Programming Languages

Welcome

WashU CSE 4205
Prof. Dennis Cosgrove
#00: Tue, Aug 26, 2025

Course Home Page

https://www.cse.wustl.edu/~dennis.cosgrove/courses/cse4205/current/

log into canvas

Don’t Come To Campus Mild Symptoms Threshold

https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html

- Fever or chills
- Cough
- Shortness of breath or difficulty breathing
- Fatigue
- Muscle or body aches
- Headache
- New loss of taste or smell
- Sore throat
- Congestion or runny nose
- Nausea or vomiting
- Diarrhea

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Seek Help Threshold

https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html

- Trouble breathing
- Persistent pain or pressure in the chest
- New confusion
- Inability to wake or stay awake
- Pale, gray, or blue-colored skin, lips, or nail beds, depending on skin tone

Seek Help Threshold

https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html

- Trouble breathing
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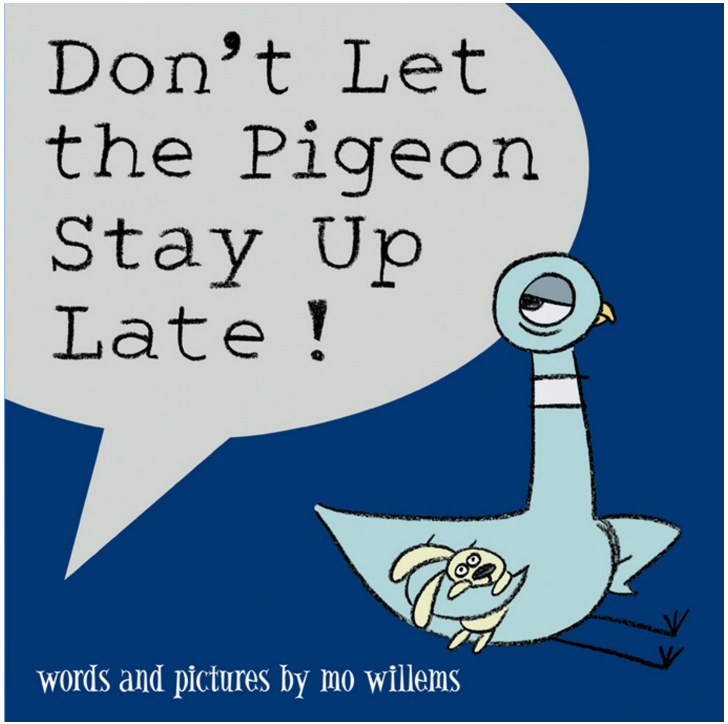
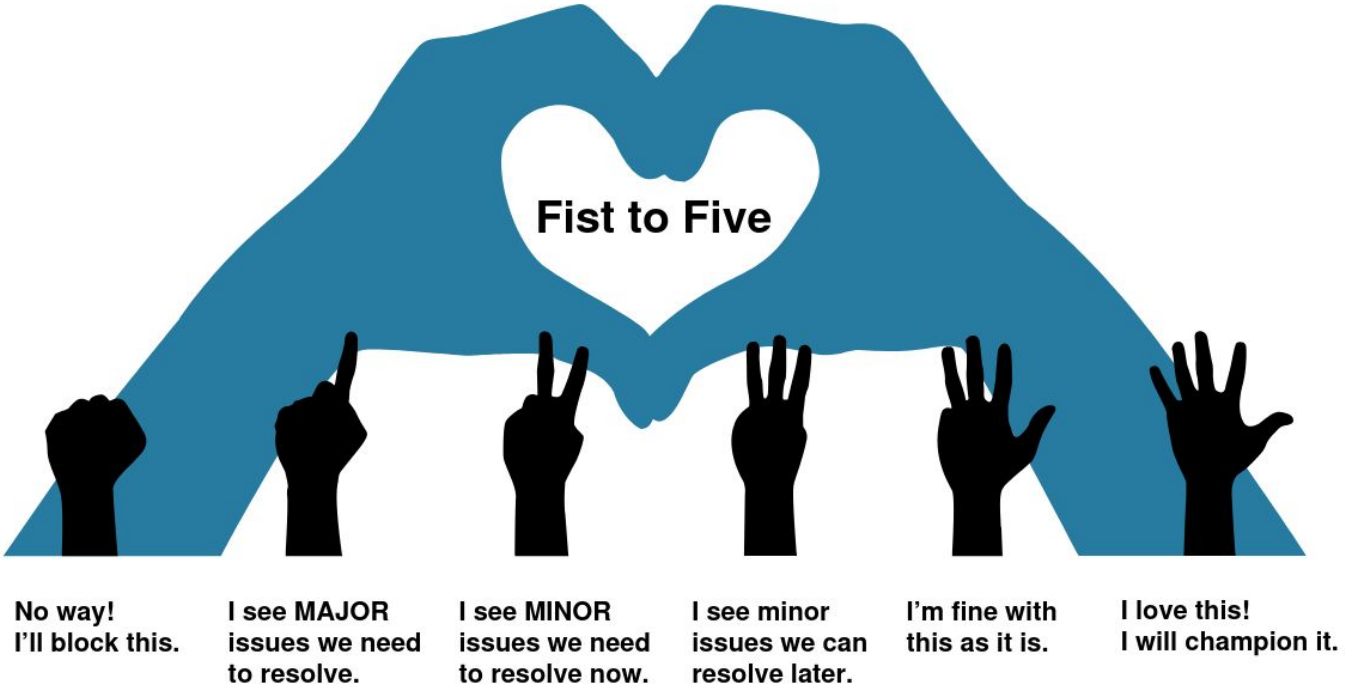
Sleep


Don't Let the Pigeon Stay Up Late!
words and pictures by mo willems

Be On The Lookout For Updates

check before coming to class (I get sick in the fall).

Fist to Five


Fist to Five
No way!
I'll block this.
I see MAJOR
issues we need
to resolve.
I see MINOR
issues we need
to resolve now.
I see minor
issues we can
resolve later.
I'm fine with
this as it is.
I love this!
I will champion it.

