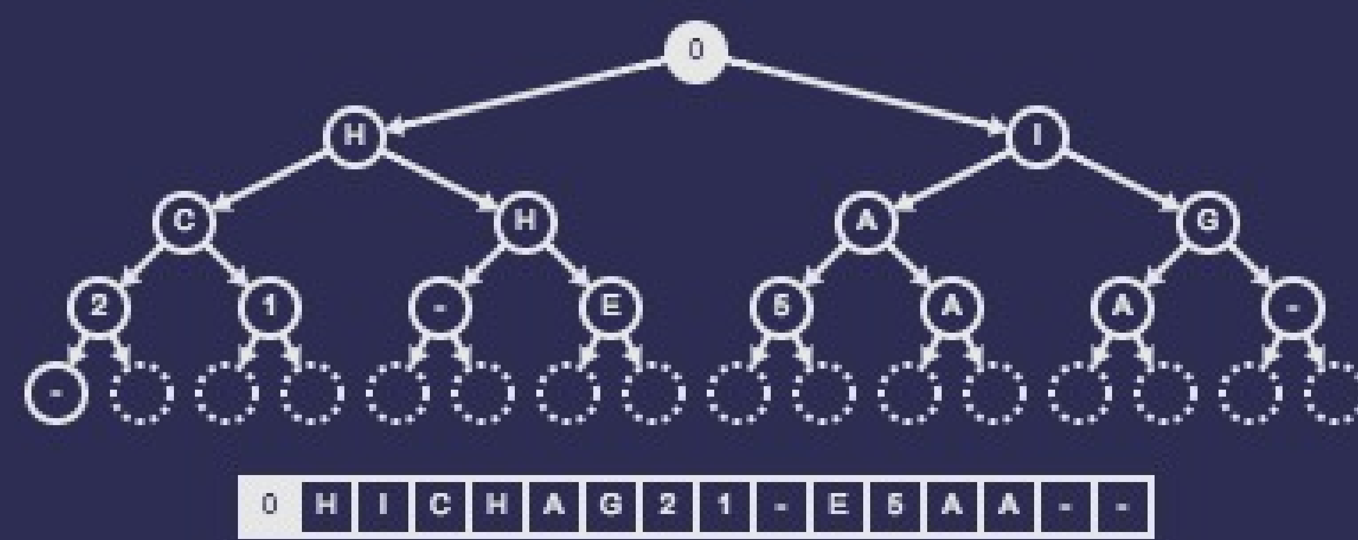
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 3. Find the last node

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

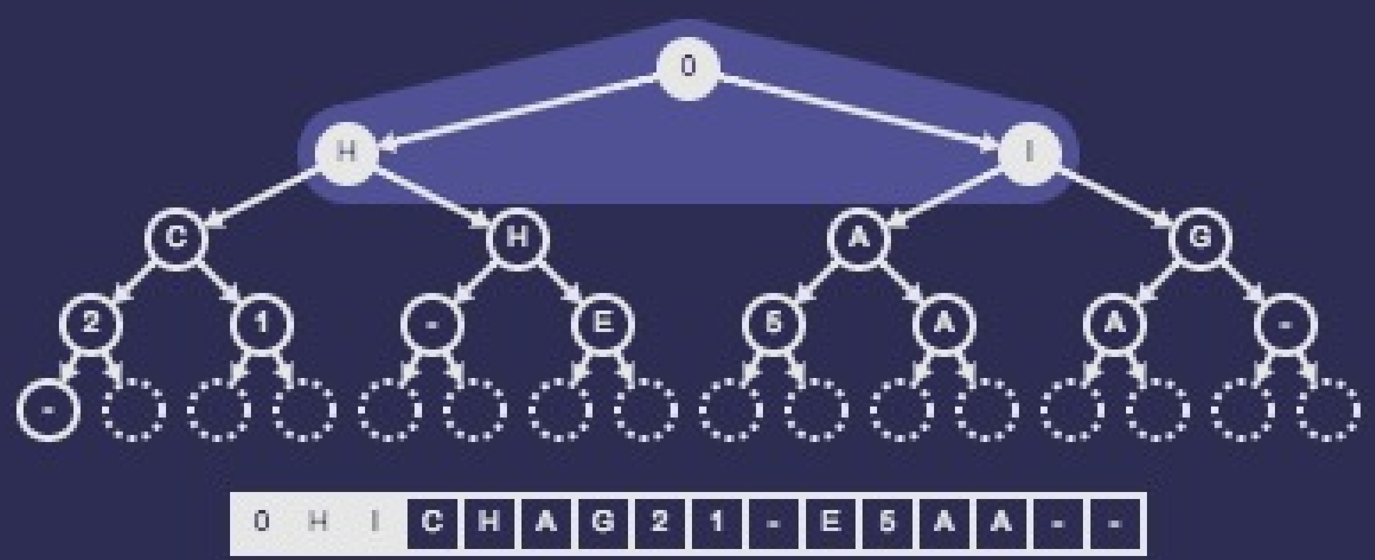
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 4. Move the last node to the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

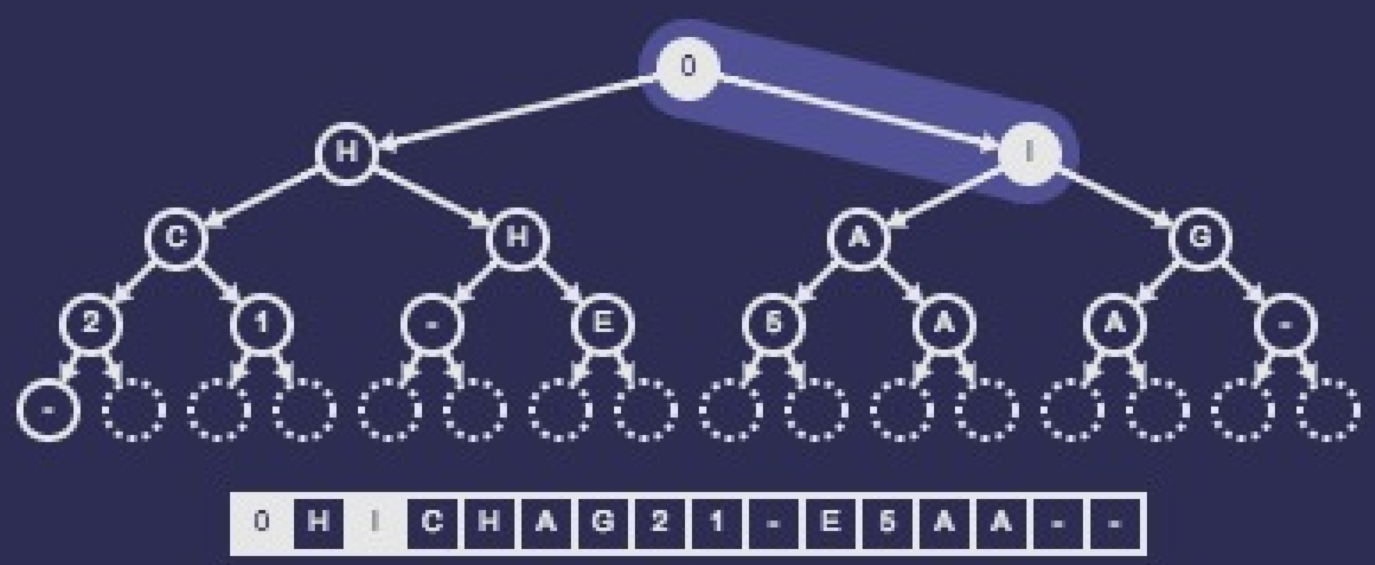
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 5. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

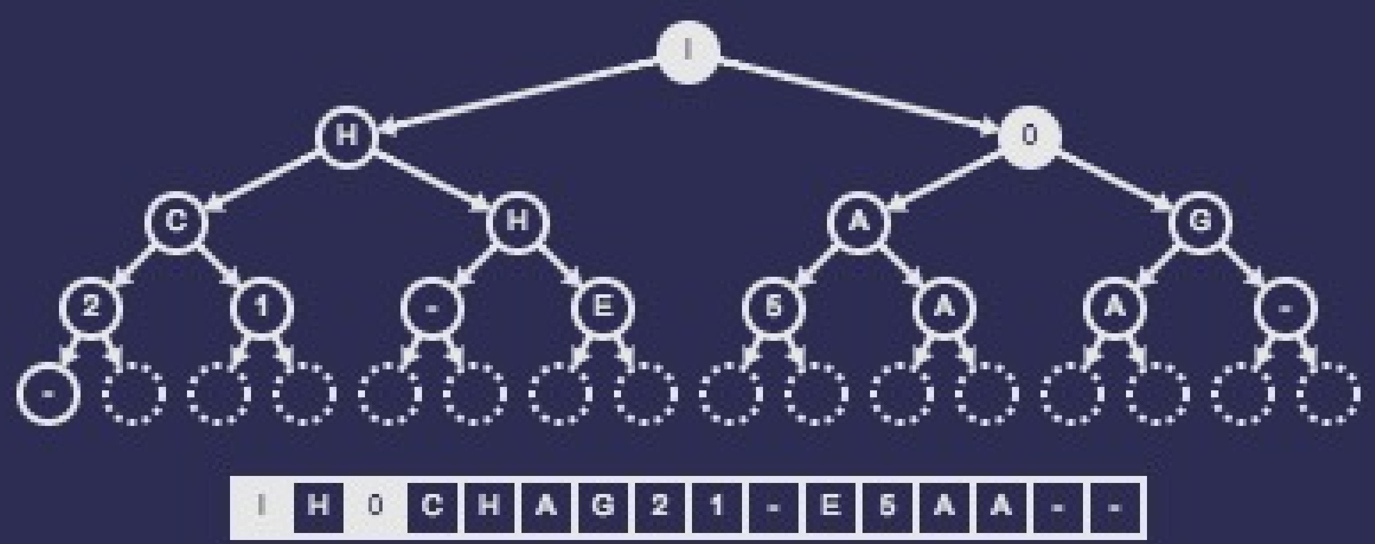
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 6. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

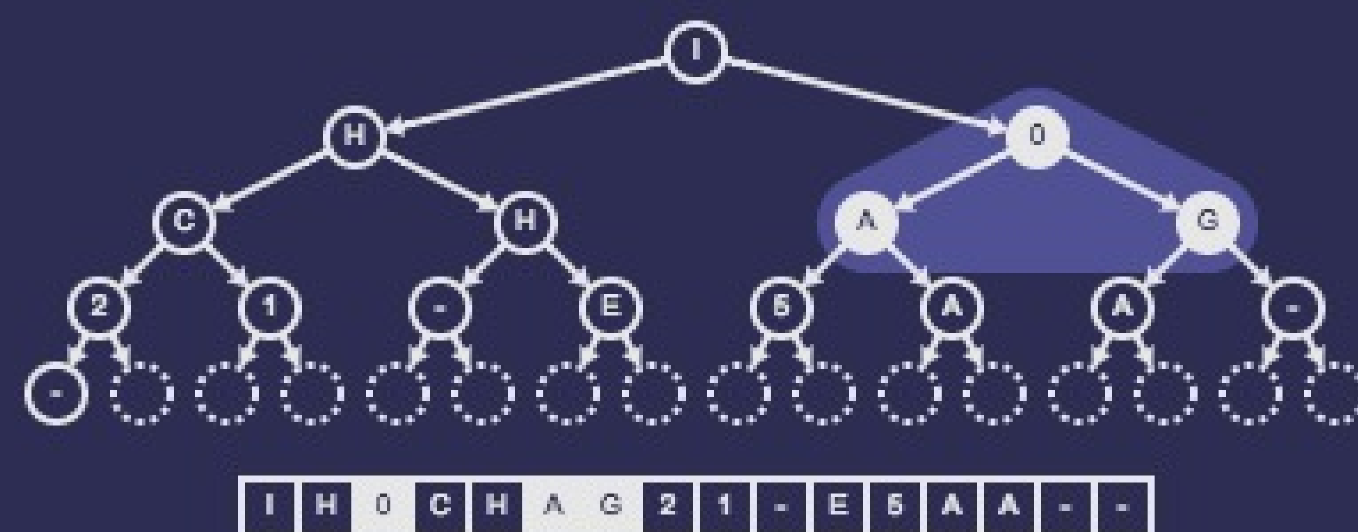
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 6. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

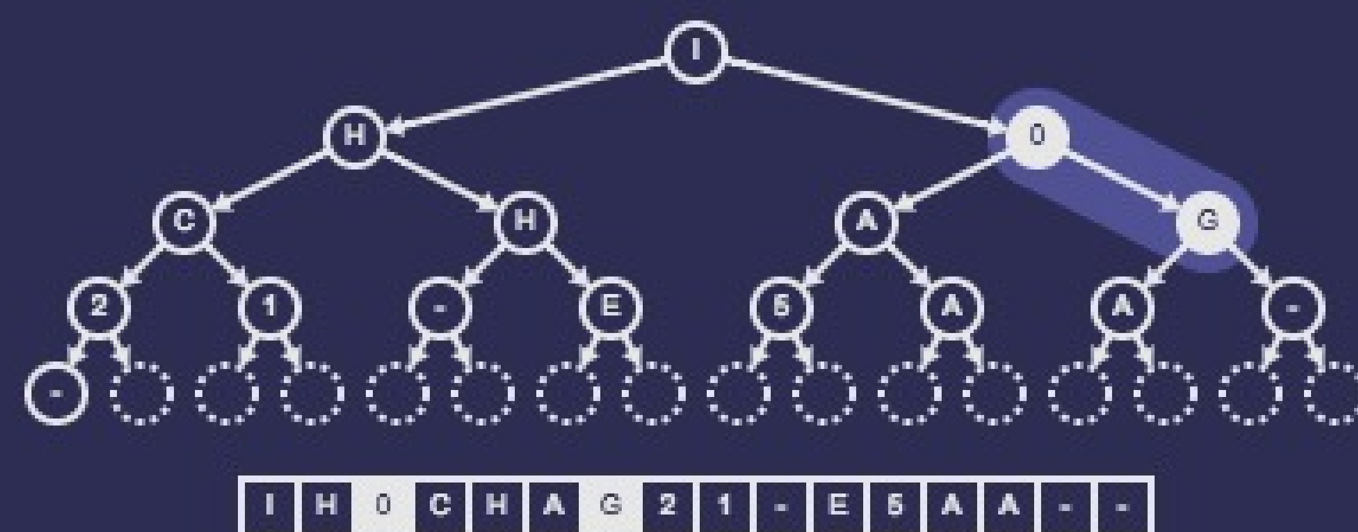
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 6. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

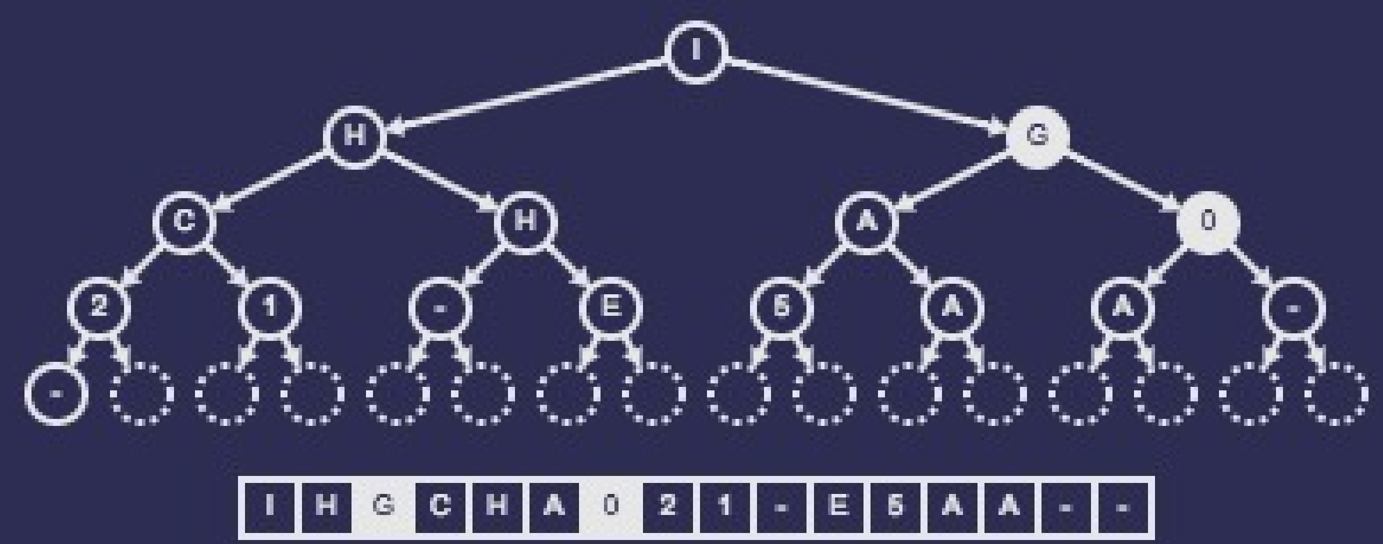
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 7. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

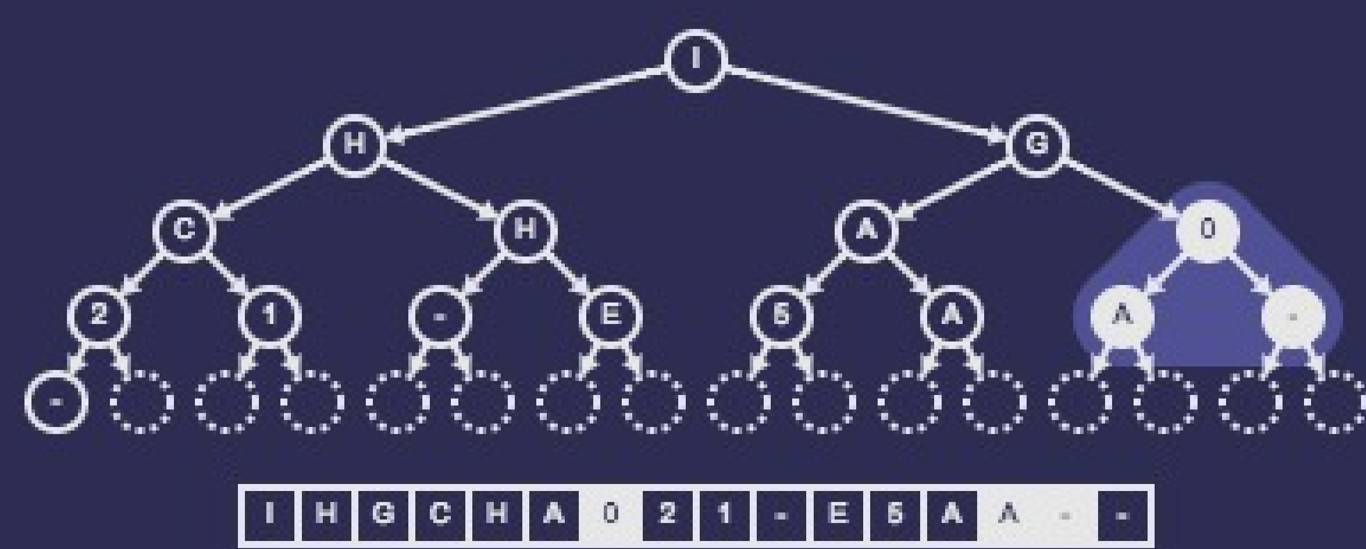
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 7. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

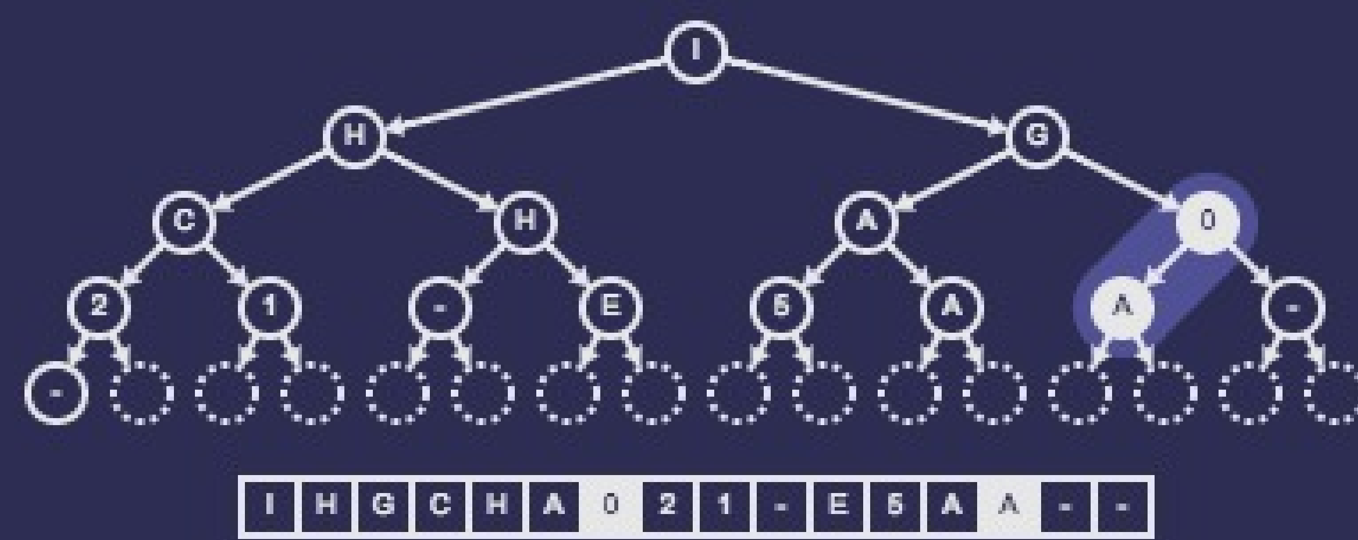
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 7. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

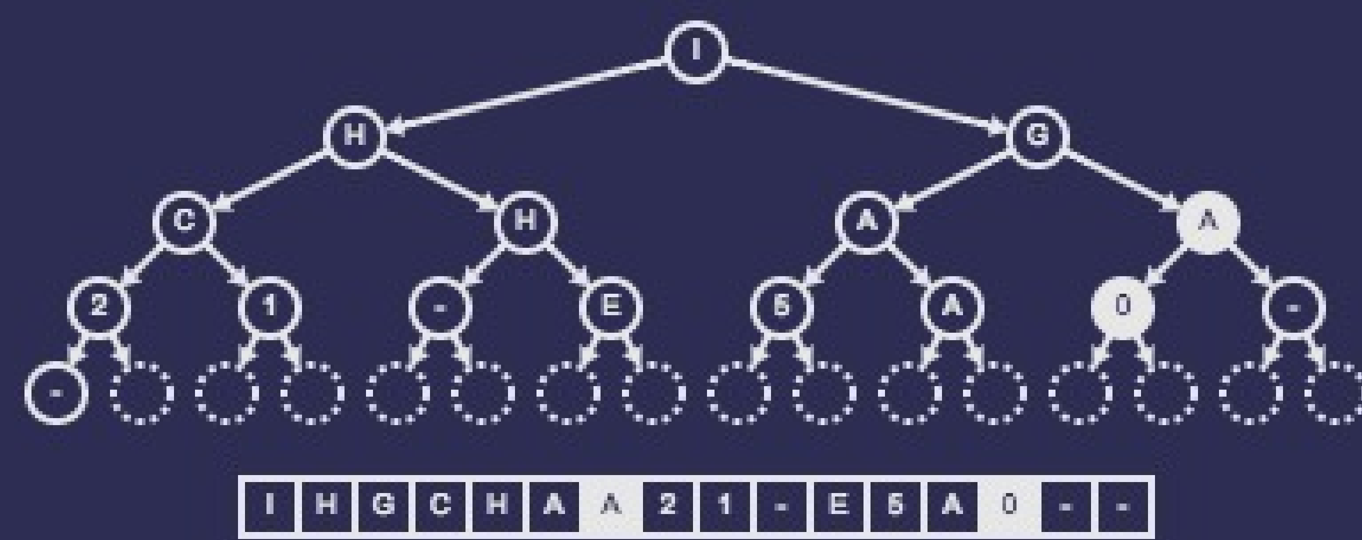
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 8. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

