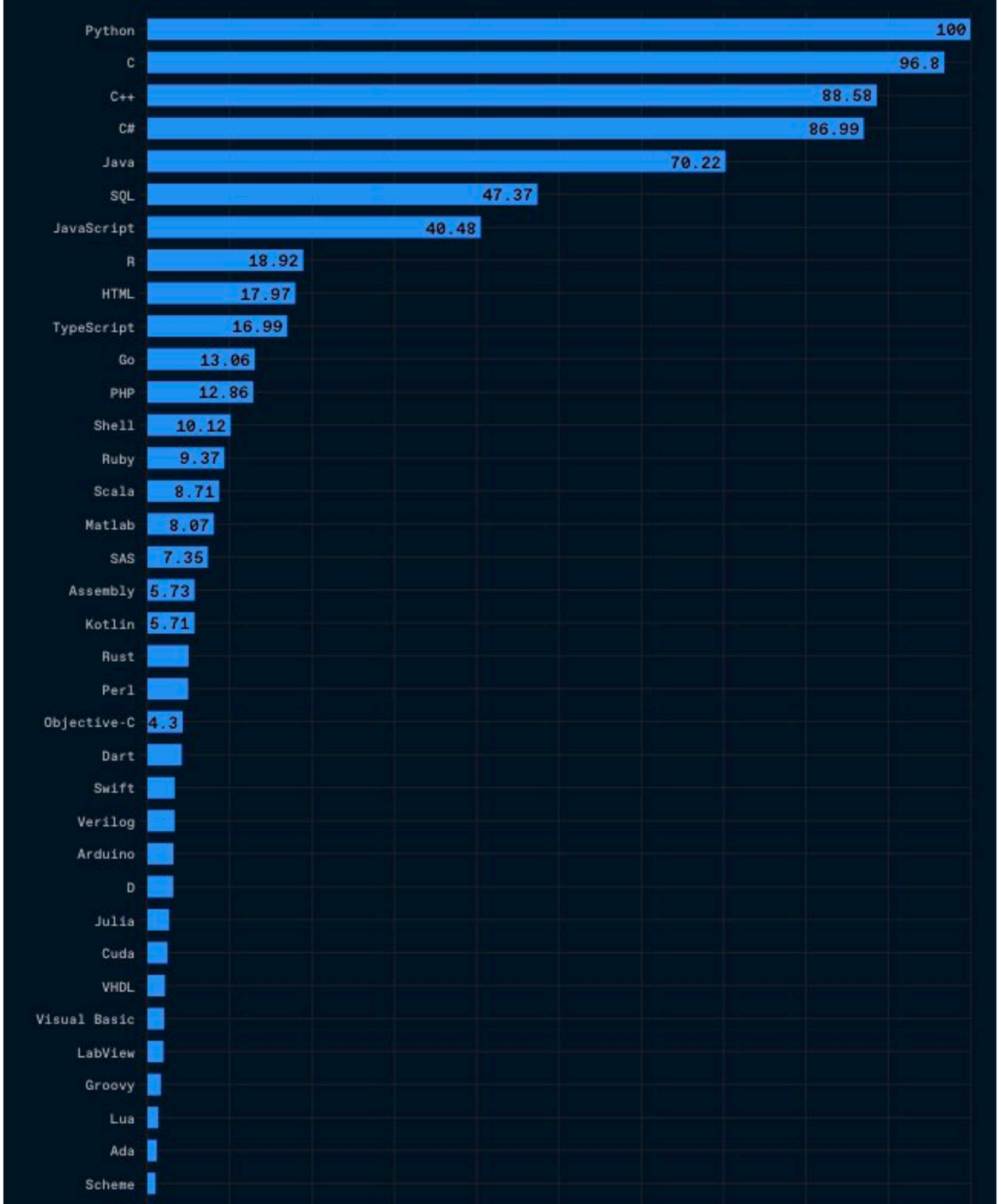
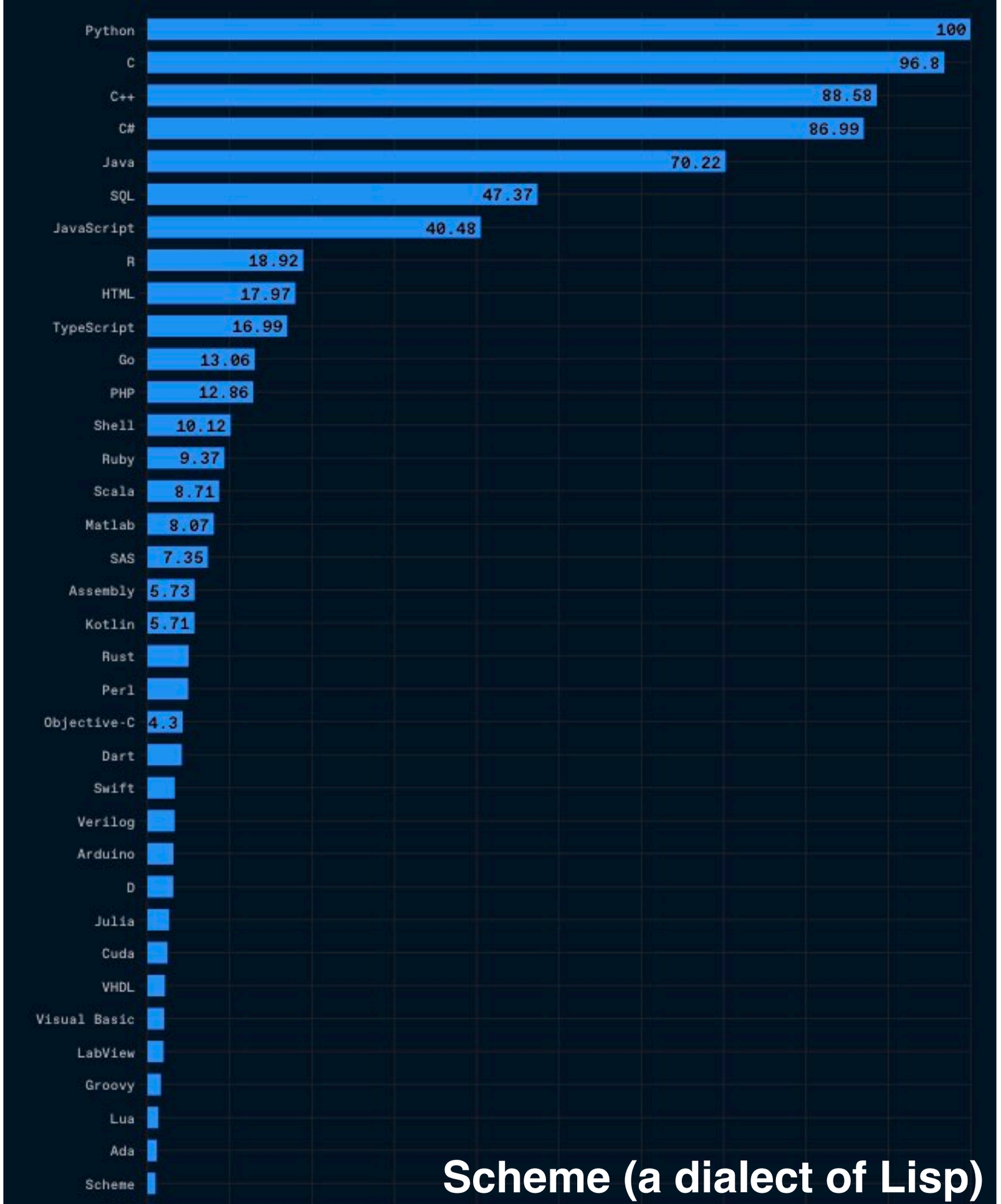
