MATH/CSE1019 A Discrete Mathematics for Computer Science

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Questions for Today

- What is Discrete Mathematics?
- Why study it?
- How will the course be run?
- How to succeed in this course?

What?

- Discrete:

  Separate, distinct;

  The opposite of continuous.

- Discrete Mathematics:

  Abstract mathematical models dealing with discrete objects and the relationship between them

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What?

- Basic tools and techniques related to computer science
  - Formal logic
  - Discrete structures - sets, functions, sequences, sums
  - Simple algorithms
  - Induction and recursion
  - Counting
- Precise and rigorous mathematical reasoning
  - Writing proofs

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Why?

Need for CS

Need for other fields

Discrete Mathematics

Need for life

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- Course website: www.cse.yorku.ca/course/1019A
- Office hours: MWF 11:00-noon
- Office: CSEB 2018
- Email: jyang@cse.yorku.ca

  Use a York account

  Start your subject line with "[1019]"

  Sign with your full name

  Send messages in plain text
- Tutorial: TBD

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Grading

Assignments	20%	
Test 1	10%	Oct 8
Test 2	15%	Nov 5
Drop Deadline		Nov 12
Test 3	15%	Dec 3
Final exam	40%	Dec 12 - 23

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Assignments

- ACADEMIC HONESTY!
- Out on Mondays and due next Monday
- Solutions will be posted on Wednesdays
- Not accepted after solutions posted
- 50% penalty if late
- 3 free "late days"

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Course Materials

- Textbook: Kenneth H. Rosen. Discrete Mathematics and Its Applications, Sixth Edition. McGraw-Hill, 2007.
- Slides: To be posted on course website

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How to Succeed

- Come to class
- Practice, practice and practice!!
- Stay on schedule
- Ask questions (office hours, tutorials)

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Overview of Propositional Logic

- A formal mathematical "language" for precise reasoning
  - Declarative propositions
  - Boolean operations: $\wedge, \vee, \neg, \rightarrow, \leftrightarrow$
  - Truth values, truth tables
- All of these are base on ideas we use daily to reason about things

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Proposition

Definition:

- Declarative sentence
- Either true or false, but not both

Examples:

2 + 1 = 3	True proposition
Toronto is the capital of Canada	False proposition
Read this carefully	Not declarative
x + 1 = 2	Neither true or false

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Proposition

- Propositions can be represented by variables: p,q...

  p: Today is Monday.

  q: Today is Tuesday.

- Truth value: True or False (T or F)

  p: True

  q: False

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Negation

- ¬p ("not p")
- ¬p is true if and only if p is false

p	¬p
T	F
F	T

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Conjunction

- Conjunction: $p \wedge q$ ("p and q")
- $p \wedge q$ is true if and only if both p and q are true

p	q	p∧q
T	T	T
T	F	F
F	T	F
F	F	F

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Disjunction

- Disjunction: $p \vee q$ ("p or q")
- $p \vee q$ is true if and only if p is true, q is true or both p and q are true

p	q	$p \vee q$
T	T	T
T	F	T
F	T	T
F	F	F

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Exclusive OR (XOR)

- Exclusive OR: $p \oplus q$ ("p or q, but not both")
- $p \oplus q$ is true if and only if p and q have different truth values

p	q	$p \oplus q$
T	T	F
T	F	T
F	T	T
F	F	F

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Truth Table

p	q	p∧q	p∨q	p⊕q
T	T	T	T	F
T	F	F	T	T
F	T	F	T	T
F	F	F	F	F

- In the truth table, we are not concerned with what p and q mean in some world -- they stand for two independent propositions that can be true or false.

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Readings and notes

- Read Section 1.1
- Practice translating between English sentences and propositional logic statements
- Think about the notion of truth tables
- Recommended exercises: 1.1:1,3

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