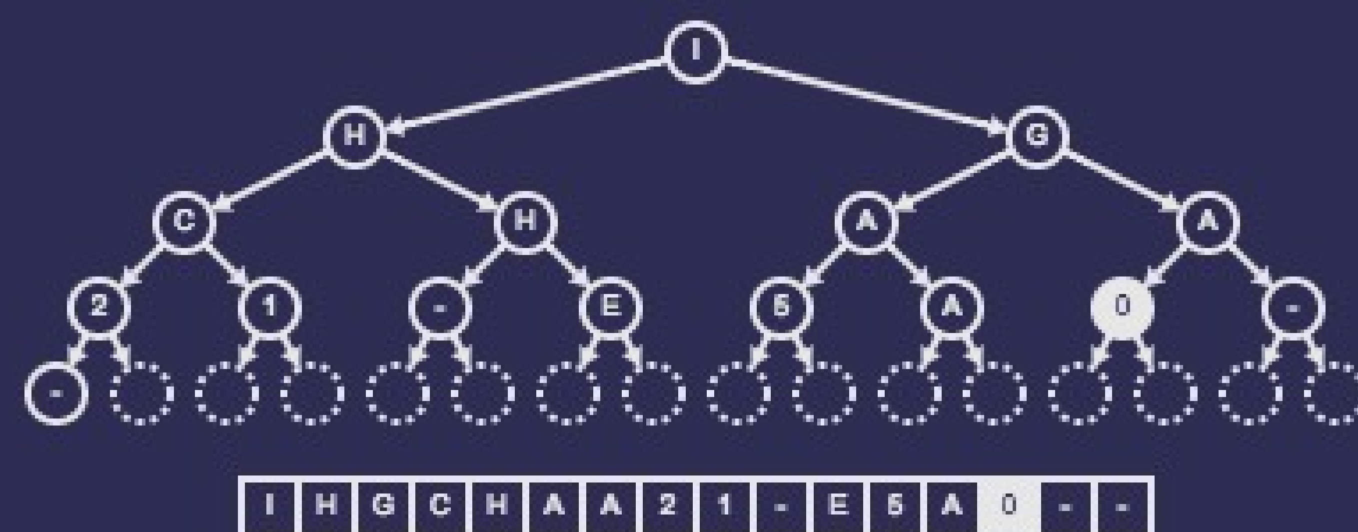
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 8. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

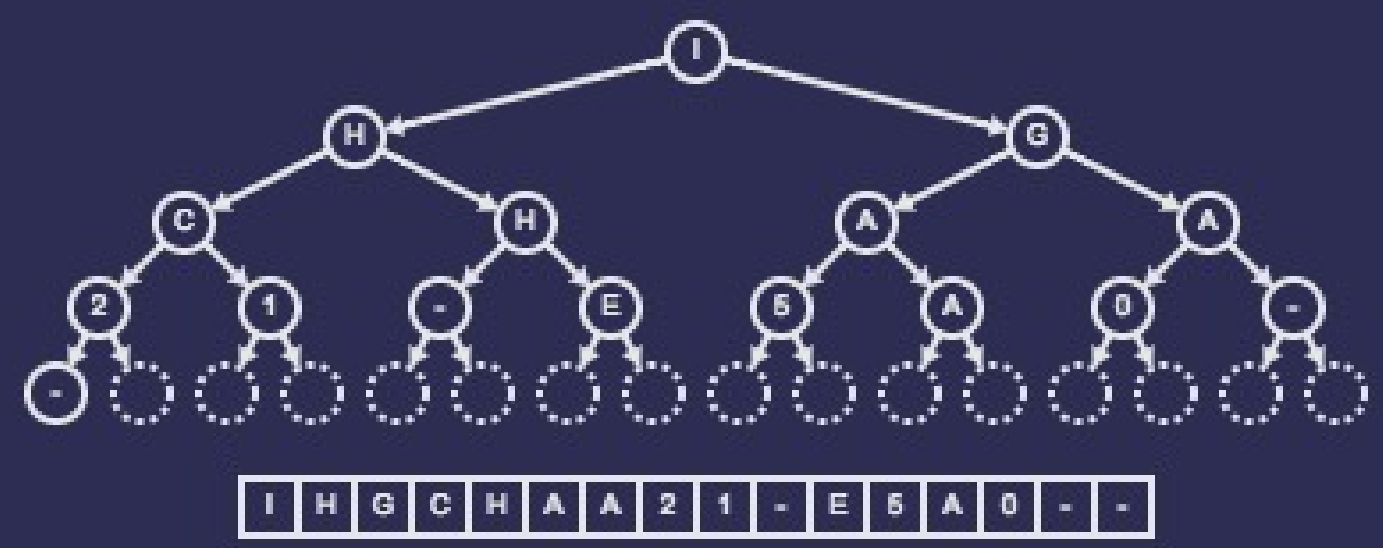
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 8. It has no children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

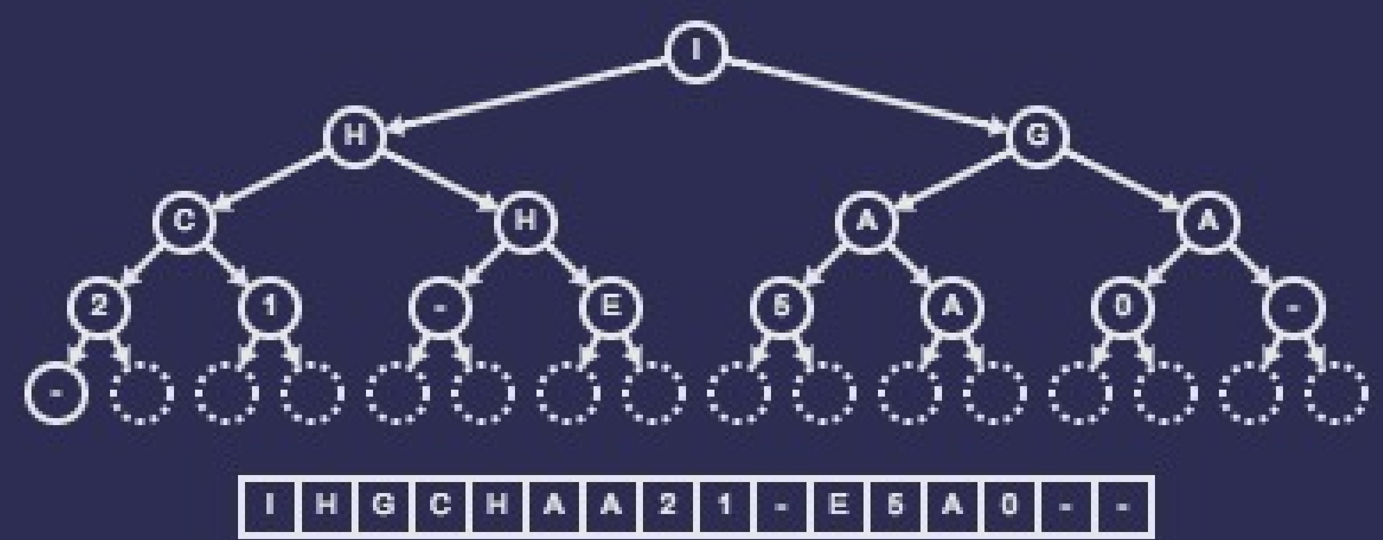
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 8. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

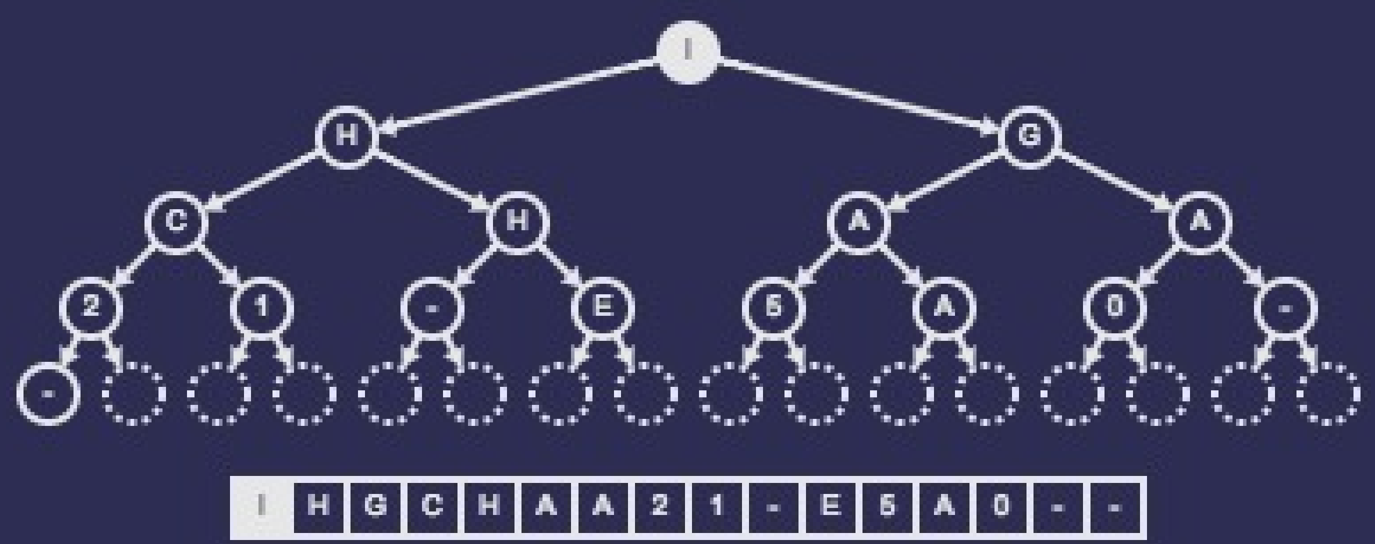
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Removing the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

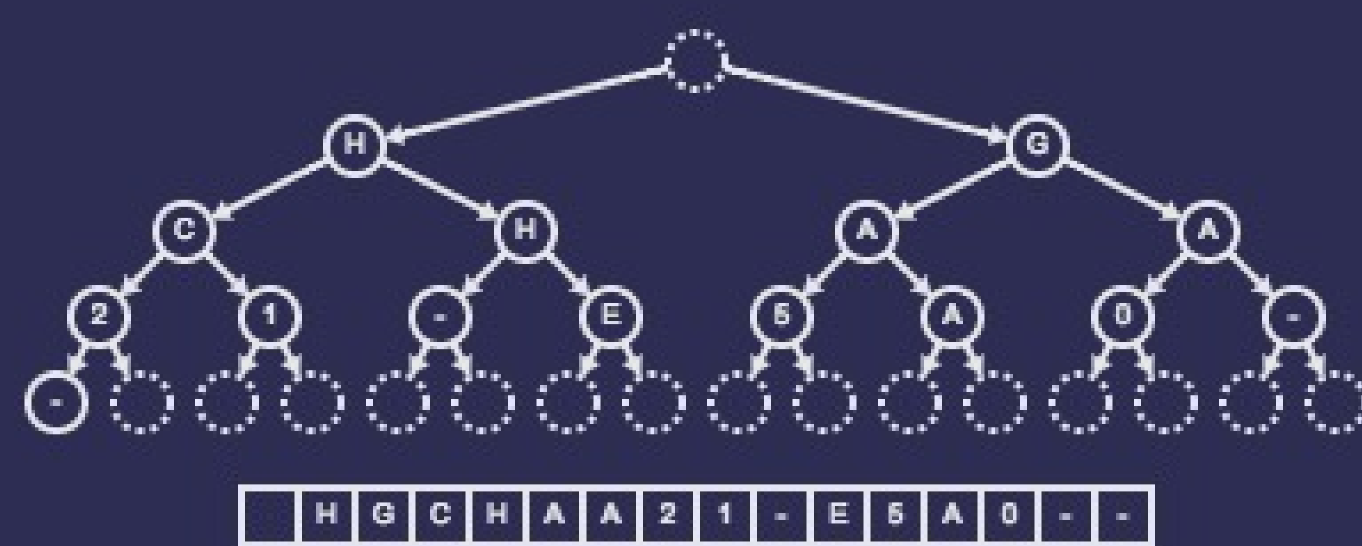
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 1. Find the root of the heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

I

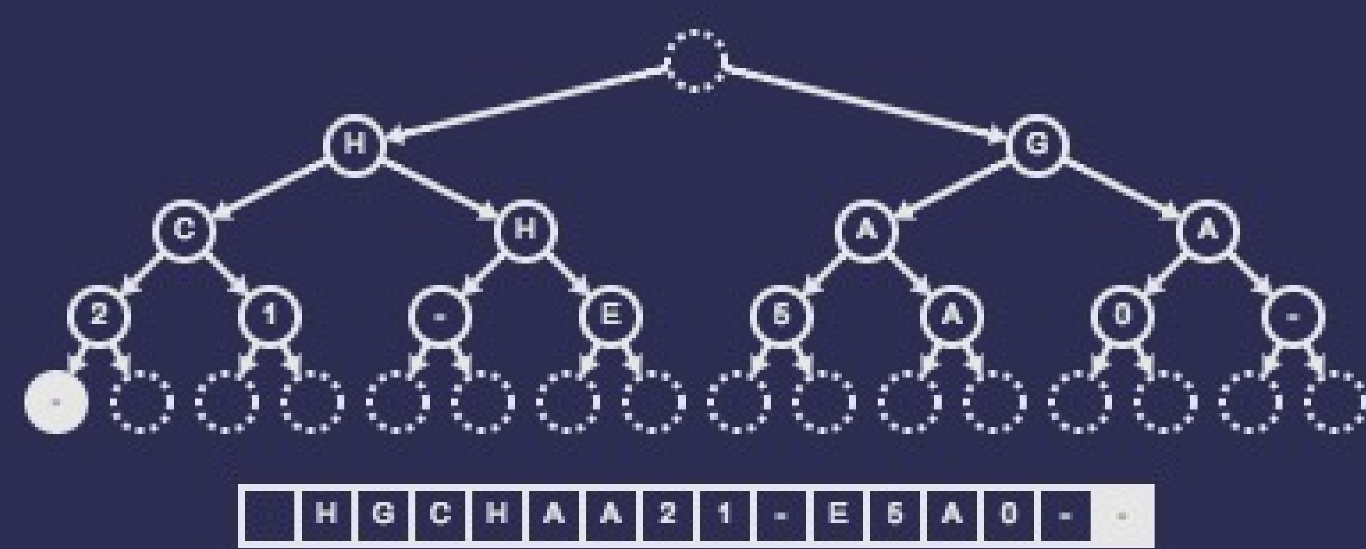
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 2. Output the value of the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

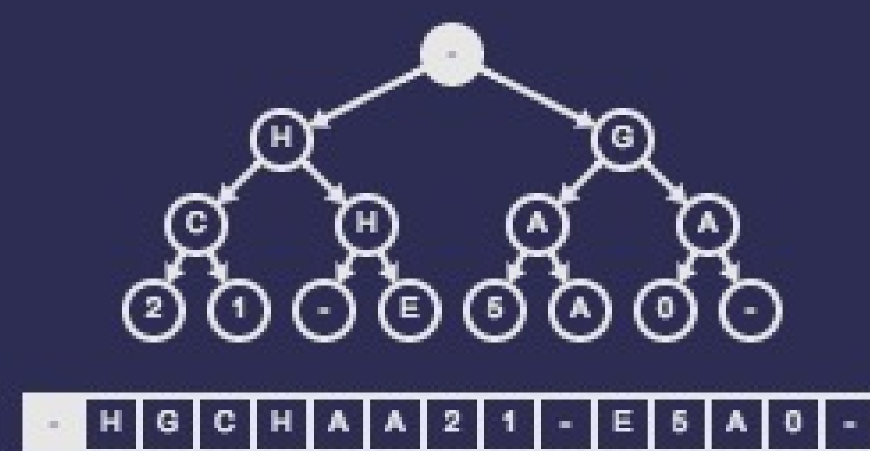
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 3. Find the last node

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

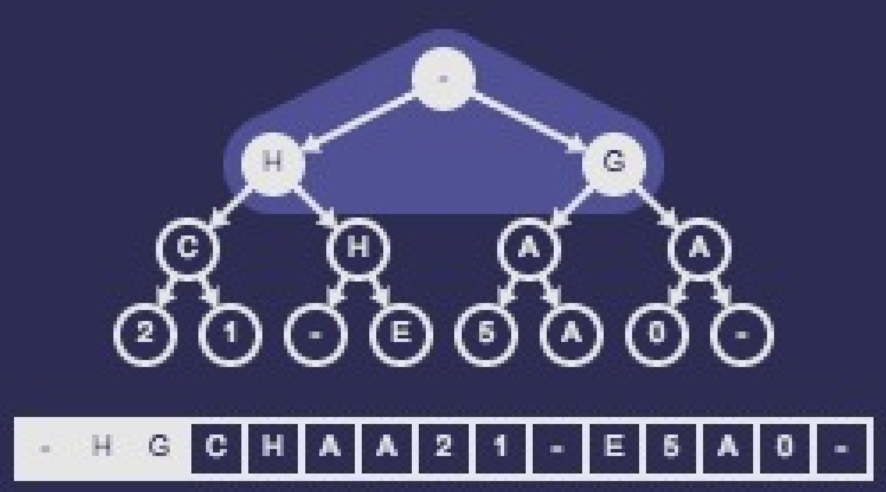
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 4. Move the last node to the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

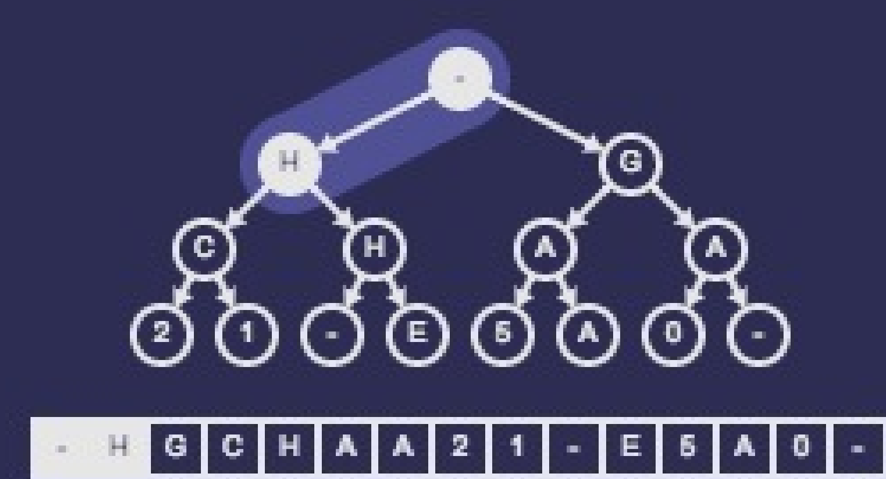
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 5. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

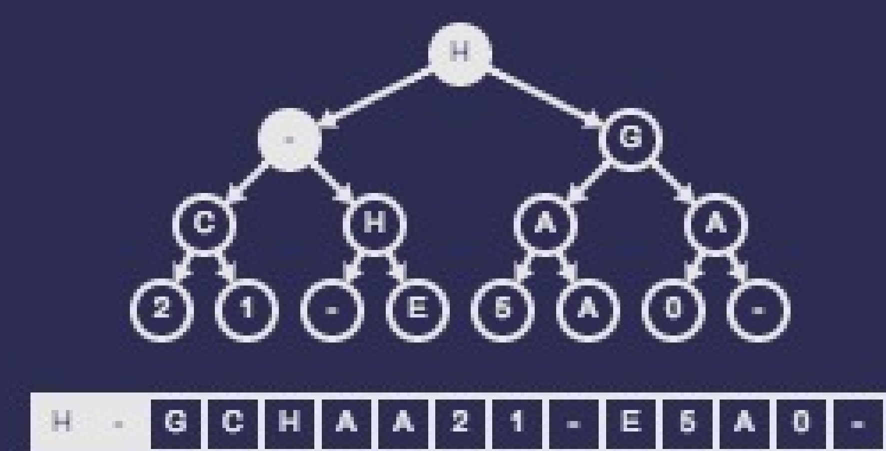
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 6. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

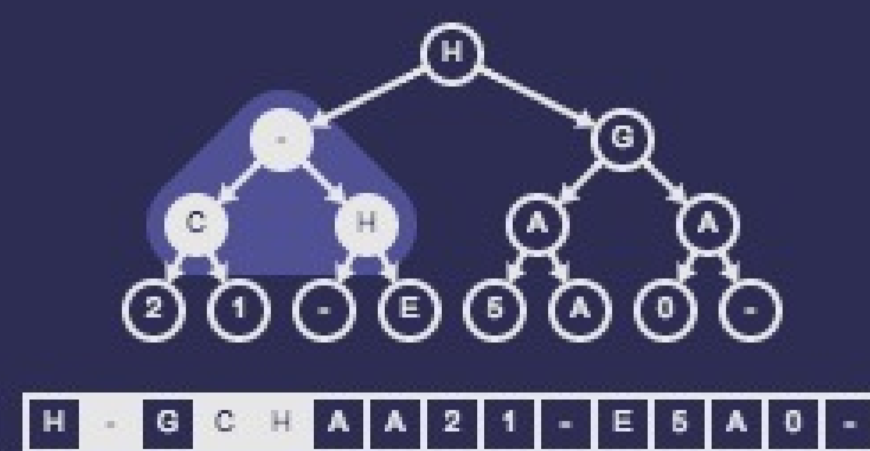
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 6. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

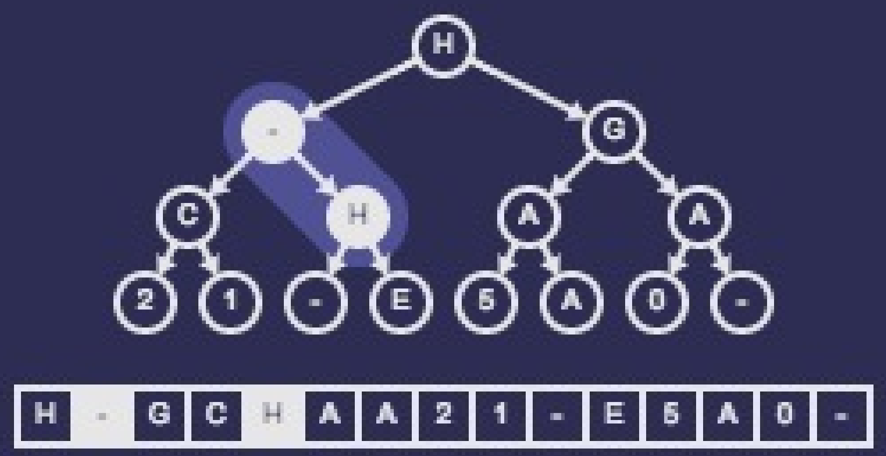
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 6. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

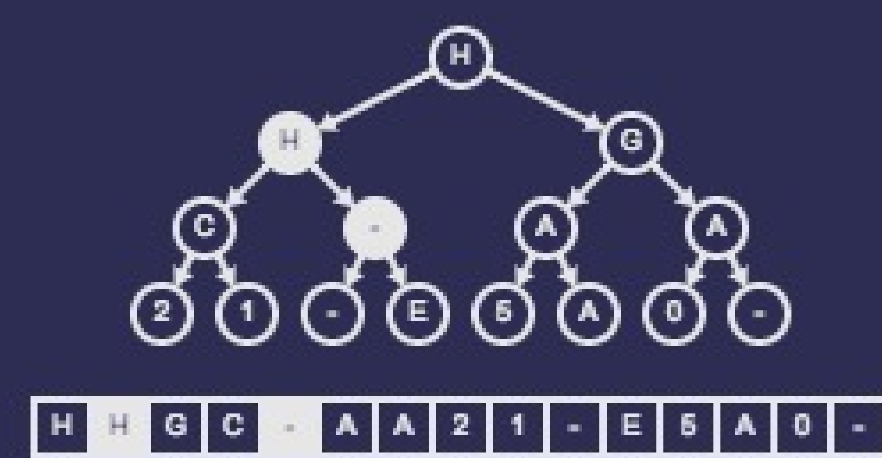
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 7. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

