1) Suppose that you have an $\theta(n^5)$ algorithm that required 10 seconds to run on a problem size of 1000. How long would you expect the algorithm to run on a problem size of 10,000?

2) Analyze the below algorithm to determine an obvious big-oh notation and its theta notation, $\Theta()$.

```
i := n
while (i >= 1) do
    for j := 1 to i do
        for k := 1 to n do
            something that takes O(1)
        end for k
    end for j
    i := i / 2
end while
```

3) Analyze the below algorithm to determine an obvious big-oh notation and its theta notation, $\Theta()$.

```
i := n
while i > 0 do
    for j = 1 to n do
        k := 1
        while k <= i do
            something of $\theta(1)$
            k := k * 2
        end while
    end for
    i := i / 2
end while
```
4) For sequential search, what is the best-case time complexity $B(n)$?

5) For sequential search, what is the worst-case time complexity $W(n)$?

6) If the probability of a successful sequential search is $p$, then what is the probability on an unsuccessful search?

7) If the probability of a successful sequential search is $p$, then what is the probability of finding the target value at a specific index in the array?

   
   
   
   
   
   
   
   
   
   
   # compares:  1  2  3  . . .  n

   probability:

Write a summation for the average number of comparisons.

8) What is the average-case time complexity, $A(n)$?

9 a) “Trace” binary search to determine the total number of basic operations in the worst-case?

   
   
   
   
   
   
   
   
   
   

<table>
<thead>
<tr>
<th>loop #</th>
<th># of basic operations</th>
<th># of elements</th>
<th>left 0 1 2 . . . midpoint 100</th>
<th>right n-1</th>
<th>target 151</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>&quot;n&quot;</td>
<td>10</td>
<td>10</td>
<td>100</td>
</tr>
</tbody>
</table>

   midpoint

   
   
   200

   $ullet$

   $ullet$

10) For a successful search, what is the worst-case time complexity $W(n)$?

11) For binary search, which location(s) of the target would cause the best-case, and what is the best-case time complexity $B(n)$?

12) Why would you expect the average-case to be closer to the worst-case than the best-case?