

8.1

8.1-1

The smallest depth of a leaf is 1, in the case that the sequence only has 2 elements in the right order and you only have to compare once.

8.1-2

Use induction:

If

$$\sum_1^n (\lg k) = \Omega(n \lg n)$$

$$\Omega(n \lg n) + \lg(n+1) > (n+1) \lg n$$

$$c(n+1) \lg n = (n+1) \lg n^c > (n+1) \lg(n+1)$$

for $c \geq 2$

8.1-3

If m of the $n!$ permutations are linear, then the heap consisting of these m permutations will have $\lg(m)$ levels. Plug in the fractions, $1/2, 1/n, 1/2^n$ in the heap, all cannot beat the height down to linear.

8.1-4

Optimal solution doesn't need to compare the elements in different subsequences. n/k sequences in total, $\Omega(k \lg(k))$ for each, so in total is $\Omega(n \lg(k))$