Selection Sort Analysis:

Size 5: 0.082secs
Size 1000: 0.095 secs
Size 10,000: 0.154 secs
Size 100,000: 5.017 secs

Merge Sort Analysis:

Size 5: 0.078 secs
Size 1000: 0.080 secs
Size 1,000,000: 0.383 secs
Size 10,000,000: 2.752 secs

As shown in the results above, Merge Sort is a much more efficient method of sorting arrays. At an array size of 100,000, Selection Sort took approximately 5 seconds to complete, but Merge Sort only took around 3 seconds to complete sorting an array of size 10,000,000. This is a significant difference that is not shown when array sizes are of smaller size such as size 5 to 1000. The difference in sorting speed occurs due to the different Big O sorting algorithms between the two sorting programs. Selection sort runs on Big O (n^2), while Merge Sort runs on Big O nLogn. O nLogn is much more efficient in the long run when compared to O n^2 because of the nature of a logarithmic function. The slope of a logarithmic function is much less steep when compared to the slope of a quadratic function which is concave up. As the array increases in size, a O n^2 algorithm will exponentially increase in run time compared to nLogn which increases at a slower rate. Selection Sort takes n comparisons to determine the smallest element, but Merge Sort uses one comparison to reduce the number of potential smallest elements by a factor of 2 and thus is more efficient.