

# CSSE 230 Day 1

Brief Course Intro  
Math Review  
Growable Array Analysis

Pick up an in-class quiz from  
the table near the door

In-class Quizzes: what and why?

## Agenda

- ▶ Roll Call (Now)
  - Please tell me
    - What name you prefer to be called
    - How to pronounce your name if I don't get it right.
- ▶ A few administrative details
- ▶ Brief tour of course materials
- ▶ Review: Algorithm Analysis/math formulas
- ▶ Growable Arrays exercise

## A Few Instructor Facts

- ▶ Degrees: Caltech, Illinois, Indiana (MA, MA, CS)
- ▶ This is my 24<sup>th</sup> year at Rose
- ▶ Have taught about 20 different courses; favorites are ...
- ▶ I have 9 children, ages 10–30, 4 grandchildren
- ▶ I live **very** close to campus
- ▶ Summer 2010 I was diagnosed with a very rare connective tissue disease, scleromyxedema
  - Thanks to God's grace and a miracle drug, IVIG, it is under control
  - I may have to miss a day's class for treatment
- ▶ I *really* like it when you include 230 as part (but not all) of the subject line in emails to me



## Contact Info

- ▶ **Claude's Office: F210**
  - MTR 2:30–5:00 PM (except when I have meetings\*)
  - WF all day (except when I have meetings\*)
  - \* See my schedule, linked from course Syllabus
  - I try to keep it up-to-date
- ▶ **Lab assistant(s) in F217:**
  - Times and staff to be determined
  - If you know of someone who did well in 230 who is looking for a Work-study or work-opportunity job, send him/her to me.
- ▶ **Phone: x8331**
- ▶ **Email: [anderson@rose-hulman.edu](mailto:anderson@rose-hulman.edu)**
- ▶ **Better: [csse230-staff@rose-hulman.edu](mailto:csse230-staff@rose-hulman.edu)**
- ▶ **Best (for many questions): Discussion forums on ANGEL.**

Q1-3

## Email Subject Lines

- ▶ Please **include 230** somewhere in your subject line
- ▶ And also **include a real subject**
- ▶ **Examples:**
  - Bad: When's WarmupAndStretching due?
  - Bad: CSSE 230
  - Good: CSSE 230: When's WarmupAndStretching due?

 Riley, Christopher R	Re: Fitness challenge software	Fri 2/29 2:35
 <b>Diane Anderson</b>	<b>RE: Please tell me what you think of thi...</b>	<b>Fri 2/29 12</b>
 Chidanandan, Archana	FW: Visions for Theoretical Computer Science	Fri 2/29 11:48
Date: Thursday		
 <b>Anderson, Claude W</b>	<b>CSSE 230: Classroom se...</b>	<b>Thu 2/2</b>

Q5(there is no Q4)

## A quick tour of the online course materials

- ▶ Syllabus
  - Attendance required!
- ▶ Schedule page
  - Look at imminent due dates
  - Posted schedule is preliminary; may change as we go along.
  - But the date for Exam 1 is fixed. (Wednesday March 28, 7–9 PM)
- ▶ ANGEL Discussion Forums and Drop Boxes

Q6-8

## Major themes of the course

- ▶ Data structures and algorithms
- ▶ Efficient programming
- ▶ Calculating running times
- ▶ Proving properties of data structures and algorithms

## Weiss Textbook

- ▶ Good mix of theory and practice, design and implementation.
- ▶ Lots of interesting language issues. He talks about Java, but applicable to other languages.
- ▶ Challenging problems, a good place to go as you review for exams.
- ▶ Read it!
- ▶ **This week: Chapters 1–6.**
  - Most should be review, so you can skim those parts.
  - Make notes of things to ask about or to focus on later.

## Bonus points for reporting bugs

- ▶ In the textbook
- ▶ In any of my materials.
- ▶ Use the Bug Report Forum on ANGEL
- ▶ More details in the Syllabus.

Programming is not a spectator sport

And neither is this course.

Ask, evaluate, respond, comment!

Is it better to ask a question  
and risk revealing your  
ignorance, or to remain silent  
and perpetuate your ignorance?