*** Does Anybody Want Exams?

No Exams

Bitbucket

accept invite and clone

Setup

- install at least JDK 17
- install IDE (IntelliJ IDEA or Eclipse or VS Code)

Clone Repo Demo

*** What Is The Best Vehicle?

*** What Criteria Might Be Applied?
*** What Are Some Exemplars For Each Criterion?

Shinkansen

Freight Train

Subway Train


5
AMD
MAHLE


HANDS-FREE
SLIDING DOORS
Available feature


89

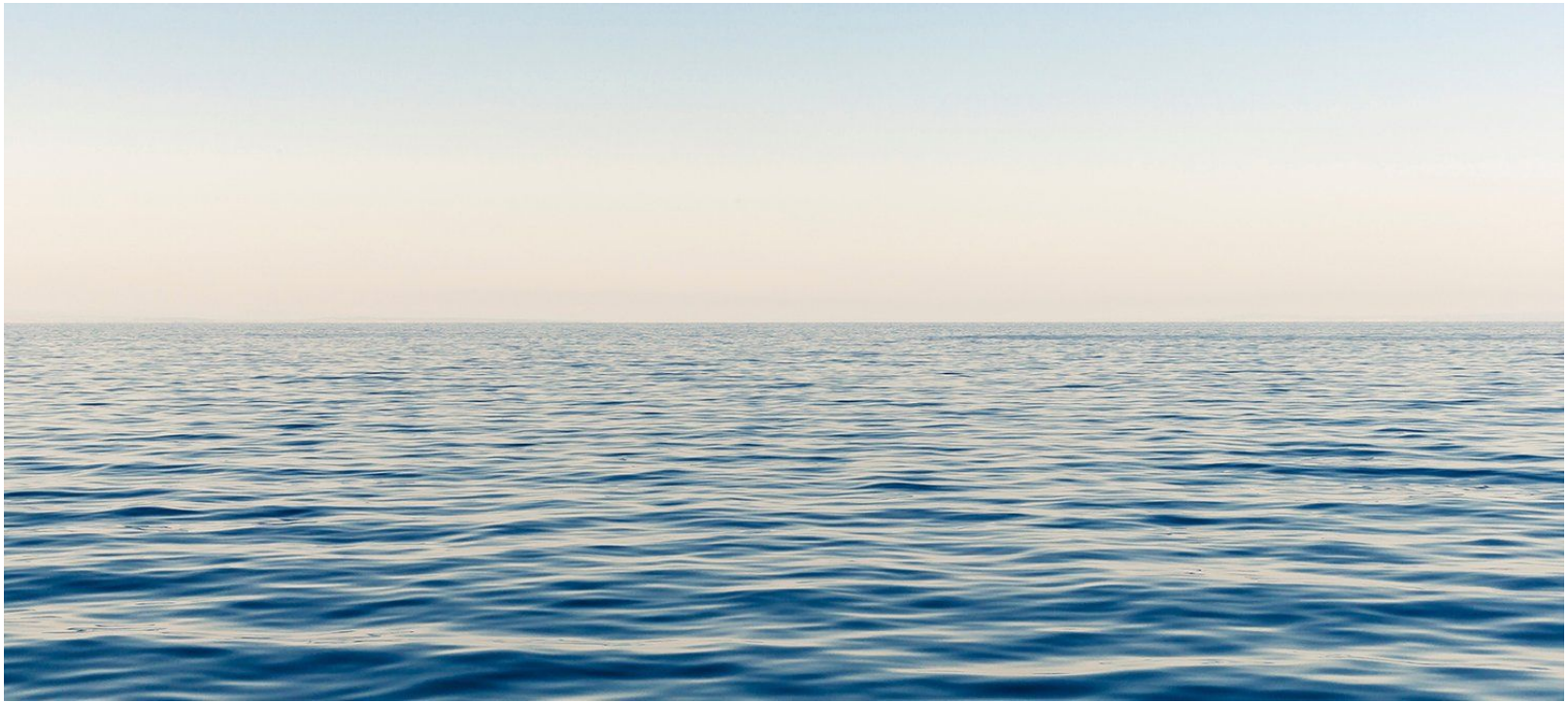
Bumblebee


PV 4
PV 4

America’s Cup

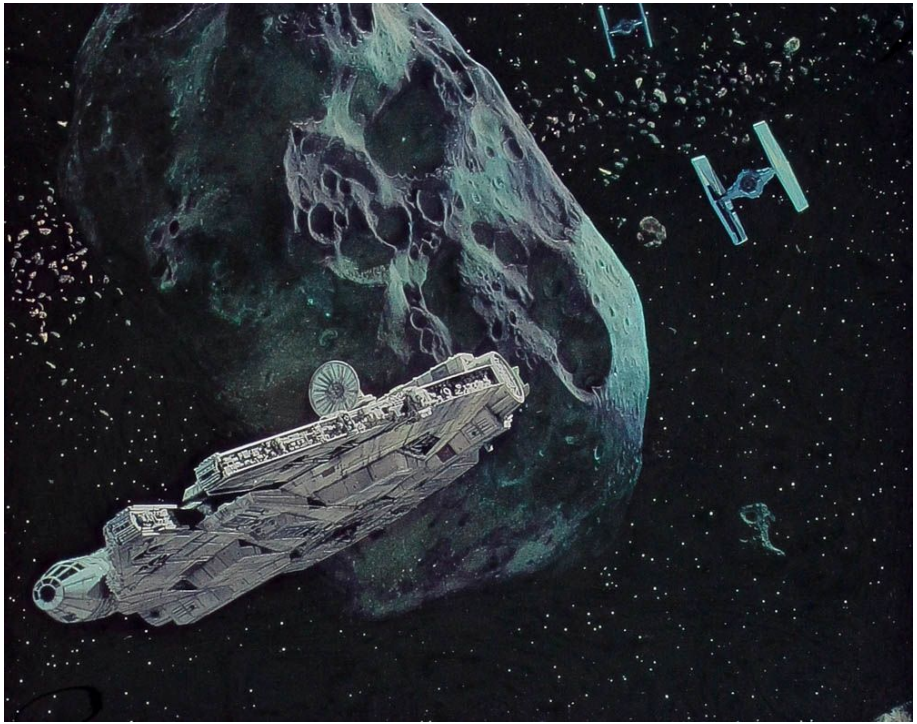
Cruise Ship

Submarine



Gossamer Albatross

Millenium Falcon

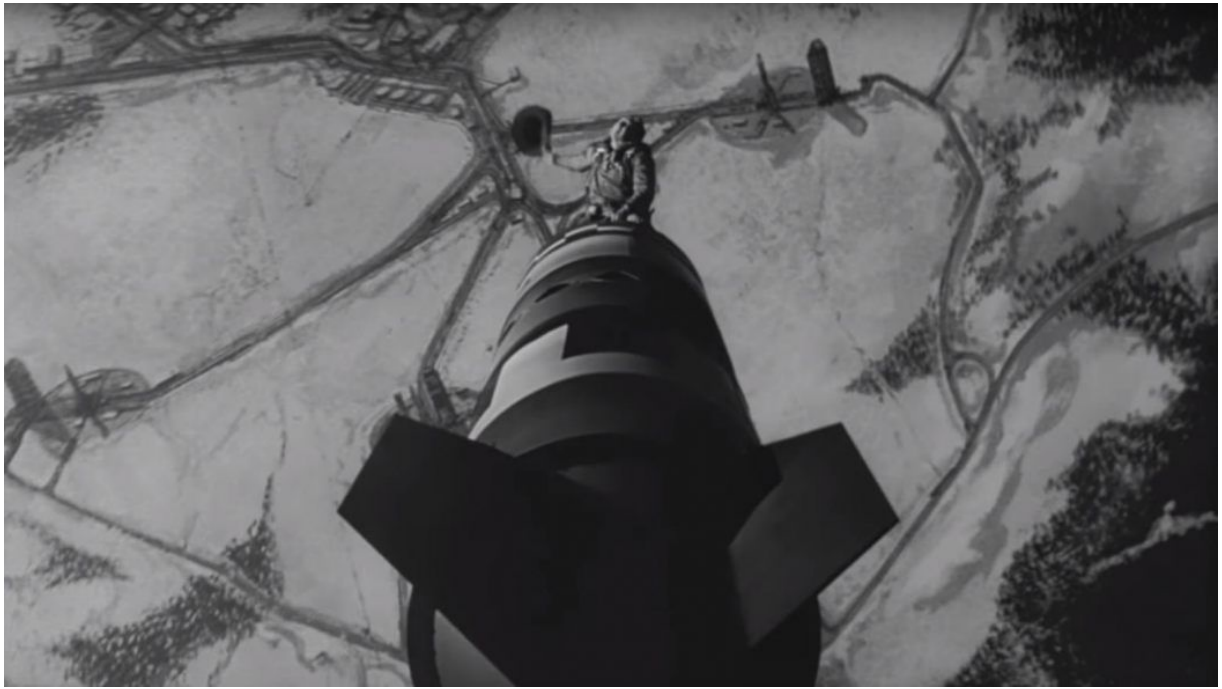


Iditarod

The best vehicle is the bike I had during high school. It made high school easier for me as it was fast and never broke.

Idk helicopters are cool

