;; Data definitions

;; A burger is
;; (make-burger bool bool)
(define-struct burger (cheese? onions?))

;; A side is either
;; 'fries
;; 'onion-rings

;; A simple-order is
;; - (make-simple-order burger side)
(define-struct simple-order (burger side))

;; A family-order is
;; - (make-family-order list-of-simple-order)
(define-struct family-order (orders))

;; An order is either
;; - simple-order
;; - family-order

;; To remind us, for list-of-order and list-of-simple-order:
;;
;; A list-of-X is

;; -------------------------------------------------------------

;; Examples for testing

;; Burger with onions (no cheese), fries on the side
(define burger+f)

;; Burger with onions (no cheese), onion rings on the side
(define burger+o)

;; Burger with cheese and onions, onion rings on the side
(define cheeseburger+o)

;; Burger with cheese (no onions), fries on the side
(define hold-the-onions)

;; An family order with no order inside (family apparently changed its mind)
(define not-hungry)

;; Family of three: burger+o, cheeseburger+o, and hold-the-onions
(define trio)

;; Trio was made using
(define trio (list burger+o cheeseburger+o hold-the-onions))
;; Family of three: hold-the-onions, hold-the-onions, and hold-the-onions
(define trio/hold-the-onions

;; ------------------------------
;; Checking orders

;; Original functions, later abstracted to need-something? and
;; need-something-for-order?:
;
;; need-fries? : list-of-order -> bool
;; Checks whether any order in l includes 'fries
(define (need-fries? l)
  (ormap (lambda (o)
            (need-fries-for-order? o))
         l))
;
;; need-fries-for-order? : order -> bool
;; Checks whether any order in o includes 'fries
(define (need-fries-for-order? o)
  (cond
   [(simple-order? o) (eq? 'fries (simple-order-side o))]
   [(family-order? o) (need-fries? (family-order-orders o))]))

;; need-something? : list-of-order -> bool
;; Return true if CHECK is produces true for every
;; order in l (including each order within each family order)
(define (need-something? CHECK l)
  (ormap (lambda (o)
            (need-something-for-order? CHECK o))
         l))

;; need-something-for-order? : order -> bool
;; Return true if CHECK is produces true for every
;; order in o (including each order within a family order)
(define (need-something-for-order? CHECK o)
  (cond
   [(simple-order? o) (CHECK o)]
   [(family-order? o) (need-something? CHECK o)]))

;; Make sure that uses of 'need-something?' cover all cases in
;; both list-of-order and order...

;; need-fries? : list-of-order -> bool
;; Checks whether any order in l includes 'fries
(define (need-fries? l)
  (need-something? (lambda (o) (eq? 'fries (simple-order-side o)))
                   l))

(check-expect (need-fries? empty) false)
(check-expect (need-fries? (list burger+f)) true)
(check-expect (need-fries? (list burger+o burger+o)) false)
(check-expect (need-fries? (list burger+o trio)) true)
(check-expect (need-fries? (list not-hungry)) false)

;; need-cheese? : list-of-order -> bool
;; Checks whether any order in l includes cheese
(define (need-cheese? l)
  (need-something? l))

(check-expect (need-cheese? empty) false)
(check-expect (need-cheese? (list cheeseburger+o)) true)
(check-expect (need-cheese? (list burger+f burger+o)) false)
(check-expect (need-cheese? (list burger+o trio)) true)
(check-expect (need-cheese? (list not-hungry)) false)

;; need-onions? : list-of-order -> bool
;; Checks whether any order in l includes onions (on burgers
;; or as rings)
(define (need-onions? l)
  (need-something? l))

(check-expect (need-onions? empty) false)
(check-expect (need-onions? (list burger+f)) true)
(check-expect (need-onions? (list hold-the-onions)) false)
(check-expect (need-onions? (list hold-the-onions burger+f)) true)
(check-expect (need-onions? (list trio)) true)
(check-expect (need-onions? (list trio/hold-the-onions)) false)
(check-expect (need-onions? (list not-hungry)) false)

;; -----------------------------------------------
;; Prioritizing orders

;; need-fries-more? : list-of-order -> bool
;; We need fries more if, no matter how far we look ahead
;; in the order list, the number of fries we need is never
;; less than the number of onions that we need.
(define (need-fries-more? l)
  (need-fries-more/given-counts? l 0 0))

;; need-fries-more/given-counts? : list-of-order num num -> bool
;; Like need-fries-more?, but assumes that we've so far
;; seen fr orders for fries and on orders for onion rings
;; (with fr >= or)
(define (need-fries-more/given-counts? l fr on)
  (cond
   [(empty? l) true]
   [else (local [(define n-fr (count-sides 'fries ))]
             (define n-on (count-sides 'onion-rings )))])
(cond
  [(< n-fr n-on) false]
  [else (need-fries-more/given-counts? (rest 1) )]))))

;; count-sides : sym order -> num
;; Counts the number of "which" sides ('fries or 'onion-rings) in o
(define (count-sides which o)
  (cond
    [(simple-order? o) ]
    [else (foldl
      0
      (family-order-orders o))]))

(check-expect (count-sides 'fries burger+f) 1)
(check-expect (count-sides 'fries burger+o) 0)
(check-expect (count-sides 'fries trio) 1)
(check-expect (count-sides 'onion-rings trio) 2)

(check-expect (need-fries-more/given-counts? (list burger+f) 0 0) true)
(check-expect (need-fries-more/given-counts? (list burger+o) 0 0) false)
(check-expect (need-fries-more/given-counts? (list burger+o) 1 0) true)
(check-expect (need-fries-more/given-counts? (list burger+f) 1 1) true)
(check-expect (need-fries-more/given-counts? (list burger+f burger+o) 0 0) true)
(check-expect (need-fries-more/given-counts? (list burger+o burger+f) 0 0) false)
(check-expect (need-fries-more/given-counts? (list trio) 0 0) false)
(check-expect (need-fries-more/given-counts? (list trio) 1 0) true)
(check-expect (need-fries-more/given-counts? (list trio burger+o) 1 0) false)

(check-expect (need-fries-more? (list burger+f)) true)
(check-expect (need-fries-more? (list burger+f burger+o burger+f)) true)
(check-expect (need-fries-more? (list burger+f burger+o burger+o)) false)
(check-expect (need-fries-more? (list trio)) false)
(check-expect (need-fries-more? (list burger+f trio)) true)