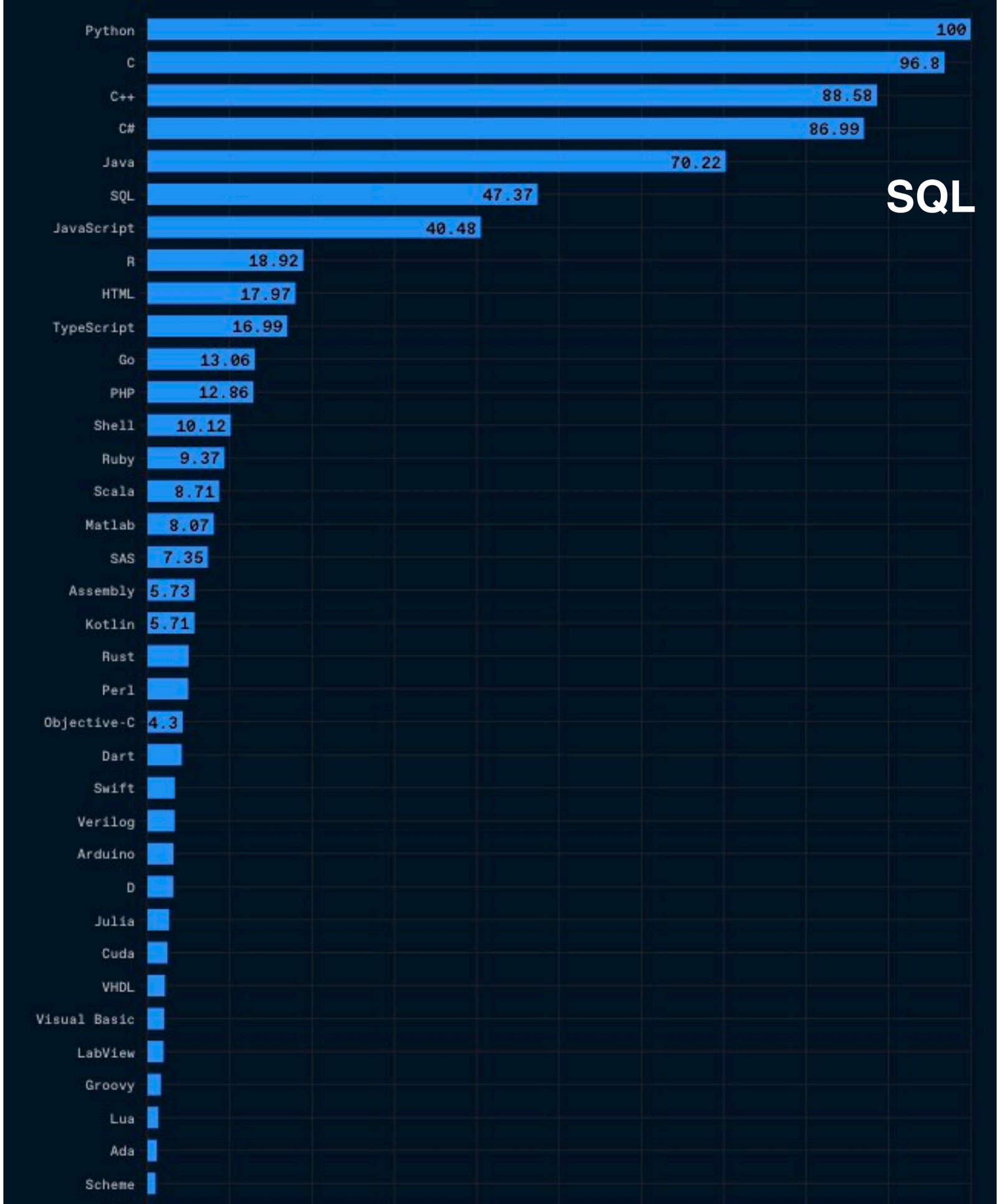
Programming Languages

