

## Midterm 2 Review Summer09

These questions are designed to help you think about course material, not to show you actual exam questions. The exam will be about 40-70 percent multiple choice, as discussed in class. The remainder will be short answer or coding.

Research shows that the best way to study for an exam is with other people. In group study, the people who start knowing more learn more, so don't think that it is only valuable to study with people who know more than you do.

When studying, always take the time to **explain** why an answer is correct. This will help you solidify your knowledge.

### 0.0.1 Project

1. Given a description of any function from the basic project (not the enhanced version), show how to create test parameters and use them in a call to the function.
2. Given a description of any function from the basic project (not the enhanced version) and sample input, show how to call the function and show its output (if any).
3. Show how to make a "board" with about half the squares containing goldfish.
4. Show how to generate a random number in a certain range. Show how to generate a vector of random numbers in a certain range.

### 0.0.2 Search and Sorting

5. What are the differences between linear and binary search?
6. Given an algorithm resembling binary search show the sequence of calls/parameters that will be generated.
7. Given a small unsorted array, explain/draw how selection sort will turn it into a sorted array (for example show the comparisons and swaps for [4 5 3 1])
8. What are the advantages of using merge sort over selection sort? Describe how merge sort works using a recursive function.
9. Think about how selection sort and merge sort work. Imagine that you had a hundred people, each with a number (similar to our in class exercise). Which sort would be easier to implement if there was leader controlling the group, but each person could act on their own. Explain/defend your answer.

### 0.0.3 MATLAB functions/programming

10. Convert a simple function with a loop to its vectorized form.
11. Use the find command to determine the position of a value you wish to find in a vector.
12. Given a vector  $m = [1\ 4\ 6\ 7\ 3\ 9]$ , give a Matlab expression that will evaluate to  $m$  with 7 removed.

13. Write a function that will remove a number from a vector. The number and vector are parameters.
14. Explain the difference in memory usage between Matlab's default representation of numbers and the representation of a mask.
15. Explain what find does.
16. Show what the find function would return when called on a vector or matrix. For example, what would find([0 1 2 3]) return?
17. Write a recursive and an iterative function to display a triangle of asterisks:

```
*  
* *  
* * *  
* * * *
```

18. Given a recursive function, show what it displays when passed certain parameters (trace the function as on Midterm 1). For example, you could be given a function that makes a geometric shape.
19. Write a recursive function to calculate a simple numeric function, like factorial or exponent.
20. Demonstrate the use of Matlab functions **any**, **all**.
21. Create, and access the fields of a structure.
22. Write a script to compare the time the cpu spends performing two functions 100 times each. Do not plot the data, just display the times.
23. Given some data in matrices, show how to plot it using the plot function.
24. Show how to grow a Matlab matrix. In general, is this a good idea? Why or why not?
25. Show how to use the Matlab function size() to help write for loops for a matrix of any size.
26. Given a for loop that traverses a matrix, show the order of the squares that are visited.