

# COMP250: Introduction to Computer Science

Jérôme Waldispühl

&

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McGill University

# About Me

- Jérôme Waldispühl
- Associate Professor of Computer Science
- I am conducting research in Bioinformatics
- How to reach me?
  - Office hours (TBA)
  - By appointment (email me to schedule a meeting)
  - Email: [jeromew@cs.mcgill.ca](mailto:jeromew@cs.mcgill.ca)
  - If you email me: Always add “COMP250” in the title!

# Where to get announcements & updates?

Official channel:

- Course web page:

<http://www.cs.mcgill.ca/~jeromew/comp250.html>

Other channels

- MyCourses
- In class!

# Evaluation

- 40% for 4 assignments
- 10% for quizzes\*
- 50% for the final exam

\* The quizzes are optional. If the average grade of the quizzes is lower than your score at the final exam, the weight of the quizzes will be reported to the final (i.e. your final will count for 60% of your grade).

Warning: There will be no modification of this scheme.

# Schedule

- Classes start... Today
- Reading week: March 5 – 11
- Classes end on April 13 (included).
- Final exam: TBD

# Organization

- 2 sections, same content, same instructors.
- On Friday, both sections are merged (i.e. 1 single lecture)
- Lecture will be recorded and available for streaming but not downloadable.
- Specific teaching assistants assigned to assignments & quizzes.

# Outline

- Jan 8-12: Background (J. Waldispühl)
- Jan 15 – Jan 23: Programming in Java (C. Gonzalez)
- Jan 24-Feb 1: Recursion (J. Waldispühl)
- Feb 2 – Feb 13: Running time (C. Gonzalez)
- Feb 14 – Mar 16: Abstract Data Structures (J. Waldispühl)
- Mar 19 – Apr 10: Selected topics (C. Gonzalez)
- Apr 11 – Apr 13: Conclusion (J. Waldispühl & C. Gonzalez)

# Textbooks

[D2012] Allen B. Downey, *How to think like a computer scientist - Java version*.

*(Available on Course Webpage)*

Other recommended textbooks:

[CH2014] Frank M. Carrano and Timothu M. Henry, *Data structures and abstractions with Java*, 4th edition, Pearson Editors.

[GT2010] Michael T. Goodrich, Roberto Tamassia, *Data Structures and Algorithms in Java*, 5th Edition, John Wiley and Sons



# Assignments

- Only programming questions
- Programming Language: Java
- Read **carefully** the formatting guidelines.
- **Strictly** follow the formatting guidelines.
- Submit your answers electronically on MyCourse.
- Each file must be submitted separately. **Do not zip your files!**
- Re-submission accepted before the deadline.
- Discuss the assignment, but do not share/copy solutions.
- Print the name of persons with whom you discussed/collaborated (including instructor and TA).

# Answering programming questions

- Submit the Java source file (i.e. not .class file)
- Separate Mycourse folder
- Ensure that your files compile on SOCS workstations (Note: Create an account if you do not already have one)
- Indent your code!
- Use the template provided.
- Do not use custom libraries (unless specified).
- Follow the syntax of the command line provided in the question.
- Use the test input & output (Note: It does not guarantee that your program is 100% correct).

# Tips

- We will provide test cases (i.e. input & output). Use them!
- BUT note that **passing all tests does not guarantee that your program is 100% correct**. We will use different ones to check that your program is correct.
- It is your responsibility to guarantee that your program:
  - Compile on SOCS workstations
  - Run with the proper syntax of the command line
  - Produces an output that follows the guidelines

If it is not the case, you will receive an email from a TA asking you to fix your program within 24h. If you fix your program, we will grade it with a 20% penalty. Otherwise, you will not be graded.

# Policy

- Late assignments will receive a 20% penalty if they are returned within less than 24h after the end of the deadline. **They will not be graded afterward.** (Tip: Submit preliminary versions early)
- **The only exceptions will be medical exceptions. You must provide a medical note (instructor & McGill).**
- No plagiarism!

**WHAT IS AN ALGORITHM?**

# Algorithms

- A **systematic** and **unambiguous** procedure that produces - in a **finite number of steps** - the answer to a question or the solution of a problem.
- Algorithms can be run on a computer, but they don't have to:
  - Mayas had algorithms to predict solar eclipses centuries in advance
  - Egyptians had algorithms to build pyramids
  - Indians had algorithms for factorizing polynomials
  - Greeks had algorithms to build all kinds of geometric construction using only a compass and straight lines.