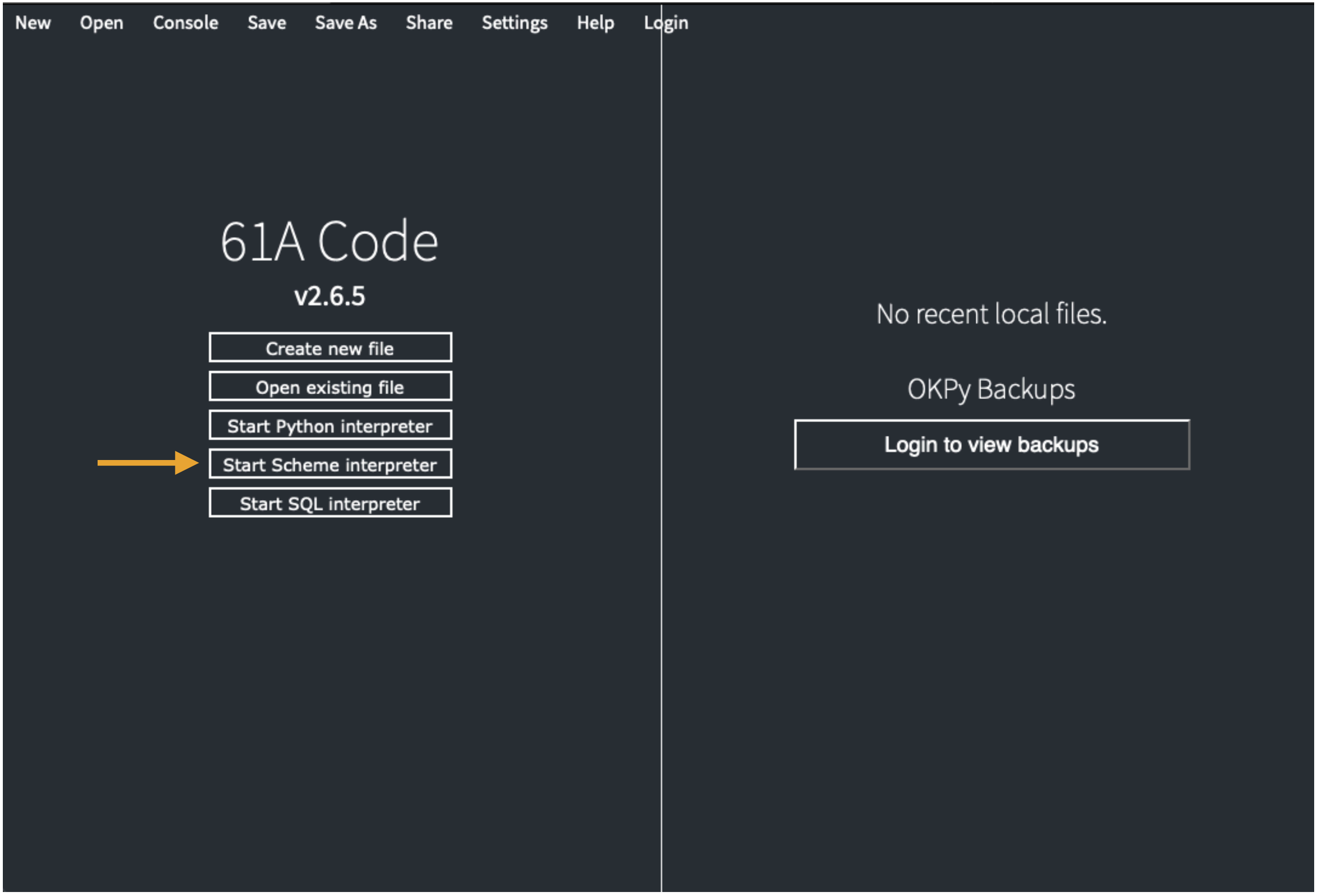


Programming Languages



Programming Languages

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61A Code
v2.6.5
Create new file
Open existing file
Start Python interpreter
Start Scheme interpreter
Start SQL interpreter
No recent local files.
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Scheme Expressions

