Worksheet: Huffman Encoding

1. Given the phrase: "she sees the three trees", build the Huffman Tree by following the steps below.

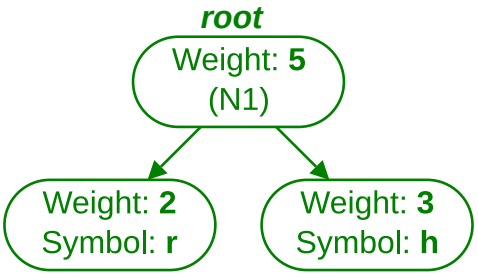
   a) Create a tally chart of frequencies for each letter.

Symbol	s	h	e	space	t	r
Tally	𝍸	𝍷	𝍸 𝍷	𝍸	𝍷	||
Total	4	3	8	4	3	2

   b) Order the symbols by frequency of occurrence with lower frequency on the left. This is the frequency-weighted priority queue for the data symbols. For symbols of equal frequency, keep the order the same as in the tally chart, above.

Symbol	r	h	t	s	space	e
Total	2	3	3	4	4	8

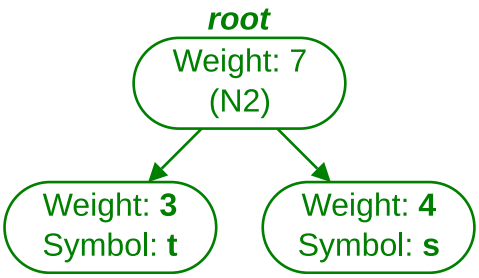
   c) Draw the first binary tree. This tree will have three nodes – a root with two leaves. Start by creating a new node and setting the first two elements from the priority queue as the left (first element) and right (second element) children. Let the symbol for the root node be ***N1***.



   d) Complete the priority queue resulting from placing node ***N1*** back onto the priority queue. Add the new node later than any existing node with the same weight that is already in the queue.

Symbol	t	s	space	*N1*	e
Total	3	4	4	5	8

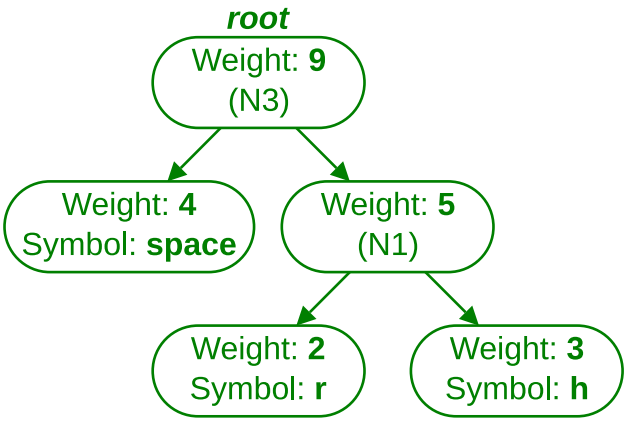
   e) Repeat the same process with the next two elements on the queue, creating new node ***N2***.



Symbol	space	*N1*	*N2*	e
Total	4	5	7	8

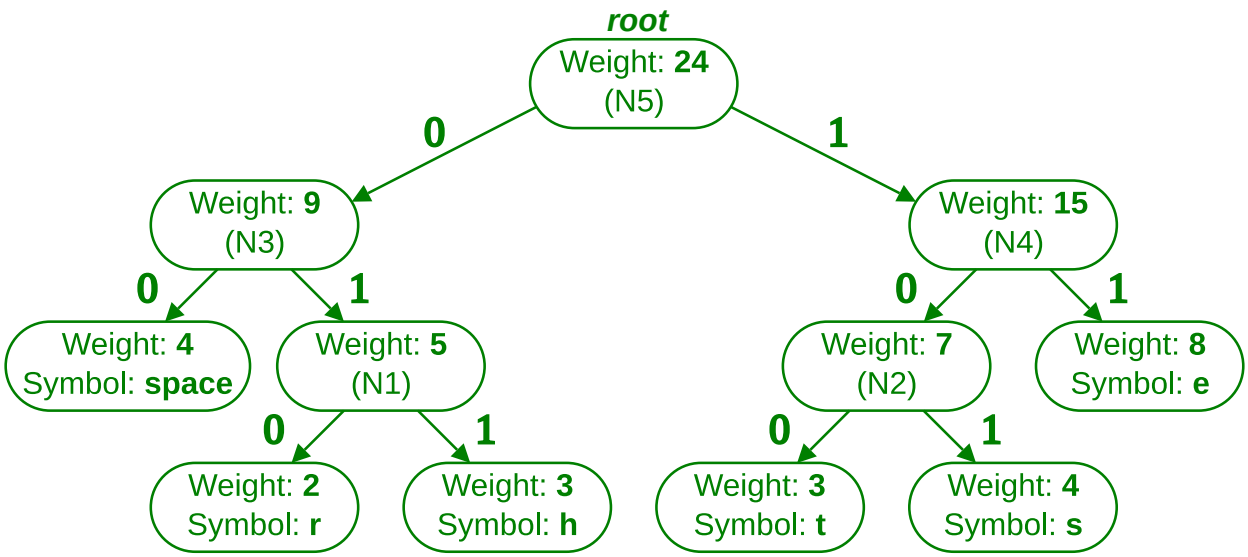
Worksheet: Huffman Encoding

f) Repeat again. This time one of the nodes will be a tree. The procedure is not different, however when you draw the tree, it will have three levels and consist of five nodes, three of which are leaf nodes.



Symbol	N2	e	N3
Total	7	8	9

g) Only three nodes in the priority queue. Complete the last two steps and draw the final tree below. Complete the two priority queue steps.



Symbol	N3	N4
Total	9	15

Symbol	N5
Total	24

h) Write the encoding on the branches of the tree above, then complete the binary code table below.

Symbol	s	h	e	space	t	r
Tally	101	011	11	00	100	010

i) Decode the message: “010111011000001111101011” rest here