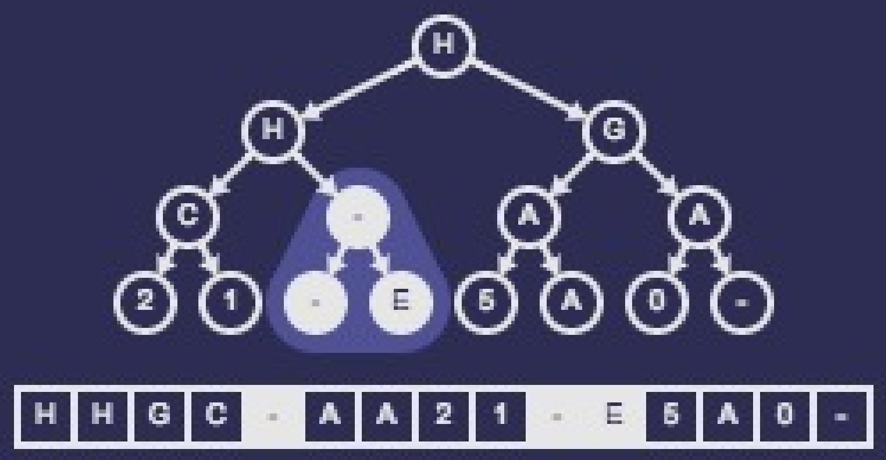
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 7. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

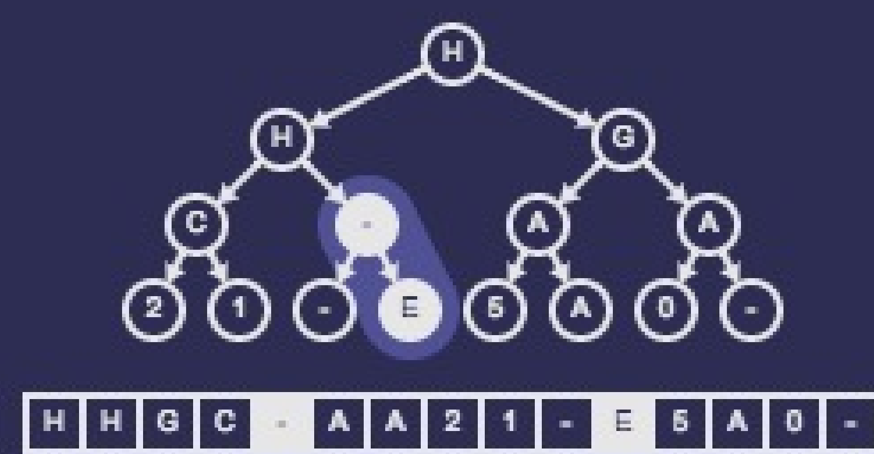
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 7. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

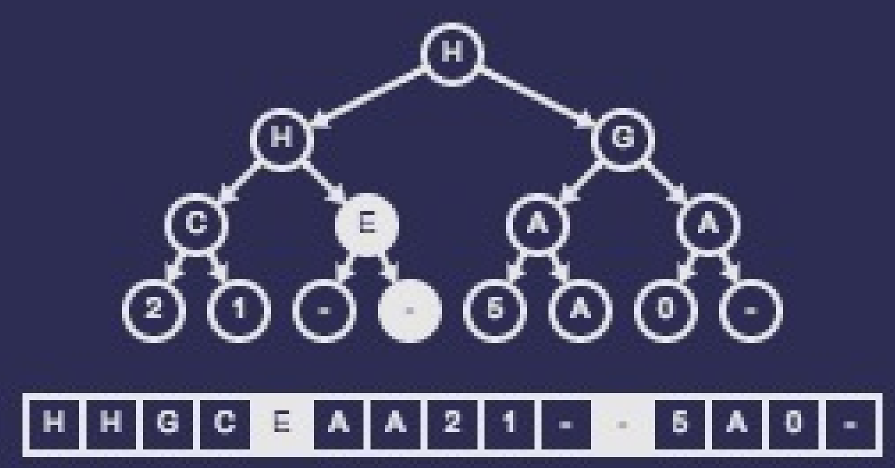
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 8. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

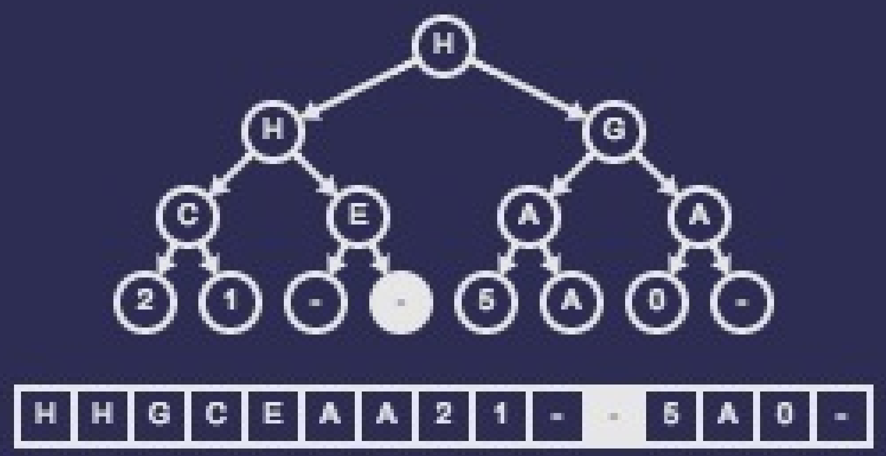
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 8. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

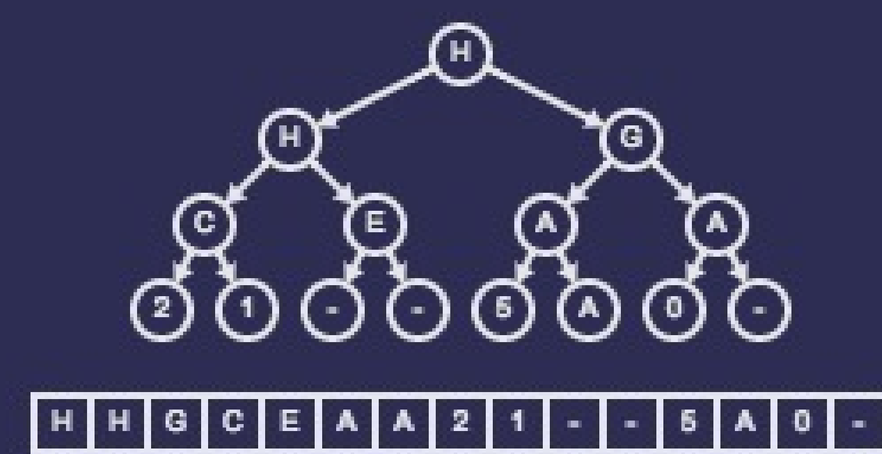
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 8. It has no children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

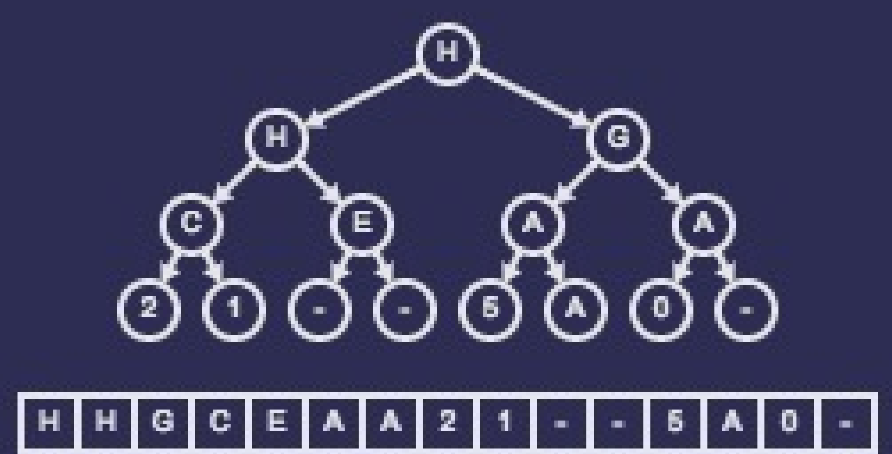
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 8. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

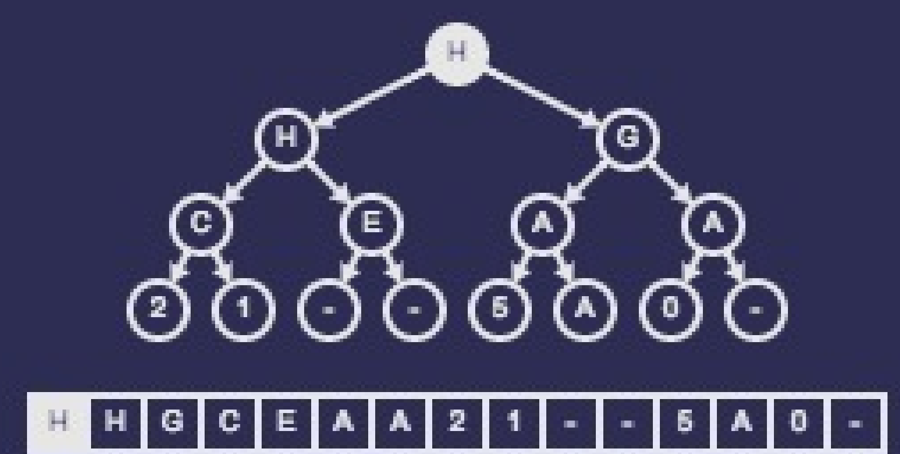
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Removing the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

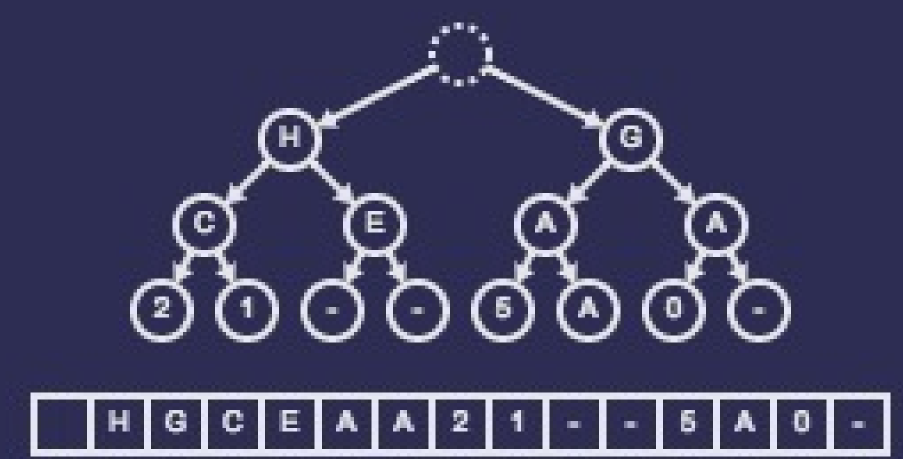
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 1. Find the root of the heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

H

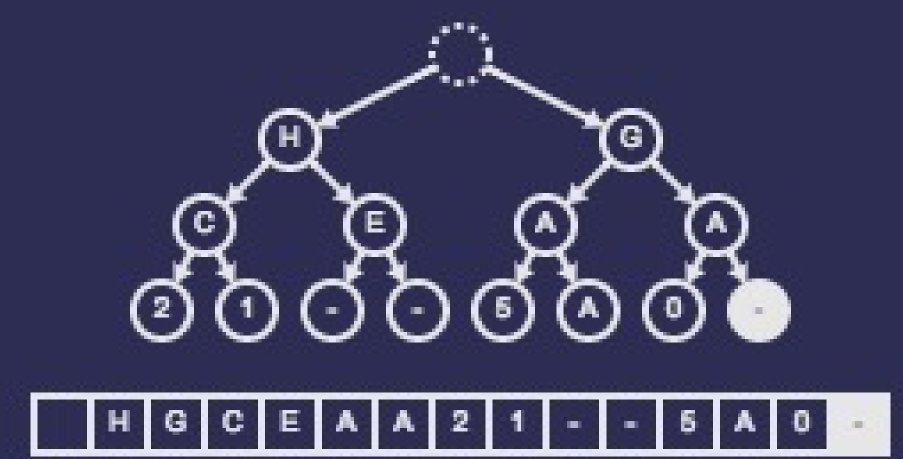
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 2. Output the value of the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

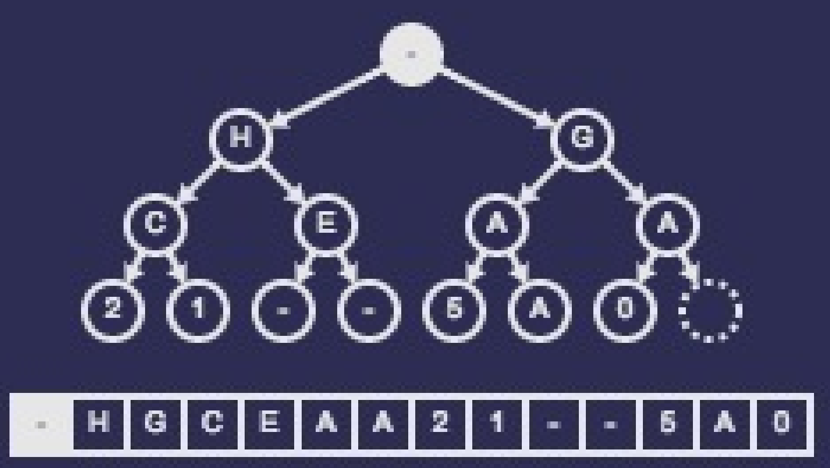
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 3. Find the last node

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

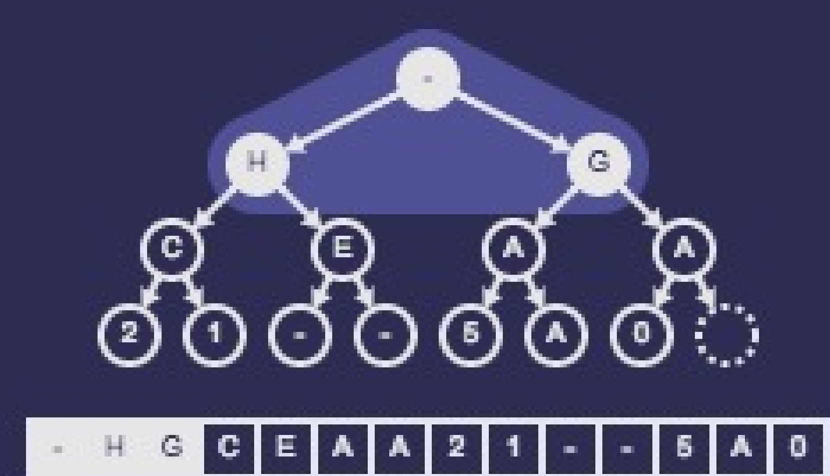
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 4. Move the last node to the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

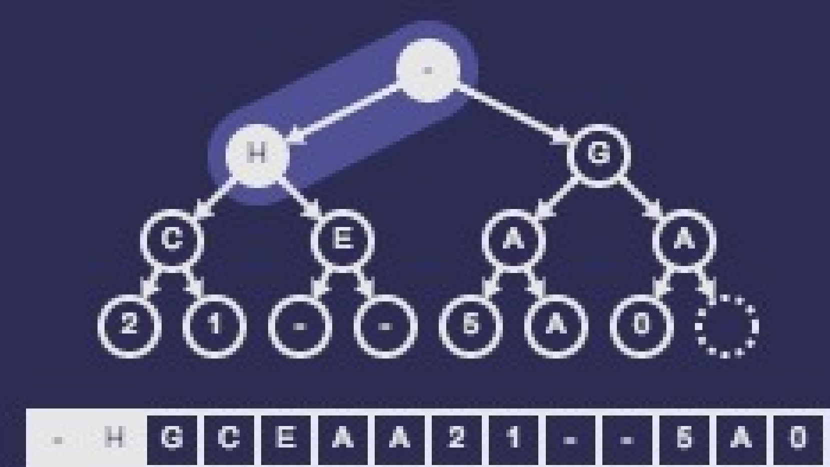
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 5. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

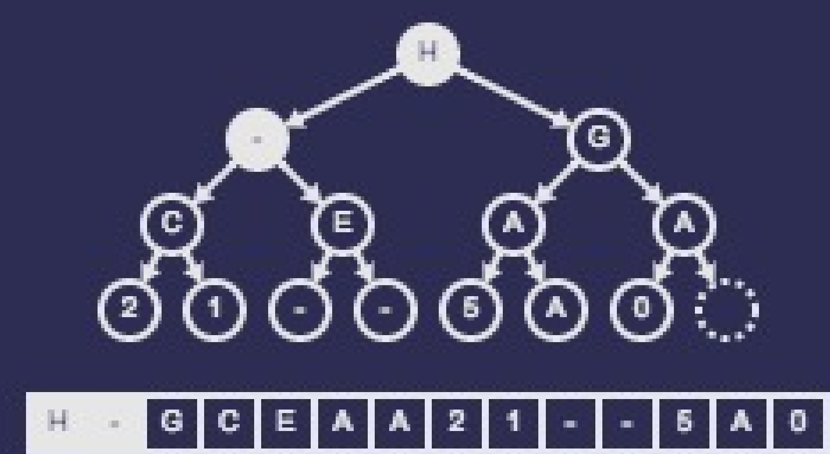
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 6. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

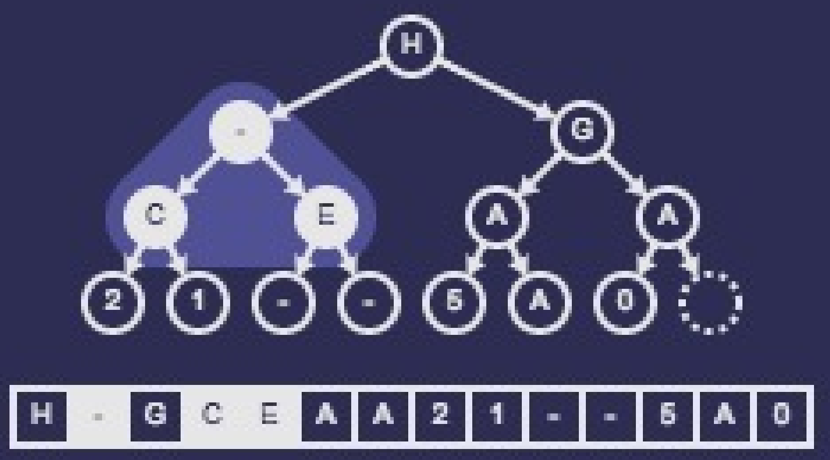
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 6. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

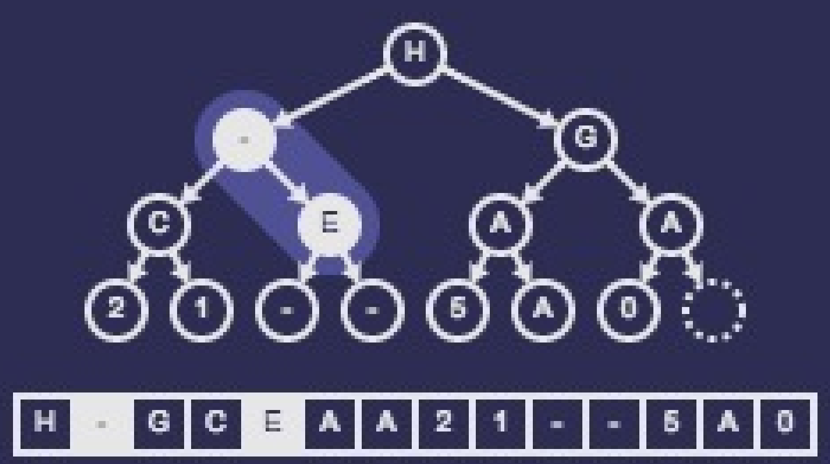
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 6. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

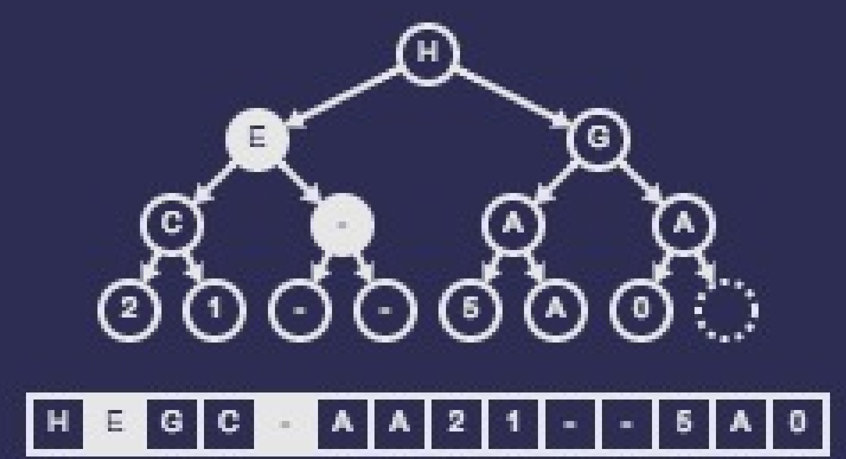
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 7. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

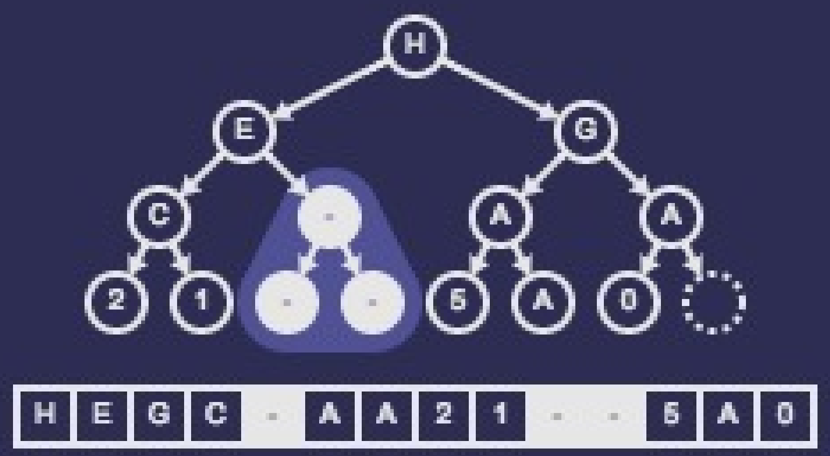
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 7. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

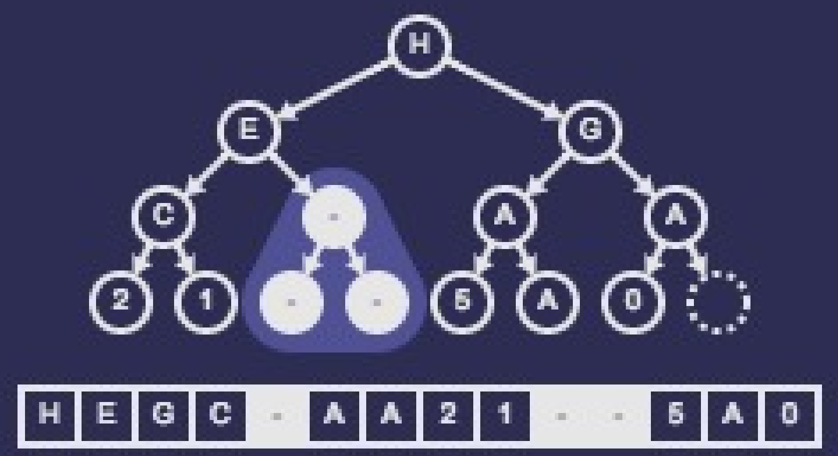
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 7. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