Python	Scheme
`1 + 2` `3 + 4 + 5 + 6`	`(+ 1 2)` `(+ 3 4 5 6)`

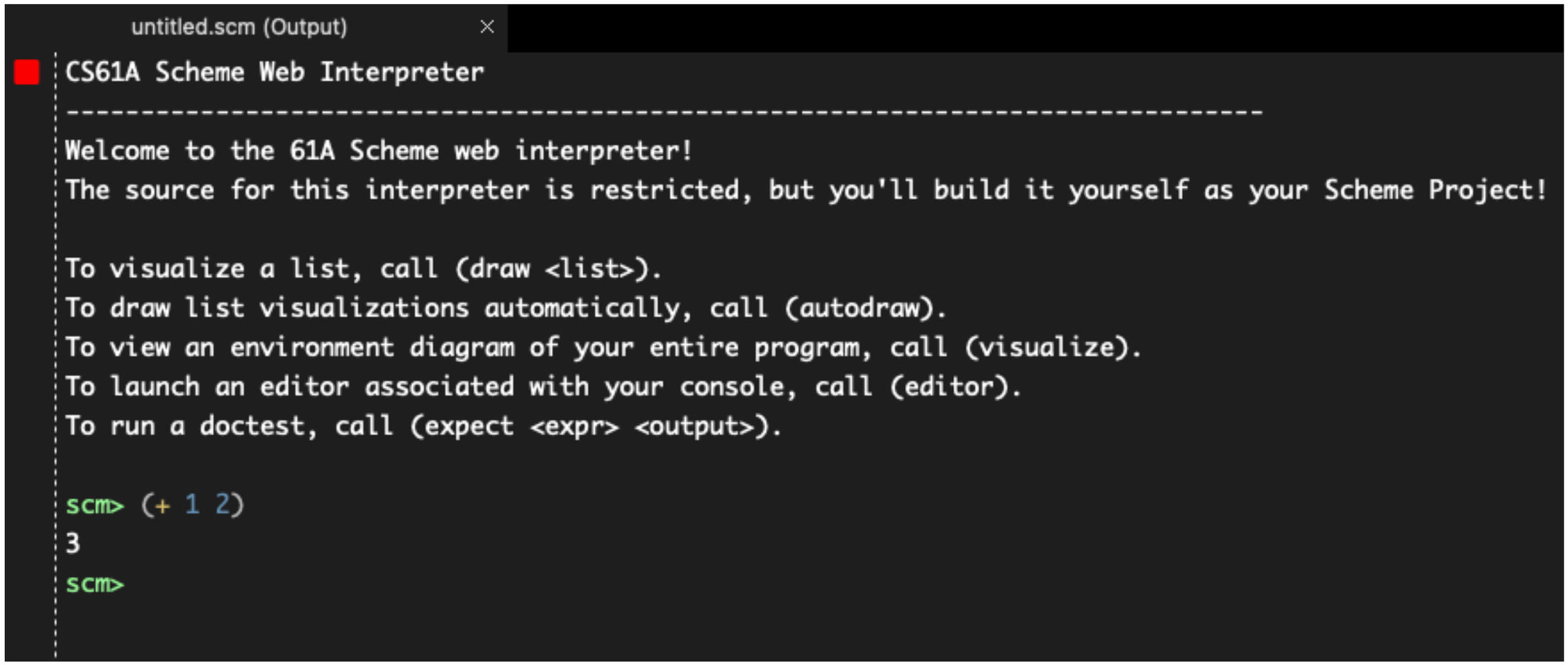
Scheme Expressions

Python	Scheme
`1 + 2` `3 + 4 + 5 + 6`	`(+ 1 2)` `(+ 3 4 5 6)`
`(2 * 4) + (3 + 5)`	`(+ (* 2 4) (+ 3 5))`

Scheme Expressions

Python	Scheme
`1 + 2` `3 + 4 + 5 + 6`	`(+ 1 2)` `(+ 3 4 5 6)`
`(2 * 4) + (3 + 5)`	`(+ (* 2 4) (+ 3 5))`
`"string"` `'string'`	`"string"`

Scheme Expressions



Scheme Special Forms

Python	Scheme
`x = 3`	`(define x 3.14)`

Scheme Special Forms

Python	Scheme
`x = 3`	`(define x 3.14)`
`if x < 0:` `    print(-x)` `else:` `    print(x)`	`(if (< x 0) (- x) x)`

Scheme Special Forms

Python	Scheme
`x = 3`	`(define x 3.14)`
`if x < 0:` `  print(-x)` `else:` `  print(x)`	`(if (< x 0) (- x) x)` `(if (< x 0) (print (- x)) (print x))`

Scheme Special Forms

Python	Scheme
`x = 3`	`(define x 3.14)`
`if x < 0:` `  print(-x)` `else:` `  print(x)`	`(if (< x 0) (- x) x)` `(if (< x 0) (print (- x)) (print x))` `(print (if (< x 0) (- x) x))`

Scheme Special Forms

Python	Scheme
`x = 3`	`(define x 3.14)`
`if x < 0:` `  print(-x)` `else:` `  print(x)`	`(if (< x 0) (- x) x)` `(if (< x 0) (print (- x)) (print x))` `(print (if (< x 0) (- x) x))`
`def abs(x):` `  if x < 0:` `  return -x` `  else:` `  return x`	`(define (abs x)` `  (if (< x 0)` `  (- x)` `  x))`

Scheme Special Forms

Python	Scheme
`x = 3`	`(define x 3.14)`
`if x < 0:` `  print(-x)` `else:` `  print(x)`	`(if (< x 0) (- x) x)` `(if (< x 0) (print (- x)) (print x))` `(print (if (< x 0) (- x) x))`
`def abs(x):` `  if x < 0:` `  return -x` `  else:` `  return x`	`(define (abs x)(if (< x 0)(- x) x))` unlike python, white space doesn't matter

Scheme Special Forms

Python	Scheme
`x = -1` `if x < 0:` `    print(x)` `    print("done")`	`(define x -1)` `(if (< x 0)` `    (begin (print x)` `           (print "done")` `     ))`

Scheme Special Forms

Python	Scheme
`` if(x < 0): print(-1) elif(x > 0): print(1) else: print(0) ```	``` (cond ((< x 0) -1) ((> x 0) 1) (else 0)) ```

Scheme Special Forms

Python	Scheme
`x = 3` `(x > 1) and (x < 10)` `true`	`(define x 3)` `(and (> x 1) (< x 10))` `#t`

Scheme Special Forms

Python	Scheme
`x = 3` `(x > 1) and (x < 10)` `true`	`(define x 3)` `(and (> x 1) (< x 10))` `#t` `(or (= x 3) (< (/ x 0) 1))` `#t`

