Literals

```
True/False : Bool
42         : number
     (Int or Float)
3.14       : Float
'a'        : Char
"abc"      : String
-- multi-line String
"""For JSON data or
"quotations"."""
```

Lists

A collection of items of the same type

```
[1,2,3,4]
1 :: [2,3,4]
1 :: 2 :: 3 :: 4 :: []
```

Arrays

```
Array.empty
Array.fromList
Array.toList
Array.get
Array.set
```

Custom Types

Custom Types start with an upper case letter

```
type User
    = Regular String Int
    | Visitor String
```

Type Annotations

```
answer : Int
answer =
    42

factorial : Int -> Int
factorial n =
    List.product
        (List.range 1 n)

distance :
    {x : Float, y : Float}
    -> Float
distance { x, y } =
    sqrt (x ^ 2 + y ^ 2)
```

Destructuring

```
sum addends =
    let
        ( a, b ) = addends
    in
    a + b

sum (a, b) = a + b

f list =
  case list of
    []      -> "Empty"
    [_]     -> "One element"
    [a,b]   -> "2 elements"
    a::b::_ -> "More than 2"

myRecord = {x=1, y=2, z=3}
sum {x, y} = x + y
onlyX {x} = x

sum ({x, y} as whole) =
    x + whole.y + whole.z

type My = My String
toString (My string) = string
type My = My {foo:Int,bar:Int}
foo (My {foo}) = foo
```

Comments

```
-- a single
-- line comment

{- a multiline comment
   {- can be nested -}
-}
```

Trick to comment/uncomment blocks of code

```
{--}
add x y = x + y
--}
```

Tuples

Can contain 2 or 3 items of different type.

```
(1,"2",True)
```

The Elm Architecture

```
Browser.sandbox
Browser.element
Browser.document
Browser.application
-- headless
Platform.worker
```

Records

A collection of key/value pairs, similar to objects in JavaScript

```
point = { x = 0, y = 0 }
point.x == 0
-- field access function
List.map .x [ point, point2 ]
-- update a field
{ point | x = 6 }
-- update many fields
{ point | x = point.x + 1
        , y = point.y + 1 }
```

Extensible Records have at least certain fields:

```
f : { b | key : a } -> a
f = .key
```

Dictionaries

```
Dict.empty
Dict.fromList
Dict.toList
Dict.get
Dict.update
```

Type Aliases

Type Aliases start with an upper case letter

```
type alias Name = String
type alias Age = Int

info : (Name, Age)
info =
  ("Steve", 28)

type alias Point =
    {x: Float, y: Float}

origin : Point
origin =
  {x = 0, y = 0}
```

Sets

```
Set.empty
Set.fromList
Set.toList
Set.insert
Set.remove
```

Type Maybe

```
type Maybe a
    = Just a
    | Nothing
```

Type Result

```
type Result err a
    = Ok a
    | Err err
```

Functions

Functions start with a lower case letter. No parentesis or commas for arguments or code blocks.

```
square n = n^2

hypotenuse a b =
  sqrt (square a + square b)
```

Anonymous functions

Anonymous functions start with "\", that resamble lambda "λ"

```
square = \n -> n^2

squares =
  List.map (\n -> n^2)
    (List.range 1 100)
```

Optimizations

```
Html.lazy
Html.keyed
```

Debugging

```
Debug.toString
Debug.log
Debug.todo
```

Routing

```
import Url.Parser exposing (s,(</>),int,string,oneOf,map)

type Route = Blog Int | User String | Comment String Int

routeParser = oneOf
  [ map Blog    (s "blog"</>int)
  , map User    (s "user"</>string)
  , map Comment (s "user"</>string</>s "comment"</>int)
  ]
```

Advanced Types

Opaque types don't expose constructors.

Phantom types restricts function arguments.

```
type Phantom a = Tag Int

() Unit, Never
```

Constrained Type Variables

```
number                (Int, Float)
appendable        (String, List a)
comparable            (Int, Float,
                     Char, String,
      lists/tuples of comparable)
compappend                (String,
                     List comparable)
```

Conditionals

```
if powerLevel > 9000 then
    "OVER 9000!!!"
else
    "meh"

if key == 40 then
    n + 1
else if key == 38 then
    n - 1
else
    n
```

Commands

```
elm repl
elm init
elm reactor
elm make
elm install
elm bump
elm diff
elm publish
```

REPL

```
:exit
:help
:reset
```

Backslash (\) for multi-line expressions

Tools

```
elm-format   elm-json
elm-review   elm-live/elm-go
elm-test     elm-doc-preview
```

JavaScript Interop

Ports, incoming and outgoing values:

```
port prices : (Float -> msg) -> Sub msg
port time : Float -> Cmd msg
```

From JS, start Elm with flags and talk to these ports:

```
<div id='app'></div>
<script src='elm.js'></script>
<script>
var app = Elm.Main.init({
  node: document.getElementById('app'),
  flags: { key: 'value' }
});
app.ports.prices.send(42);
app.ports.time.subscribe(callback);
app.ports.time.unsubscribe(callback);
</script>
```

Pipe Operator

```
viewNames1 names =
    String.join ", " (List.sort names)

viewNames2 names =
    names
        |> List.sort
        |> String.join ", "

viewNames3 names =
    String.join ", " <| List.sort names
```

Operators

```
+  -  *  /  ^          math
//                     int division
==  /=                 equality
<  >  <=  >=  max  min comparison
not  &&  ||  xor       booleans
++                     append
modBy  remainderBy     fancy math
and  or  xor           bitwise
<|  |>  <<  >>         functions
::                     cons
```

Most can be used in "prefix notation" too:

```
a + b == (+) a b
```

Modules Imports

```
import List             -- preferred
import List as L
import List exposing (..)
import List exposing ( map, foldl )
import Maybe exposing ( Maybe )
import Maybe exposing ( Maybe(..) )
```

Side Effects Task/Cmd

```
Task.perform     Task.attempt
Task.andThen     Cmd.batch
```

Tasks can be chained. Cmds only batched.

Hello World

```
module Main exposing (main)
import Html exposing (..)
main =
   div [] [text "Hello World!"]
```

Hello World with Elm-UI

```
module Main exposing (main)
import Element exposing (..)
main =
  layout [] <|
    el [] [text "Hello World!"]
```

Pattern Matching

```
case maybeList of
    Just xs -> xs
    Nothing -> []

case xs of
    [] ->
      Nothing
    first :: rest ->
      Just (first, rest)

case n of
    0 -> 1
    1 -> 1
    _ -> fib (n-1) + fib (n-2)
```

Counter

Available at https://ellie-app.com/

```
module Main exposing (main)

import Browser
import Html exposing (..)
import Html.Events exposing (..)

type alias Model = { count : Int }
initialModel = { count = 0 }

type Msg = Increment | Decrement

update msg model =
 case msg of
   Increment -> {model | count = model.count+1}
   Decrement -> {model | count = model.count-1}

view model =
  div []
    [ button [onClick Increment ] [ text "+1"]
    , div [] [text<|String.fromInt model.count]
    , button [onClick Decrement ] [ text "-1"]
    ]

main =
  Browser.sandbox
    { init = initialModel
    , view = view
    , update = update
    }
```

+1
0
-1

Source: https://github.com/lucamug/elm-cheat-sheet/ Elm official guide: https://guide.elm-lang.org/ Elm syntax: https://elm-lang.org/docs/syntax Version 1.1