PAUL G. ALLEN SCHOOL
OF COMPUTER SCIENCE & ENGINEERING

CSE 341
Section 3

HW1 Tips
Tail Recursion
Pattern-Matching

Agenda

- HW1 tips
  - Avoid reimplementation of functions
- Pattern-matching over expression trees
- A little tail recursion
  - What is and isn't tail recursive?
  - How can we make functions tail recursive?

Homework 1 Check-In

Things to keep in mind:

- Easy to miss things when learning a new language!
- Test as you go & design your tests *carefully*
- Read the spec before, during, and after each problem. It's worth the extra time!
  - Check for correctness *and* redundancy/style (and review the CSE 341 Style Guide before submitting!)
- Functional programming emphasizes code reuse
  - Avoid re-implementing functionality where possible
  - Will become even more important later with higher-order function

Key Concepts Review

- Custom datatypes
  - all of (records), one of (variants)
- Pattern matching
  - Powerful way to break apart data
- Tail recursion
  - Space efficiency of loops with recursive functions

val-Pattern Matching

Remember our unit test?

```
(* Neat trick for creating hard-fail tests: *)

val true = ((4 div 4) = 1);
```

Just a pattern match!

"Match the left hand side against the value 'template' true, binding any variables (there aren't any!)"

Adventures in pattern matching

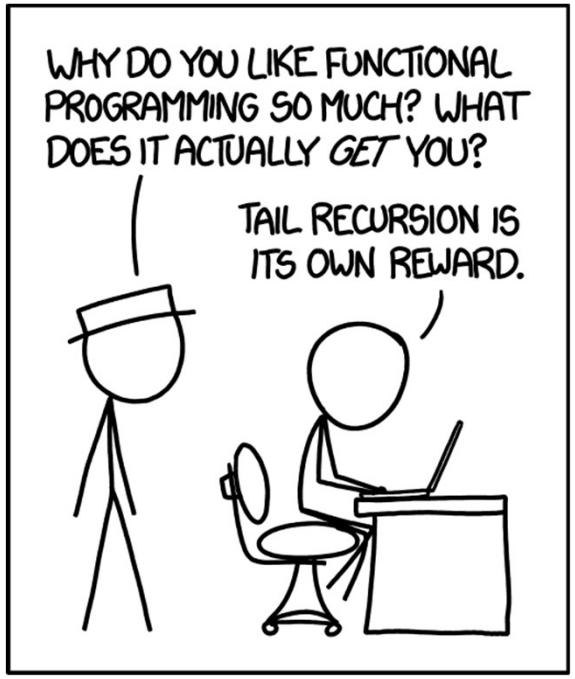
- Shape example
- Function-pattern syntax if we get to it

Pattern Matching

- We can pattern match over `datatypes`
- Beware “non-exhaustive matching”
  - Pattern matching can avoid “empty list” exceptions!
- Most functions pattern match over a single argument
  - SML has special syntax for this common case!
  - Use is a matter of taste
- Let’s work through some examples!

Tail Recursion

What is it?



Briefly: if a function will immediately return after making a call, we can reuse the stack space of the current function.

Tail Recursion

Quickcheck!

- Discuss the problems with your breakout rooms!

Tail Recursion

- Was `length` tail recursive?
- Was `all_positive` tail recursive?
- Why tail recursion?