CMPT 140: Introduction to Programming

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CMPT140
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- ***Pick up syllabus***
- ***Sign-in sheet***

Outline for today

- Course information
  - Course website, syllabus, schedule
- Programming as problem-solving
  - Tools, toolsmiths, toolboxes
  - Top-down vs. bottom-up design
  - Example: woodcutting
- Demo of our Python programming environment
- Tour of the CSI computing lab

About CMPT 140

- Software development is about problem-solving
- Computing science is inherently interdisciplinary
  - Users, clients: must interact with and understand people!
- This course is not about "cracking" (trying to destroy or break into things)
- It's not even about "hacking" (lone wizard staring at computer late at night)
- It's about solving problems using software!

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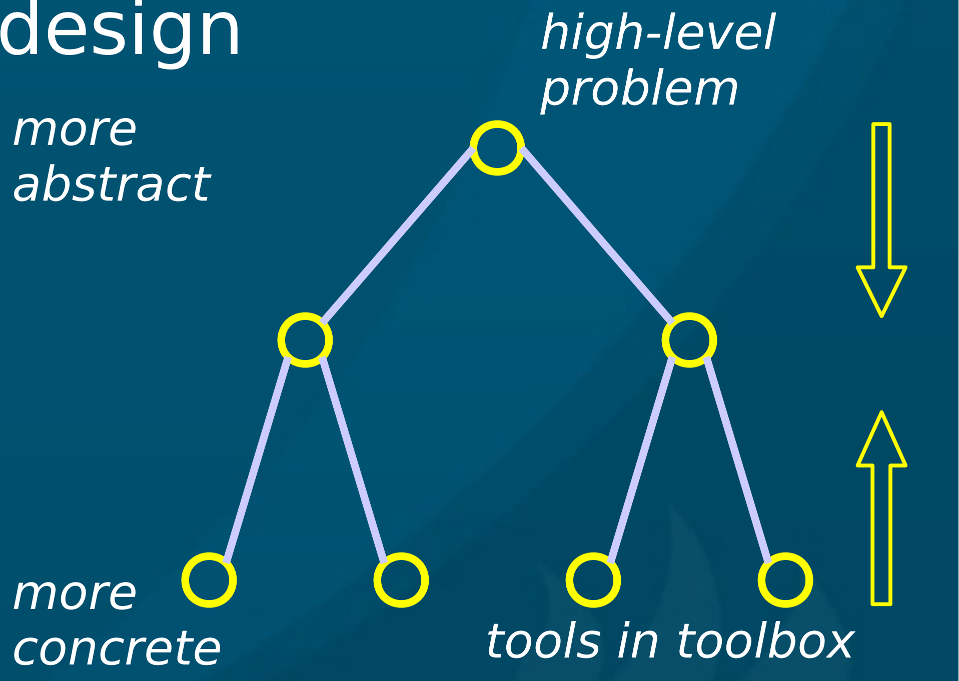
Programming is problem solving

- What are problems we might want to solve?
  - One is at the bottom of Mt. Baker and wishes to be at the top
  - A large mailing list needs to be sorted alphabetically to search for duplicates
  - A business owner needs to maximize customer satisfaction and profits
  - Two children are listening to the Canucks hockey game but ought to be sleeping
- The right tool for the right job
  - Computers are not always the right tool!

Problem solving

- Top-down vs. bottom-up design



- ***W***rite everything down
- ***A***pprehend the problem
- ***D***esign a solution
- ***E***xecute the plan
- ***S***crutinize the results

The Art of the Toolsmith

- Computers and software are tools; Computing scientists are toolsmiths
- The success of the tool is evaluated by the user, not by the toolmaker!

```
+   threadfn = create->threadfn;
+   data = create->data;
+
+   /* Block and flush all signals (in case we're not from keventd). */
+   sigfillset(&blocked);
+   sigprocmask(SIG_BLOCK, &blocked, NULL);
+   flush_signals(current);
+
+   /* By default we can run anywhere, unlike keventd. */
+   set_cpus_allowed(current, mask);
+
+   /* OK, tell user we're spawned, wait for stop or wakeup */
+   __set_current_state(TASK_INTERRUPTIBLE);
+   complete(&create->started);
+   schedule();
+
+   if (!kthread_should_stop())
+      ret = threadfn(data);
+
+   /* It might have exited on its own, w/o kthread_stop.  Check. */
+   if (kthread_should_stop()) {
+      kthread_stop_info.err = ret;
+      complete(&kthread_stop_info.done);
+   }
+   return 0;
```

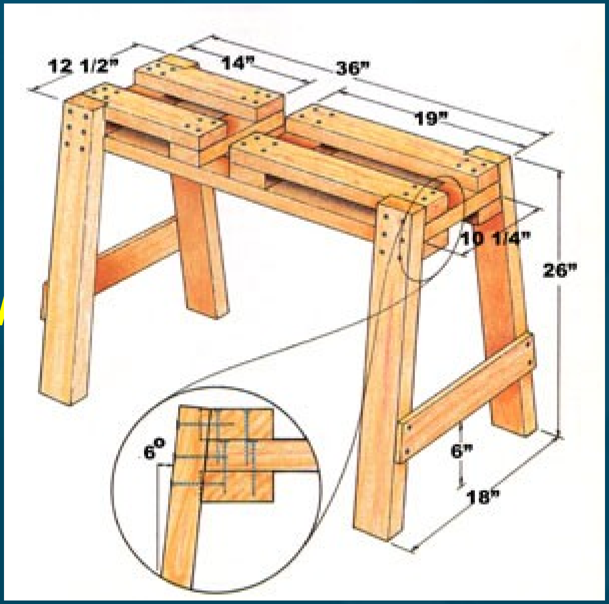
≠

“the code is so beautiful!”

