

Exercise 1.33. You can obtain an even more general version of `accumulate` (exercise 1.32) by introducing the notion of a `filter` on the terms to be combined. That is, combine only those terms derived from values in the range that satisfy a specified condition. The resulting `filtered-accumulate` abstraction takes the same arguments as `accumulate`, together with an additional predicate of one argument that specifies the filter. Write `filtered-accumulate` as a procedure. Show how to express the following using `filtered-accumulate`:

- a. the sum of the squares of the prime numbers in the interval a to b (assuming that you have a `prime?` predicate already written)
- b. the product of all the positive integers less than n that are relatively prime to n (i.e., all positive integers $i < n$ such that $\text{GCD}(i, n) = 1$).

Answer.

```
(define (filter-accumulate filter combiner null-value term a next b)
  (cond ((> a b) null-value)
        ((filter a)
         (combiner (term a)
                   (filter-accumulate filter combiner null-value term (next a) next b)))
        (else (filter-accumulate filter combiner null-value term (next a) next b))))
```

a.

```
(define (prime-sum-sq a b)
  (filter-accumulate prime? + 0 square a inc b))
```

b.

```
(define (relat-prime-product 1 n)
  (filter-accumulate relat-prime? * 1 identity inc b))
```

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