E External path length and
I internal path length

$E = I + 2n$

I - the total number of comparisons needed to build a binary search tree whose internal path length is I.

- the total number of comparisons to run the binary search sort via such a tree (same as for Quicksort)

Avg. number of comparisons to search successfully for a key in a B.S. tree whose internal path length is I.

$$C = \frac{I + n}{n} = \frac{I}{n} + 1$$

Avg. number of comparisons to search unsuccessfully for a key in a B.S. tree whose external path length is E

$$c' = \frac{E}{n+1} = \frac{I+2n}{n+1} \approx \frac{I+2n}{n} =$$

$$= \frac{I}{n} + 2 = c+1$$

Best case

$$I \approx n \lg n - 2n$$

$$E = I + 2n \approx n \lg n$$

$$c = \frac{I}{n} + 1 \approx \lg n - 1$$

$$c' \approx c + 1 = \lg n$$

Avg. case

$I \approx 1.4 n \lg n - 2.8 n$

$E \approx 1.4 n \lg n - 0.8 n$

$C \approx 1.4 \lg n - 1.8$

$C' \approx 1.4 \lg n - 0.8$

Worst case

$I = \frac{n(n-1)}{2}$

$E = \frac{n(n+3)}{2}$

$C = \frac{n+1}{2}$

$C' = \frac{n+3}{2}$