Depends on what the goal is, but rockets are cool.



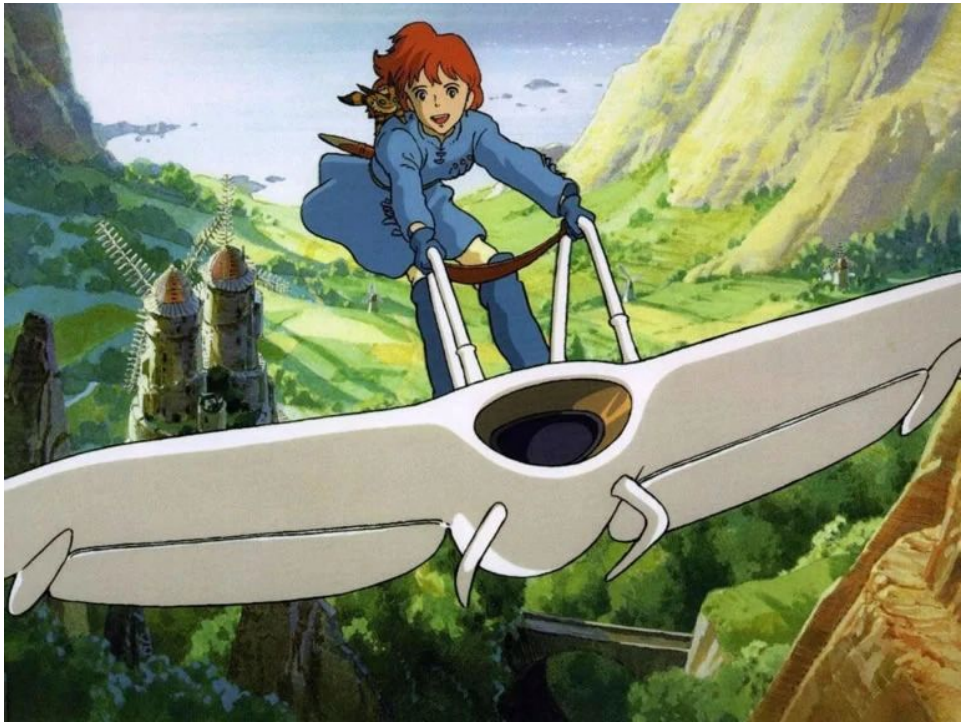
R.V.

Howl’s Moving Castle

Totoro Cat Bus

Super Comfy Looking

Nausicaä Glider



What is the best programming language?

Origin Story

DC: “I will never do 131 again”

RC: “We need you to teach 131 again”

*DC: “The real problem is 231 *and* 131, so I could teach 131 but not also 231”*

RC: “You can teach anything you want to a small group of students”

DC: “Advanced Parallel Programming, maybe?”

RC: “Perfect, now we just need a number. 425 hasn’t been taught in years, we’ll just use that.”

DC: “What’s 425?”

Course Hero

Dan Grossman

Professor and Deputy Director
Paul G. Allen School of Computer Science & Engineering
University of Washington

I cannot say enough good things about his online course.

