

# Anonymous functions

Since map, filter, and fold are **so important**, we're going to have you try them out.

One helpful trick is the ability to define an anonymous function

```
(fn x => x + 2)
```

Need two arguments? Use currying!

```
(fn x => fn y => x+y)
```

Using `map`, write a one-line expression that satisfies the specification:

- ▶ Input: This list of ints as input:
  - ▶ `[1,2,~3,~4,5,6,~7,~8]`
- ▶ Output: The absolute value of the input list as reals
  - ▶ `[1.0,2.0,3.0,4.0,5.0,6.0,7.0,8.0]`
- ▶ Recall that...
  - ▶ `real(n)` converts an integer to a real, and
  - ▶ `abs(n)` converts a number to its absolute value
  - ▶ `map f l` applies function `f` to each element of `l`

```
– map (fn x => real(abs(x)))  
    [1,2,~3,~4,5,6,~7,~8];  
val it = [1.0,2.0,...,8.0] : real list
```

Using `filter`, write a one-line expression that satisfies the specification:

- ▶ Input: This list of ints as input:
  - ▶ `[1,2,...,20]`
- ▶ Output: A list of ints that are multiples of 3 or 5 but not multiples of both.
  - ▶ `[3,5,6,9,10,12,18,20]`
- ▶ Recall that...
  - ▶ `List.filter f l` evaluates test `f` on each element of list `l` and returns a list of those that pass
  - ▶ `not` is SML's logical not

```
– List.filter (fn x => (((x mod 3 = 0)
  orelse (x mod 5 = 0)) andalso (not
  (x mod 15 = 0)))) [1,2,...,20];
val it = [3,5,6,9,10,12,18,20] : int list
```

# Fold

Using `fold`, write a one-line expression that satisfies the specification:

- ▶ Input: This list of booleans as input:
  - ▶ `[true, true, false, true, true, false, false, true]`
- ▶ Output: The result of taking the exclusive-or of the input
  - ▶ `true`
- ▶ Recall that...
  - ▶ `foldr f e l` collapses list `l` into a single value by repeatedly applying `f` using the initial value `e`
    - ▶ Function `f` takes a pair of arguments, rather than just one
  - ▶  $x \oplus y = (x \vee y) \wedge \neg(x \wedge y)$

```
– foldr (fn (x, y) => (x oralso y)
  andalso (not (x andalso y)))
  false [true, true, ..., true];
val it = true : bool
```