CS 2150 Exam 1, fall 2022

Name _____

You MUST write your e-mail ID on **EACH** page. And put your name on the top of this page, too.

If you are still writing when "pens down" is called, your exam will be ripped up and not graded. So please do that first. Sorry to have to be strict on this!

There are 6 pages to this exam. Once the exam starts, please make sure you have all the pages. Questions are worth different amounts of points.

Answers for the short-answer questions should not exceed about 20 words; if your answer is too long (say, more than 30 words), you will get a zero for that question!

This exam is CLOSED text book, closed-notes, closed-calculator, closed-cell phone, closed-computer, closed-neighbor, etc. Questions are worth different amounts, so be sure to look over all the questions and plan your time accordingly. Please sign the honor pledge below.

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A crash reduces
Your expensive computer
To a simple stone.

Page 2: C++

1. [3 points] Which of the below lines causes an error during compilation and *briefly* why? If none of the lines cause an error write "none".

```
line 1:    int a = 2;
line 2:    int* b = &a;
line 3:    int* c = b;
line 4:    int* d = a;
```

2. [3 points] *Briefly,* what is different about array base names, as compared to pointers, and why?

3. [3 points] *Briefly,* what is wrong with the following code, and what is likely to happen? Assume this uses the ListNode class from lab 2, and that the proper include's and namespace lines have been used.

```
ListNode *l = new ListNode();
l->value = 3;
delete l;
cout << l->value << endl;
```

4. [3 points] *Briefly,* what is the point of passing a parameter by constant reference?

Page 3: Lists

5. [3 points] Which of the following operations is more efficient in a double linked list than a single linked list? *Briefly*, why?

   (a) traversing through the list

   (b) deleting a node with a given location

   (c) deleting the node at the beginning

   (d) deleting the node at the end

   (e) searching an unsorted list for a given item

6. [3 points] Consider three list data structures: vector, singly-linked list, and doubly-linked list. *Briefly*, give one advantage of each over the other two.

7. [6 points] Fill in the running times into the table below. For a linear run time, enter it as "n" instead of "$\Theta(n)$" or "linear", and similarly for the other running times. Assume any operation is on the "efficient" side of a data structure (inserting at the head, for example, rather than in the middle.

	insert / push	remove / pop	find / top
Vector			
Singly linked list			
Stack, linked-list based			
Stack, vector-based			
Stack, array-based			

Page 4: Numbers

8. [3 points] What is the sum, in base 10, of the following 8-bit two's-complement integers? Show your work, but put your final answer in the box provided.

$$00001101 + 11111001 + 11100100 =$$

9. [6 points] Convert -13.875 into IEEE 754 floating point notation (big-Endian). Show your work!

10. [3 points] Convert 430, in base 5, to base 7. Show your work!

Page 5: Miscellaneous

11. [3 points] *Briefly,* give an example of an algorithm that is $O(n^2)$ but not $\Omega(n \log n)$. What is its big-Theta running time?

12. [3 points] How much *total* space is allocated by the compiler based on the statement `double d[5];`? *Briefly,* why?

13. [3 points] *Briefly,* what are file permissions in a UNIX system, and why do we need them?

14. [3 points] Have you completed the UNIX honor pledge? If not, when will you complete it by? FYI, the link to the UNIX honor pledge is on the Collab landing page. (You get full credit on this question as long as you answer honestly.)

Page 6: No questions here

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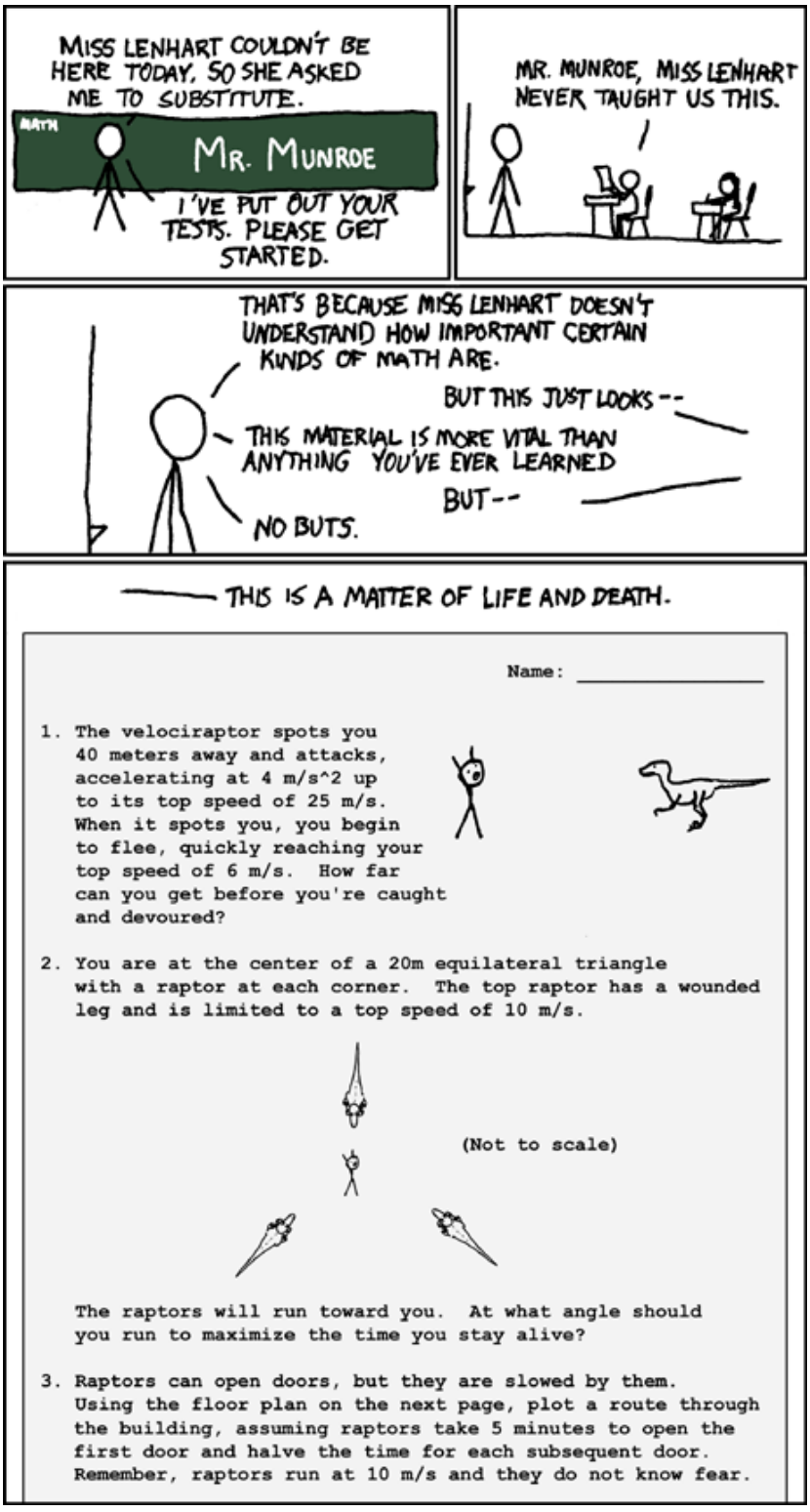

xkcd #135