

```
fun append (xs,ys) =  
  if xs=[]  
  then ys  
  else (hd xs)::append(tl xs,ys)  
  
fun map (f,xs) =  
  case xs of  
    [] => []  
  | x::xs' => (f x)::(map(f,xs'))  
  
val a = map (increment, [4,8,12,16])  
val b = map (hd, [[8,6],[7,5],[3,0,9]])
```

# Programming Languages

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*Optional: Why Study General PL Concepts*

What is the best kind of car?

What is the best kind of shoes?

# *Cars / Shoes*

Cars are used for rather different things:

- Winning a Formula 1 race
- Taking kids to soccer practice
- Off-roading
- Hauling a mattress
- Getting the wind in your hair
- Staying dry in the rain

Shoes:

- Playing basketball
- Going to a formal
- Going to the beach

# *More on cars*

- A good mechanic might have a specialty, but also understands how “cars” (not a particular make/model) work
  - The upholstery color isn’t essential (syntax)
- A good mechanical engineer really knows how cars work, how to get the most out of them, and how to design better ones
  - I don’t have a favorite kind of car or a favorite PL
- To learn how car pieces interact, it may make sense to start with a classic design rather than the latest model
  - A popular car may not be best
  - May especially not be best for learning how cars work

# *Why semantics and idioms*

This course focuses as much as it can on semantics and idioms

- Correct reasoning about programs, interfaces, and compilers *requires* a precise knowledge of semantics
  - Not “I feel that conditional expressions might work like this”
  - Not “I like curly braces more than parentheses”
  - Much of software development is designing precise interfaces; what a PL means is a *really* good example
- Idioms make you a better programmer
  - Best to see in multiple settings, including where they shine
  - See Java in a clearer light even if I never show you Java

# *Hamlet*

The play *Hamlet*:

- Is a beautiful work of art
- Teaches deep, eternal truths
- Is the source of some well-known sayings
- Makes you a better person

Continues to be studied centuries later even though:

- The syntax is really annoying to many (yet rhythmic)
- There are more popular movies with some of the same lessons
- Reading Hamlet will not get you a high-paying job