Schedule

https://www.cse.wustl.edu/~cosgroved/courses/cse425s/current/

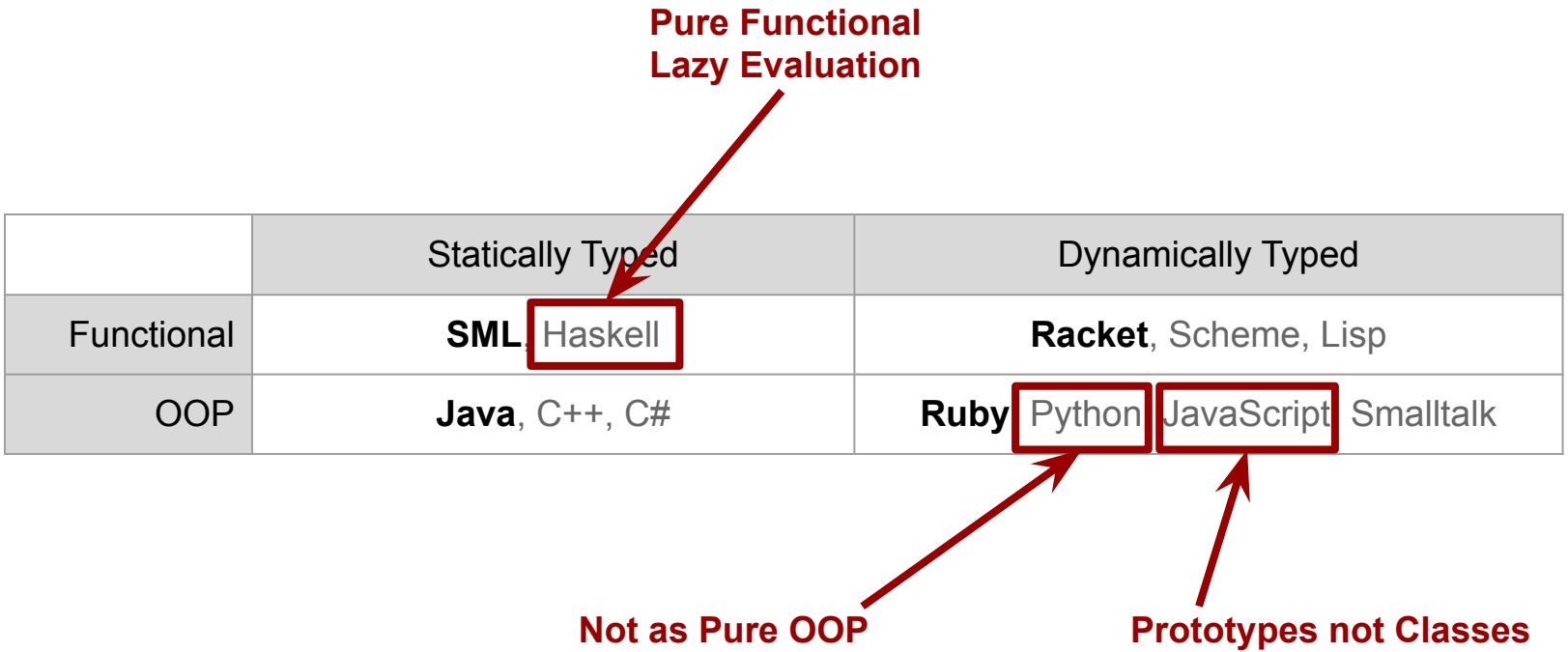
canvas:

- https://wustl.instructure.com/courses/133737
- https://wustl.instructure.com/calendar

Languages Chosen

	Statically Typed	Dynamically Typed
Functional	**SML**	**Racket**
OOP	**Java**	**Ruby**

Languages Not Chosen



	Statically Typed	Dynamically Typed
Functional	**SML**, Haskell	**Racket**, Scheme, Lisp
OOP	**Java**, C++, C#	**Ruby**, Python, JavaScript, Smalltalk

Languages Not Chosen

	Statically Typed	Dynamically Typed
Functional	**SML**, Haskell	**Racket**, Scheme, Lisp
OOP	**Java**, C#, C++	**Ruby**, Python, JavaScript, Smalltalk

C, Pascal, Rust, Go, Matlab, Prolog, ….

A Contrast In Leniency

SML

Ruby

Also Ruby

What To Expect: Time

	Statically Typed	Dynamically Typed
Functional	 **SML (A)**	 **Racket (B)**
OOP	 **Java**	 **Ruby (C)**

ML: Coursera Programming Languages A

Racket: Coursera Programming Languages B

Ruby: Coursera Programming Languages C

Java: In Class Demos and Programming Exercises

Prep

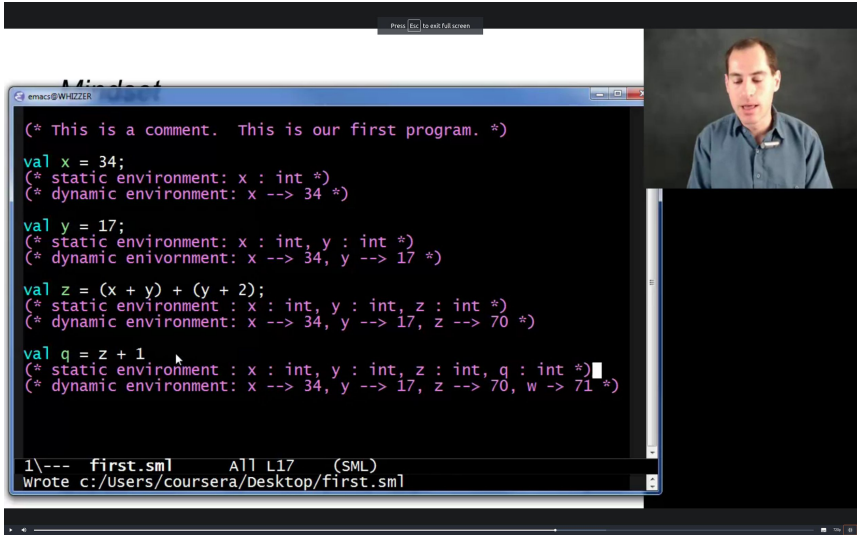
Watch Some Videos, Read Some Text, …

Fill out the Synthesis and Question Form

Due the night before class

Lots of Video to Watch (Prep 1)