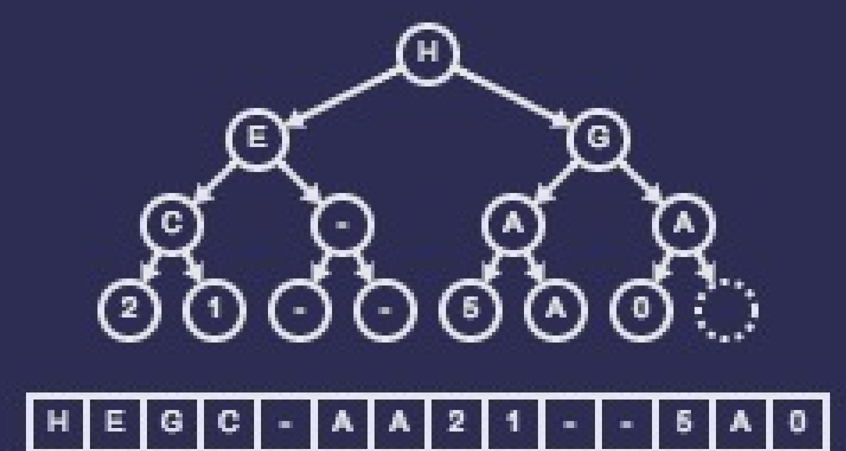
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 8. The elements are in the correct order

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

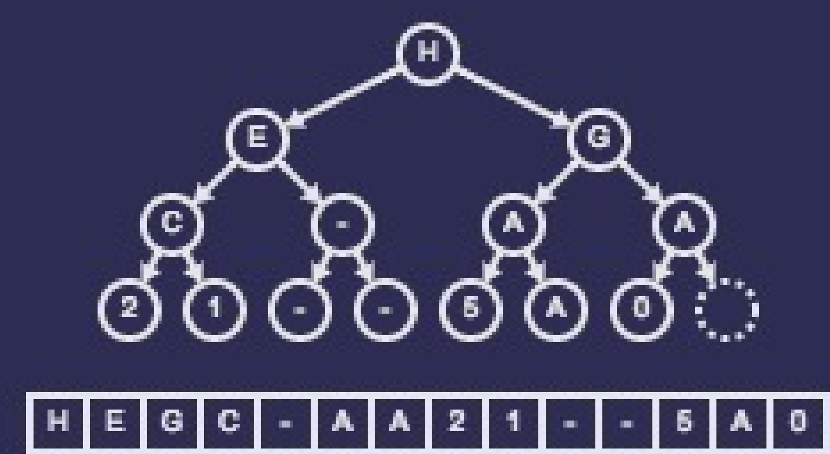
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 8. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

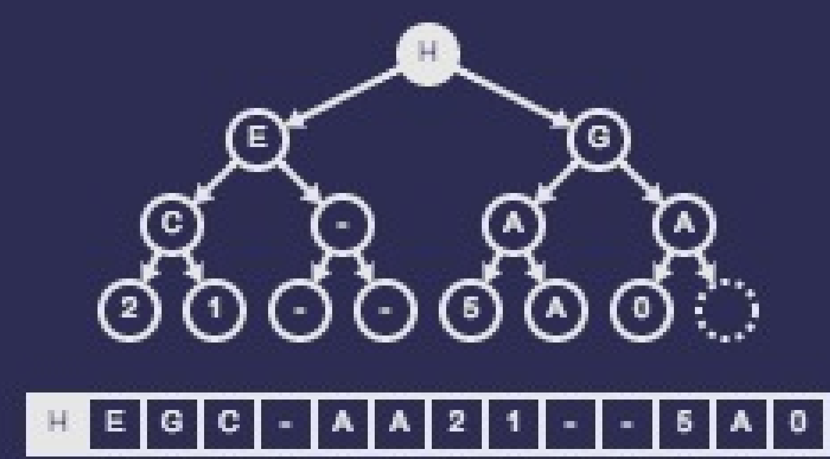
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Removing the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

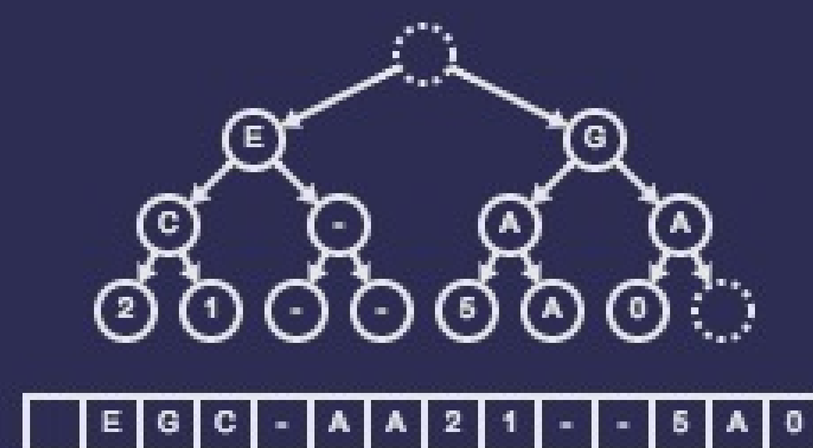
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 1. Find the root of the heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

H

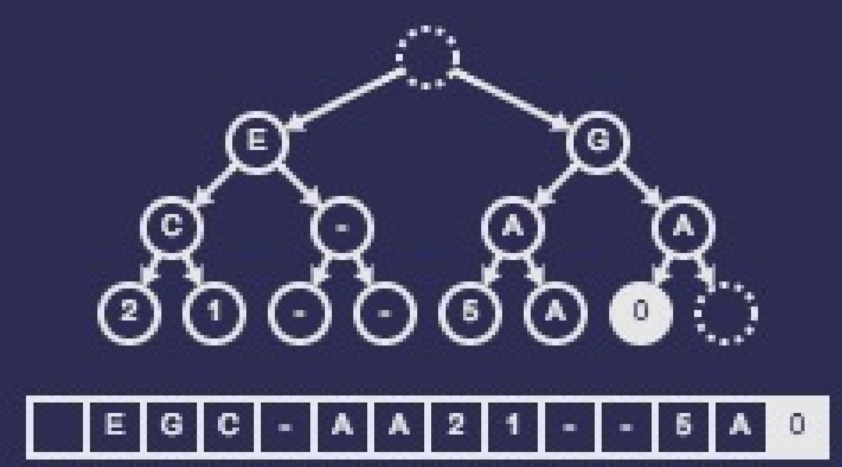
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 2. Output the value of the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

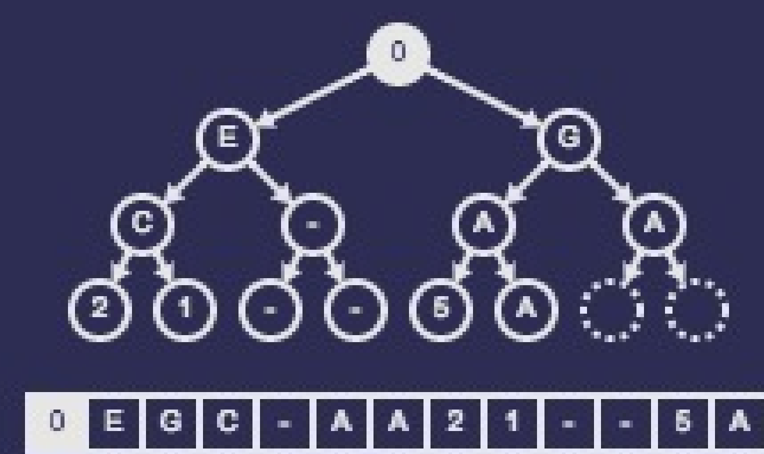
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 3. Find the last node

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

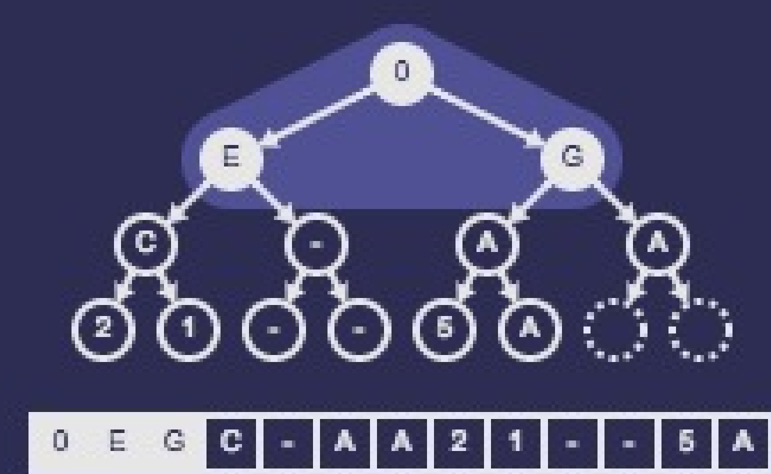
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 4. Move the last node to the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

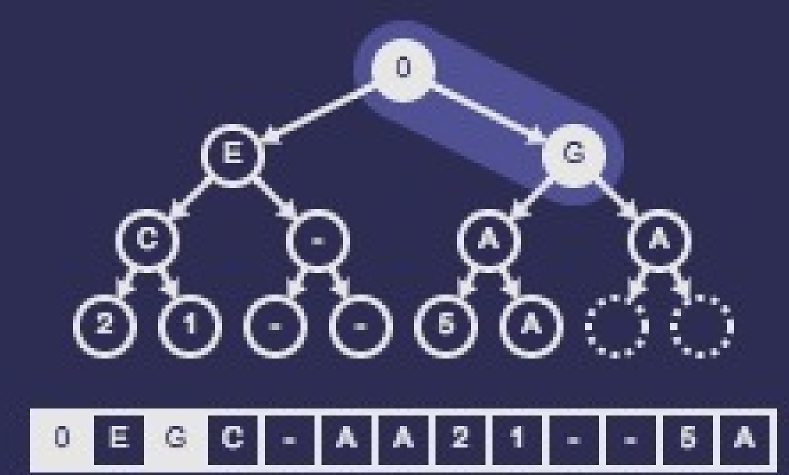
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 5. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

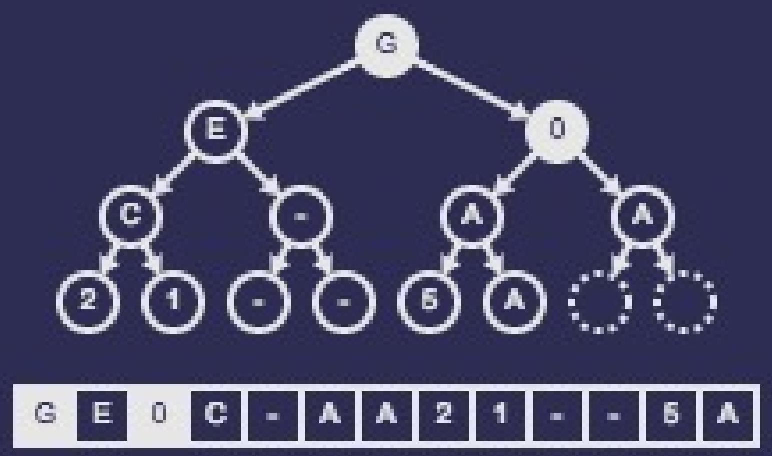
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 6. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

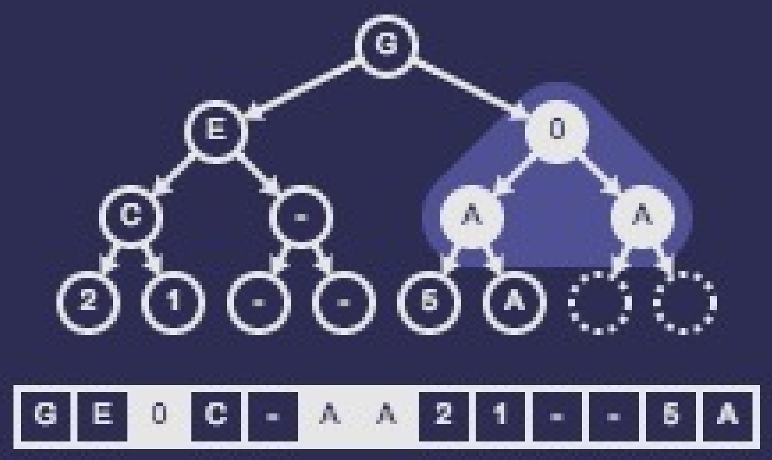
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 6. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

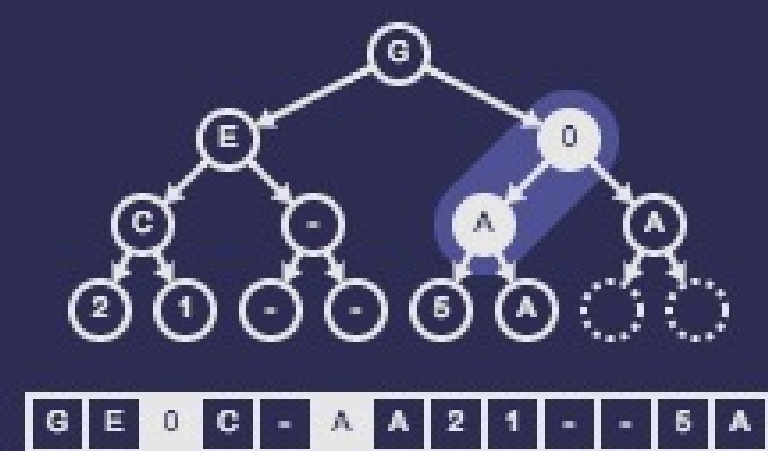
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 6. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

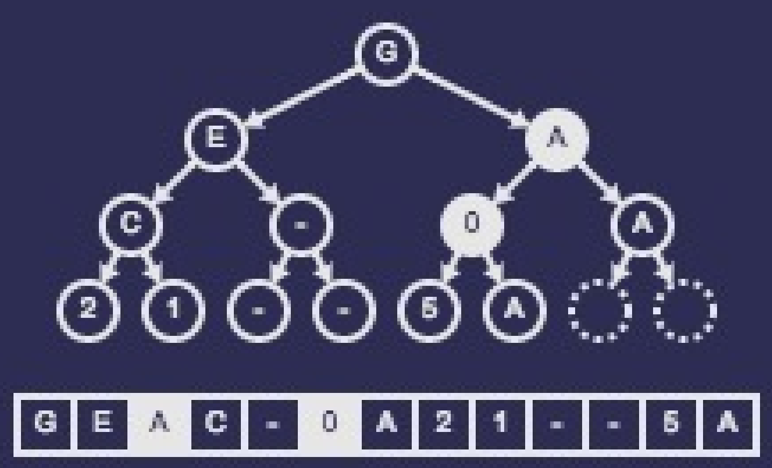
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 7. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

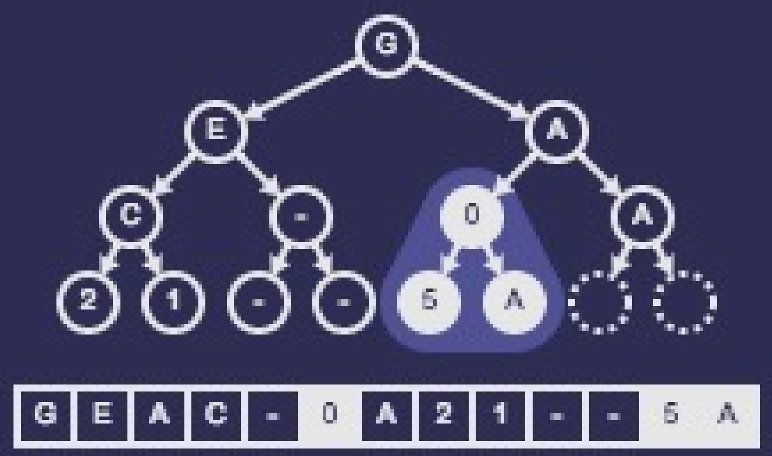
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 7. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

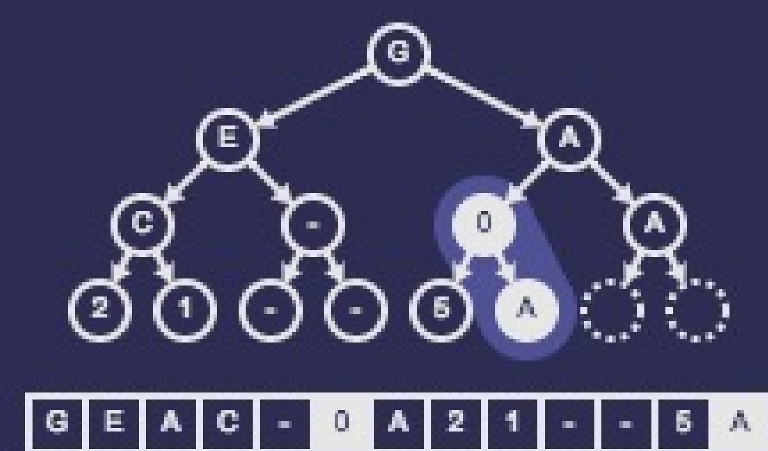
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 7. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

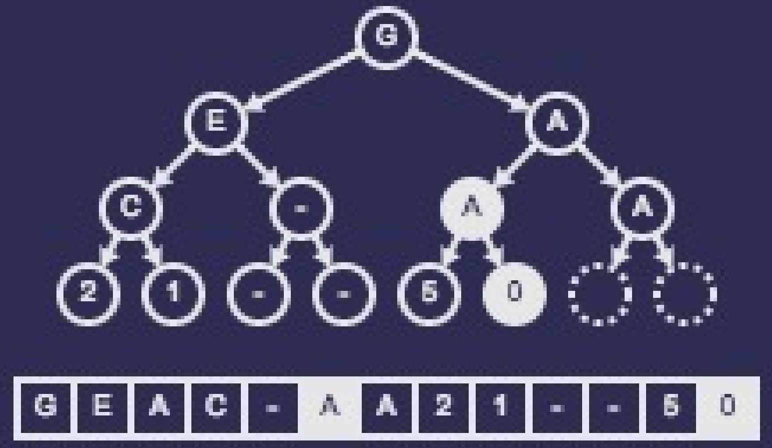
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 8. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

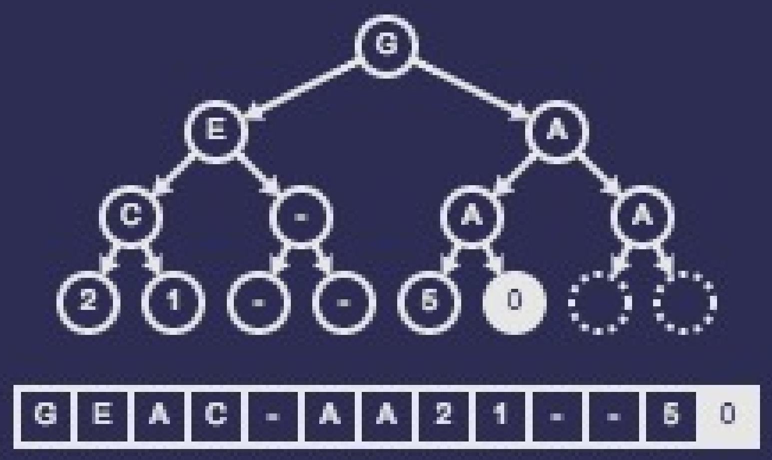
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 8. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

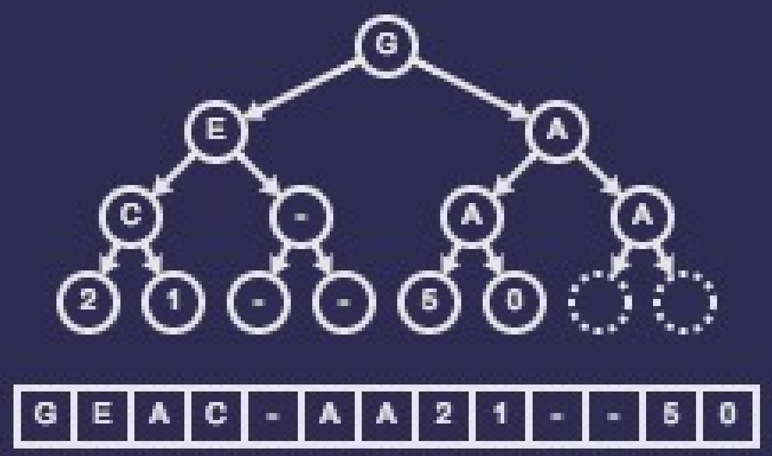
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 8. It has no children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

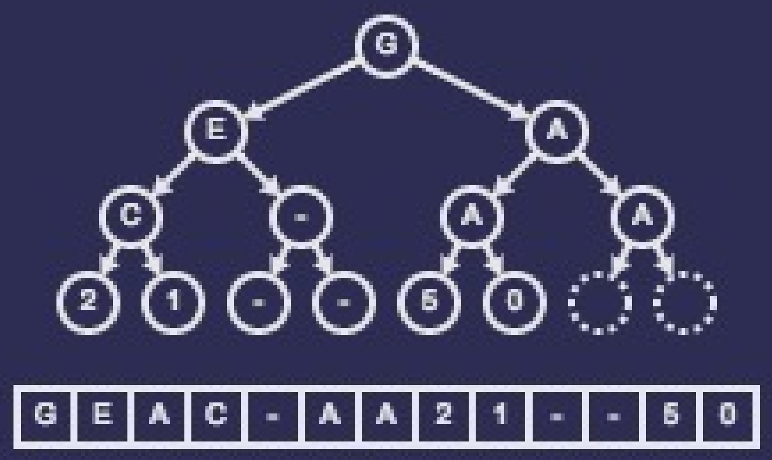
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 8. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

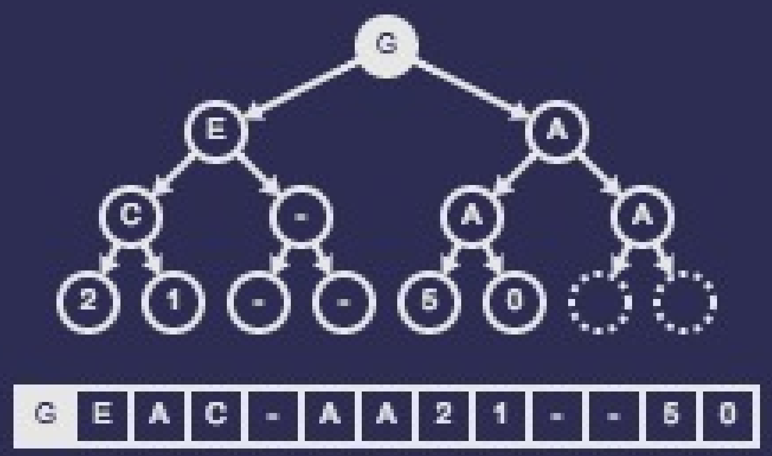
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Removing the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

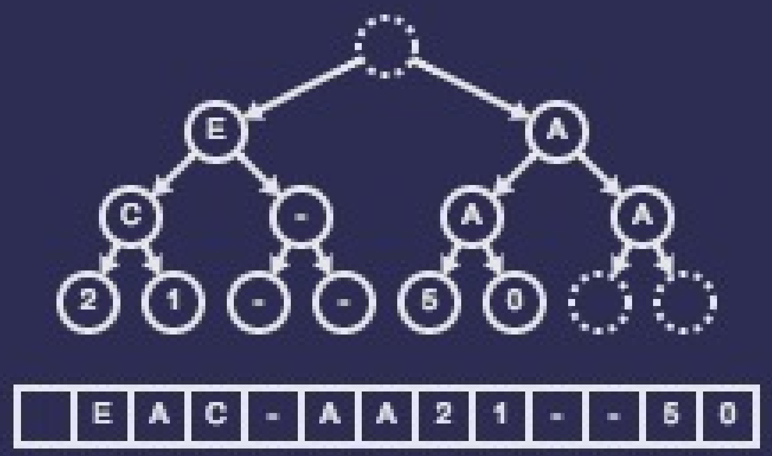
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 1. Find the root of the heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

G

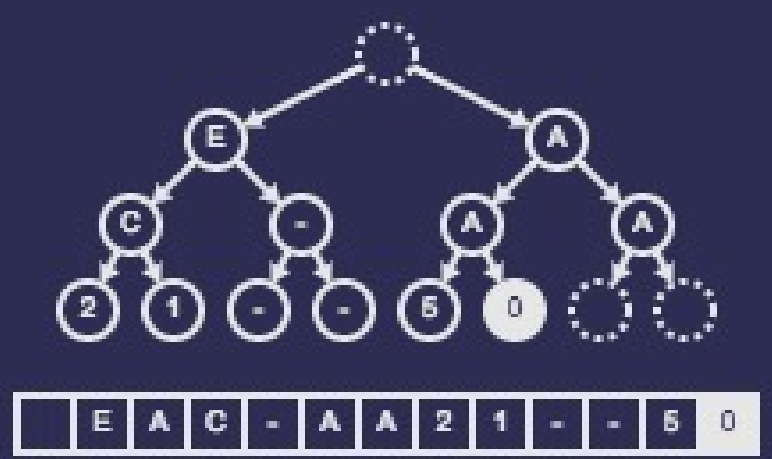
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 2. Output the value of the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

