

**Quiz 4.** For questions 3-8, circle the correct answer. Points: ( $2 \cdot 1.5 + 3 \cdot 9 = 30$ )

1. Write your full name.	Key
2. Write your UA email.	
<p><b>Questions 3-5 refer to the pseudocode below.</b>  <math>Q</math> = an empty min priority queue that holds integers  <b>for</b> <math>i</math> <b>from</b> 1 <b>to</b> <math>N</math>:              <math>Q.insert(i)</math>  <b>end for</b></p>	
<p>3. If <math>Q</math> is implemented as an unsorted array (of size <math>N</math>), what is the runtime of the pseudocode?          A. <math>O(\log N)</math>    <b>B. <math>O(N)</math></b>    C. <math>O(N \log N)</math>    D. <math>O(N^2)</math>    E. The answer is not listed.</p>	
<p>4. If <math>Q</math> is implemented as a sorted array (of size <math>N</math>), what is the runtime of the pseudocode? Note that the sorting here would be in descending order so that the minimum would always be farthest to the right.          A. <math>O(\log N)</math>    B. <math>O(N)</math>    C. <math>O(N \log N)</math>    <b>D. <math>O(N^2)</math></b>    E. The answer is not listed.</p>	
<p>5. If <math>Q</math> is implemented as an array-based min binary heap, what is the runtime of the pseudocode?          A. <math>O(\log N)</math>    <b>B. <math>O(N)</math></b>    C. <math>O(N \log N)</math>    D. <math>O(N^2)</math>    E. The answer is not listed.</p>	
<p>6. Which of the following recurrence relations best describes the worst-case runtime of Mergesort?          A. <math>T(N) = T(N - 1) + \log N</math>    B. <math>T(N) = T(N/2) + N</math>    <b>C. <math>T(N) = 2T(N/2) + N</math></b>          D. <math>T(N) = T(N - 1) + N</math>    E. <math>T(N) = 2T(N/2) + 1</math></p>	
<p>7. Which of the following recurrence relations best describes the worst-case runtime of Quicksort?          A. <math>T(N) = T(N - 1) + \log N</math>    B. <math>T(N) = T(N/2) + N</math>    C. <math>T(N) = 2T(N/2) + N</math>  <b>D. <math>T(N) = T(N - 1) + N</math></b>    E. <math>T(N) = 2T(N/2) + 1</math></p>	
<p>8. Which of the following recurrence relations best describes the best-case runtime of Quicksort?          A. <math>T(N) = T(N - 1) + \log N</math>    B. <math>T(N) = T(N/2) + N</math>    <b>C. <math>T(N) = 2T(N/2) + N</math></b>          D. <math>T(N) = T(N - 1) + N</math>    E. <math>T(N) = 2T(N/2) + 1</math></p>	
<p>9. Which of the following recurrence relations best describes the worst-case runtime of Heapsort?  <b>A. <math>T(N) = T(N - 1) + \log N</math></b>    B. <math>T(N) = T(N/2) + N</math>    C. <math>T(N) = 2T(N/2) + N</math>          D. <math>T(N) = T(N - 1) + N</math>    E. <math>T(N) = 2T(N/2) + 1</math></p>	
<p>10. What is the load factor for a hashtable using separate chaining?  <b>A. The percentage of the table that is filled.</b>  <b>B. The average length of the lists.</b>          C. The total number of elements in the table.          D. The number of open positions in the table.          E. None of the above.</p>	
<p>11. If a hashtable using separate chaining uses a table of size <math>M</math> and contains <math>N</math> key-value pairs, what is the expected runtime of a <i>get</i> operation, assuming a good hash function?          A. <math>O(N)</math>    B. <math>O(M)</math>    C. <math>O(M/N)</math>    <b>D. <math>O(N/M)</math></b>    E. <math>O(N^2)</math></p>	
<p><b>Extra Credit.</b>          Who are Marshall Mathers and Gordon Sumner?</p>	

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