“does it do the job?”

Toolchains

- Complex problems need sophisticated tools
- Complex tools are built up from simpler tools
- Always know what's in your toolbox:
  the tools you have to tackle problems
  - In software: libraries
  - In math: axioms
  - In philosophy: worldview
    context

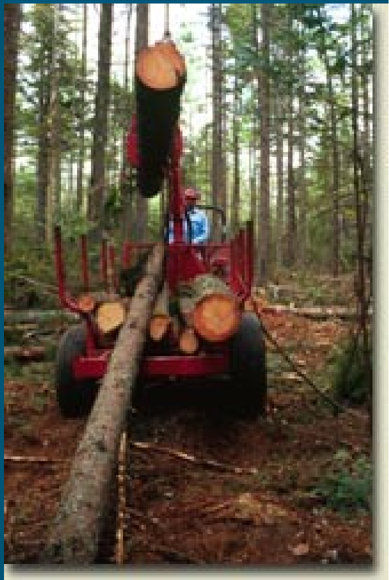


- In 14x: Python + libraries

Woodcutting example

- (see M2 text ch1.4, pp.4-5)
- Problem: cut 10 cubic metres of firewood
- Solution: 1st pass, 2nd pass, ...
- What are the library functions used in each version?

Woodcutting example

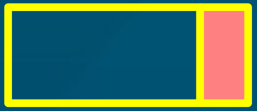


- We write out the solution in different levels of detail depending on
  - Who/what is executing the solution
  - What tools are available
- The solution is different for
  - An experienced lumberjack, w/good tools
  - A rookie who's never used a chainsaw
  - A software-controlled robot
  - A busy construction foreman
- *(which are more abstract / more concrete?)*

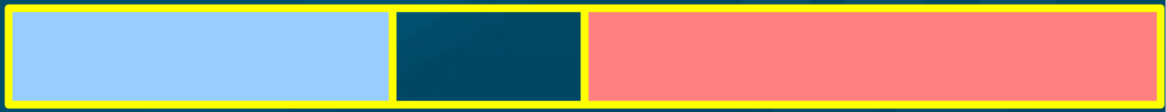
Designing software vs. "hacking code"

Write
Apprehend
Design
Execute
Scrutinize

- Look before you leap;
  think before you speak;
  design before you code!
- Programmer's optimistic schedule:
  - 4/5th coding
  - 1/5th testing/debugging



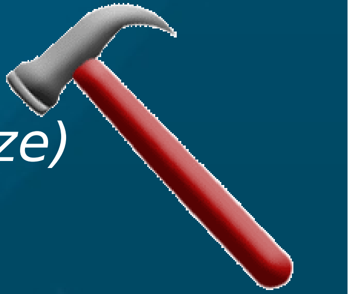
- Real-life schedule:



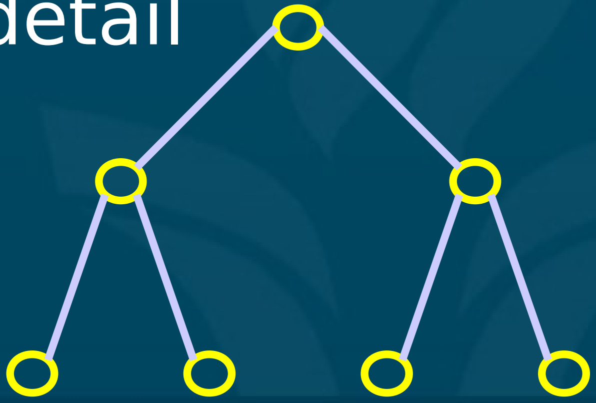
  - 1/3rd planning (***W***rite, ***A***pprehend, ***D***esign)
  - 1/6th coding (***E***xecute)
  - 1/2 testing/debugging (***S***crutinize)

Review

- Toolsmiths must know their toolboxes
  - (what does it mean for a computing scientist to be a toolsmith?)



- ***WADES*** *(Write, Apprehend, Design, Execute, Scrutinize)*
- Top-down vs. bottom-up
- First step in problem-solving? (don't code yet!)
- Levels of abstraction / levels of detail



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Python/IDLE demo

- (demo of the Python programming environment)

Why Python?

- Why not M2, Java, C++, C#, PHP, Ruby, etc.?
- Syntax vs. semantics (more in a later section)
- At the CMPT14x level, the semantics of procedural programming in all these languages are pretty much the same
  - The only difference is syntax:

```
for (i=0; i<10; i++) {                (C++)
for i in range(10)                 (Python)
```

- After this class, you'll be able to pick up any procedural language pretty quickly

TODO items

- Familiarize yourself with the course website: http://cmpt140.seanho.com
- Do the Python/IDLE intro by next Fri (nothing to turn in, not graded)
  - Lab1 is due the following Wed after that
- Read ch1 of the textbook
- HW01 next Wed before start of class
  - Electronic turn-in: upload to myCourses

Tour of the CSI computer lab

- Neu20, also called “the senior lab”
- Only for students enrolled in a CMPT course
- Keepers of the Lab: Joel Schwartz, Dave Friesen
- Different login, network from rest of TWU
- Special key issued to you, tracks usage
- Food/drink are allowed; fridge/microwave/sink
- Closed during chapel
- Security cameras go straight to recording; only looked at if something bad happens
- Don't make bad things happen; be good!