# Compass and straight-line construction

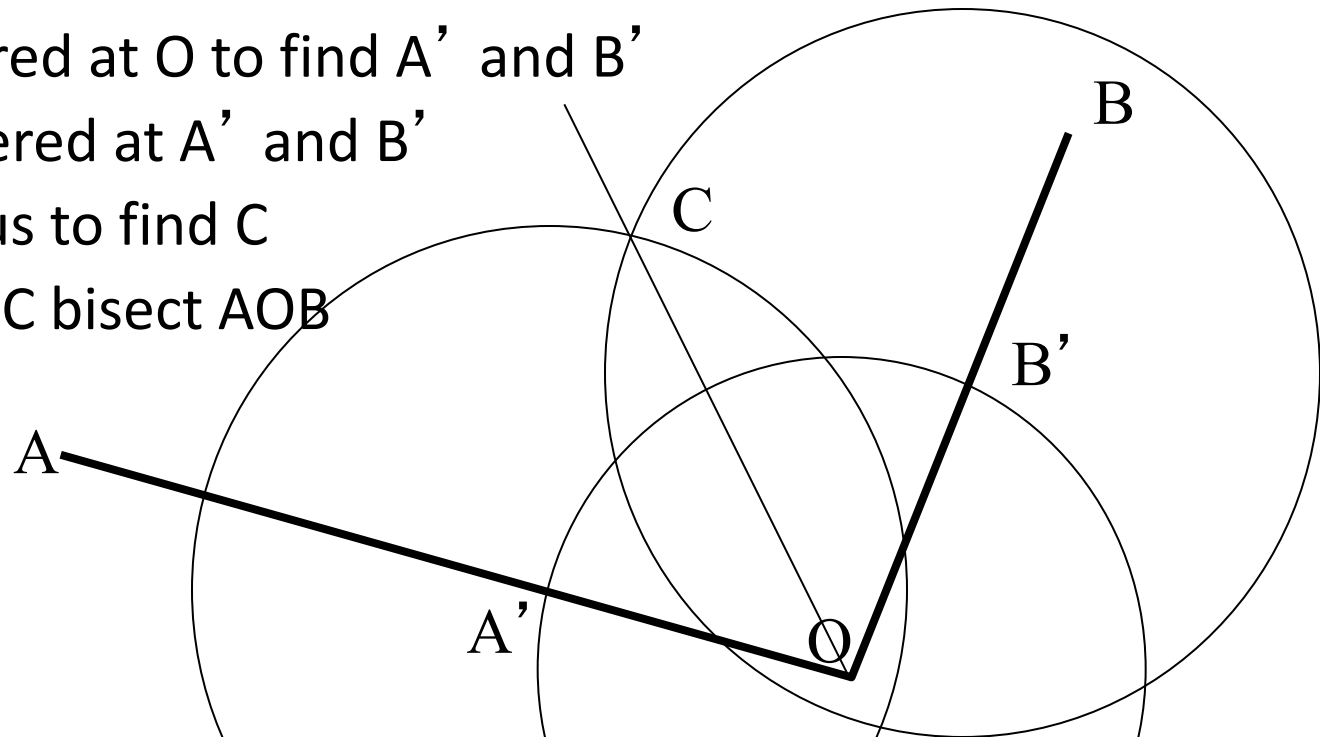
- Problem: Angle bisection

INPUT: An angle defined by three points AOB

OUTPUT: A point C such that  $\angle AOC = \angle BOC$

- Algorithm:

- Draw circle centered at O to find  $A'$  and  $B'$
- Draw circles centered at  $A'$  and  $B'$  of the same radius to find C
- Then  $\angle AOC$  and  $\angle BOC$  bisect  $\angle AOB$



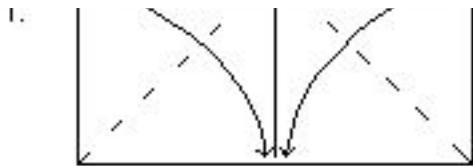
# Problem: Butterfly Origami

INPUT: 2:1 rectangle

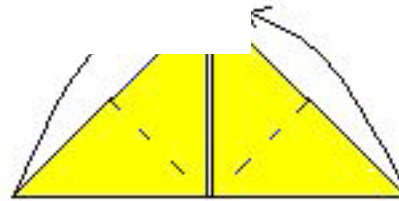
OUTPUT: A butterfly

IFLY

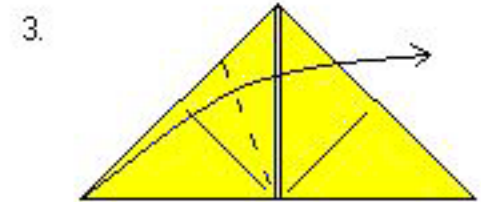
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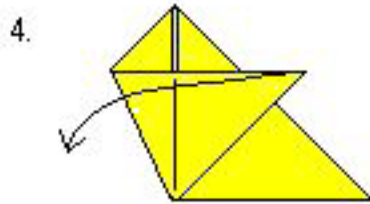
2 valley folds to the center