xkcd: Editors
Courses and Software Setup
PL A 0 video: optional-who-i-am-acknowledgments
PL A 0 video: what-the-course-is-about-initial-motivation
(Optional) PL A 0 video: recommended-background
(Optional) PL A 0 video: why-part-a-part-b-part-c
(Optional) PL A 0 video: grading-policy
PL A 0 video: optional-very-high-level-outline
(Optional) PL A 0 reading: about-the-course
(Optional) PL A 0 reading: some-more-perspective-on-recommended-background
(Optional) PL A 0 reading: why-are-there-3-courses-part-a-part-b-part-c
(Optional) PL A 0 reading: grading-policy-details
(Optional) PL A 0 discussionPrompt: discussion-forums-why-are-you-participating
PL A 1 reading: section-1-welcome-message
PL A 1 reading: section-1-reading-notes
PL A 1 video: ml-variable-bindings-and-expressions
PL A 1 video: rules-for-expressions
PL A 1 video: the-repl-and-errors
PL A 1 video: shadowing
PL A 1 video: functions-informally
PL A 1 video: functions-formally
PL A 1 video: pairs-and-other-tuples
PL A 1 video: introducing-lists
PL A 1 video: list-functions
PL A 1 video: let-and-efficiency
video: Making Sense of SML Error Output

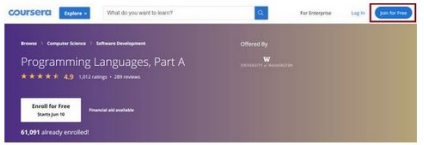


Do NOT pay for Coursera Courses

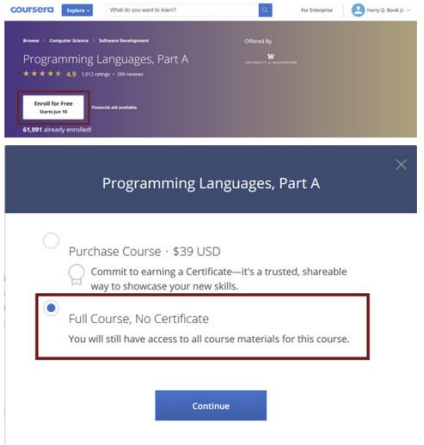
https://classes.engineering.wustl.edu/cse425s/index.php?title=Setup

Coursera [edit]

- follow the link to Programming Languages Part A
- click "Join For Free" in the top right corner.



- do what you need to do to join coursera (and log in, if necessary).
- click on enroll for free



repeat for

- Programming Languages Part B
- Programming Languages Part C

TAs

Office Hours

coming soon

Office Hours

Do NOT share screen

Always post a link to the updated file(s) in your git repo

Wiki

https://classes.engineering.wustl.edu/cse425s/index.php?title=Main_Page

piazza for discussions

Submitting email addresses right after class

Let me know if you want an email address other than @wustl.edu address

https://piazza.com/class/memxlsmn3dr5gk

Please post publicly unless personal

Do NOT post screenshots

Always post a link to the updated file(s) in your git repo

What to Expect

You should become a better programmer in all languages

What You Might Experience

Strange struggle you have not felt in a long, long time.

Adjust as we go

I will do my best to give you fair warning when as this class adjusts

I will try not to move the goalposts

More Lecture Heavy When Online

More time to code and/or bonus discussion time when in person.

Patience Will Be Required

Academic Integrity

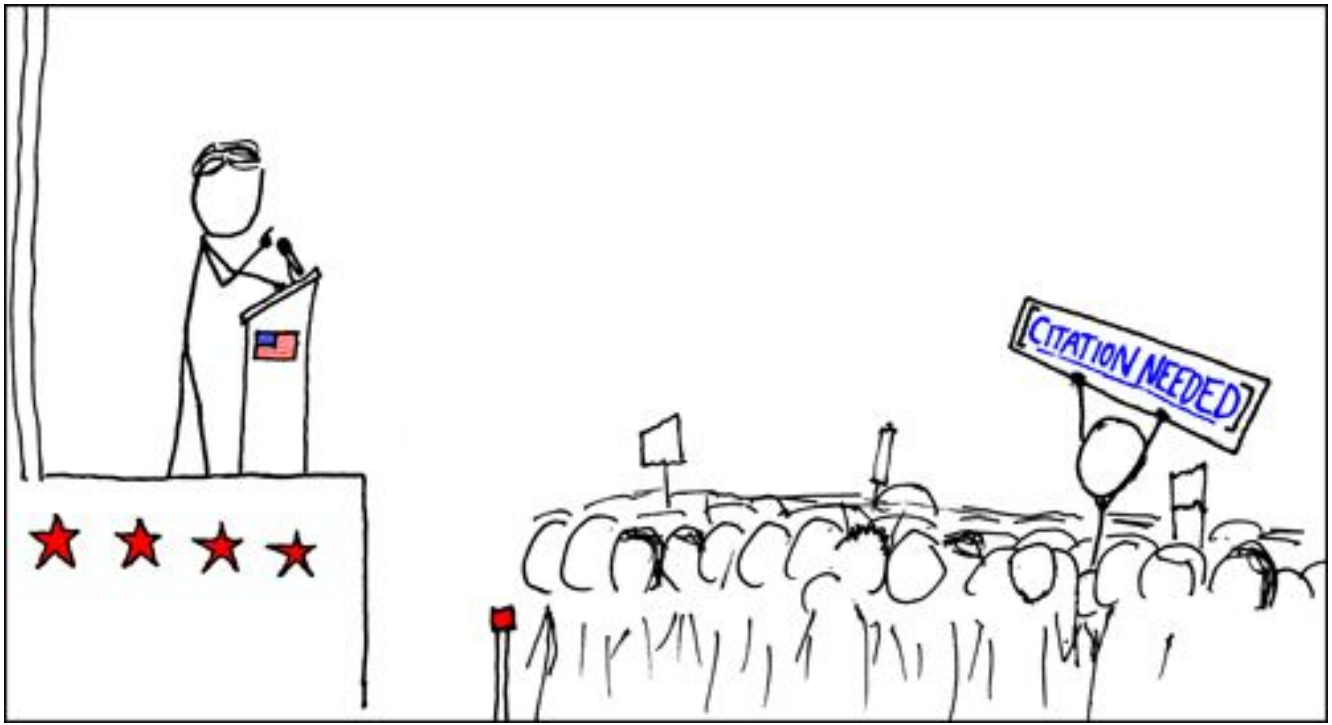
Any act of dishonesty (e.g. cheating, lying) will be referred to the Dean's office in Engineering Student Services.

