

COMP302: Programming Languages and Paradigms

# Assignment Project Exam Help

Prof. Brigitte Pientka (Sec 01)

bpientka@cs.mcgill.ca

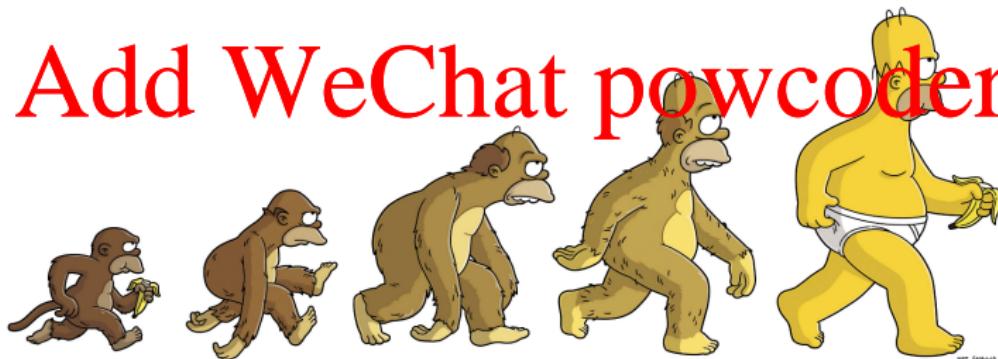
Francisco Ferreira (Sec 02)

fferre8@cs.mcgill.ca

<https://powcoder.com>

Week 1-1 , Fall 2017

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MACHINE

ASSEMBLY

PROCEDURAL

OBJECT ORIENTED

FUNCTIONAL

**Theme** Thorough introduction to the foundations and paradigms of programming languages.

# Assignment Project Exam Help

**Prerequisite** COMP 250 or COMP 203

- Evaluation**
- Five homeworks (25%)
  - Midterm (10 %)
  - Final (65%)

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**Late days** You have two late days for homeworks

**Office** Prof. B. Pientka's office is in McConnell Eng. 107N.

Prof. F. Ferreira's office hours are in Trotter 310

**Office hours** Prof. B. Pientka: Tue, Thu 11:30am - 12:30pm

Thu 4:00pm - 5:30pm

Prof. F. Ferreira: Tue: 3:00pm - 5:00pm

**TA's** See My Courses

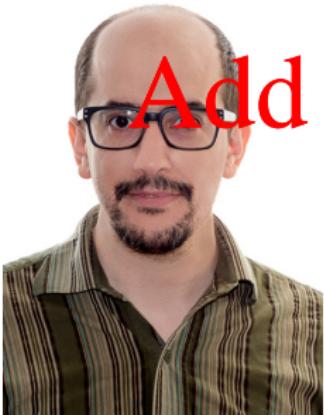
**Website** On MyCourses

### **Short Bio:** Brigitte Pientka

- 
- Studied CS at the Technical University Darmstadt (Germany) and at the University of Edinburgh
  - Visiting Researcher at Cornell University
  - PhD in Computer Science at CMU
  - Professor at McGill since 2003

**Fun:** Everything to do with food (cooking, growing vegetables, etc); Reading books (mysteries, biographies); Swimming, biking, hiking

### **Short Bio:** Francisco Ferreira

- 
- Undergrad. degree in Computer Science in Argentina
  - MSc from Université de Montréal
  - PhD Student in Computer Science at McGill
  - Worked in the telecom and gaming industries.

**Fun:** I love photography, travelling and being a nerd. I like biking and Italian food.

# Programming Languages we use (or have used)

- Programming languages we use (or have used)

Agda - Beluga - C - Haskell - Java - Latex - Lisp - Modula-2 - Ocaml -  
Pascal - Perl - PHP - Prolog - Python - Ruby - Scheme - SML - SQL  
Twelf ...

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Twelf ...

- Research we do: Foundations of Programming Languages, Logic, Verification, Automated Reasoning, Logical frameworks, Type Theory

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# Teaching Assistants



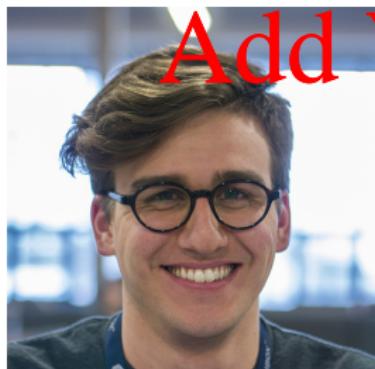
**Short Bio:** Aliya Hameer (Msc. Student)

**Work** Programming Lang., Compilers

**Fun** Loves to dance, and occasionally, to climb down  
the sides of 20-storey building

**About Functional Programming:**

*"Pattern matching is so powerful and elegant!  
I... I'll hard for me to return to languages without  
pattern-matching capabilities."*



**Short Bio:** Jeremie Poisson (U3 Honours Soft. Eng.)

**Work** Cyber security (mostly in mobile apps)

**Fun** Enjoys working, reading and drinking coffee; has  
a cat named Pixel

**What is the coolest thing in Functional Programming?**

*"Higher-order functions; relatively simple once  
mastered yet very powerful and they make you  
look awesome!"*

# Teaching Assistants



**Short Bio:** Tricia Olson(Msc. in CS)

**Work** Applying reinforcement learning to the development of an artificial pancreas  
**Fun** run, climb, knit, and consume podcasts.