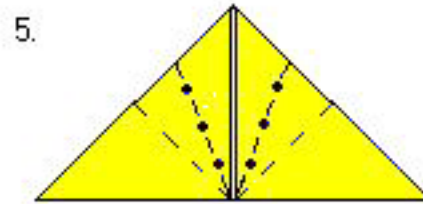
2 valley folds and unfold



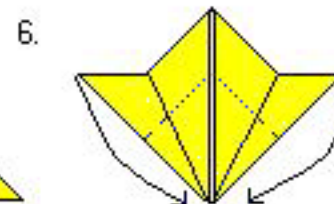
Valley fold to the right lining up the crease made in step 2 with the center line.



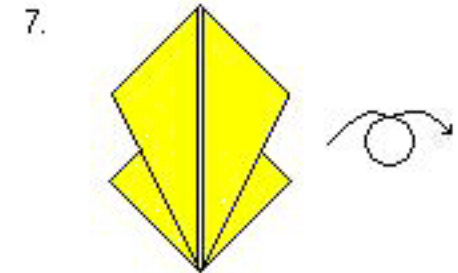
Unfold  
Repeat steps  
3 and 4 on the right



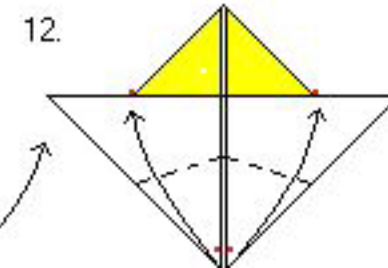
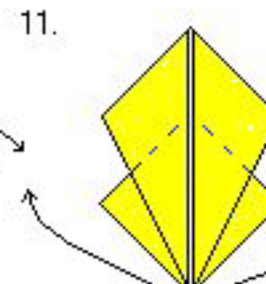
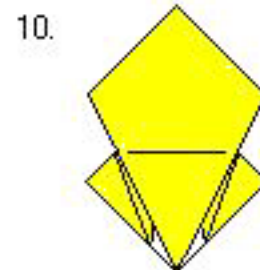
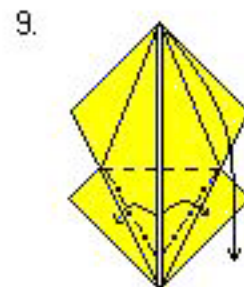
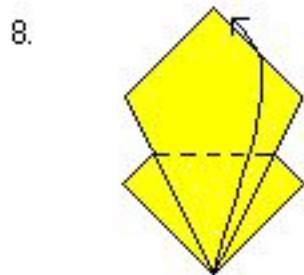
Reverse fold in and  
out on each side



2 reverse folds



Turn over





# Indian Chickpeas

From: demers@ere.umontreal.ca (Demers Serge)

Date: Sun, 12 Sep 93 14:20:01 -0400

Here is one of our favorite "vegetarian dish".  
We always include it to our menu for an indian dinner.

250 gr of chickpeas (1 cup)  
2 Tbsp vegetable oil  
1 onion chopped  
2 cm cinnamon stick  
4 cloves  
2 garlic cloves, squashed  
2 cm fresh ginger, chopped  
1 green chili pepper, finely chopped  
2 tsp ground coriander  
3/4 cup of chopped tomatoes (from a can)  
1 tsp garam massala  
1 Tbsp cilantro, chopped

Problem: Chickpea cooking

INPUT: Ingredients (left)

OUTPUT: Yummy (but spic

Soak chickpeas overnight, rince, cook in water until tender. Drain.  
KEEP THE COOKING LIQUID!

In a frying pan heat the oil, fry onion until golden. Add cinnamon  
and cloves, cook a few seconds. Add garlic, ginger, chili pepper  
ground coriander and cook 5 minutes, stirring.  
Add tomatoes, with the juice and cook until all liquid  
has evaporated.

Add the chickpeas to the pan, mixe well, cook 5 minutes.  
Pour the cooking liquid of the chickpeas and simmer for 25 minutes  
until all the liquid is gone.

Sprinkle with the garam massala and cilantro.

Can be served hot of cold.

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Serge Demers

# To think about...

Think of three different ways to solve the following problem:

## **PROBLEM: LIST INTERSECTION**

- Input:
  - A long list of students taking COMP250
  - A long list of students taking MATH240
- Output:
  - How many students are taking both classes?
- Assume that you only have names, no ID number, and that comparing one name to another takes time because they are hand-written