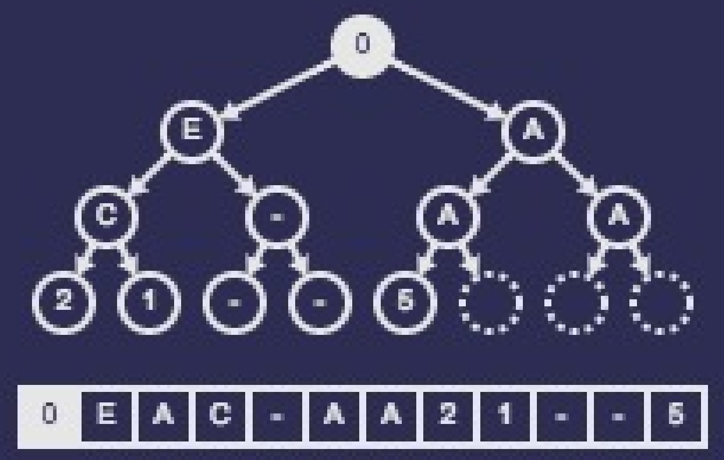
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 3. Find the last node

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

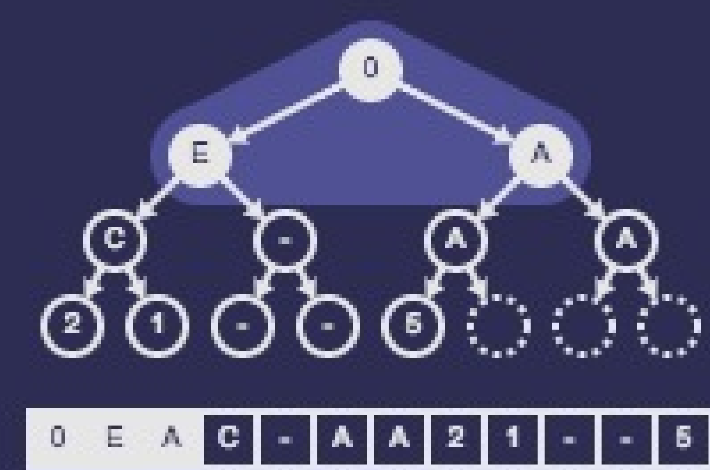
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 4. Move the last node to the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

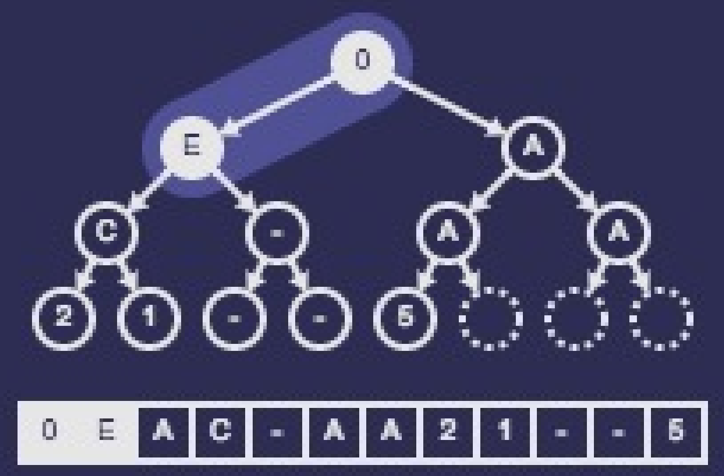
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 5. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

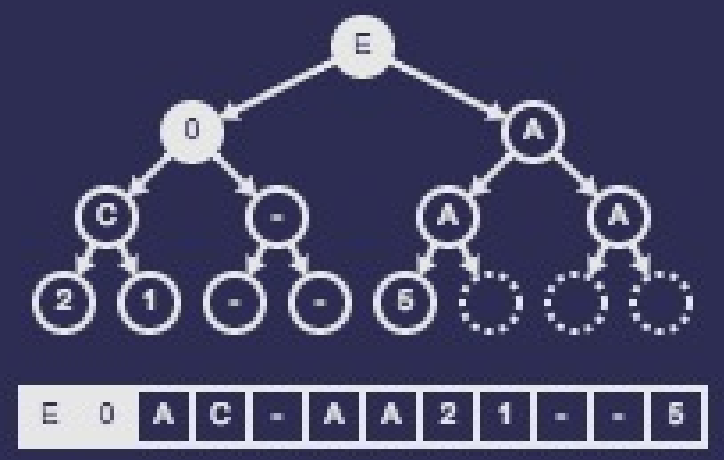
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 6. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

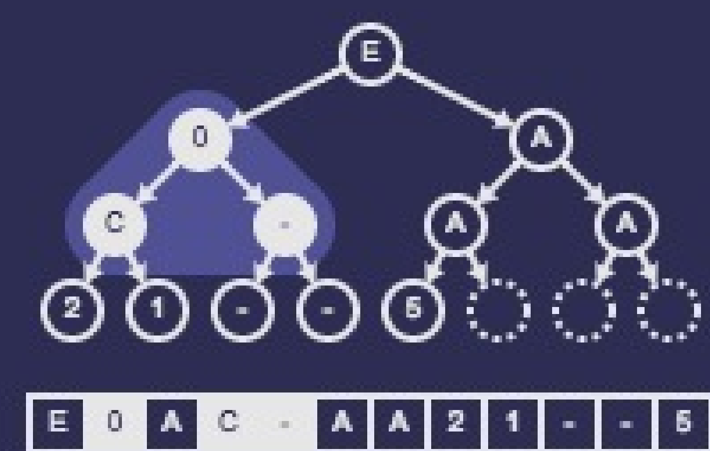
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 6. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

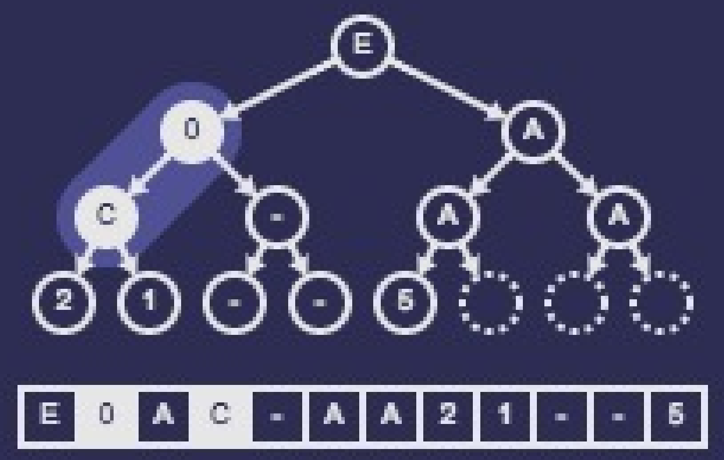
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 6. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

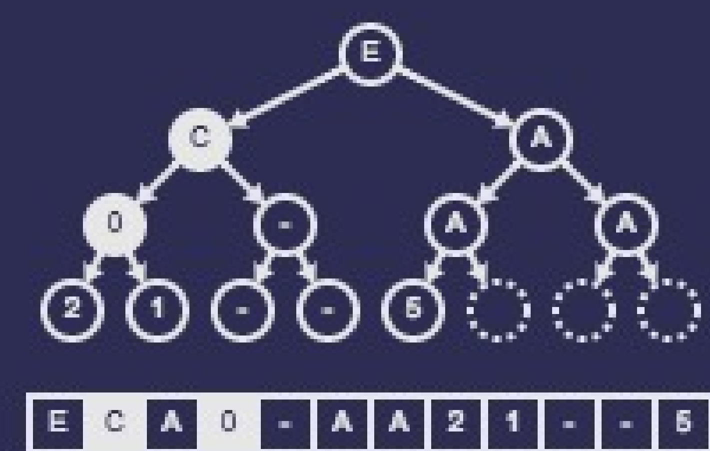
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 7. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

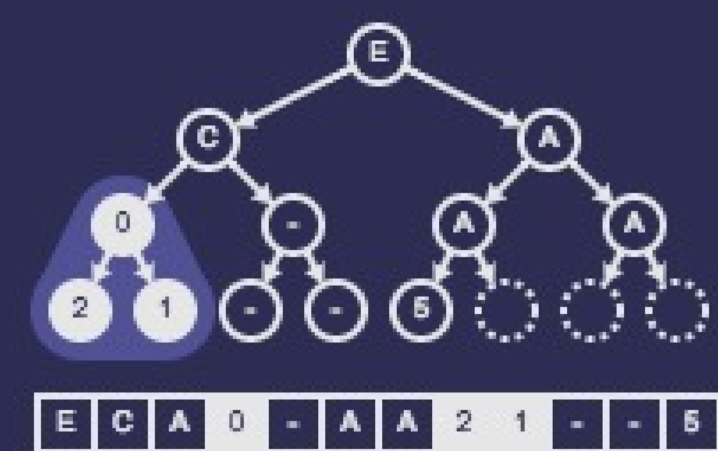
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 7. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

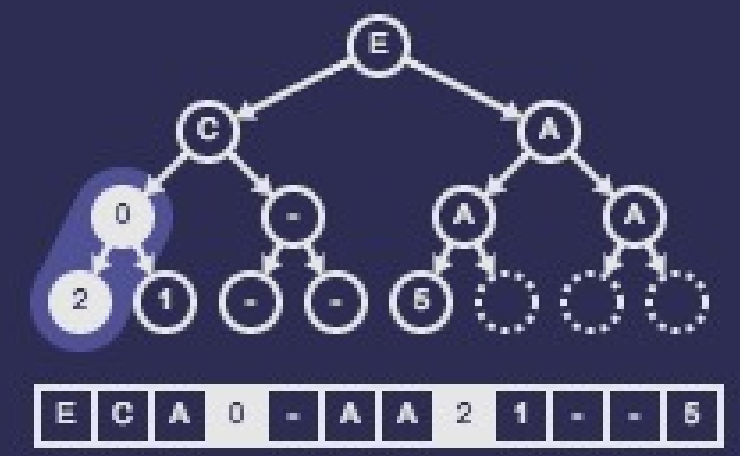
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 7. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

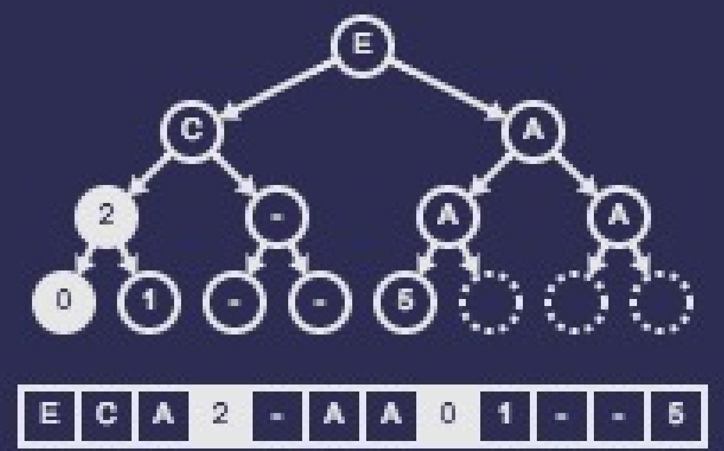
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 8. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

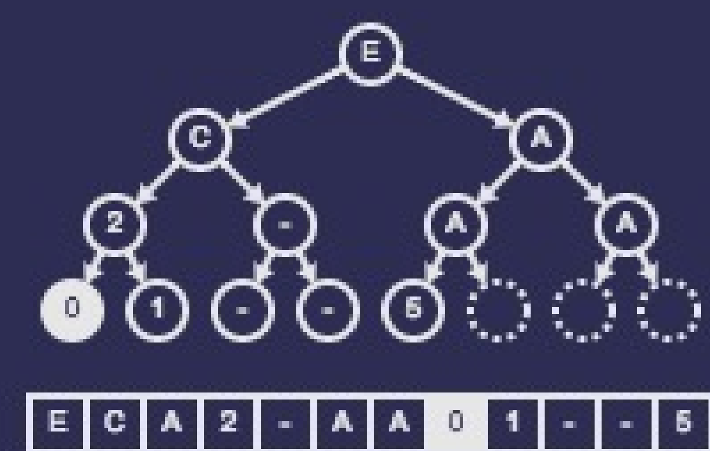
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 8. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

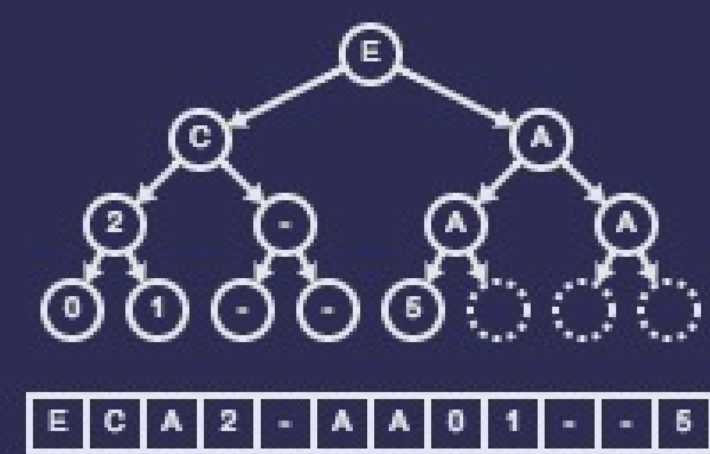
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 8. It has no children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

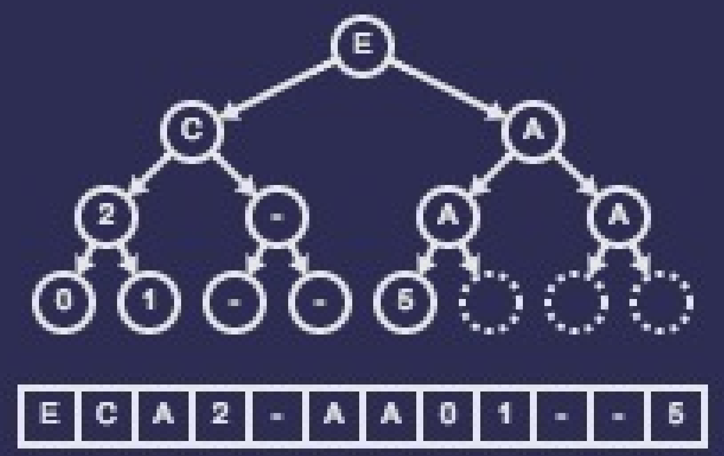
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 8. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

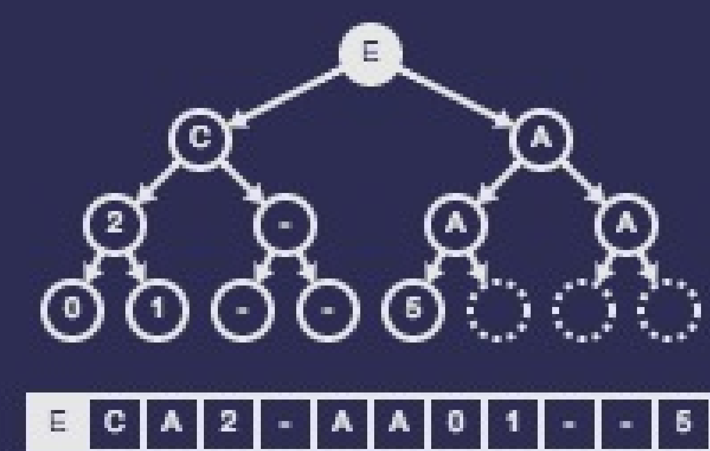
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Removing the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

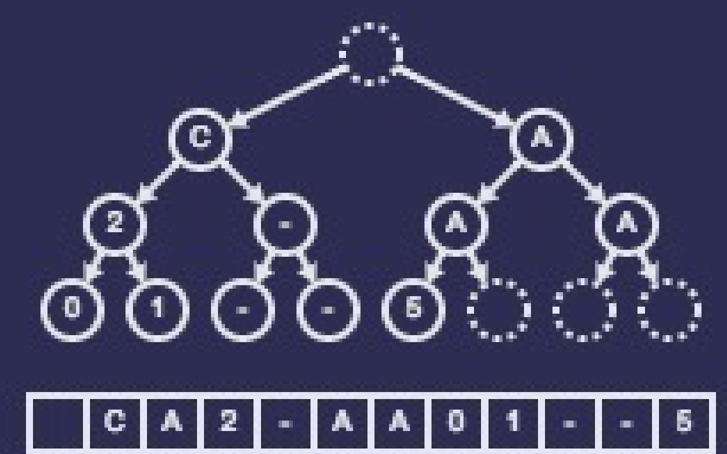
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 1. Find the root of the heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

E

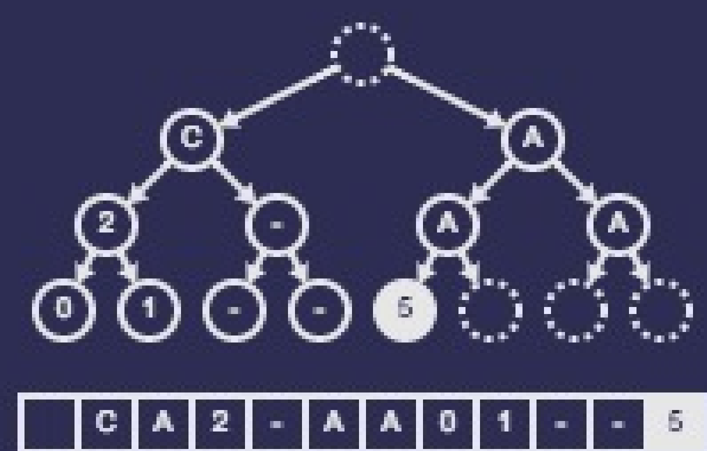
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 2. Output the value of the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

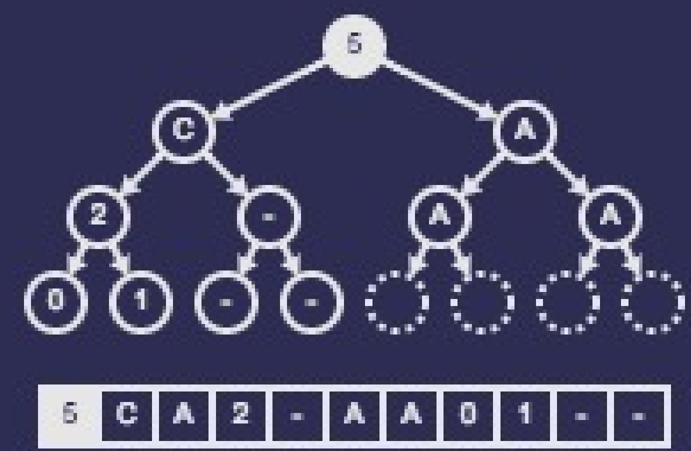
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 3. Find the last node

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

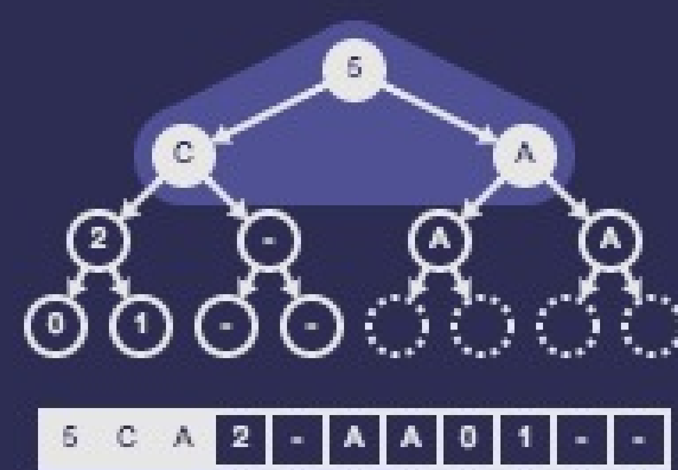
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 4. Move the last node to the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

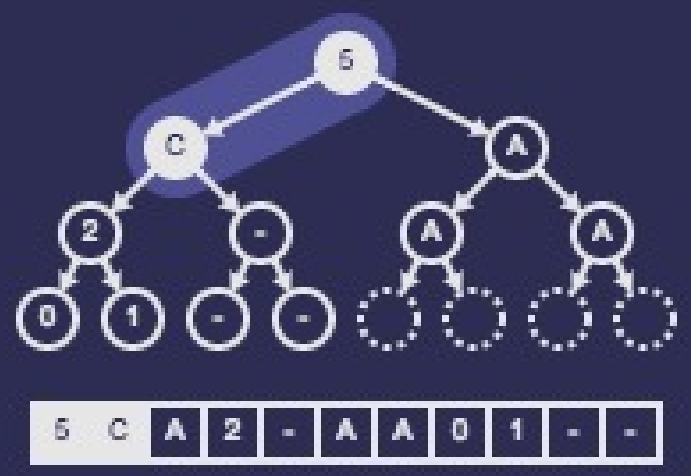
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 5. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

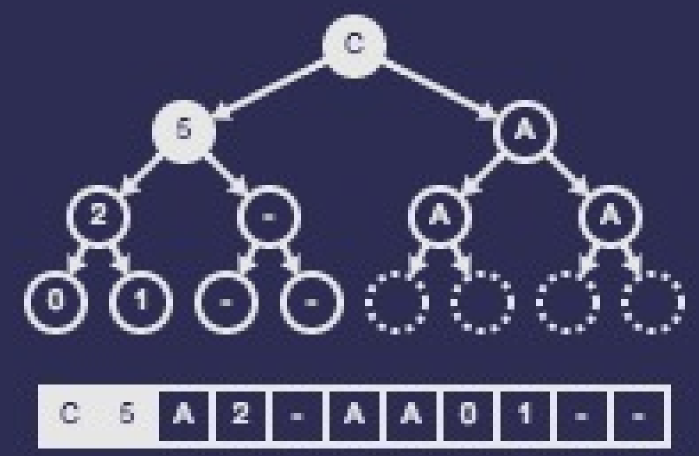
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 6. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

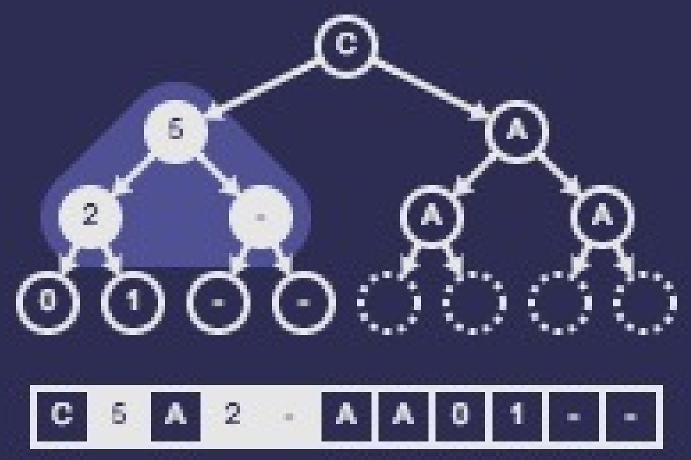
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 6. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

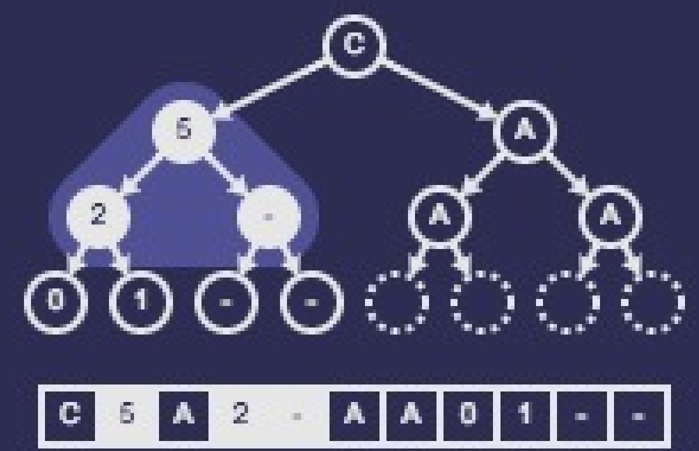
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 6. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

