I'll Miss You
Wrapping up

CSC165, MATHEMATICAL EXPRESSION AND REASONING FOR COMPUTER SCIENCE

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(Brief) comments on the final exam
Check course website for...

Some content details
Final exam aid sheet and cover page
Extra office hour schedule
Final exam study tips

1. **Space out your studying.** It's more effective to engage with material in several shorter sessions rather than one long cramming night.


3. **Work with others** (intelligently). Help each other review material, explain concepts, get "unstuck". Don't work with people who'll distract you—even if you're friends!
Hey folks,

Anybody want to study for the final together? I’m going to be in BA3200 on _____ at 1pm onwards, feel free to join! I’m looking to do really well on the final, so some serious studying will be happening. I’ll be the one wearing the AWESOME cat sweater.

P.S. This post is so ironic because I copied exactly what David showed us in class, lol.
Aim for mastery

“Mastery” means that you are the expert.

Go beyond “re-reading and re-doing”:
- create multiple solutions
- identify common mistakes or errors
- explain ideas to others
- make up new questions
Final exam day tips

1. **Take care of yourself.** Sleep and eat well. Have some fun!
2. **Arrive early.** (but not too early)
3. **Bring a watch, drink, and snack.**
4. **Skim every question.** Play to your strengths.
5. **Get key ideas down first, leave space for details.**
Looking back, looking ahead

WHAT WERE THE BIG THEMES FROM CSC165?
WHERE CAN YOU GO FROM HERE?
Expressing ideas precisely

By the end of this course, you should be able to:

- Translate statements between English and predicate logic
- Read and understand new definitions, and expand them in statements
Reading and writing proofs

By the end of this course, you should be able to:

◦ Write a formal proof header based on the structure of the statement being proved.
◦ Write correct *chains of reasoning* using definitions, assumptions, intermediate steps, and external facts.
◦ Apply different proof techniques.
Analysing algorithm running time

By the end of this course, you should be able to:

- Analyse the running time of an algorithm...
  - Using an exact step counts
  - Using over-/underestimates
- Analyse the worst-case/best-case runtime of an algorithm
- Analyse the average-case runtime of an algorithm
Working with new domains

By the end of this course, you should be able to:

- Read definitions about new mathematical domains, such as number theory, number representations, asymptotic bounds, and graphs...

  *And whatever else comes next!*
Some future courses

CSC236/240 – recursive runtime, algorithm correctness
CSC263/265 – data structures
CSC373 – algorithms
CSC473 – advanced algorithms

CSC438 – computability and logic
CSC463 – computational complexity
Some future courses

CSC304 – game theory
CSC336 – numerical computing
CSC384 – artificial intelligence
CSC410 – software testing and verification
CSC486 – knowledge representation
The limits of computation
The story so far

**CSC165**
Given an algorithm, let's analyse how long it takes to run.

**CSC263/373**
Given a problem, design an efficient algorithm to solve the problem.
A "meta" question

Given a problem, does there exist an efficient algorithm to solve it?
The satisfiability problem

Given a propositional formula

\[(p \land q) \lor (\neg p \land r)\]

is there a truth assignment that makes the formula true?
The (literally) million-dollar question

Does there exist an efficient algorithm to solve satisfiability?
Another "meta" question

Given a problem, does there exist an efficient algorithm to solve it?
The halting problem

Given an algorithm \texttt{my\_alg} and input \texttt{x}, determine whether \texttt{my\_alg(x)} halts or runs forever.
In Python

def halts(my_alg, x):
    """Return True if my_alg(x) halts, and False otherwise."
    """
A really big universal

In 1936, Alan Turing proved that *no* algorithm can solve the halting problem.

"For all algorithms $A$, $A$ does not solve the halting problem."
Thank you for being a great class!

Good luck on the final exam, and have a restful summer!