If found in violation, the student will receive an F in the course and a permanent mark on their record.

https://classes.engineering.wustl.edu/cse425s/index.php?title=Main_Page#Academic_Integrity

https://wustl.edu/about/compliance-policies/academic-policies/undergraduate-student-academic-integrity-policy/

You MUST cite your sources



Grade Ranges

A+ [0.967 - 1.0]
A [0.933 - 0.967)
A- [0.900 - 0.933)
B+ [0.867 - 0.900)
B [0.833 - 0.867)
B- [0.800 - 0.833)

What can you expect?

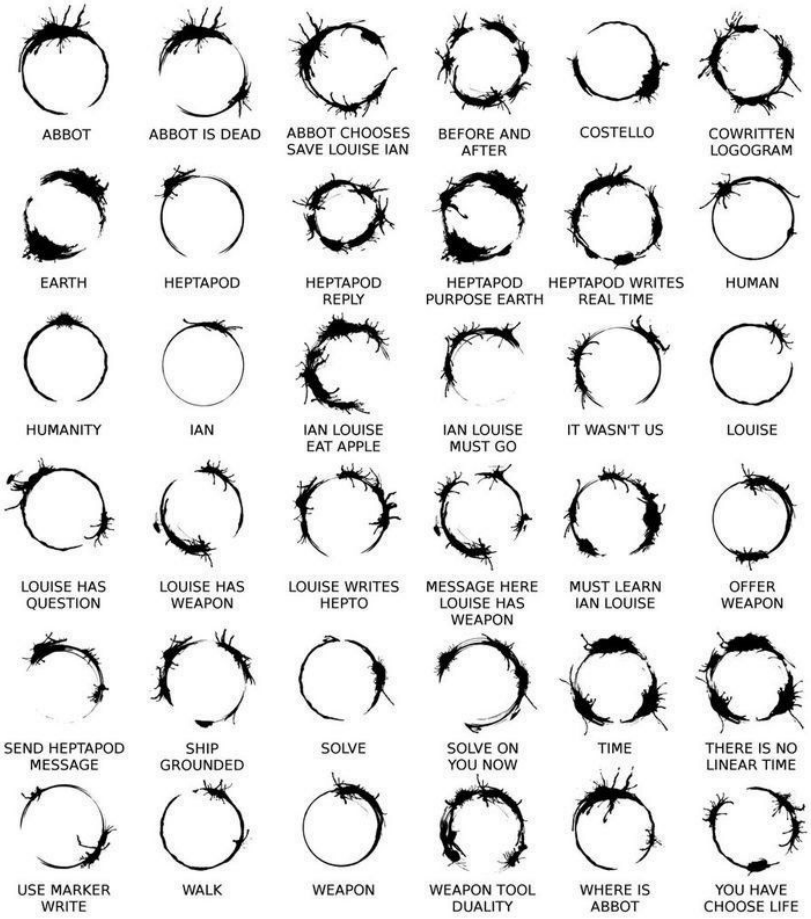
- No expensive textbook to buy
  - 1984 by George Orwell or the graphic novel version.
  - Stories of Our Life by Ted Chiang

Contact me directly if purchasing these books will be a burden and I will buy them for you.


BE A GOODTHINKER
AVAILABLE NOW
THE NEWSPEAK DICTIONARY
11th EDITION
printed by the MINISTRY of PLENTY
ALL OTHER EDITIONS UNGOOD
AVOID DUCKSPEAK

HEPTAPOD LOGOGRAMS WITH TRANSLATION

(source : http://bit.ly/2l14vJQ)



COMPILED BY EMMA HOLLEN (@EMMADEGEEKME)

Arrival

Exercises are required (no surprise there)

- UW exercises are from the Coursera Courses (Prof. Grossman has shared them with us as well).
- WashU exercises

Always get at least a weekend and the next week to finish (Thanks to student suggestion)

Pass the tests and you should be okay. You will be contacted if something is discovered that you need to fix.

You must submit your own work.

Grade Composition

- Prep Q&S Forms (10%) (3 free misses)
- In Class Worksheet (3%)
- WashU Exercises (75%) commit and push to git repo on bitbucket
- UW Exercises (12%) commit and push to git repo on bitbucket
  - Calendar Date Assignment
  - Card Game Assignment
  - Pattern Matching Assignment
  - Streams Assignment
  - Tetris Assignment
  - Geometry Language Assignment (Split Assignment: 30% SML, 70% Ruby)

Exercises

1. (SML) WashU Exercise Sum Distances To Origin with Functions
2. (SML) WashU Exercise Closest To Origin
3. (SML) UW Exercise Calendar Date
4. (SML) WashU Exercise Eliminate Unsorted
5. (SML) WashU Exercise Hearts Card Game
6. (SML) UW Exercise Card Game
7. (SML) WashU Exercise Spreadsheet
8. (SML) UW Exercise Pattern Matching
9. (SML) WashU Exercise Scan Higher Order Function
10. (SML) WashU Exercise Binary Search Tree
11. (SML) WashU Exercise Chained (Single List and Hashed) Dictionaries
12. (Java) WashU Exercise ImList<E>
13. (SML) WashU Exercise Sorted Dictionary
14. (Java) WashU Exercise java.util.Optional<T>
15. (Java) WashU Exercise Tail Recursion
16. (SML) WashU Exercise Spreadsheet To Dictionaries
17. (Java) WashU Exercise Higher Order Functions Hall of Fame
18. (Racket) WashU Exercise Sierpiński
19. (Racket) UW Exercise Streams
20. (Racket) WashU Exercise Cantor
21. (Racket) WashU Exercise IBPL List Converter
22. (Racket) WashU Exercise Snowflake
23. (Racket) WashU Exercise IBPL Interpreter
24. (Racket) WashU Exercise IBPL Functions and Macros
25. (Ruby) WashU Exercise Render Part A
26. (Ruby) UW Exercise Tetris
27. (Ruby) WashU Exercise Render Part B
28. (Ruby) WashU Exercise Render Part C
29. (Ruby + SML) UW Exercise Geometry Language
30. (Ruby) WashU Exercise Render Part D
31. (Ruby) WashU Exercise Branch
32. (Java) WashU Exercise Iterable ImList<E>

Do You Want Other Resources?

