

INFO6205 Mid-term exam — sample questions

2. Matching: Order of growth: Match up the order of growth in terms...

Points: 7.50000

Question	Match up the order of growth in terms of n , the size of the problem, with the name used to describe that order of growth.		
Answer	Match Question Items Answer Items		
	A. -	A. n^2	A. quadratic
	B. -	B. n	B. linear
	C. -	C. $n \log n$	C. linearithmic
	D. -	D. $\log n$	D. logarithmic
	E. -	E. n^0	E. constant

1. Multiple Choice: Data structures: Which of the following statements are...

Points: 5.00000

Question	Which of the following statements are true with respect to lists and arrays?
Answer	<p>A. A doubly-linked list is used to implement a queue</p> <p>B. A bag can be implemented only by a linked list.</p> <p><input checked="" type="checkbox"/> C. A linked list is ideally suited to implementing a stack.</p> <p>D. Two linked lists cannot support all of the operations required for a queue.</p>

3. Calculated Numeric: Genome: The human genome is said to have 3,00...

Points: 12.00000

Question	The human genome is said to have 3,000,000,000 base pairs. You need to search for a particular sequence in chromosomes I through IV (approximately 1,000,000,000 base pairs). Using the "brute force" method (which uses to $k N$ operations, where k is a constant and N is the number of base pairs scanned) takes one year (on average)—that's to say approximately 30,000,000 seconds. A colleague has developed an algorithm that can improve the time to be $3 k \lg N$ where \lg is log to the base 2. How long will the search take, on average, in seconds. You don't need a calculator—just remember that $\lg 1000$ is 10.
Answer	3
Answer range +/-	2

4. Essay: Quicksort: Implement the (basic) partition&...

Points: 18.50000

Question	Implement the (basic) partition algorithm for quicksort: <pre>private static int partition(Comparable[] a, int lo, int hi) { // TODO partition into $a[lo..j-1]$, $a[j]$, $a[j+1..hi]$ and return j // You may assume method <code>private boolean less(Comparable x, Comparable y)</code> }</pre>
Answer	

5. True/False: Sorting: The input to a merge sort (comparing ...

Points: 7.00000

Question

The input to a merge sort (comparing the key values) is a series of key-value pairs:

("A", 123), ("B", 371), ("A", 255), ("C", 756), ("A", 42)

The output of the merge is:

("A", 42), ("A", 123), ("A", 255), ("B", 371), ("C", 756)

Answer

True

False

6. Matching: Union-Find implementations: Please match up the following impleme...

Points: 8.00000

Question

Please match up the following implementations of Union-Find (n sites) with the closest-matching order-of-growth characteristic--for the *union* operation--from the right-hand side.

Answer	Match Question Items	Answer Items
A. -	A. quick-find	A. n
B. -	B. quick-union	B. between $\lg n$ and n
C. -	C. weighted quick-union	C. $\lg n$
D. -	D. weighted quick-union with path compression	D. 1

7. Multiple Choice: Only the best: You have to identify the best item (t...

Points: 6.00000

Question

You have to identify the best item (the largest key value) from a stream of data that runs throughout the business day and may involve a million or more items. At the close of business you must send out an email identifying the (single) best item. In order to minimize resource usage for this task, you should use:

Answer

A. A: quicksort and head, that's to say $get(o)$

B. B: a max priority queue of size 1

C. C: linear scan

D. D: any of the above

E. E: either A or B

F. either B or C

G. either A or C

8. Matching: Computer Museum: You take a visit to the Computer Muse...

Points: 12.00000

Question

You take a visit to the Computer Museum and you see an exhibit which does sorting on a very old computer. It cycles through the following datasets for each of two dataset sizes (20 and 50) and each of four algorithms:

1. random
2. partially sorted
3. reverse-sorted
4. multi-key

With your smart phone, you time the various sorts to try to identify the algorithms from among insertion sort, selection sort, merge sort and quick sort.

Here are the timings:

	20 R	20 S	20 Rv	20 multi	50 R	50 S	50 Rv	50 multi
A	7.04	1.98	10.01	4.68	29.58	6.1	61.46	36.45
B	10.72	10.74	10.73	10.76	65.13	65.12	65.11	65.14
C	4.63	4.65	4.66	4.64	14.99	15.00	14.97	15.01
D	4.52	4.51	4.53	6.72	13.67	13.69	13.68	32.66

Answer

Match Question Items Answer Items

A. - A. Algorithm A A. Insertion sort

B. - B. Algorithm B B. Selection sort

C. - C. Algorithm C C. Merge sort

D. - D. Algorithm D D. Quick sort

