1. Ans:

Given,

Total # of numbers to sort = 4

so, the total number of leaves in the decision tree $= n! = 4!$

If the height of the tree is h, then

(Since total no. of leaves $\leq 2^h$)

$\Rightarrow 2^h \geq 4!$

$\Rightarrow h \geq \log_2(4!)$

$= \log_2(24)$

$= 4.6$

≈ 5

$\therefore h \geq 5$

so, from this, we can conclude that the total number of comparisons to sort the 4 numbers should be at least 5.

$\Rightarrow$ In general, to sort n elements, comparison sort must make $\Omega(n \log n)$ comparisons in the worst case.