**About Functional Programming:**

*"The Curry Howard Isomorphism is really neat!"*

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**Short Bio:** Matt Grenander (MSc. in CS)

**Work** Natural Language Processing, machine learning  
**Fun** Explore Montreal with friends, food, discovering restaurants, ice cream shops, cafés and parks around the city.



**What is the coolest thing in Functional Programming?**

*"How much it can achieve with so few lines of code. I remember some questions on assignments in COMP 302 that were not at all trivial, yet could be answered with a single line of code."*

# Teaching Assistants

**Short Bio:** Eric Zhang

**Work** MSc. in CS

**Fun** Coaching the McGill division 2 league of legends team

**About Functional Programming:**

*"Higher order functions are super cool!"*

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**Short Bio:** Kayla Branson

**Work** (U3) student majoring in Computer Science and minor in Communications

**Fun** Travel and explore new places to eat and shop;  
Intern at Microsoft (Vancouver)

**What is the coolest thing in Functional Programming?**

*"The lack of side effects when your code works,  
you know exactly why it works and how it will  
behave. "*



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# Teaching Assistants



**Short Bio:** Jacob Errington

**Work:** U4, Mathematics & Computer Science.

**Fun:** listening to and making music; speaks the constructed language Lojban.

**About Functional Programming:**

*"The coolest thing about functional programming is how easy it is to design and implement new languages."*

**Short Bio:** Leila Fabing

**Work:** Biology and Computer Science Joint Major

**Fun:** Food; cooking, hosting and dinner party hosting; the Malaysian and Singaporean Students Assoc.

**What is the coolest thing in Functional Programming?**

*"I loved how svelte and yet powerful functional programming is, it really changes the way you conceive and process your code. "*



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Does it matter in which Section I am enrolled in?

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Does it matter in which Section I am enrolled in? – NO

- Same material and slides
- Same homeworks
- Same exams

- Come to each of us for questions!
- Choose the office hours and lecture times that work best for you

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# Assignment Project Exam Help

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1. Provide a thorough introduction to fundamental concepts in programming languages

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Higher order functions, State-full vs state-free computation, Modelling objects and closures, Exceptions to defer control, Continuations to defer control, Polymorphism, Partial evaluation, Lazy programming, Modules, ...

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2. Show different ways to reason about programs

Type checking, Induction, Operational semantics, QuickCheck, ...

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# The four main goals of COMP 302

1. Provide a thorough introduction to fundamental concepts in programming languages  
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<https://powcoder.com>
2. Show different ways to reason about programs  
Type checking, Induction, Operational semantics, QuickCheck, ...
3. Introduce fundamental principles in programming language design  
Grammars and parsing, Operational semantics and interpreters, Type checking, polymorphism, and subtyping  
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2. Show different ways to reason about programs  
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3. Introduce fundamental principles in programming language design  
Grammars and parsing, Operational semantics and interpreters, Type checking, polymorphism, and subtyping
4. Expose students to a different way of thinking about problems  
It's like going to the gym; it's good for you!

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## How we achieve these goals

This course: functional programming in OCaml

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- Equal playing field
- Allows us to explain and model object-oriented and imperative programming
- Isolates concepts such as state-full vs state-free, modules and functions, etc.
- Statically typed language enforces disciplined programming  
also demonstrates that types are important maintenance tool
- Easy to reason about runtime behavior and cost

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*"A language that doesn't affect the way you think about  
programming, is not worth knowing." - A. Perlis*

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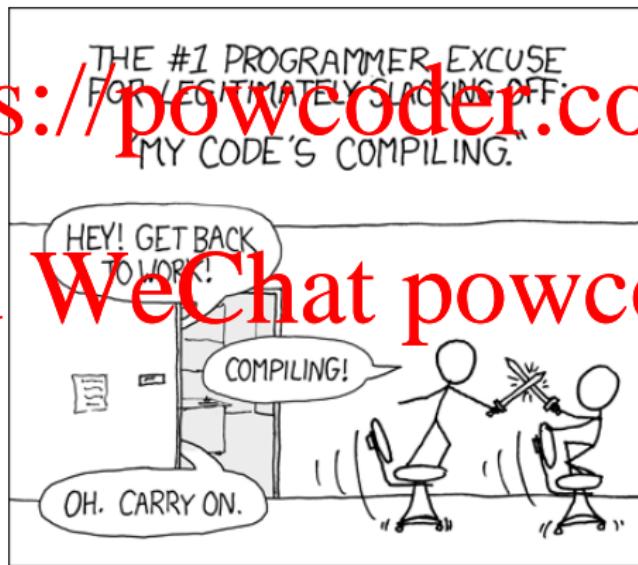
## Guiding Principle #2

*"Simple, elegant solutions are more effective, but they are harder to find than complex ones, and they require more time, which we so often believe to be unnatural." - N. Mirth*

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- Science and craft of programming

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## Why do I need to know this?

