

## 19.9 Big O Summary for This Chapter's Searching and Sorting Algorithms

Figure 19.7 summarizes the searching and sorting algorithms covered in this chapter with the Big O for each. Figure 19.8 lists the Big O values we've covered in this chapter along with a number of values for  $n$  to highlight the differences in the growth rates.

| Algorithm                    | Location  | Big O         |
|------------------------------|---|---------------|
| <i>Searching Algorithms:</i> |   |               |
| Linear search                | <a href="#">Section 19.2</a>                            | $O(n)$        |
| Binary search                | <a href="#">Section 19.4</a>                            | $O(\log n)$   |
| Recursive linear search      | <a href="#">Exercise 19.8</a>                           | $O(n)$        |
| Recursive binary search      | <a href="#">Exercise 19.9</a>                           | $O(\log n)$   |
| <i>Sorting Algorithms:</i>   |   |               |
| Selection sort               | <a href="#">Section 19.6</a>                            | $O(n^2)$      |
| Insertion sort               | <a href="#">Section 19.7</a>                            | $O(n^2)$      |
| Merge sort                   | <a href="#">Section 19.8</a>                            | $O(n \log n)$ |
| Bubble sort                  | <a href="#">Exercises 19.5</a> and <a href="#">19.6</a> | $O(n^2)$      |

## Fig. 19.7

Searching and sorting algorithms with Big O values.

| $n =$         | $O(\log n)$ | $O(n)$        | $O(n \log n)$ | $O(n^2)$                    |
|---------------|-------------|---------------|---------------|-----------------------------|
| 1             | 0           | 1             | 0             | 1                           |
| 2             | 1           | 2             | 2             | 4                           |
| 3             | 1           | 3             | 3             | 9                           |
| 4             | 1           | 4             | 4             | 16                          |
| 5             | 1           | 5             | 5             | 25                          |
| 10            | 1           | 10            | 10            | 100                         |
| 100           | 2           | 100           | 200           | 10,000                      |
| 1000          | 3           | 1000          | 3000          | <b><math>10^6</math></b>    |
| 1,000,000     | 6           | 1,000,000     | 6,000,000     | <b><math>10^{12}</math></b> |
| 1,000,000,000 | 9           | 1,000,000,000 | 9,000,000,000 | <b><math>10^{18}</math></b> |

## Fig. 19.8

Number of comparisons for common Big O notations.