Feel free to interrupt  
during class discussions

» Learning trumps  
politeness in this  
course!

## Assistance and Assistants!

- ▶ I want to help those who are working hard and need help
  - And so do the student assistants
  - Please feel free to come to us for help
  
- ▶ But we're not your mother ...
  - YOU must take charge of your education
  - Don't procrastinate!
  - Ask questions!



## CSSE 230 Grading scale:

### Grading Scale

Label	Minimum Percent	
A	87.5	<a href="#">Edit</a> <a href="#">Delete</a>
B+	82.5	<a href="#">Edit</a> <a href="#">Delete</a>
B	77.5	<a href="#">Edit</a> <a href="#">Delete</a>
C+	72.5	<a href="#">Edit</a> <a href="#">Delete</a>
C	67.5	<a href="#">Edit</a> <a href="#">Delete</a>
F	0	<a href="#">Edit</a> <a href="#">Delete</a>

- ▶ Why the lower numbers for grade cut-offs?
- ▶ Why no D grades?

## Something due almost every day this week!

- ▶ Lots of reading (skim, slow down on parts that are new)
- ▶ Introduce Yourself discussion forum on ANGEL (due Tuesday at 8 AM)
- ▶ ANGEL diagnostic quizzes (due Tuesday 8AM and Wednesday 8AM)
- ▶ First written assignment (due Thursday 8 AM),
- ▶ Multi-part programming assignment
  - WarmUpAndStretching, due Monday at 8 AM.
  - 5 days, 5 programs (start today!)
- ▶ Read the schedule page carefully as you prepare for each day.

## More Administrivia Tomorrow

» Bring your questions about the syllabus!

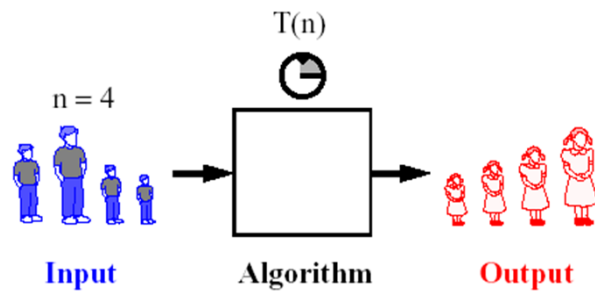




# Analysis/Math Review

## Credit where credit is due...

- ▶ Images like this one:

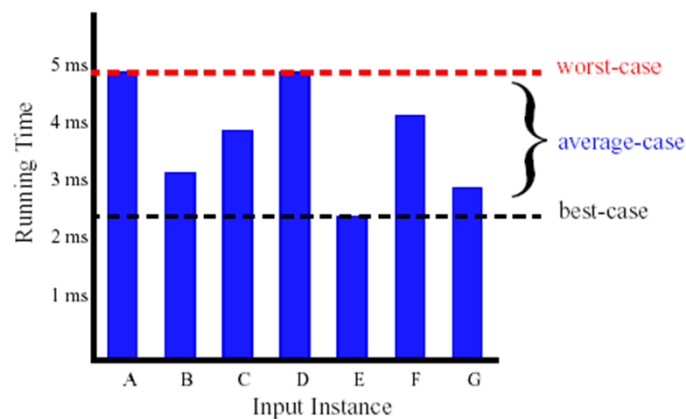


- ▶ are from *Data Structures and Algorithms in JAVA* by Michael Goodrich and Roberto Tomassia

## Running Times

- ▶ Algorithms may have different *time complexity* on different data sets
- ▶ What do we mean by "Worst Case" time complexity?
- ▶ What do we mean by "Average Case" time complexity?
- ▶ What are some application domains where knowing the Worst Case time complexity would be important?

## Average Case and Worst Case



## You Floor Me

- Floor

$\lfloor x \rfloor =$  the largest integer  $\leq x$

- Ceiling

$\lceil x \rceil =$  the smallest integer  $\geq x$

- **java.lang.Math**, provides the static methods **floor()** and **ceil()**

## Yes, yes. Sum of the time.

- **Summations**

- general definition:

$$\sum_{i=s}^t f(i) = f(s) + f(s+1) + f(s+2) + \dots + f(t)$$

- where  $f$  is a function,  $s$  is the start index, and  $t$  is the end index

## You call this progress?

- **Geometric progression:**  $f(i) = a^i$ 
  - given an integer  $n \geq 0$  and a real number  $0 < a \neq 1$

$$\sum_{i=0}^n a^i = 1 + a + a^2 + \dots + a^n = \frac{1 - a^{n+1}}{1 - a}$$

Memorize  
this  
formula!

