

; merge : list-of-numbers list-of-numbers → list-of-numbers
; to merge the sorted, non-duplicate lists l1 and l2
; into a single list that is sorted, and has no duplicates

```
(define (merge l1 l2)
  (cond
    [(and (empty? l1) (empty? l2)) empty]
    [(and (cons? l1) (empty? l2))
     (cons (first l1) (merge (rest l1) l2))]
    [(and (empty? l1) (cons? l2))
     (cons (first l2) (merge l1 (rest l2)))]
    [(and (cons? l1) (cons? l2))
     (cond
       [(< (first l1) (first l2))
        (cons (first l1) (merge (rest l1) l2))]
       [(= (first l1) (first l2))
        (cons (first l1)
              (merge (rest l1) (rest l2)))]
       [(> (first l1) (first l2))
        (cons (first l2) (merge l1 (rest l2)))]))]))
```

```
(merge  
  (list 2 4 5 7)  
  (list 1 3 5 9))
```



```
(merge  
  (list 2 4 5 7)  
  (list 1 3 5 9))
```

```
⇒ (cons  
   1  
   (merge  
     (list 2 4 5 7)  
     (list 3 5 9)))
```

```
← (cons  
  1  
  (merge  
    (list 2 4 5 7)  
    (list 3 5 9)))
```

```
(cons
  1
  (cons
    2
    (merge
      (list 4 5 7)
      (list 3 5 9))))))
```

```
← (cons
  1
  (merge
    (list 2 4 5 7)
    (list 3 5 9))))
```

```
(cons  
  1  
  (cons  
    2  
    (merge  
      (list 4 5 7)  
      (list 3 5 9))))))
```

⇒

```
(cons
  1
  (cons
    2
    (merge
      (list 4 5 7)
      (list 3 5 9))))))
```

```
⇒ (cons
  1
  (cons
    2
    (cons
      3
      (merge
        (list 4 5 7)
        (list 5 9))))))
```

```
← (cons
  1
  (cons
    2
    (cons
      3
      (merge
        (list 4 5 7)
        (list 5 9))))))
```



```
(cons
  1
  (cons
    2
    (cons
      3
      (cons
        4
        (merge
          (list 5 7)
          (list 5 9)))))))
```

```
← (cons
  1
  (cons
    2
    (cons
      3
      (merge
        (list 4 5 7)
        (list 5 9))))))
```

```
(cons  
  1  
  (cons  
    2  
    (cons  
      3  
      (cons  
        4  
        (merge  
          (list 5 7)  
          (list 5 9))))))
```

⇒

```
(cons
  1
  (cons
    2
    (cons
      3
      (cons
        4
        (merge
          (list 5 7)
          (list 5 9)))))))
```

```
⇒ (cons
  1
  (cons
    2
    (cons
      3
      (cons
        4
        (cons
          5
          (merge
            (list 7)
            (list 9))))))))
```

```
← (cons
  1
  (cons
    2
    (cons
      3
      (cons
        4
        (cons
          5
          (merge
            (list 7)
            (list 9))))))))))
```

```
(cons
  1
  (cons
    2
    (cons
      3
      (cons
        4
        (cons
          5
          (cons
            7
            (merge
              (list)
              (list 9))))))))))
```

```
← (cons
  1
  (cons
    2
    (cons
      3
      (cons
        4
        (cons
          5
          (merge
            (list 7)
            (list 9))))))))))
```

```
(cons  
  1  
  (cons  
    2  
    (cons  
      3  
      (cons  
        4  
        (cons  
          5  
          (cons  
            7  
            (merge  
              (list)  
              (list 9))))))))))
```

⇒

```
(cons
  1
  (cons
    2
    (cons
      3
      (cons
        4
        (cons
          5
          (cons
            7
            (merge
              (list)
              (list 9))))))))))
```

```
⇒ (cons
  1
  (cons
    2
    (cons
      3
      (cons
        4
        (cons
          5
          (cons
            7
            (cons
              9
              (merge
                (list)
                (list))))))))))
```

```
← (cons
  1
  (cons
    2
    (cons
      3
      (cons
        4
        (cons
          5
          (cons
            7
            (cons
              9
              (merge
                (list)
                (list))))))))))
```



```
(cons
  1
  (cons
    2
    (cons
      3
      (cons
        4
        (cons
          5
          (cons
            7
            (cons 9 empty)))))))
```

```
← (cons
  1
  (cons
    2
    (cons
      3
      (cons
        4
        (cons
          5
          (cons
            7
            (cons
              9
              (merge
                (list)
                (list))))))))))
```