- Science and craft of programming

- Skills you learn will help you become a better programmer  
more productive, code is easier to maintain and read, etc.

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- Needed in some upper level courses

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- It is cool stuff!

And it is fun!

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- It is cool stuff!

And it is fun!



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- You might even get a job!

Financial and banking sector; for example Jane Street Capital  
Facebook (Facebook Messenger is 50% OCaml)

What does a good student do?

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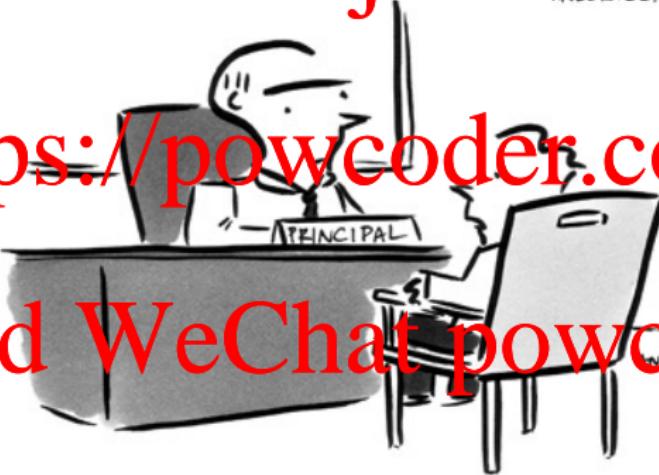
What does a good student do?

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INDEEDCOMICS.COM

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A black and white cartoon illustration. A teacher with glasses and a mustache sits behind a large, dark wooden desk, looking down at a student. The desk has a nameplate that reads "PRINCIPAL". The student is sitting across from the teacher, looking back over their shoulder. The student's desk is light-colored. The background is plain.

"It's not cheating, it's crowdsourcing."

What does a good professor do?

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- All work submitted must represent your own efforts.

- Assignments may be done in groups of 2.

- Honors pledge :

"We certify that both partners contributed equally to the work submitted here and that it represents solely our own efforts."

- List both team members with their name and student ID at the top of each file submitted.
  - Splitting the problem set in equal parts where one team member solves part A and the other independently solves part B is not allowed.

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- Copying solutions completely or partially is not allowed.
- Allowing others to copy your solutions is not acceptable. You are responsible of protecting your work. **Make sure your files and directories are not public!**

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<https://powcoder.com> Let's practice.

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## Scenario 1

*Alice and Bob agreed to be in one team and have started to work already on question 1 of the homework. After COMP 330, Matt and Bob have coffee together and start talking about question 2 of the COMP 302 homework.*

*They start sketching the idea on paper. Matt wants to see if their ideas work. He takes out his laptop and types up the solution. It works! He sends the solution to Bob via email and they happily split. A week later, Alice and Bob submit the solution to Q2; Matt also submits the same solution.*

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## Scenario 1

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Is the behaviour of Alice, Bob, and Matt in line with the copyright and collaboration policy of this course?

## Scenario 2

*Alice and Bob agreed to be in one team and have started to work already on question 1 of the homework. Alice talks over Skype with Amy and she mentions that she and Bob are really stuck on Q3 of the COMP302 homework. Amy clears up her misunderstanding and gives her a hint. Alice then meets with Bob and explains how to go about solving Q3.*

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## Scenario 2

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Is the behaviour of Amy, Alice, and Bob in line with the copyright and collaboration policy of this course?

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## Scenario 3

*Alice and Bob work together on HW 5 and have decided to use the version control provided by github to better collaborate.*

*John is really stuck on HW 5 and starts browsing the resources available on the internet. He finds their github directory, copies their work. He changes the names of some of the helper functions and submits it.*

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*The TAs notice that there are two identical solutions modulo renaming some of the helper functions - but the code is otherwise identical.*

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## Scenario 3

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What happens? Who is in violation of the student code of conduct at McGill?

Last but not least ...

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Some advice ...

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- Come to class

- Read the notes

- Do the homework

- Ask questions

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Talk to us

- If you are worried you will fail, **talk to us**.

• If you don't understand the homework problem, **talk to us**.

- If you don't understand the class material, **talk to us**.

OR

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Post your questions on the discussion board!

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## Zer0th Assignment

- Install OCaml on your laptop, if you don't use the labs

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- Check out [ocaml.org](http://ocaml.org)!
- Check the FAQ on the course website on myCourses.
- Read about some of the use of OCaml in industry.

<https://ocaml.org/learn/companies.html>

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