# Recursive Binary Tree Search

Trace the following code

|  |  |
| --- | --- |
| **1**  **2**  **3**  **4**  **5**  **6**  **7**  **8**  **9**  **10**  **11**  **12**  **13**  **14**  **15**  **16**  **17** | def binary\_tree\_search(node, search\_item):  path.append(values[node])  if values[node] == search\_item:  return "Value in Tree. Path: "+str(path)  elif values[node] < search\_item:  if tree\_right[node] == -1:  return "Value not in Tree"  return binary\_tree\_search(tree\_right[node], search\_item)  elif values[node] > search\_item:  if tree\_left[node] == -1:  return "Value not in Tree"  return binary\_tree\_search(tree\_left[node], search\_item)  path = [ ]  # node[ 0, 1, 2, 3, 4, 5, 6, 7, 8, 9]  values = [10, 1, 17, 4, 11, 8, 14, 5, 12, 16]  tree\_left = [ 1, -1, 4, -1, -1, 7, 8, -1, -1, -1]  tree\_right= [ 2, 3, -1, 5, 6, -1, 9, -1, -1, -1]  print(binary\_tree\_search(0, 5)) |

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| **call** | **node** | **search\_item** | **path** | **Output** |
|  |  |  | [] |  |
| 1 | 0 | 5 | [10] |  |
| 2 | 1 |  | [10,1] |  |
| 3 | 3 |  | [10,1,4] |  |
| 4 | 5 |  | [10,1,4,8] |  |
| 5 | 7 |  | [10,1,4,8,5] |  |
| 4 |  |  |  |  |
| 3 |  |  |  |  |
| 2 |  |  |  |  |
| 1 |  |  |  | Value in Tree. Path:  [10,1,4,8,5] |

**Stack Heap**

# Iterative Binary Tree Search

Trace the following code

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| --- | --- |
| **1**  **2**  **3**  **4**  **5**  **6**  **7**  **8**  **9**  **10**  **11**  **12**  **13**  **14**  **15**  **16**  **17**  **18**  **19** | def binaryTreeSearch(values,tree\_right,tree\_left,search\_item):  node=0  path = []  while values[node] != search\_item and node!=-1:  path.append(values[node])  if values[node] > search\_item:  node=tree\_left[node]  else:  node=tree\_right[node]  if node!= -1:  path.append(values[node])  return "vistied nodes",path  else:  return "Value not found in tree"  values = [10,1,17,4,11,8,14,5,12,16]  tree\_left = [1,-1,4,-1,-1,7,8,-1,-1,-1]  tree\_right=[2,3,-1,5,6,-1,9,-1,-1,-1]  search\_item=8  print(binaryTreeSearch(values,tree\_right,tree\_left,search\_item)) |

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| **node** | **search\_item** | **path** |
| 0 | 8 | [] |
| 1 |  | [10] |
| 3 |  | [10,1] |
| 5 |  | [10,1,4] |
|  |  | [10,1,4,8] |