- geometric progressions exhibit exponential growth

Exercise: What is  $\sum_{i=2}^6 3^i$  ?

This will be useful for today's  
Growable Arrays exercise!

Q9,10

If the opposite of pro is con,  
what's the opposite of progress?

- **Arithmetic progressions:**

- An example

$$\sum_{i=1}^n i = 1 + 2 + 3 + \dots + n = \frac{n^2 + n}{2}$$

Memorize  
this  
formula!

Exercise:  $\sum_{i=21}^{40} i$

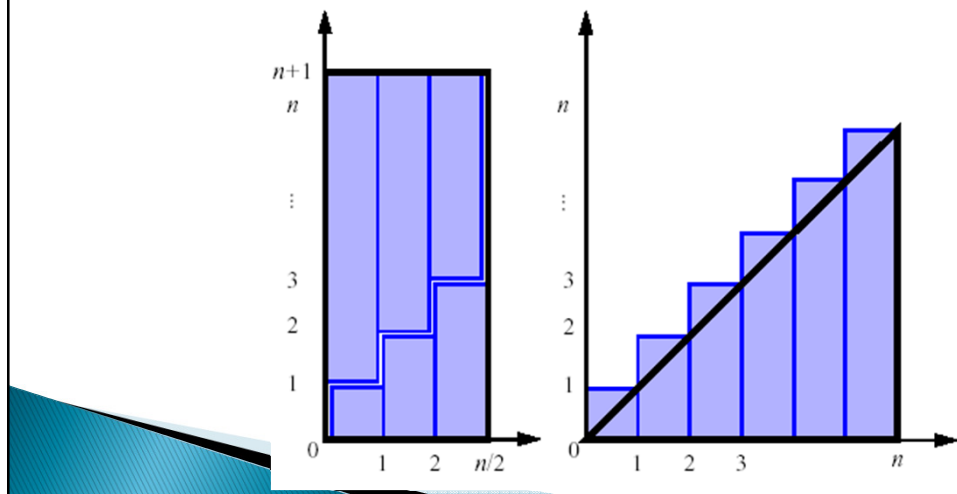
Also useful for today's  
Growable Arrays exercise!

Q11,12

## Visual proofs

$$\sum_{i=1}^n i = 1 + 2 + 3 + \dots + n = \frac{n^2 + n}{2}$$

- two visual representations



## Example: Selection Sort

```
for (i=n-1; i>0; i--) {
    find the largest element among a[0] ... a[i];
    exchange the largest element with a[i];
}
```

- How many comparisons of array elements are done?
- How many times are array elements copied?

(When you think you have the answers,  
compare with a partner)

Q13, 14, turn in the quiz

# Growable Array Analysis

- » An exercise in doubling, done by pairs of students

## Growable Arrays

```
// Read an unlimited number of String; return a String [ ]
public static String [ ] getStrings( ) {
    Scanner in = new Scanner( System.in );
    String [ ] array = new String[ 5 ];
    int itemsRead = 0;
    System.out.println( "Enter any number of strings, one per line; " );
    System.out.println( "Terminate with empty line: " );

    while( in.hasNextLine( ) ) {
        String oneLine = in.nextLine( );
        if( oneLine.equals( "" ) )
            break;
        if( itemsRead == array.length )
            array = resize( array, array.length * 2 );
        array[ itemsRead++ ] = oneLine;
    }

    System.out.println( "Done reading" );
    return array;
}
```

Original array size = 5

We don't know in advance how many strings there will be

Grow when necessary

How does `resize()` work?

What is the main "overhead cost" of resizing?

## Work on Growable Array Exercise

- ▶ Work with a partner
- ▶ Hand in the document before you leave today
- ▶ Get help as needed from me and the students assistants.