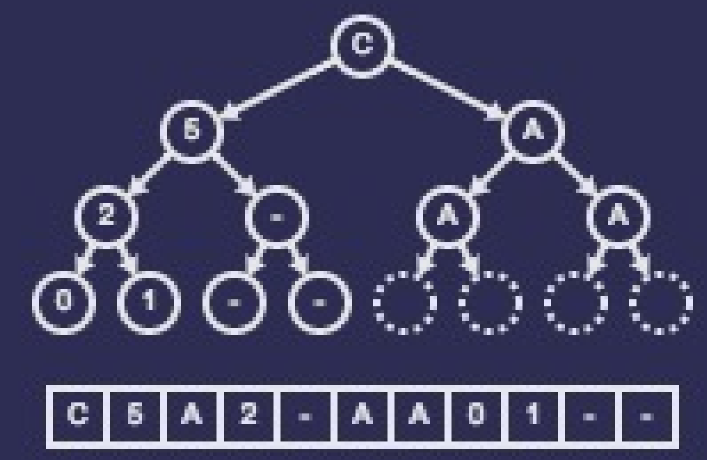
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 7. The elements are in the correct order

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

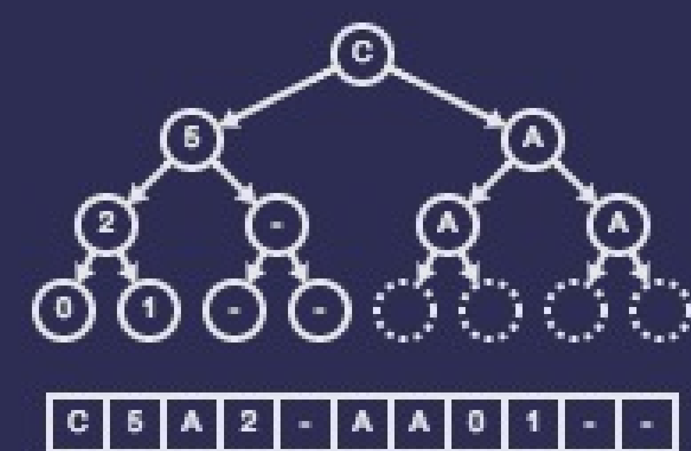
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 7. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

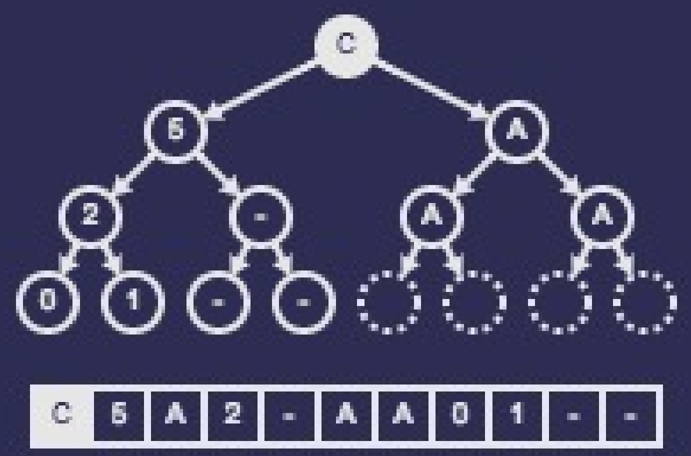
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Removing the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

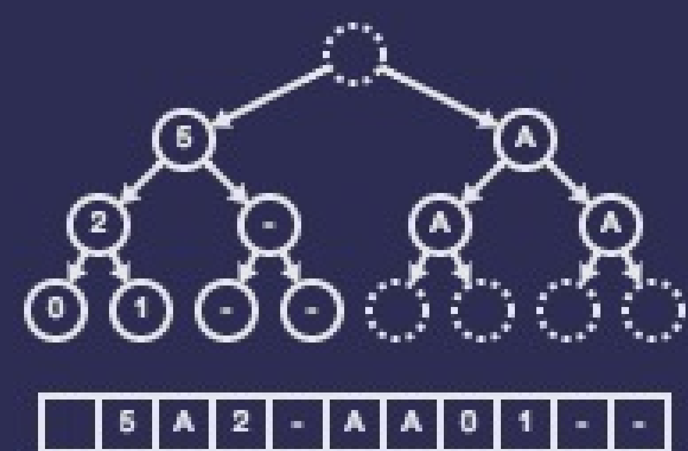
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 1. Find the root of the heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

C

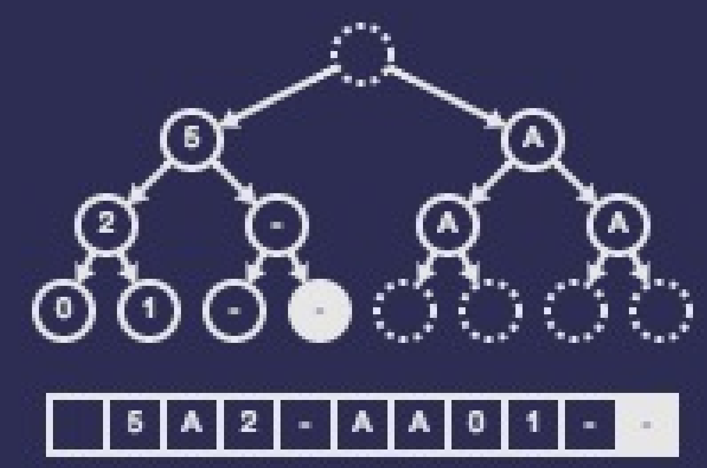
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 2. Output the value of the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

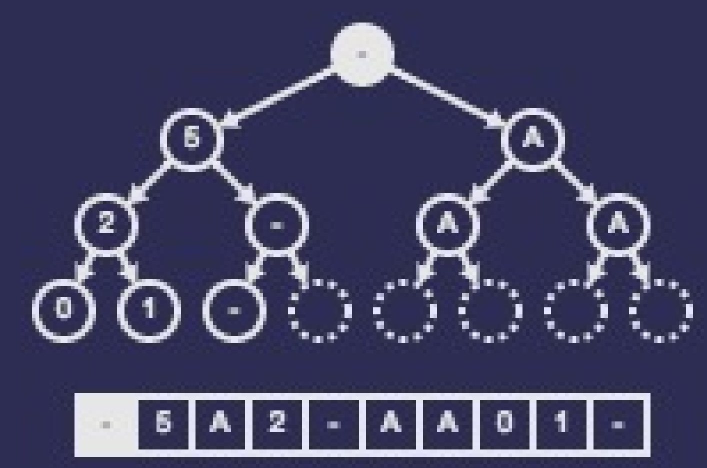
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 3. Find the last node

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

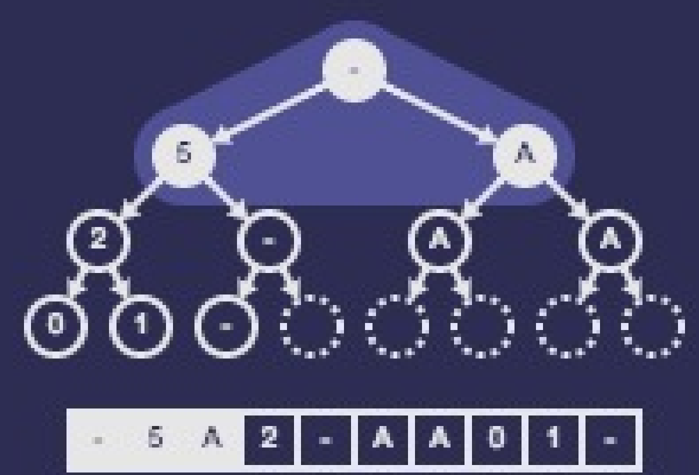
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 4. Move the last node to the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

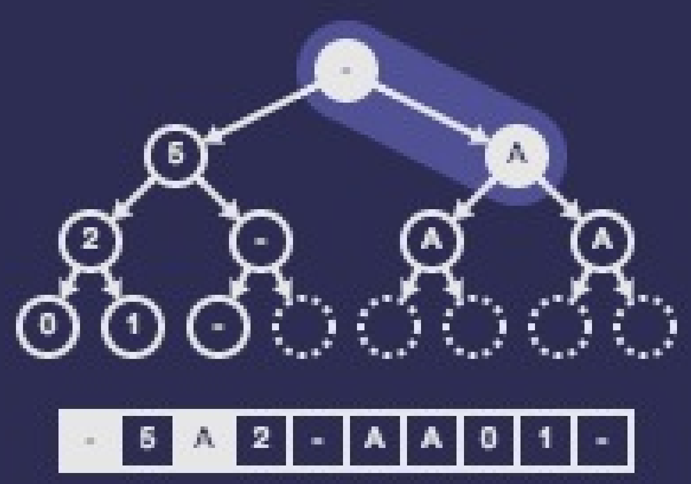
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 5. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

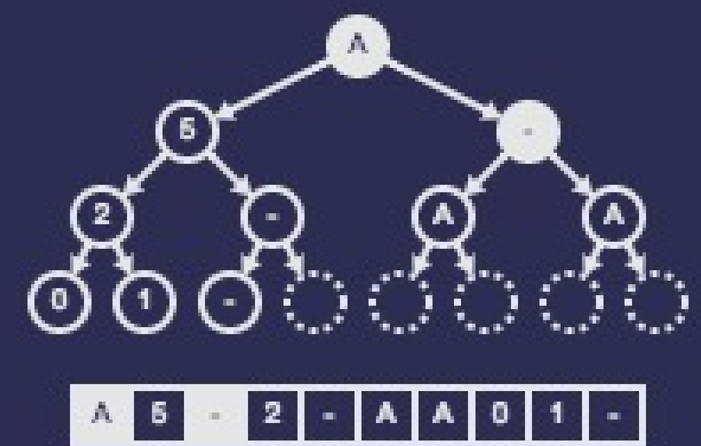
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 6. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

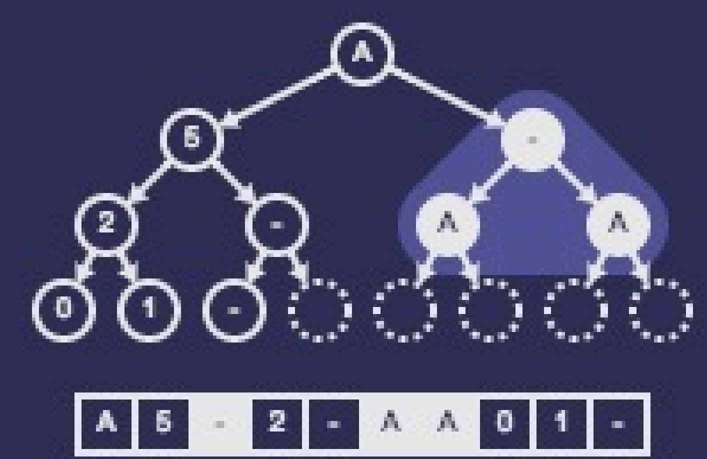
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 6. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

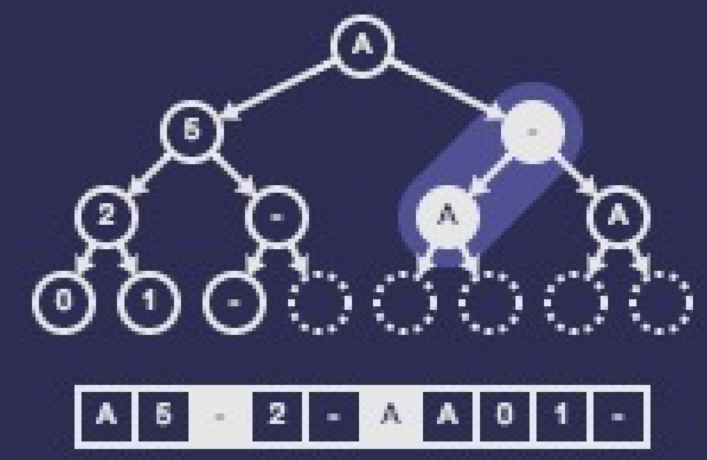
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 6. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

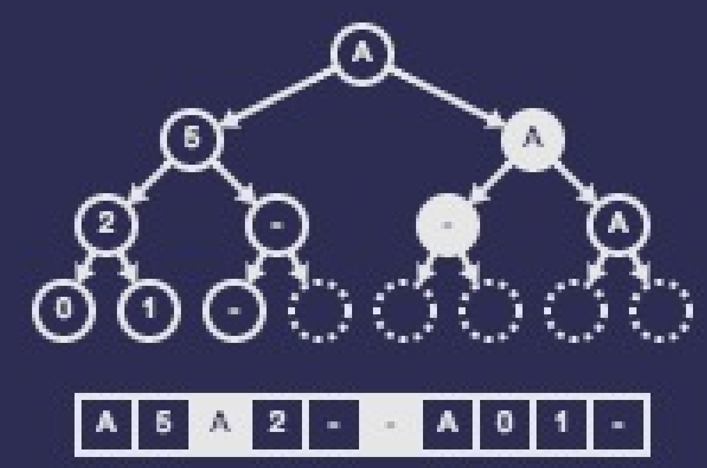
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 7. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

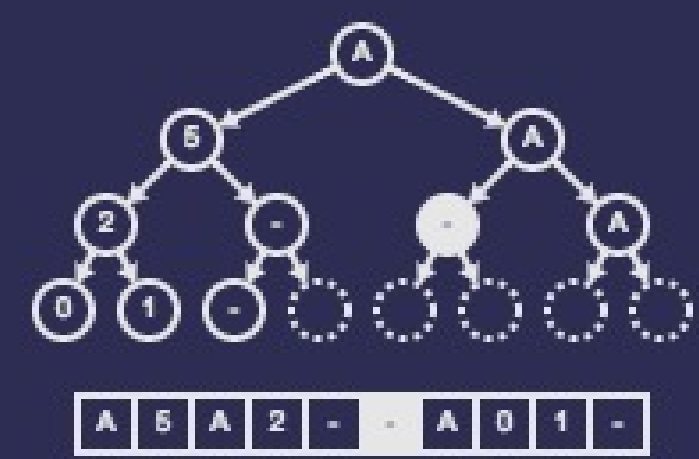
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 7. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

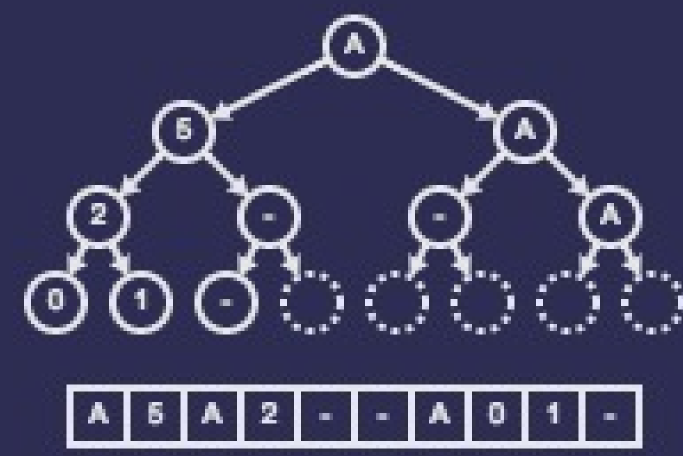
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 7. It has no children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

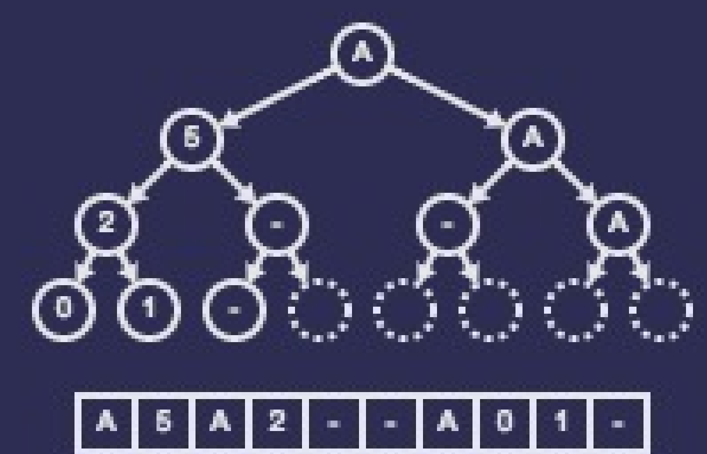
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 7. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

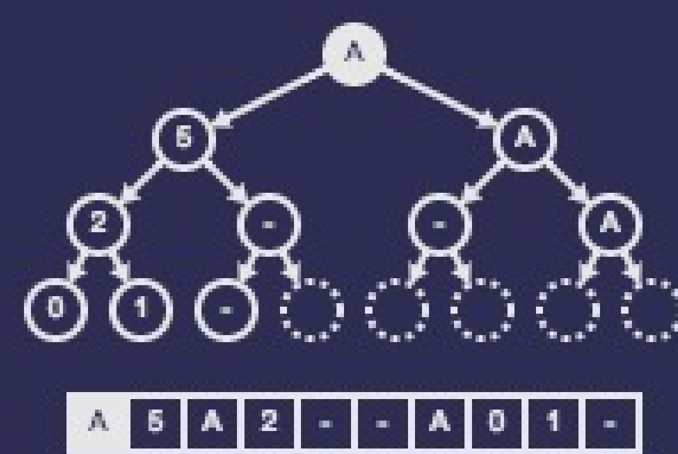
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Removing the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

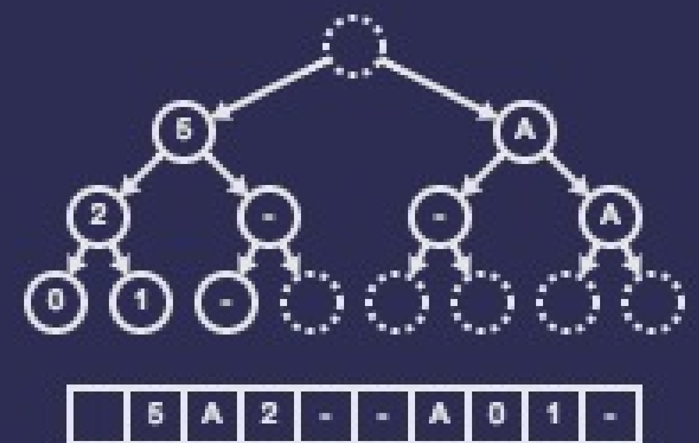
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 1. Find the root of the heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

A

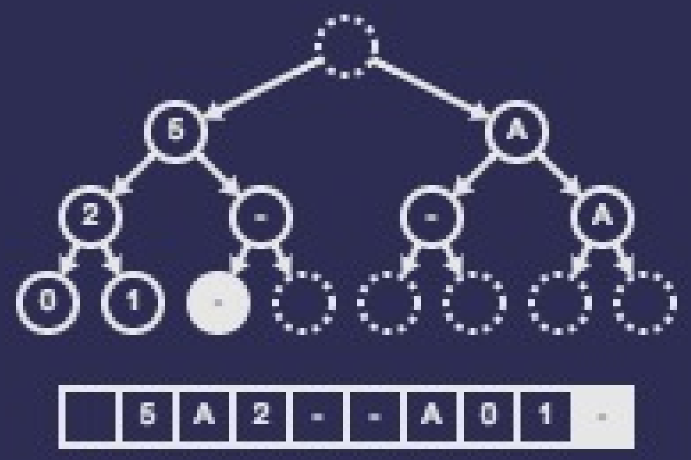
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 2. Output the value of the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

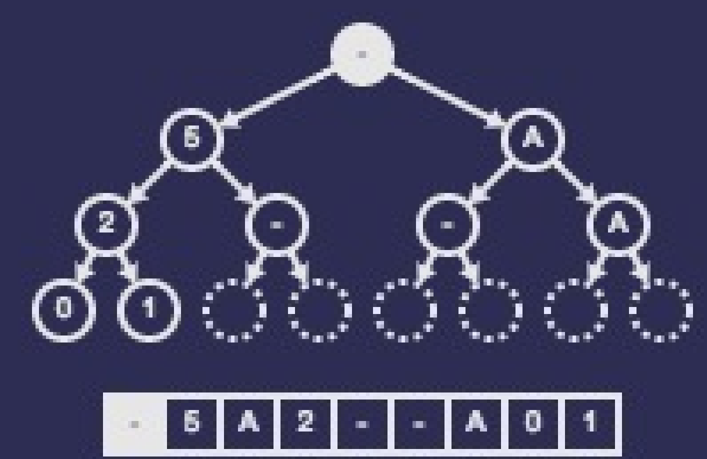
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 3. Find the last node

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

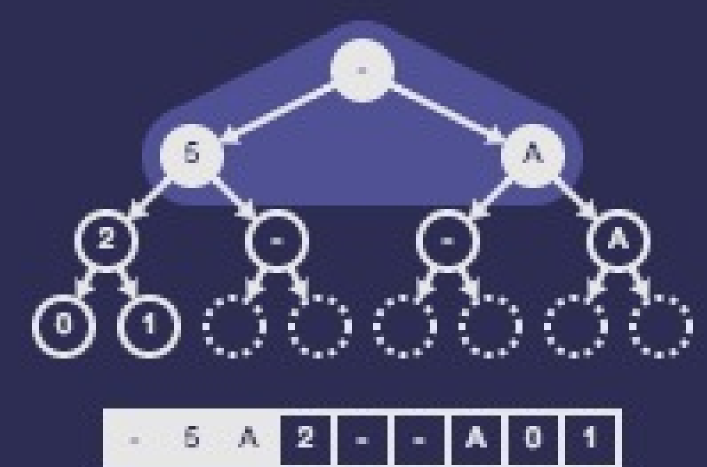
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 4. Move the last node to the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

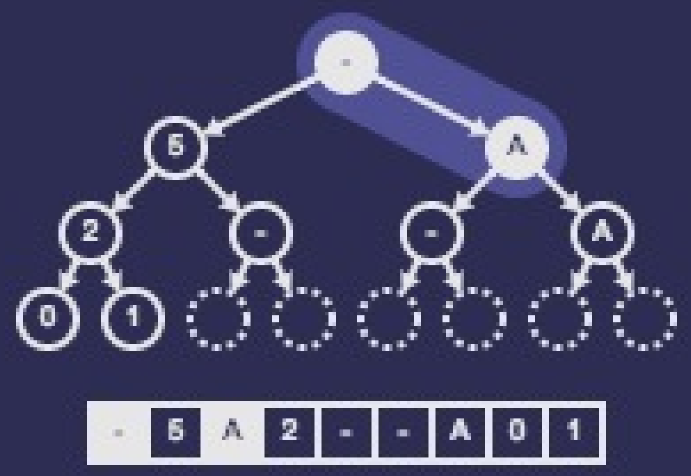
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 5. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

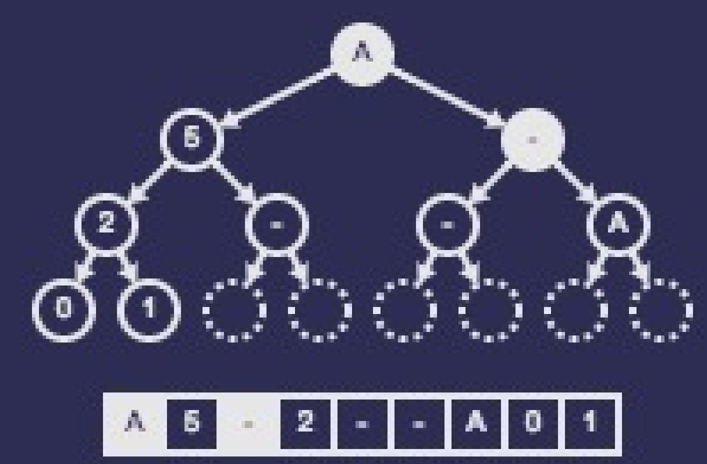
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 6. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