- What other resources would you like?
  - Post to piazza (anonymous, if necessary)

I Will Do My Best To Not Move Goalposts

Story time: ImmutableList<E> exercise from previous semester

Programming Languages Course

https://twitter.com/cszhu/status/1134218861660712960?lang=en

*** How many have used Java?

*** Burned By == vs equals()?

*** Assigned Variables?

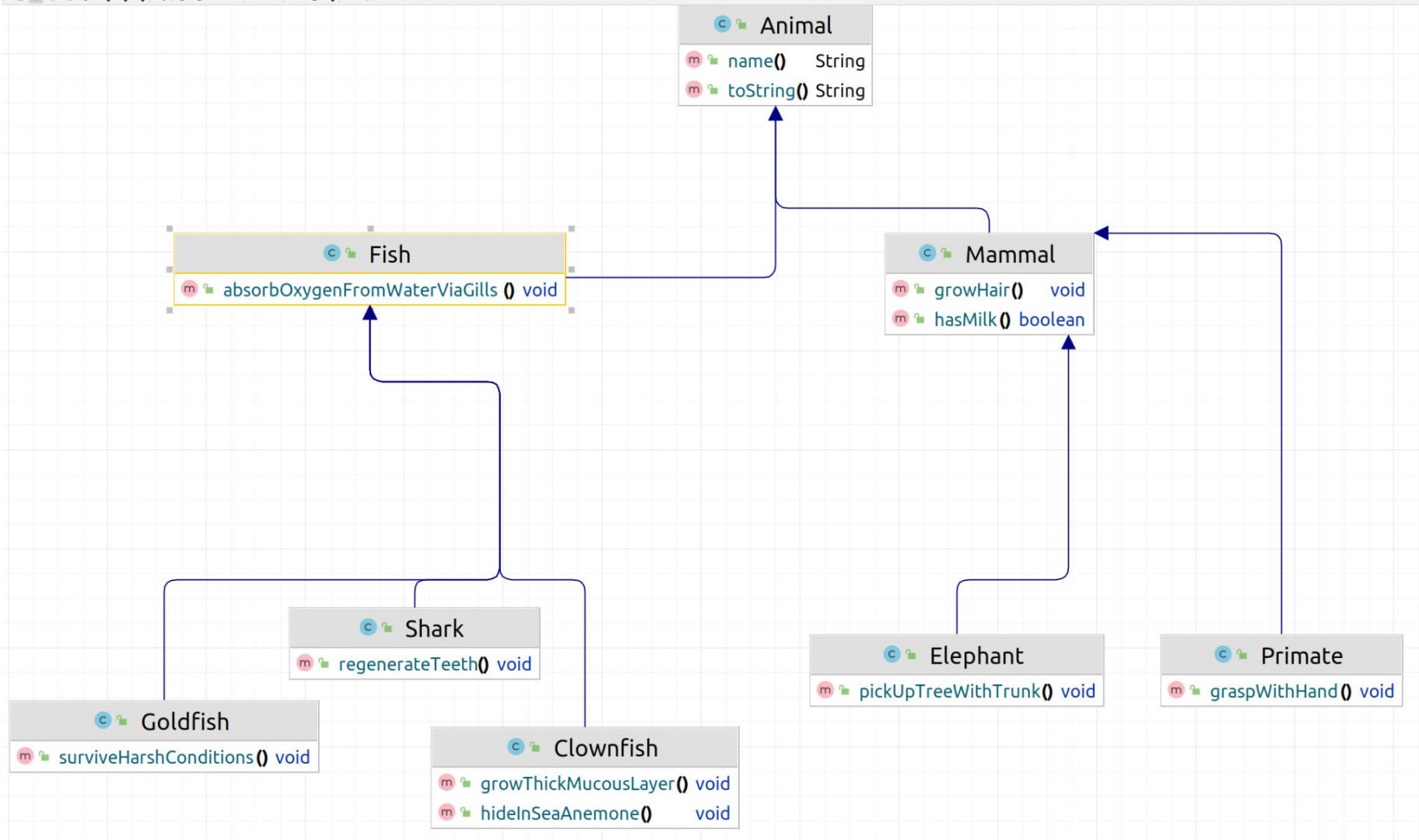
*** What Does a = b; in Java Do?

C++ has pointers. Does Java have pointers?

Is it better for not having pointers?

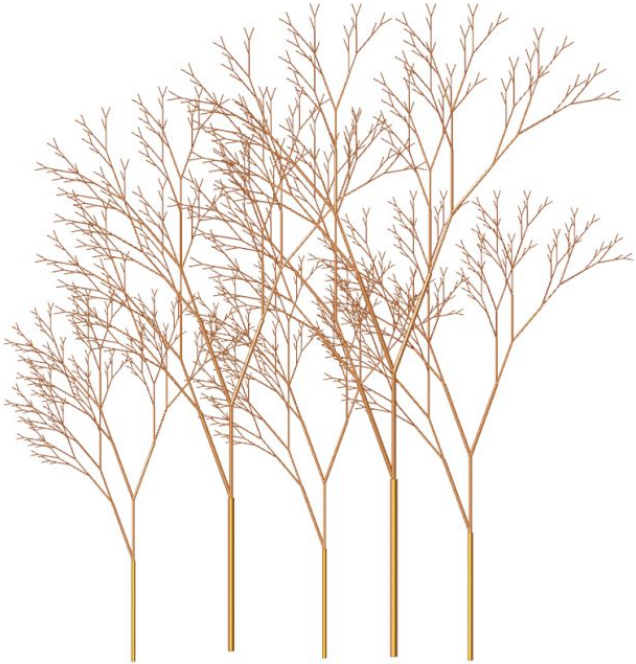
*** Created a Class Hierarchy?

