CSE 20: Discrete Mathematics for Computer Science

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Today's Topics
1. Introduce myself to you
2. Course structure and procedures
3. Introduce Discrete Mathematics

Class basics: your grade
- Final: 40% (must pass to pass the class)
- Midterm: 30% (best out of two)
- Homework: 20%
- Reading quizzes: 5%
- Participation (clicker): 5%

What do I do in class?
- Think of me as your tutor
- Be your guide in inducing you to explore concepts
- Create situations and pose problems that set the scene for your exploration
- Answer your questions
- Not spend lecture reading the textbook to you with slightly different words
What do you do before class?
- Read the relevant chapters in the online textbook
- Answer all the interactive question in the textbook ("reading quiz")
- Come prepared with any questions that you may have

What do you do in class?
(before class, you prepared yourself by reading the textbook and answering the reading quizzes)
1. I ask a question
2. You first answer it by yourself
3. Then discuss in assigned groups of 3-4 students
   - Like a jury, you must come to a unanimous decision
   - Answer the question a second time
4. I will ask groups to share their insights, and I will provide additional clarification as needed

Have you used clickers before?
A. Yes
B. No
C. Maybe

“But professor, wouldn’t it be more efficient if you just taught us the right answer to begin with?”
- Have you ever heard of an aerobics class where the instructor did all the exercises at the front of class, while the class just watched attentively?
- Me neither.
- To learn, you must do the work with your own muscle (your brain).
What do you do in this course?

- Prepare your brain for maximum in-class learning
  - Reading, interactive quizzes
- In class: engage with your neighbors and the class, engage with the ideas
  - Turn them upside down and sideways, think about what common errors or misconceptions might be
- Seek help and seek to help others
  - In class, forums, office hours, discussion section
  - I expect each class member to contribute to an environment of mutual aid and cooperation

Tips for a good group discussion

- Take turns being the first one to talk
- Once you all agree on the answer, don’t stop!
  - Always go over each wrong answer and explain why it is wrong
  - Also interesting and useful to think about why somebody might be tempted to choose it—how was the professor hoping to “trick” somebody by including that wrong answer?
  - Even if your group-mate has said something very clearly and correctly, it’s a good idea to repeat it yourself
    - “So, what I think you said was, ...”
    - Might seem pointless, but your brain will remember better if YOU say it too

Rules for what you do in this course

- Reading quizzes
  - Yes:
    - Open book, though being able to answer without a book is a good sign
    - You can retry a question if you answer incorrectly, and you can take as much time as you need
  - No:
    - Sharing answers on a reading quiz is as inappropriate as sharing answers on an in-class exam—don’t do it

Rules for what you do in this course

- Homework
  - Homework should be solved in groups of 3-4 students
  - Use forums to post advertisements looking for groups, or announcing group availability
  - Example: “Hey a bunch of us are in S&E library right now until about midnight if anyone wants to join us.”
  - Expect homework to be hard. This is the best preparation for midterm / final
Textbook

- We will use an online textbook from Zybooks
  http://www.zybooks.com/
- Sign in, use the code: UCSDCSE20Fall2015
- Contains:
  - Reading material
  - Interactive questions (“reading quiz”)

Optional extra study help

- Essentials of Discrete Mathematics by David J. Hunter, 2nd edition
- Pretty similar to zybooks
- Discrete Mathematics with Applications by Susanna Epp
- Very verbose, can be good if you like detailed explanations and examples

Website

- Join our class on TED (homework, other critical stuff) http://ted.ucsd.edu
- Register your clicker
- We set up two discussion forums:
  - One for all your questions
  - One for scheduling group study

Discrete Mathematics
What is Discrete Mathematics?
- Training in the mathematical techniques and ways of thinking that you will need to succeed in a CSE major, and as a computer programmer
- We’ll spend a great deal of time focusing on logic
  - Logical thinking
  - Hardware logic
  - Programming logic
  - Logical argument and proof

Relations to future classes
- Prepares you for nearly all future classes, eg CSE100 (data structures), CSE101 (algorithms), CSE105 (computability),... as well as more domain specific classes (compilers, databases, etc)
- In all of them, you will need to be able to argue formally why something works or doesn’t work. The goal of this class is to teach you how to do so.

Logical reasoning
- It makes all other progress and innovation possible!
- It saves us from scenes like this: http://www.youtube.com/watch?v=zzMhU_4m-g
- We will look at logic from a highly formal, mathematical perspective that allows us to be much more accurate than just “what makes sense”
  - Many things that we can discover with proof and logic are very counter-intuitive!
- We have to rely on our formal approach, not just intuition about what seems to make sense

Analogy to algebra
- $2x + 6 \ ?= \ 2(x + 3)$
- How do we know these are equal?
  A. We can try out several values of $x$, like 3, -3, 1.3333... and see that both sides are equal (have to be sure to try “weird”/different examples not just obvious ones)
  B. We can try every single value of $x$ and check that both sides are equal
  C. Other/None/More than one
Thought of the Week

“To be a good geek you have to have both humility and arrogance in equal measures. The humility is so you’ll admit you don’t know something and get help/read the docs/etc. The arrogance is the bit that says "I don’t know that now… but I can and I will soon."

--Thomas Beagle, IT/programmer