Scheme Special Forms

Python	Scheme
`x = 3` `(x > 1) and (x < 10)` `true`	`(define x 3)` `(and (> x 1) (< x 10))` `#t` `(or (= x 3) (< (/ x 0) 1))` `#t` `(define x 2)` `(or (= x 3) (< (/ x 0) 1))` `Error: division by zero`

Scheme Lambda Expressions

Python	Scheme
`f = lambda x,y,z: x+y+abs(z)` `f(1,2,3)`	`(define f (lambda (x y z)` `(+ x y (abs z))))` `(f 1 2 3)`

Scheme Let Expressions

Python	Scheme
a = 3 b = 4 c = math.sqrt(a*a + b*b) # a and b remain bound	(define c (let ((a 3)(b 4)) (sqrt (+ (* a a) (* b b))))) ; a and b are not bound here

Scheme Let Expressions

Python	Scheme
	; inline comment ;; short comment on own line ;;; longer explanatory comment

Scheme

```
(number? 3)
#t

(zero? 2)
#f

(integer? 2.2)
#f

(equal? 2 2) ; see also eq?
#t

(string? "foo")
#t
```

Python	Scheme
`for x in range(10):` `  print(x)` `x = 0` `while(x < 10):` `  print(x)` `  x = x + 1`	

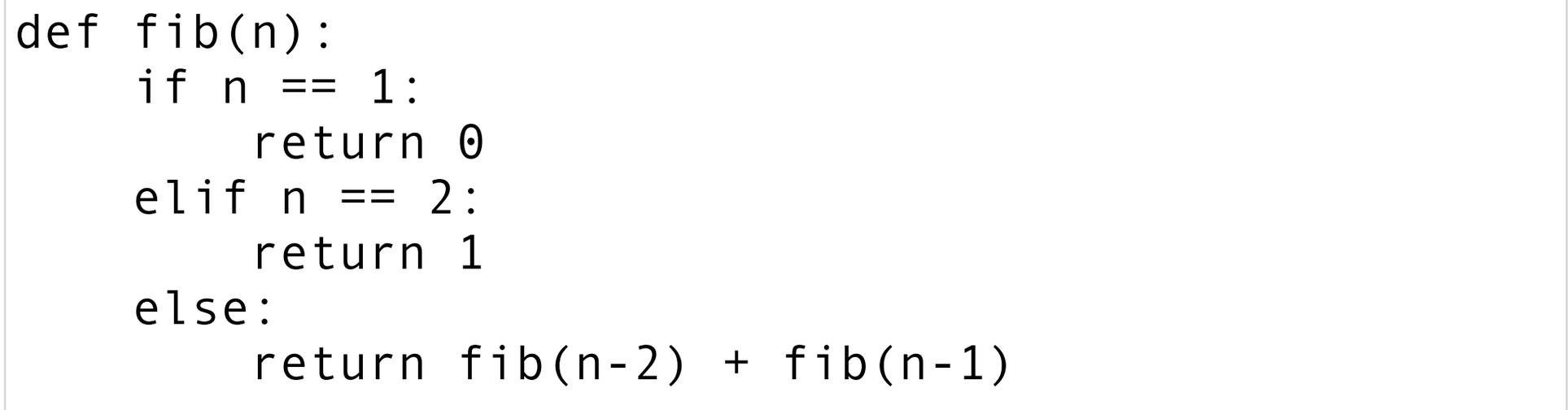
Python	`def factorial(n):` `    if n == 0:` `        return 1` `    else:` `        return n * factorial(n-1)`
Scheme	

Python	`def factorial(n):` `  if n == 0:` `  return 1` `  else:` `  return n * factorial(n-1)`
Scheme	`(define (factorial n)` `  (if (= n 0)` `  1` `  (* n (factorial (- n 1)))` `  )) `