*** Sub vs. Super. Which has more?

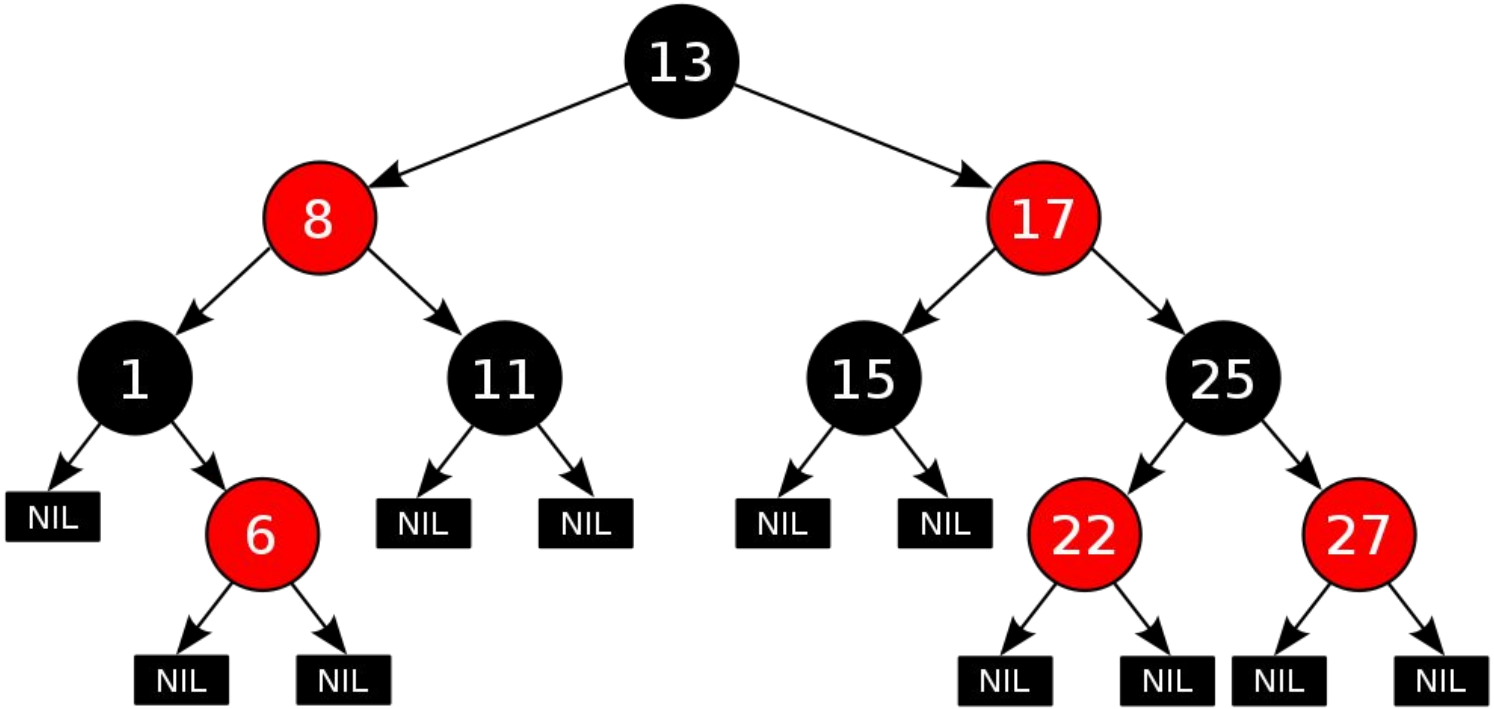

Animal
name() String
toString() String
Fish
absorbOxygenFromWaterViaGills () void
Mammal
growHair() void
hasMilk() boolean
Shark
regenerateTeeth() void
Goldfish
surviveHarshConditions() void
Clownfish
growThickMucousLayer() void
hideInSeaAnemone() void
Elephant
pickUpTreeWithTrunk() void
Primate
graspWithHand() void

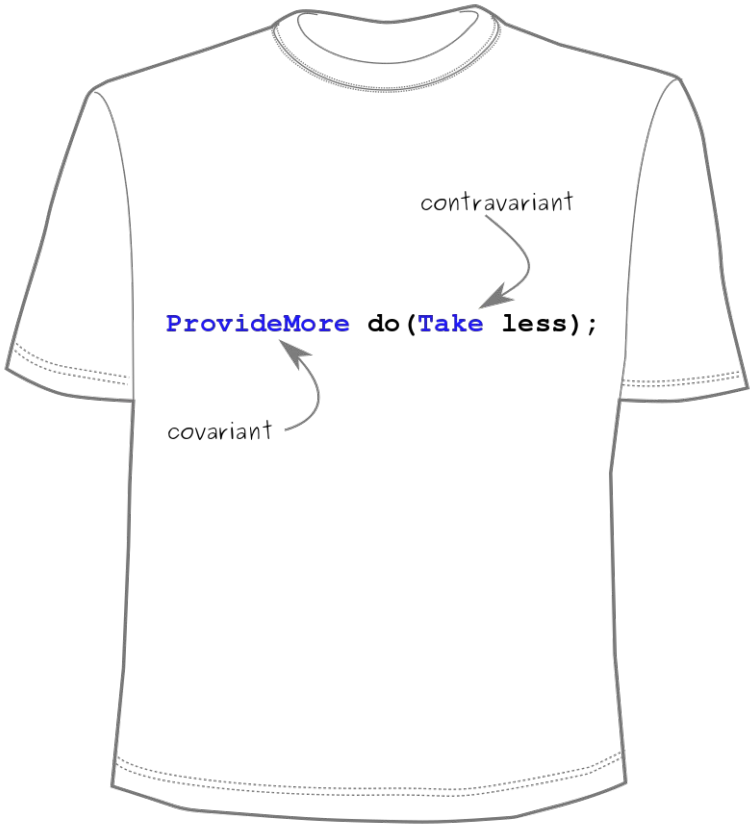
*** Which way do trees grow?

*** Which way do trees grow?



*** Which way do CS trees grow?




contravariant
ProvideMore do(Take less);
covariant

*** Used null?

assigning null demo

What is null good for?

What is the type of null?

Demo ML, Racket, and Ruby

sum up to 10