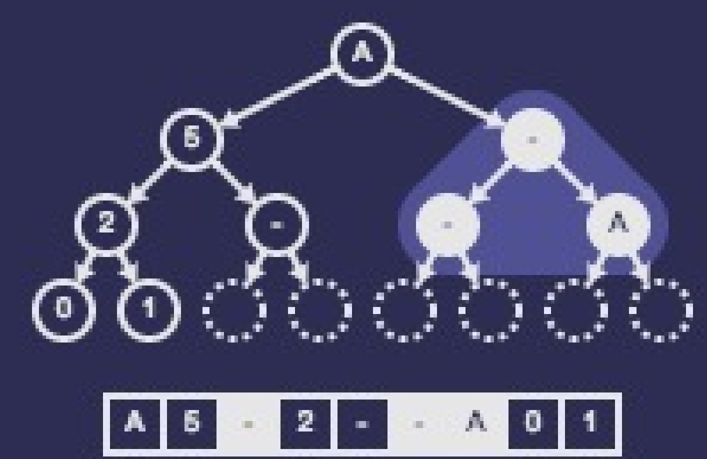
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 6. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

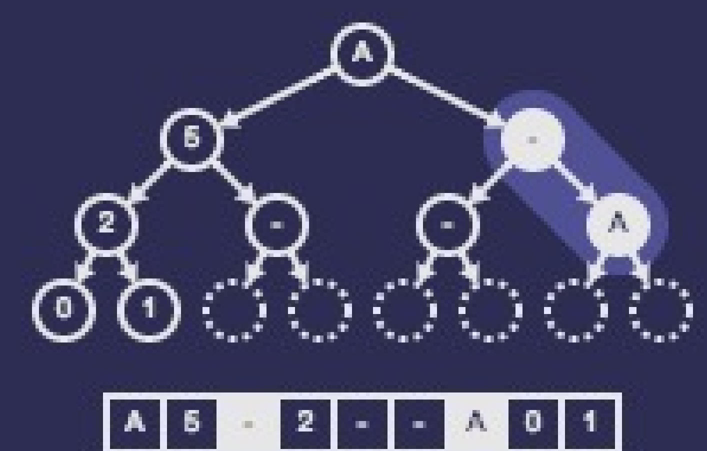
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 6. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

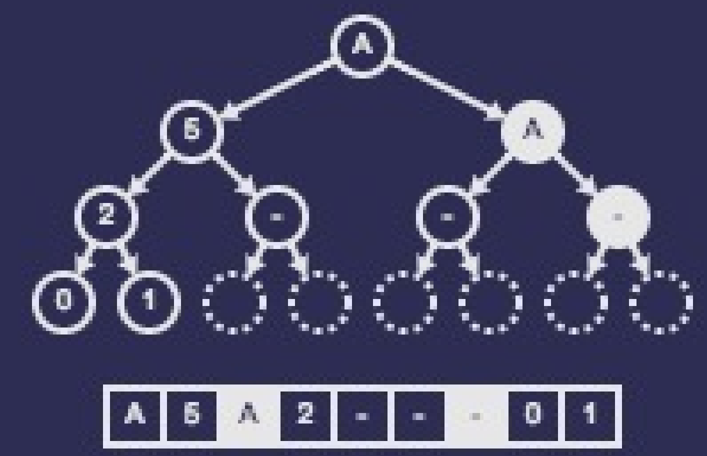
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 7. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

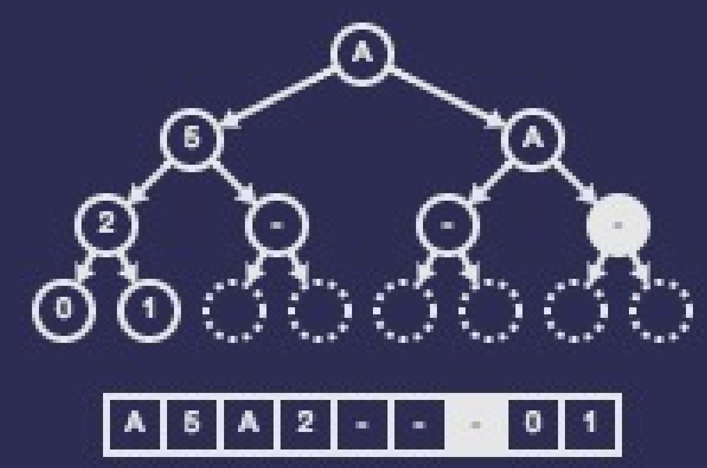
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 7. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

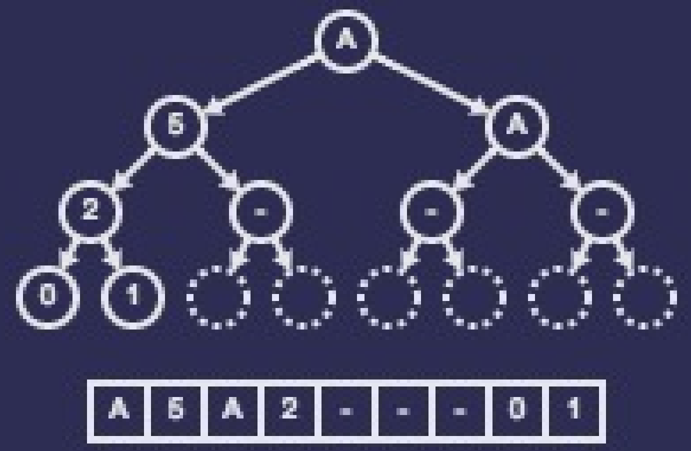
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 7. It has no children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

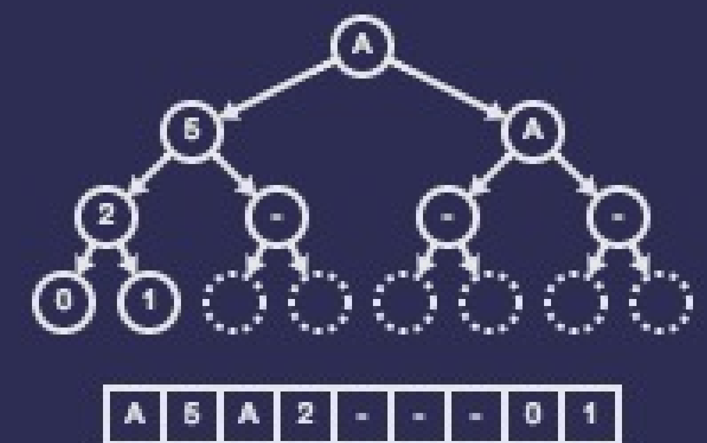
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 7. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

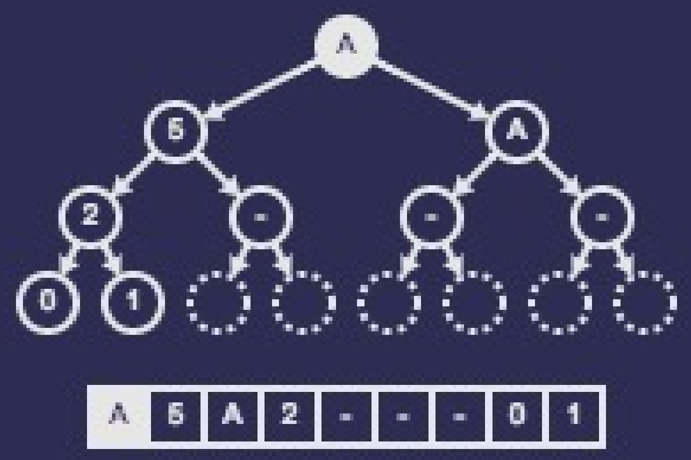
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Removing the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

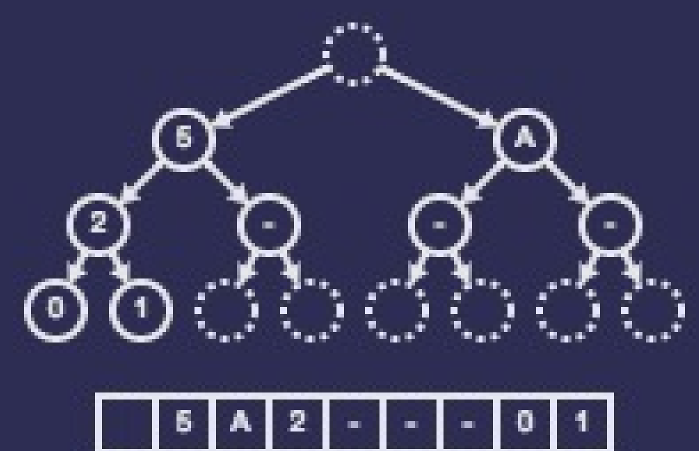
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 1. Find the root of the heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

A

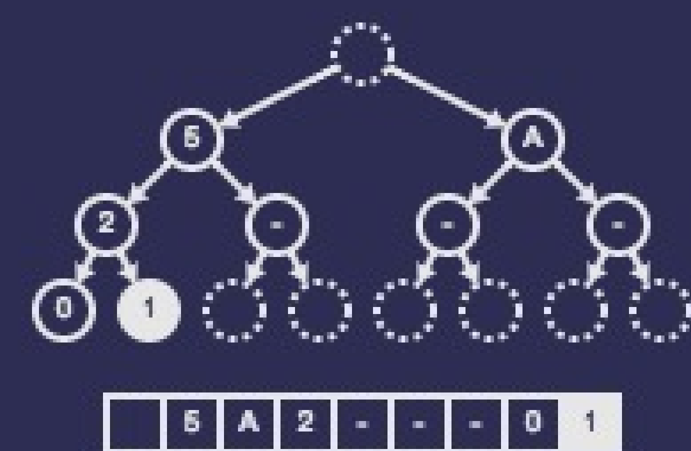
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 2. Output the value of the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

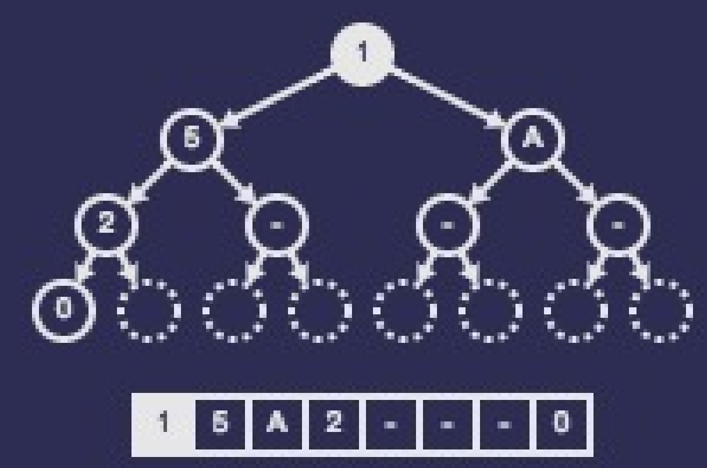
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 3. Find the last node

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

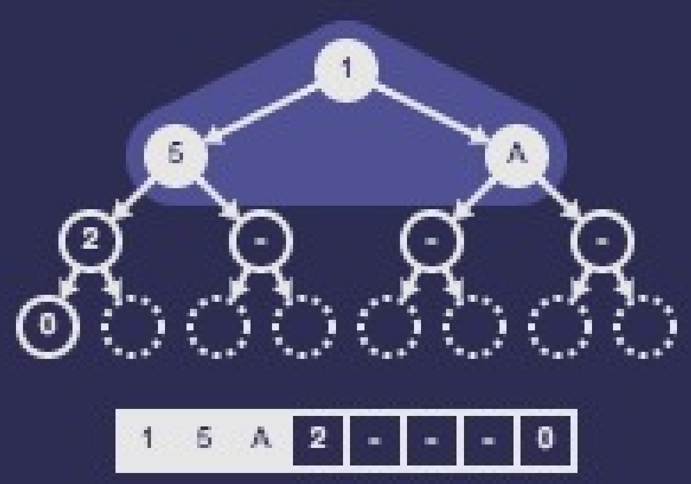
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 4. Move the last node to the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

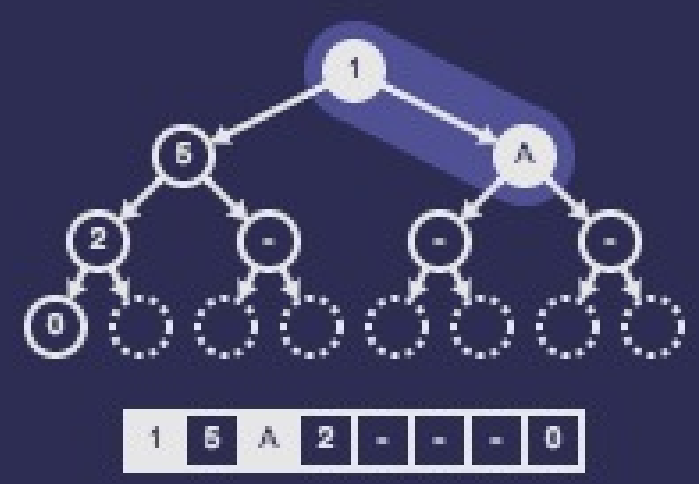
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 5. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

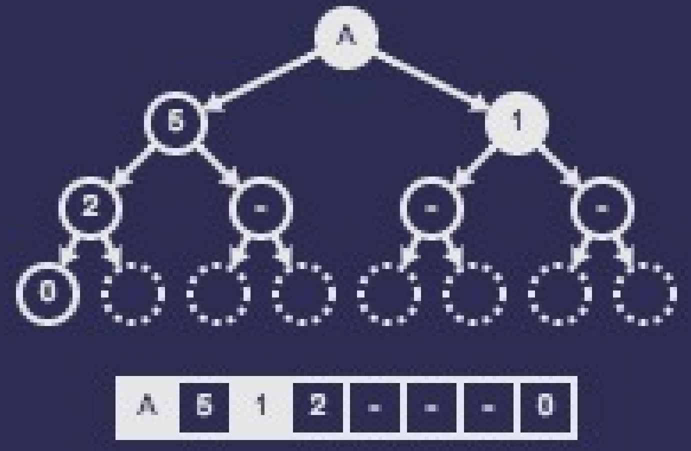
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 6. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

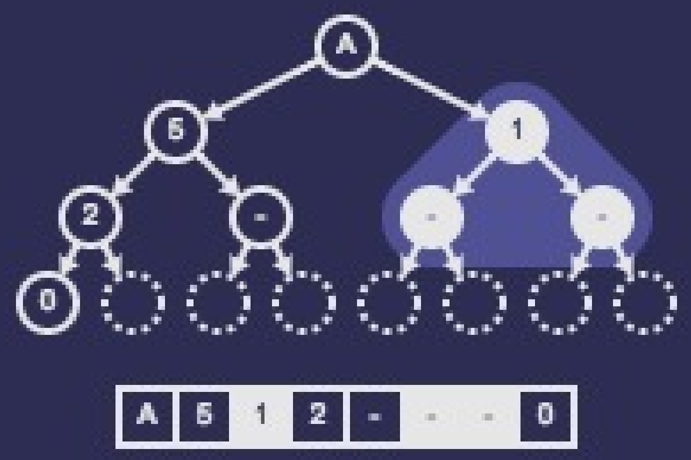
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 6. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

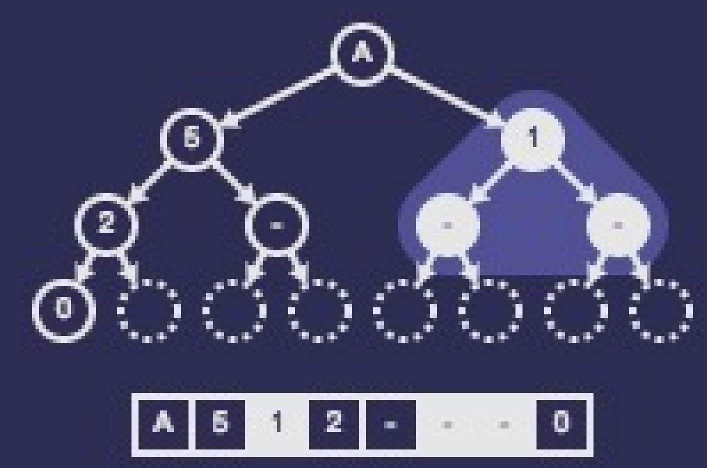
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 6. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

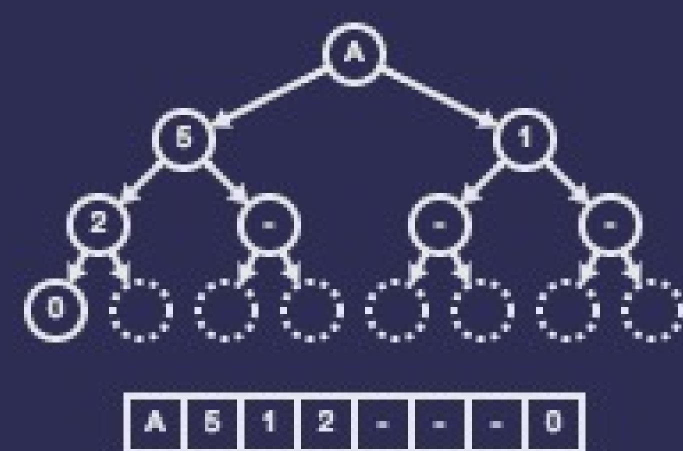
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 7. The elements are in the correct order

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

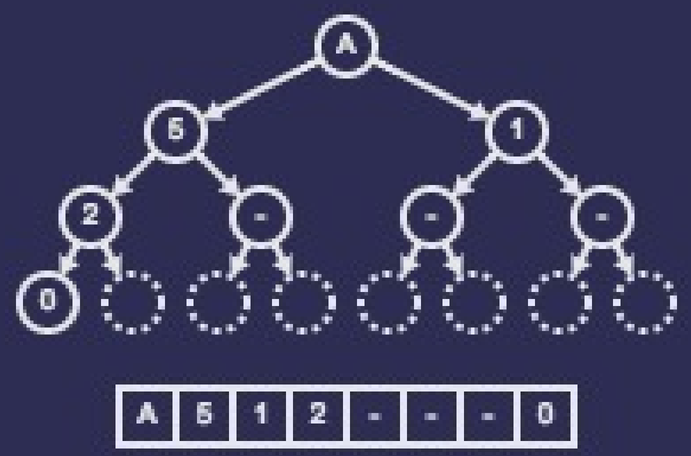
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 7. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

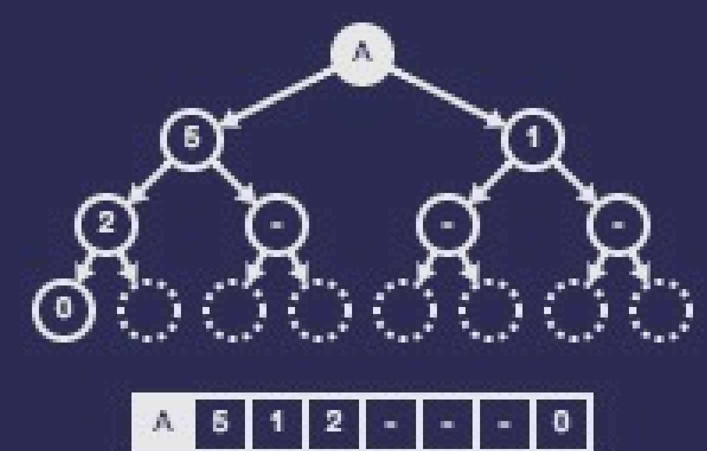
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Removing the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

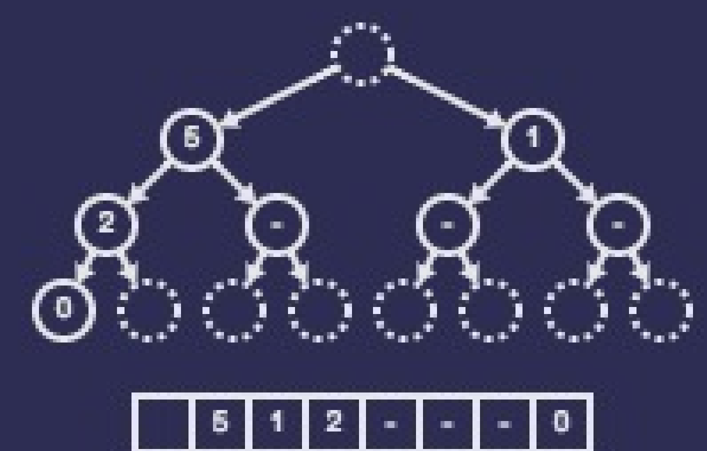
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 1. Find the root of the heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

A

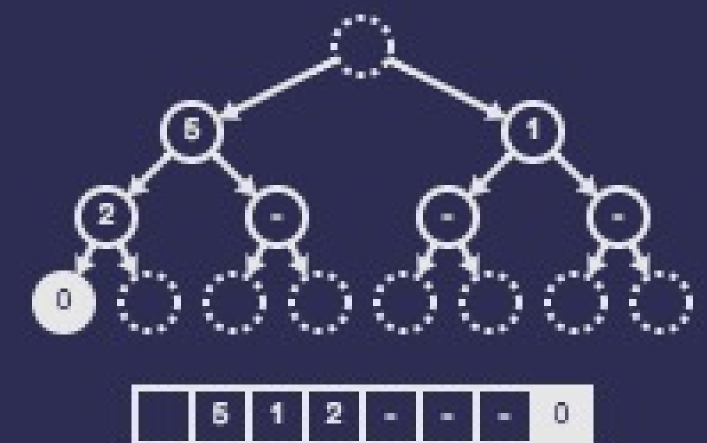
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 2. Output the value of the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

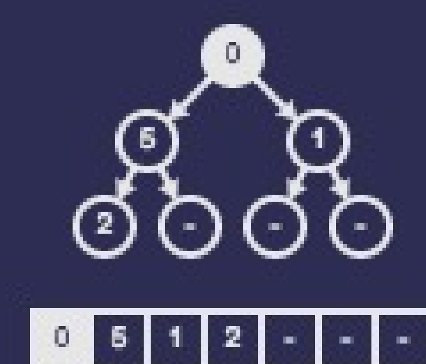
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 3. Find the last node

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

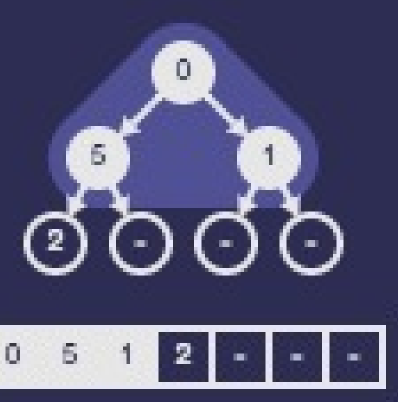
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 4. Move the last node to the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

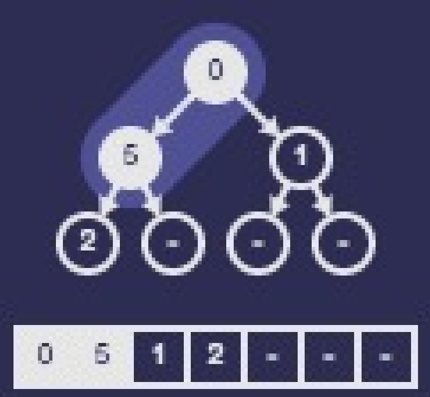
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 5. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

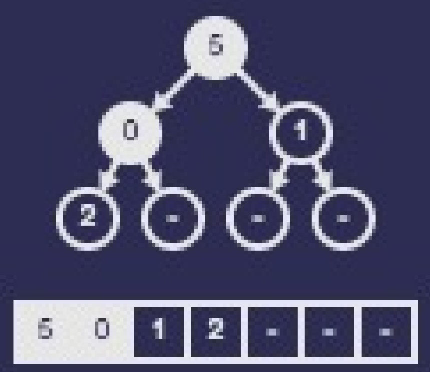
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 6. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

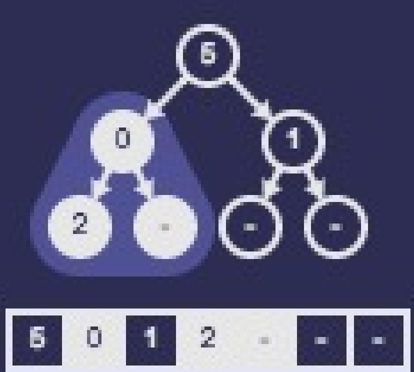
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 6. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