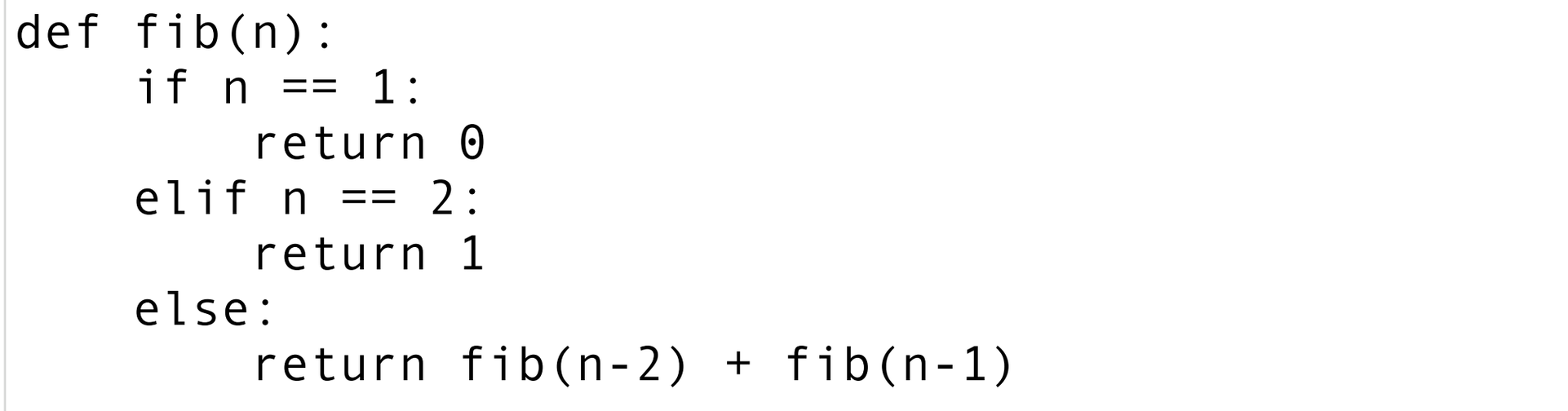
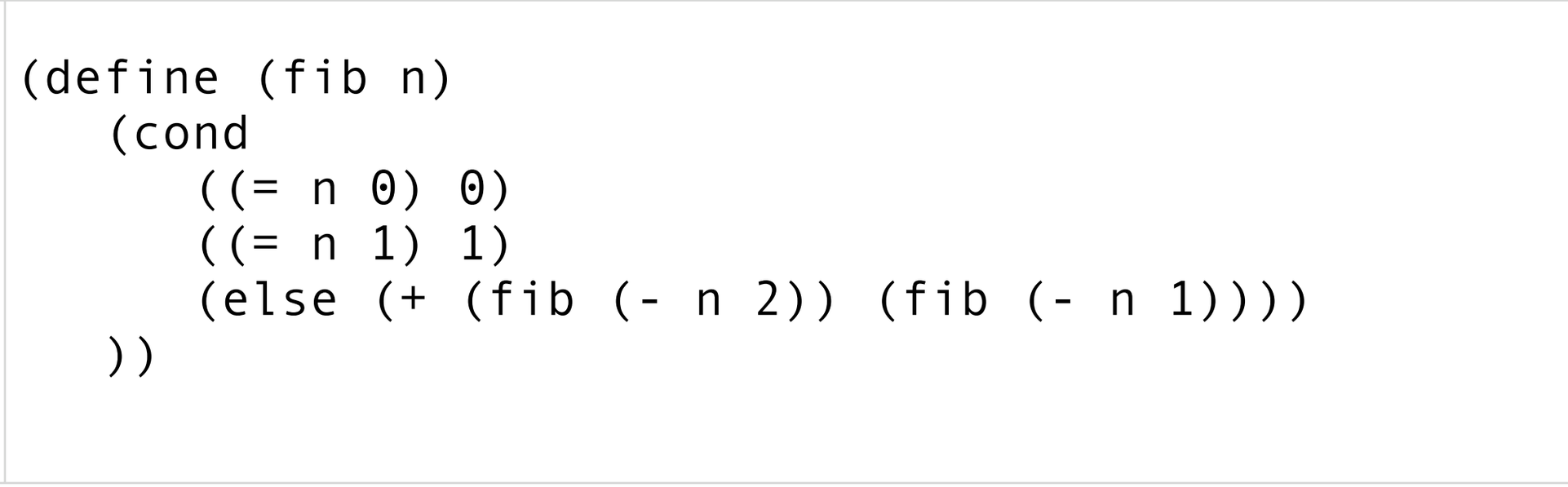
Python	`def perfectSquare(x,i=0):` `  if i > sqrt(x):` `  return False` `  else:` `  return i*i==x or perfectSquare(x,i+1)`
Scheme	

Python	`def perfectSquare(x,i=0):` `  if i > sqrt(x):` `  return False` `  else:` `  return i*i==x or perfectSquare(x,i+1)`
Scheme	`(define (perfectSquare n i)` `  (if (> i (sqrt n))` `  #f` `  (or (= (* i i) n) (perfectSquare n (+ i 1)))` `  ))` `(perfectSquare 16 0)`

Python	`def perfectSquare(x,i=0):` `  if i > sqrt(x):` `  return False` `  else:` `  return i*i==x or perfectSquare(x,i+1)`
Scheme	`(define (perfectSquare n i)` `  (if (> i (sqrt n))` `  #f` `  (or (= (* i i) n) (perfectSquare n (+ i 1)))` `  ))` `(perfectSquare 16 0)`
Scheme	`(define (perfectSquare n)` `  (define (psHelper n i)` `  (if (> i (sqrt n))` `  #f` `  (or (= (* i i) n) (psHelper n (+ i 1)))` `  ))` `  (psHelper n 0))` `(perfectSquare 16)`

