$\frac{n}{2}$ $\frac{n}{2}+1$ $\frac{n}{2}+2$ $\frac{n}{2}+3$

possible num of keyCmp (n=8): 4, 5, 6, 7

4 keyCmp

1 1 vs 5, 2 vs 5, 3 vs 5, 4 vs 5

2 5 vs 1, 5 vs 2, 5 vs 3, 5 vs 4

7 keyCmp

1 1 vs 2, 3 vs 2, 3 vs 4, 5 vs 4, 5 vs 6, 7 vs 6, 7 vs 8

⋮

12/8

smaller (larger)				larger (smaller)			

base case best (4)

~~worst (7)~~ 2 large, 2 small | 2 large, 2 small

$\frac{n}{2}$ to n-1 { 3 large, 1 small | 1 large, 3 small

n = 16: base case (8) smaller, (8) larger

$\frac{n}{2}$ to n-1 { 7s, 1l; 6s, 2l; 5s, 3l; 4s, 4l

n = 4: base case smaller (2), larger (2)

$\frac{n}{2}$ to n-1 { 1s, 1l

4	→	4
5 keyCmp	→ merge	3
6	→	2
7	→	1

1 2 3 5   4 6 7 8

1 vs 4, 2 vs 4, 3 vs 4, 5 vs 4, 5 vs 6

[1] [2] [3] [4] [5] [6] [7] [8]

1 2 3 6   4 5 7 8

1 vs 4, 2 vs 4, 3 vs 4, 6 vs 4, 6 vs 5, 6 vs 7

[1] [2] [3] [4] [5] [6] [7] [8]

2 3 7 8   1 4 5 6 ← disproved $\frac{n}{4}$ large, $\frac{n}{4}$ small each subarray leads to worst

2 vs 1, 2 vs 4, 3 vs 4, 7 vs 4, 7 vs 5, 7 vs 6

[1] [2] [3] [4] [5] [6] [7] [8]

1 4 6 7   2 3 5 8

1 vs 2, 4 vs 2, 4 vs 3, 4 vs 5, 6 vs 5, 6 vs 8, 7 vs 8

[1] [2] [3] [4] [5] [6] [7] [8]

worst case: largest 2 elements in different subarrays

1 2 3 8   4 5 6 7

1 vs 4, 2 vs 4, 3 vs 4, 8 vs 4, 8 vs 5, 8 vs 6, 8 vs 7

[1] [2] [3] [4] [5] [6] [7] [8]

[| | |7] [| | |8] / [| | |8] [| | |7]

(1 to 6) $(n-2)! \cdot 2$ $2 \cdot 6!$

↳ $2(n-2)!$ $[2(\frac{n}{2}-1)]! \cdot 2$