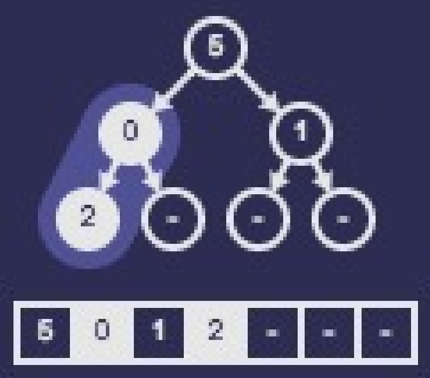
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 6. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

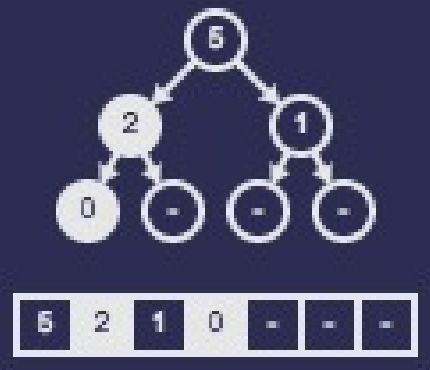
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 7. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

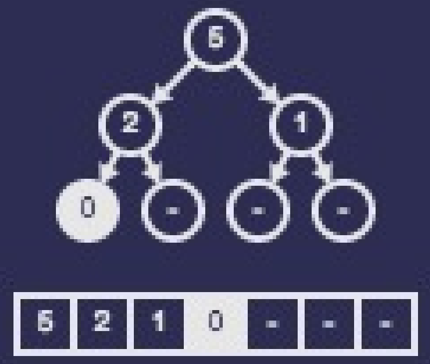
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 7. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

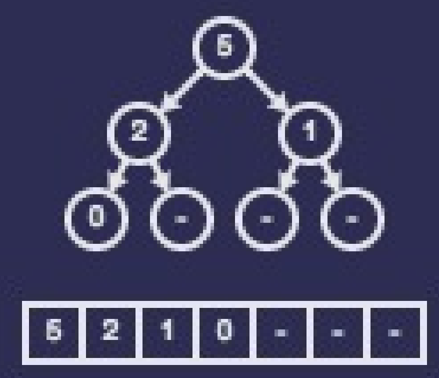
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 7. It has no children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

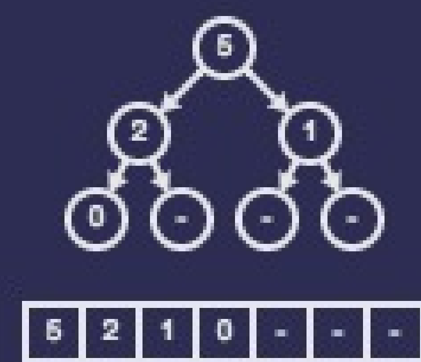
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 7. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

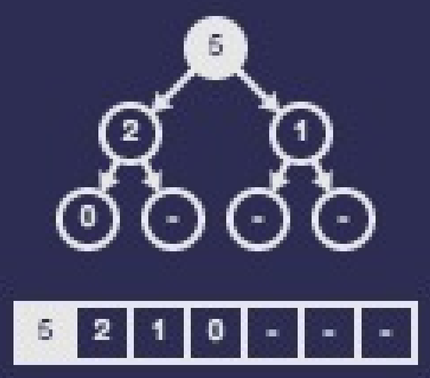
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Removing the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

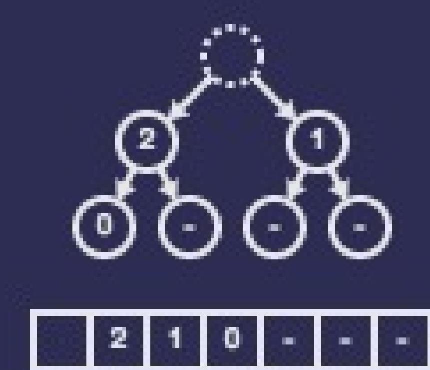
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 1. Find the root of the heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

5

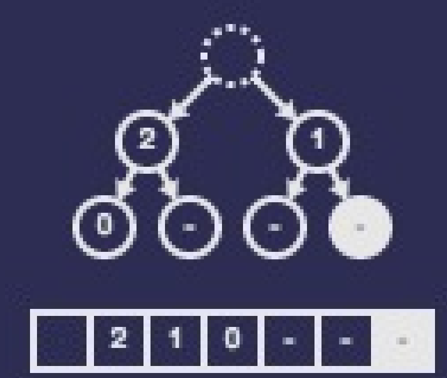
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 2. Output the value of the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

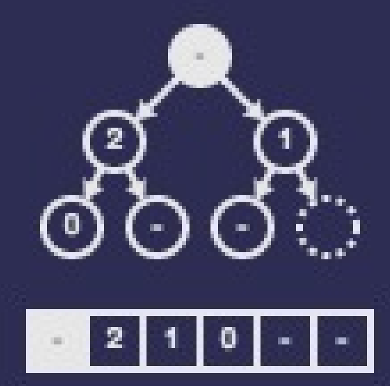
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 3. Find the last node

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

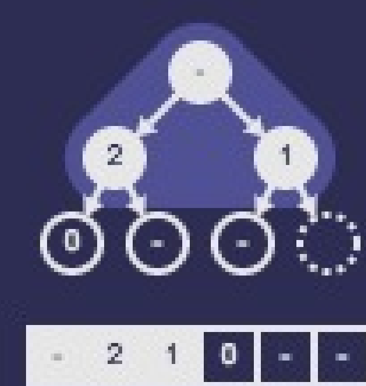
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 4. Move the last node to the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

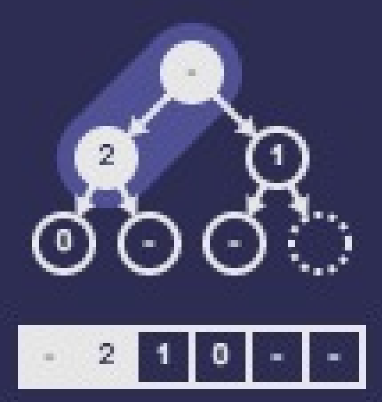
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 5. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

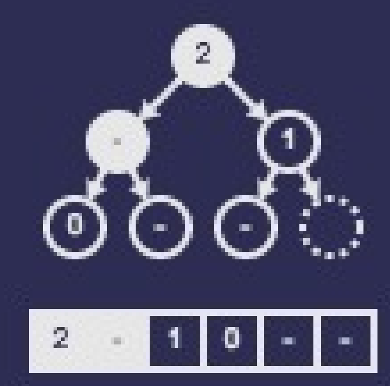
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 6. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

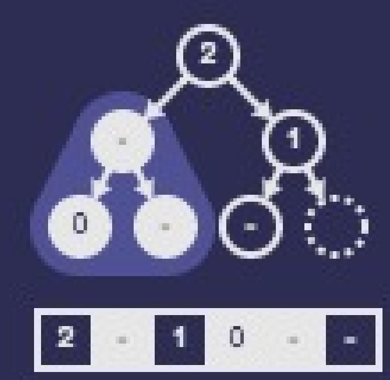
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 6. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

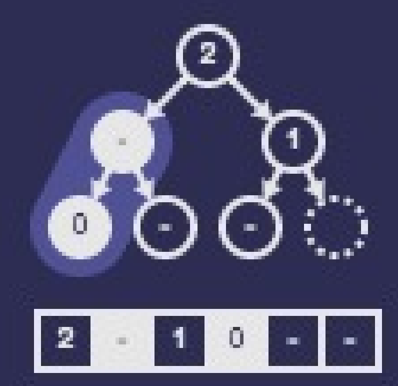
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 6. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

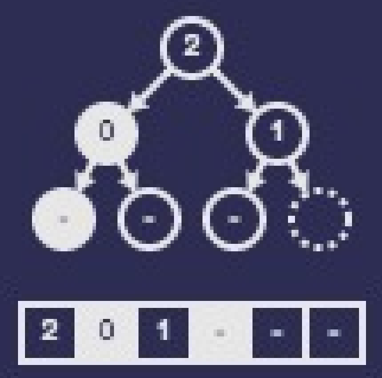
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 7. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

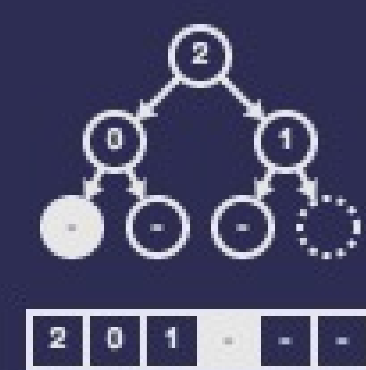
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 7. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 7. It has no children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

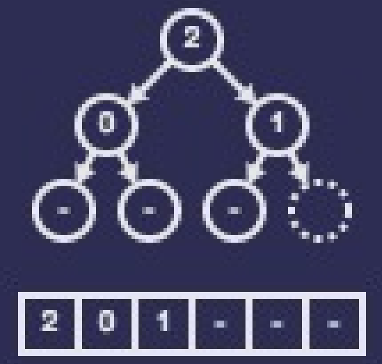
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 7. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

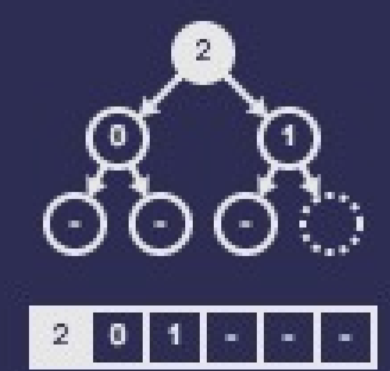
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Removing the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

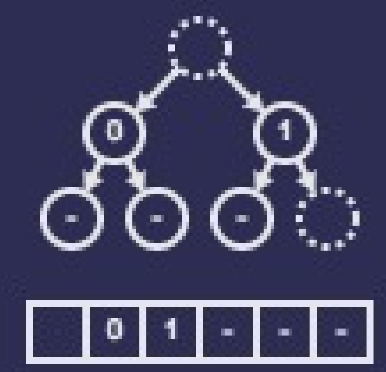
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 1. Find the root of the heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

2

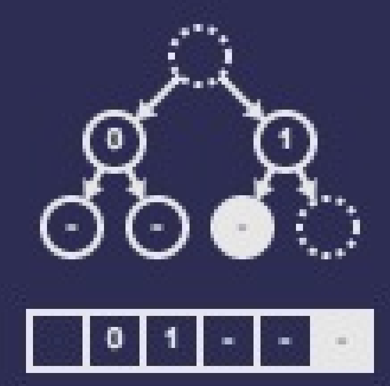
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 2. Output the value of the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

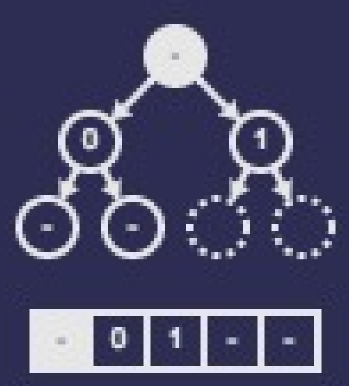
2, 5,
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 3. Find the last node

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

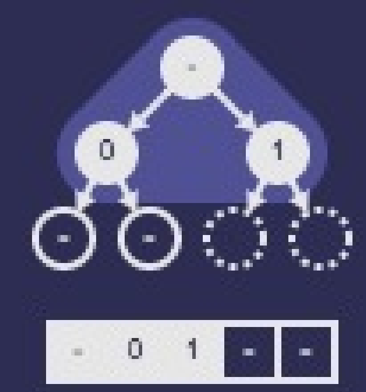
2, 5,
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 4. Move the last node to the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

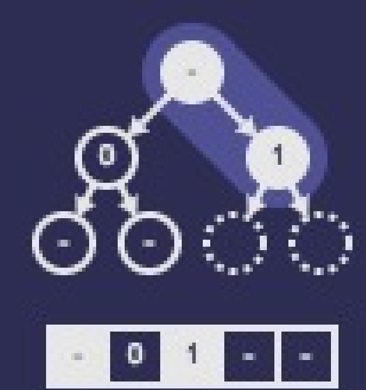
2, 5,
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 5. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

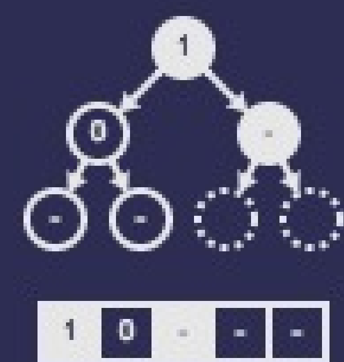
2, 5,
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 6. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

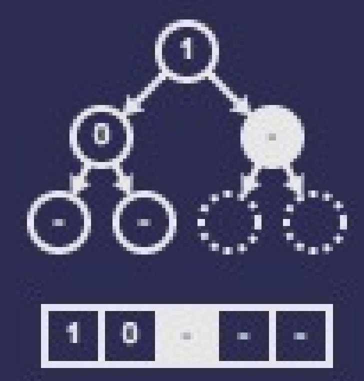
2, 5,
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 6. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

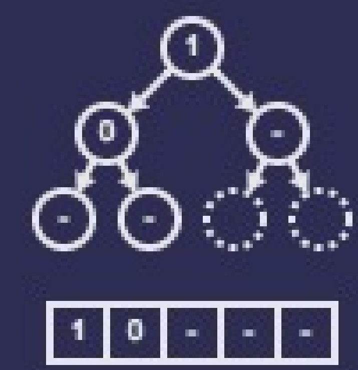
2, 5,
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 6. It has no children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

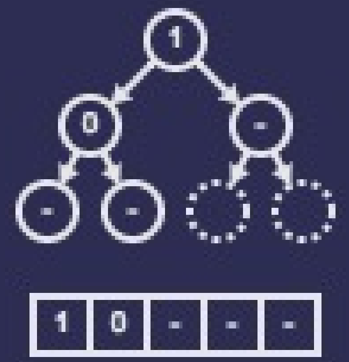
2, 5,
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 6. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

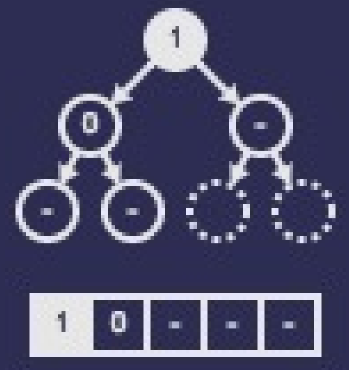
2, 5,
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Removing the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

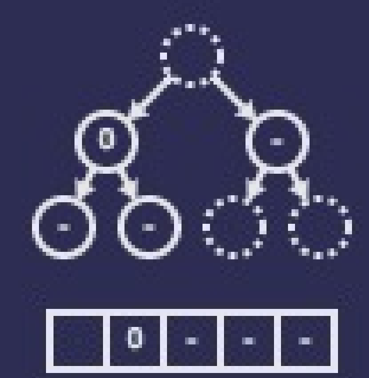
2, 5,
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 1. Find the root of the heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

1

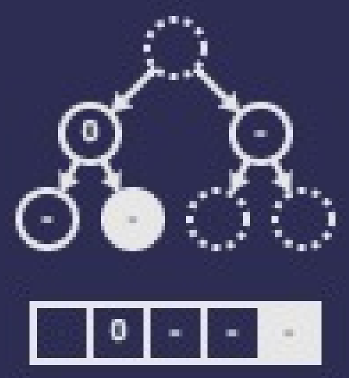
2, 5,
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 2. Output the value of the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

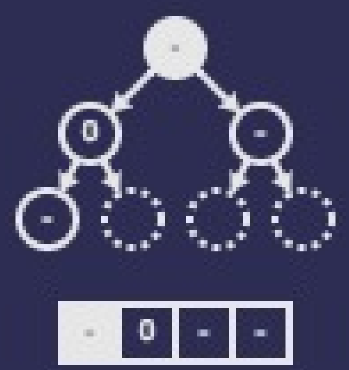
1, 2,
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 3. Find the last node

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

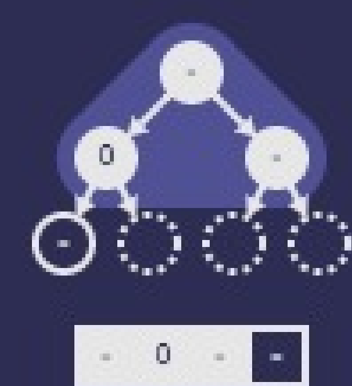
1, 2,
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 4. Move the last node to the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

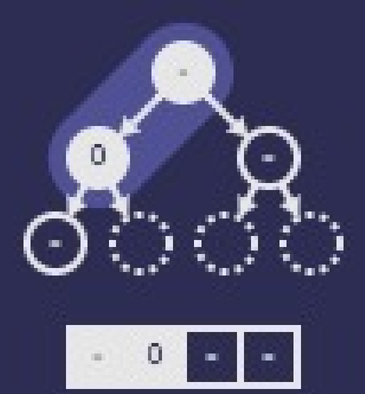
1, 2,
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 5. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

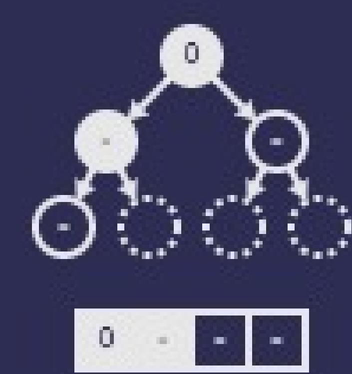
1, 2,
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 6. One of its children is larger

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

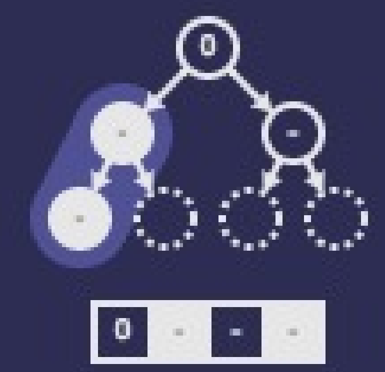
1, 2,
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 6. Swap it with its largest child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

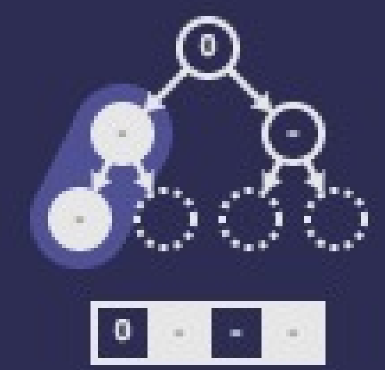
1, 2,
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 6. Compare the node with its child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

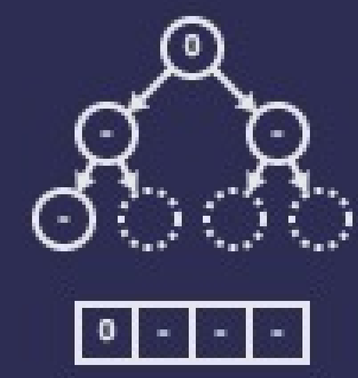
1, 2,
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 7. The elements are in the correct order

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

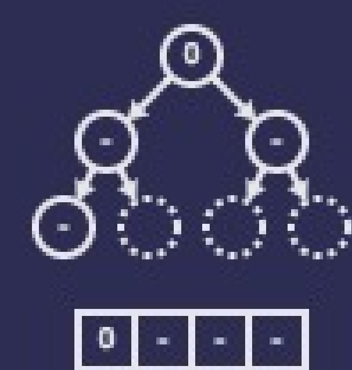
1, 2,
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 7. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

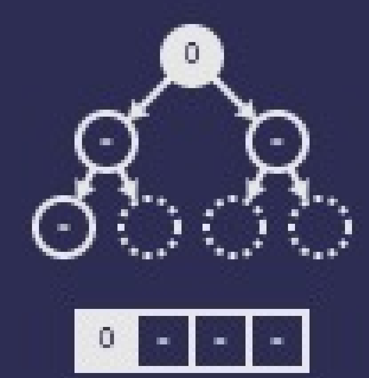
1, 2,
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Removing the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

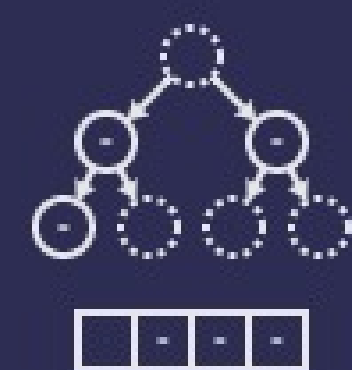
1, 2,
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 1. Find the root of the heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

0

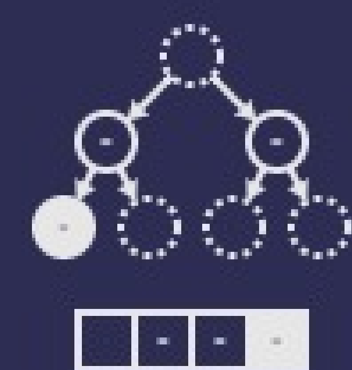
1, 2,
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 2. Output the value of the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

0, 1,
2, 5,
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 3. Find the last node

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

0, 1,
2, 5,
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 4. Move the last node to the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

0, 1,
2, 5,
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 5. Compare the node with its two children

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

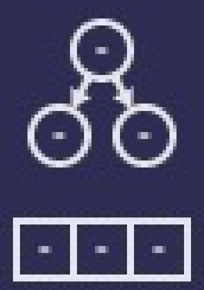
0, 1,
2, 5,
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 6. The elements are in the correct order

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

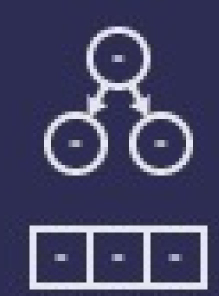
0, 1,
2, 5,
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 6. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

0, 1,
2, 5,
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Removing the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

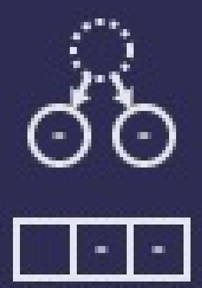
0, 1,
2, 5,
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 1. Find the root of the heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

-

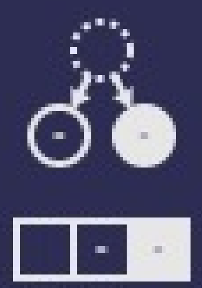
0, 1,
2, 5,
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 2. Output the value of the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT



OUTPUT

-, 0,
1, 2,
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 3. Find the last node

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

-, 0,
1, 2,
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 4. Move the last node to the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

-, 0,
1, 2,
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 5. Compare the node with its child

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

-, 0,
1, 2,
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 6. The elements are in the correct order

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

-, 0,
1, 2,
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 6. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

-, 0,
1, 2,
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Removing the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

-, 0,
1, 2,
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 1. Find the root of the heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

-

-, 0,
1, 2,
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 2. Output the value of the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

-, -, 0,
1, 2,
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 3. Find the last node

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

-, -, 0,
1, 2,
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 4. Move the last node to the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

-, -, 0,
1, 2,
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 5. The heap has a single element

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

-, -, 0,
1, 2,
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 6. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

-, -, 0,
1, 2,
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Removing the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

-, -, 0,
1, 2,
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 1. Find the root of the heap

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

-

-, -, 0,
1, 2,
5, A,
A, A,
C, E,
G, H,
H, I,
L, M,
M, O,
O, P,
R, R,
S, S,
T, T

Step 2. Output the value of the root

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

-, -, -,
0, 1,
2, 5,
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 3. The heapy is now empty

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

-, -, -,
0, 1,
2, 5,
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 4. So we are done

HEAPSORT

A, L, G, O,
R, I, T, H,
M, S, -, C,
A, M, -, 2,
0, 1, 5, -,
H, E, A, P,
S, O, R, T

INPUT

OUTPUT

-, -, -,
0, 1,
2, 5,
A, A,
A, C,
E, G,
H, H,
I, L,
M, M,
O, O,
P, R,
R, S,
S, T,
T

Step 55. The array has now been sorted