Python	
Scheme	

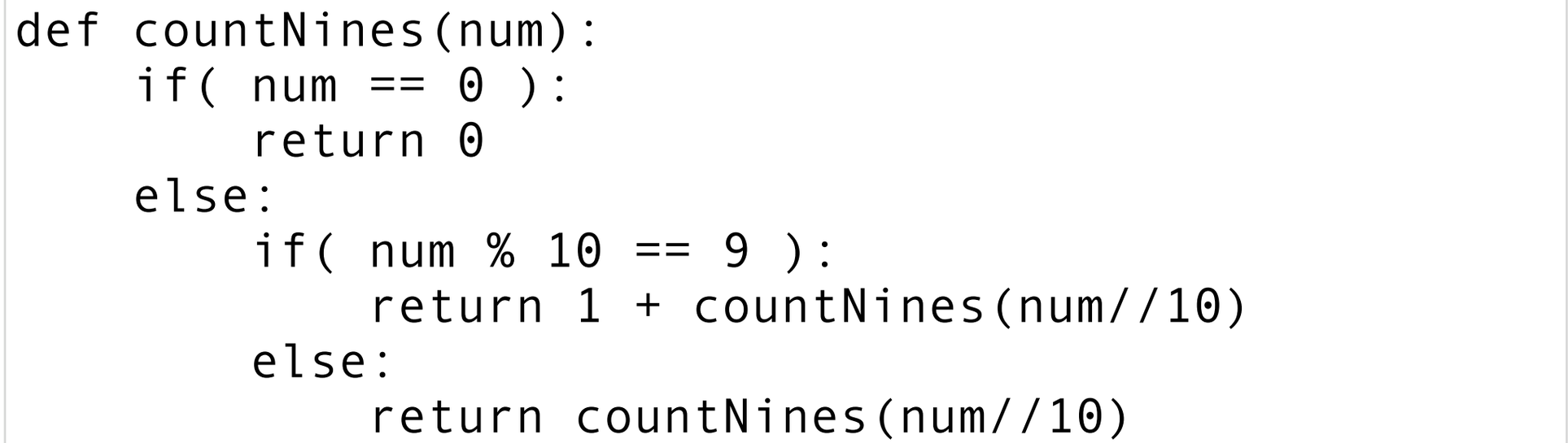
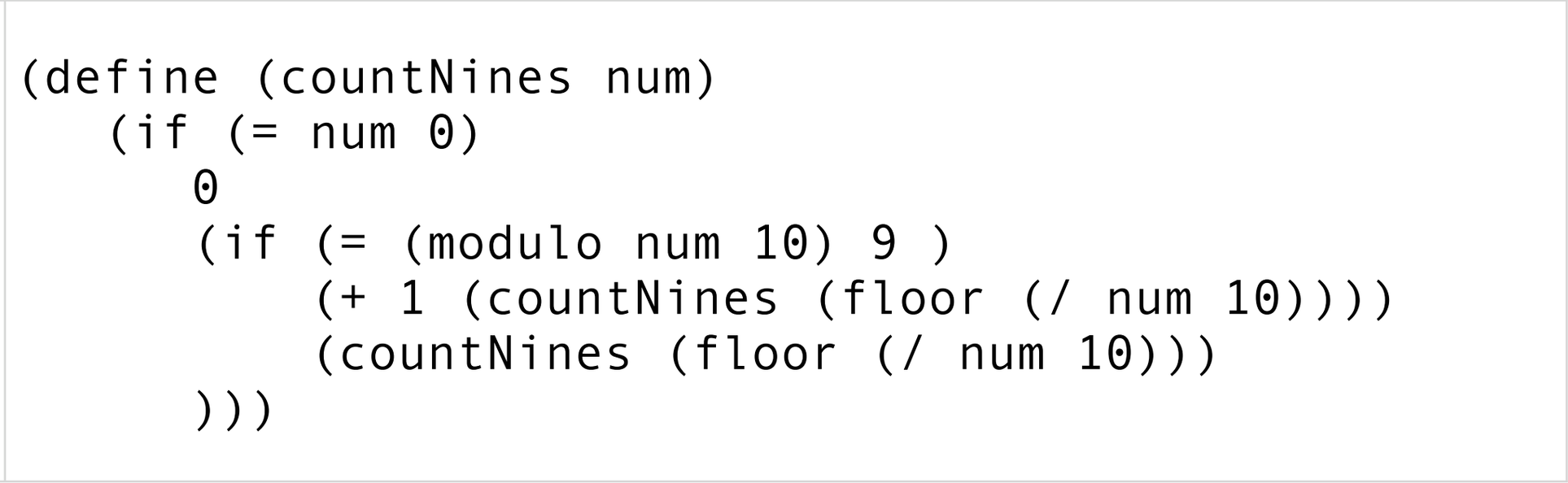
```
def fib(n):
    if n == 1:
        return 0
    elif n == 2:
        return 1
    else:
        return fib(n-2) + fib(n-1)
```

Python	
Scheme	

```
def fib(n):
    if n == 1:
        return 0
    elif n == 2:
        return 1
    else:
        return fib(n-2) + fib(n-1)
```

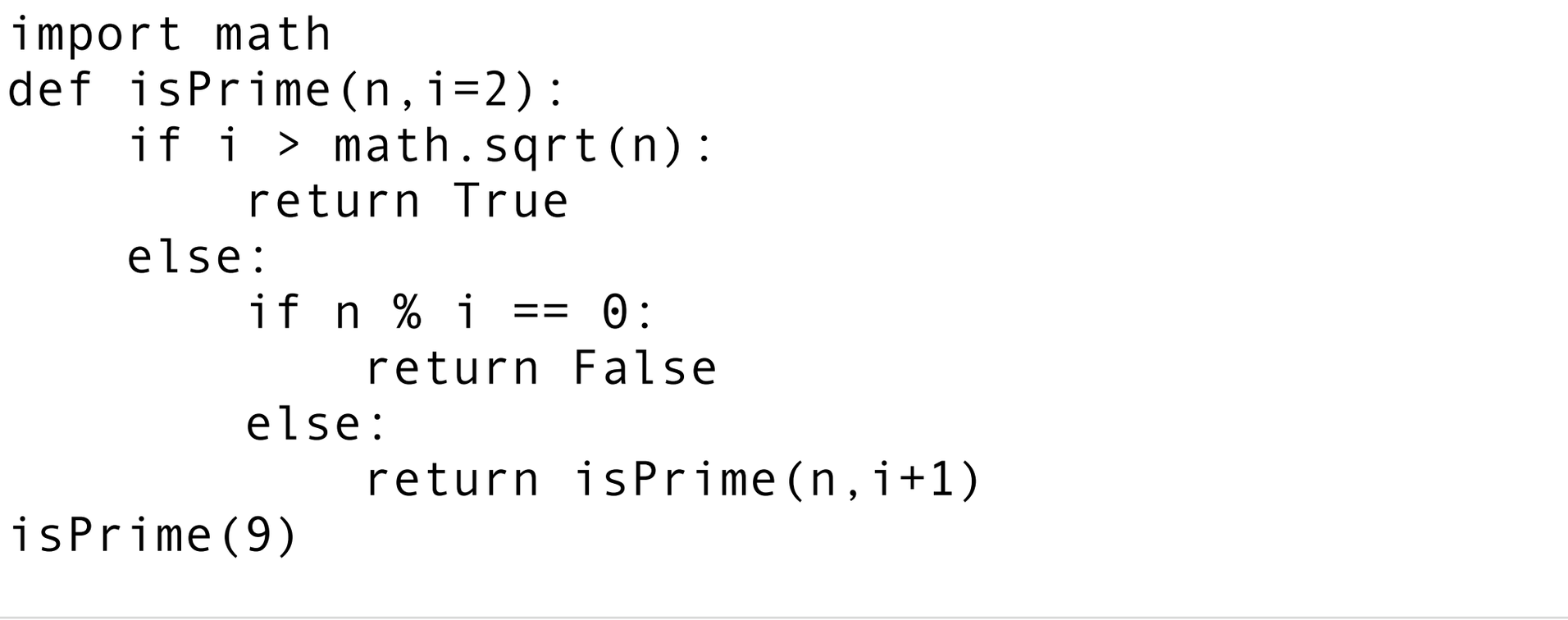
```
(define (fib n)
   (cond
      ((= n 0) 0)
      ((= n 1) 1)
      (else (+ (fib (- n 2)) (fib (- n 1))))
   ))
```

