



### Basic Syntax and Data Types

#### Core Syntax

<code>()</code>	All Scheme code is enclosed in parentheses. This signifies a function call or a special form.
<code>def</code>	Used to define variables and procedures.
<code>ine</code>	<b>Example:</b> <code>(define x 10)</code>
<code>lam</code>	Creates anonymous functions (procedures).
<code>bda</code>	<b>Example:</b> <code>(lambda (x) (+ x 1))</code>

#### Data Types

Numbers	Integers, decimals, fractions. <b>Example:</b> <code>10</code> , <code>3.14</code> , <code>1/2</code>
Booleans	<code>#t</code> (true) and <code>#f</code> (false).
Characters	Represented with <code>#\</code> . <b>Example:</b> <code>#\a</code> , <code>#\space</code>
Strings	Sequences of characters enclosed in double quotes. <b>Example:</b> <code>"hello"</code>
Symbols	Unique identifiers, often used as keys. <b>Example:</b> <code>'symbol</code>
Lists	Ordered collections of data. <b>Example:</b> <code>'(1 2 3)</code>

#### Basic Procedures

<code>+</code> , <code>-</code> , <code>*</code> , <code>/</code>	Arithmetic operators. <b>Example:</b> <code>(+ 1 2)</code> (evaluates to 3)
<code>=</code>	Numerical equality comparison. <b>Example:</b> <code>(= 1 1)</code> (evaluates to <code>#t</code> )
<code>cons</code>	Constructs a new list by adding an element to the beginning of an existing list. <b>Example:</b> <code>(cons 1 '(2 3))</code> (evaluates to <code>'(1 2 3)</code> )
<code>car</code>	Returns the first element of a list. <b>Example:</b> <code>(car '(1 2 3))</code> (evaluates to <code>1</code> )
<code>cdr</code>	Returns the rest of the list after the first element. <b>Example:</b> <code>(cdr '(1 2 3))</code> (evaluates to <code>'(2 3)</code> )

### Control Structures

#### Conditional Execution

<code>i</code>	Basic conditional statement. <code>(if condition then-expression else-expression)</code> <b>Example:</b> <code>(if (= x 10) "x is 10" "x is not 10")</code>
<code>co</code> <code>nd</code>	Multi-way conditional. <code>(cond (condition1 expression1) (condition2 expression2) ... (else expression))</code> <b>Example:</b> <code>(cond ((&gt; x 0) "positive") ((&lt; x 0) "negative") (else "zero"))</code>

#### Iteration and Recursion

Recursion	Scheme primarily uses recursion for iteration. A function calls itself until a base case is reached. <b>Example:</b> <code>(define (factorial n) (if (= n 0) 1 (* n (factorial (- n 1)))))</code>
<code>do</code>	The <code>do</code> form provides a looping construct. <code>(do ((variable initial update) ...) (termination-condition result) body ...)</code> <b>Example:</b> <code>(do ((i 0 (+ i 1)) (sum 0 (+ sum i)) ((&gt; i 10) sum) (display i) (newline)))</code>

#### Boolean Operations

<code>and</code>	Returns <code>#t</code> if all expressions are true. <b>Example:</b> <code>(and (&gt; 5 3) (&lt; 10 20))</code>
<code>or</code>	Returns <code>#t</code> if at least one expression is true. <b>Example:</b> <code>(or (&gt; 5 3) (&gt; 10 20))</code>
<code>not</code>	Negates a boolean value. <b>Example:</b> <code>(not (= 5 3))</code>

### Working with Lists

## List Manipulation

<code>list</code>	Creates a list from given elements.  <b>Example:</b> <code>(list 1 2 3)</code> (evaluates to <code>'(1 2 3)</code> )
<code>append</code>	Concatenates lists.  <b>Example:</b> <code>(append '(1 2) '(3 4))</code> (evaluates to <code>'(1 2 3 4)</code> )
<code>reverse</code>	Reverses the order of elements in a list.  <b>Example:</b> <code>(reverse '(1 2 3))</code> (evaluates to <code>'(3 2 1)</code> )
<code>length</code>	Returns the number of elements in a list.  <b>Example:</b> <code>(length '(1 2 3))</code> (evaluates to <code>3</code> )

## Input and Output

### Basic I/O

<code>display</code>	Prints a value to the console.  <b>Example:</b> <code>(display "Hello, world!")</code>
<code>newline</code>	Prints a newline character to the console.  <b>Example:</b> <code>(newline)</code>
<code>read</code>	Reads a Scheme expression from the input.  <b>Example:</b> <code>(read)</code>

### Formatted Output

<code>format</code>	Formatted output (implementation-dependent, check your Scheme system's documentation).  <b>Example (Racket):</b> <code>(format #t "The value of x is ~a" x)</code>
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## Mapping and Filtering

<code>map</code>	Applies a function to each element of a list and returns a new list with the results.  <b>Example:</b> <code>(map (lambda (x) (* x 2)) '(1 2 3))</code> (evaluates to <code>'(2 4 6)</code> )
<code>filter</code>	Creates a new list containing only the elements that satisfy a given predicate (a function that returns <code>#t</code> or <code>#f</code> ).  <b>Example:</b> <code>(filter (lambda (x) (&gt; x 1)) '(1 2 3))</code> (evaluates to <code>'(2 3)</code> )

## List Predicates

<code>null?</code>	Checks if a list is empty.  <b>Example:</b> <code>(null? '())</code> (evaluates to <code>#t</code> )
<code>list?</code>	Checks if a value is a list.  <b>Example:</b> <code>(list? '(1 2 3))</code> (evaluates to <code>#t</code> )
<code>member</code>	Checks if an element is a member of a list.  <b>Example:</b> <code>(member 2 '(1 2 3))</code> (evaluates to <code>'(2 3)</code> )

### File I/O

<code>open-input-file</code>	Opens a file for input.  <b>Example:</b> <code>(define input-port (open-input-file "data.txt"))</code>
<code>open-output-file</code>	Opens a file for output.  <b>Example:</b> <code>(define output-port (open-output-file "output.txt"))</code>
<code>read-char</code>	Reads a single character from an input port.  <b>Example:</b> <code>(read-char input-port)</code>
<code>write-char</code>	Writes a single character to an output port.  <b>Example:</b> <code>(write-char #\a output-port)</code>
<code>close-input-port</code>	Closes an input port.  <b>Example:</b> <code>(close-input-port input-port)</code>
<code>close-output-port</code>	Closes an output port.  <b>Example:</b> <code>(close-output-port output-port)</code>