Python	`def countNines(num):` `    if( num == 0 ):` `        return 0` `    else:` `        if( num % 10 == 9 ):` `            return 1 + countNines(num//10)` `        else:` `            return countNines(num//10)`
Scheme	

Python	
Scheme	

```
def countNines(num):
    if( num == 0 ):
        return 0
    else:
        if( num % 10 == 9 ):
            return 1 + countNines(num//10)
        else:
            return countNines(num//10)
```

```
(define (countNines num)
   (if (= num 0)
       0
       (if (= (modulo num 10) 9 )
           (+ 1 (countNines (floor (/ num 10))))
           (countNines (floor (/ num 10)))
       )))
```

Python	
Scheme	

Python

```
import math
def isPrime(n,i=2):
    if i > math.sqrt(n):
        return True
    else:
        if n % i == 0:
            return False
        else:
            return isPrime(n,i+1)
isPrime(9)
```

Scheme

```
(define (isPrime n i)
   (if (> i (sqrt n))
       #t
       (if (= (modulo n 2) 0)
          #f
          (isPrime n (+ i 1)))
    ))
(isPrime 9 2)
```

Python

```
import math
def isPrime(n,i=2):
    if i > math.sqrt(n):
        return True
    else:
        if n % i == 0:
            return False
        else:
            return isPrime(n,i+1)
isPrime(9)
```

Scheme

```
(define (isPrime n i)
   (cond ((> i (sqrt n)) #t)
         ((= (modulo n 2) 0) #f)
         (else (isPrime n (+ i 1)))
    ))
(isPrime 9 2)
```

```
(define (single-digit x)
    ; return true if x>=0 and x<10)

(single-digit 5)
#t

(single-digit 12)
#f
```

```
(define (single-digit x)
   (and (>= x 0) (< x 10)))

(single-digit 5)
#t

(single-digit 12)
#f
```

```
(define (single-digit x)
   (and (>= x 0) (< x 10)))

(single-digit 5)
#t

(single-digit 12)
#f


(if (= 5 (+ 2 3)) 10 20)
```

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(define (single-digit x)
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#t

(single-digit 12)
#f



(if (= 5 (+ 2 3)) 10 20)
10
```

```
(define (single-digit x)
   (and (>= x 0) (< x 10)))

(single-digit 5)
#t

(single-digit 12)
#f



(if (= 5 (+ 2 3)) 10 20)
10

(define (my-max x y)
   ; your code)
(my-max 20 10)
20
```

```
(define (single-digit x)
   (and (>= x 0) (< x 10)))

(single-digit 5)
#t

(single-digit 12)
#f



(if (= 5 (+ 2 3)) 10 20)
10

(define (my-max x y)
   (if (> x y) x y))
(my-max 20 10)
20
```

```
(define (single-digit x)
   (and (>= x 0) (< x 10)))

(single-digit 5)
#t

(single-digit 12)
#f



(if (= 5 (+ 2 3)) 10 20)
10

(define (my-max x y)
   (if (> x y) x y))
(my-max 20 10)
20



(define (my-max3 x y z)
   (if (and ???)
       x
       (if ???
           y
           z)))
(my-max3 4 12 8)
12
```

```
(define (single-digit x)
   (and (>= x 0) (< x 10)))

(single-digit 5)
#t

(single-digit 12)
#f



(if (= 5 (+ 2 3)) 10 20)
10

(define (my-max x y)
   (if (> x y) x y))
(my-max 20 10)
20



(define (my-max3 x y z)
   (if (and (> x y) (> x z))
       x
       (if (> y z)
           y
           z)))
(my-max3 4 12 8)
12
```

```
(define (single-digit x)
   (and (>= x 0) (< x 10)))

(single-digit 5)
#t

(single-digit 12)
#f



(if (= 5 (+ 2 3)) 10 20)
10

(define (my-max x y)
   (if (> x y) x y))
(my-max 20 10)
20



(define (my-max3 x y z)
   (if (and (> x y) (> x z))
       x
       (if (> y z)
           y
           z)))
(my-max3 4 12 8)
12
```

```
(define (my-max3 x y z)
   (cond ((and (> x y) (> x z)) x)
         ((> y z) y)
         (else z)))
```