| bars make cores

|_ `spec alas (map term tome)`
produces a door (a core with sample)

|% `(unit term) (map term tome)`
produces a core (battery and payload)

|@ `(unit term) (map term tome)`
produces a wet core (battery and payload)

|. hoon
produces a trap (a core with one arm)

|: `[hoon hoon]`
produces a gate with a custom sample

|- `hoon`
produces a trap (a core with one arm) and evaluates it

|^ `hoon (map term tome)`
produces a core whose battery includes a `$` arm and computes the latter

|~ `[spec value]`
produces an iron gate

|* `[spec value]`
produces a wet gate (a one-armed core with sample)

|= `[spec value]`
produces a dry gate (a one-armed core with sample)

|? `hoon`
produces a lead trap

|$ `(lest term) spec`
produces a mold

$ bucs form molds

$@ `[spec spec]`
structure that normalizes a union tagged by head atom

$: `(list spec)`
forms a cell type (tuple) `[a=foo b=bar c=baz]`

$_ `hoon`
structure that normalizes to an example `_foo`

$% `(list spec)`
structure that recognizes a union tagged by head atom

$* `hoon`
bunt (irregular form is `*`)

$^ `hoon`
structure that normalizes a union tagged by head depth (cell)

$~ `[hoon spec]`
defines a custom type default value

$- `[spec spec]`
structure that normalizes to an example gate

$= `[skin spec]`
structure that wraps a face around another structure `foo=bar`

$? `(list spec)`
forms a type from a union of other types `?($foo $bar $baz)`

$> `[spec spec]`
structure from filter (requiring)

$< `[spec spec]`
structure from filter (excluding)

$$ `[spec (map term spec)]`
structure from recursion

$| `[spec hoon]`
structure with verification
$. `[spec (map term spec)]`
structure as read–write core
$+ `[stud spec]`
standard structure
$; `hoon`
manual structure
$/ `[spec (map term spec)]`
structure as write-only core
**$`** `[spec (map term spec)]`
structure as read-only core
$& `[spec hoon]`
repaired structure
$! `[spec (map term spec)]`
structure as opaque core

% **cens put the fun in function**

%_ `[wing (list (pair wing hoon))]`
resolves a wing with changes, preserving type
%. `[hoon hoon]`
calls a gate, inverted
%^ `[hoon hoon hoon hoon]`
calls a gate with triple sample
%+ `[hoon hoon hoon]`
calls a gate with a cell sample
%- `[hoon hoon]`
calls a gate `(fun arg)`
%: `[hoon (list hoon)]`
calls a gate with many arguments
%~ `[wing hoon hoon]`
evaluates an arm in a door `~(arm core arg)`
%* `[wing hoon (list (pair winghoon))]`
evaluates an expression, then resolves a wing with changes
%= `[wing (list (pair wing hoon))]`
resolves a wing with changes `foo(x 1, y 2, z 3)`

: **cols make cells**

:_ `[hoon hoon]`
constructs a cell, inverted
:^ `[hoon hoon hoon hoon]`
constructs a cell, 4-tuple `[a b c d]`
:+ `[hoon hoon hoon]`
constructs a cell, 3-tuple `[a b c]`
:- `[hoon hoon]`
constructs a cell, 2-tuple `[a b]`, `a^b`
:~ `(list hoon)`
constructs a null-terminated list `~[a b c]`
:* `(list hoon)`
constructs an n-tuple `[a b c d e …]`
::
marks a comment

. dots nock

.+ `atom`
increments an atom using Nock 4 `+(42)`

.* `[hoon hoon]`
evaluates using Nock 2

.= `[hoon hoon]`
tests for equality using Nock 5 `=(a b)`

.? `hoon`
tests for cell or atom using Nock 3

.^ `[spec hoon]`
loads from namespace using Nock 12

^ kets cast

^| `hoon`
converts a gold core to an iron core (invariant)

^. `[hoon hoon]`
typecasts on value

^- `[spec hoon]`
typecasts by explicit type label `` `foo`bar ``

^+ `[hoon hoon]`
typecasts by inferred type

^& `hoon`
converts a core to a zinc core (covariant)

^~ `hoon`
folds constant at compile time

^= `[skin hoon]`
binds name to a value `foo=bar`

^? `hoon`
converts a core to a lead core (bivariant)

^* `spec`
produces example type value

^: `spec`
produces a ‘factory’ gate for a type

~ sigs hint

~| `[hoon hoon]`
prints in stack trace if failure

~$ `[term hoon]`
profiler hit counter

~_ `[hoon hoon]`
prints in stack trace, user-formatted

~% `[chum hoon tyre hoon]`
registers jet

~/ `[chum hoon]`
registers jet with registered context

~< `[$@(term [term hoon]) hoon]`
raw hint, applied to product (“backward”)

~> `[$@(term [term hoon]) hoon]`
raw hint, applied to computation (“forward”)

~+ `[@ hoon]`
caches a computation

~& `[@ud hoon hoon]`
prints (used for debugging)

~? `[@ud hoon hoon hoon]`
prints conditionally (used for debugging)

~= `[hoon hoon]`
detects duplicate
~! `[hoon hoon]`
prints type if compilation failure

; mics make

;: `[hoon (list hoon)]`
calls a binary function as an n-ary function `:(fun a b c d)`
;< `[spec hoon hoon hoon]`
glues a pipeline together (monadic bind)
;~ `[hoon (list hoon)]`
glues a pipeline together with a product-sample adapter (monadic bind)
;; `[spec hoon]`
normalizes with a mold, asserting fixpoint
;+
(Sail) makes a single XML node
;*
(Sail) makes a list of XML nodes from Hoon expression
;= `marl:hoot`
(Sail) makes a list of XML nodes
;/ `hoon`
(Sail) yields tape as XML element

= tises alter

=| `[spec hoon]`
combines default type value with the subject
=. `[wing hoon hoon]`
changes one leg in the subject
=? `[wing hoon hoon hoon]`
changes one leg in the subject conditionally
=^ `[skin wing hoon hoon]`
pins the head of a pair; changes a leg with the tail
=: `[(list (pair wing hoon)) hoon]`
changes multiple legs in the subject
=/ `[skin hoon hoon]`
combines a named noun with the subject
=; `[skin hoon hoon]`
combines a named noun with the subject, inverted
=< `[hoon hoon]`
composes two expressions, inverted `foo:bar`
=> `[hoon hoon]`
composes two expressions
=- `[hoon hoon]`
combines a new noun with the subject
=* `[(pair term (unit spec)) hoon hoon]`
defines an alias
=, `[hoon hoon]`
exposes namespace
=+ `[hoon hoon]`
combines a new noun with the subject
=~ `(list hoon)`
composes many expressions

? wuts test

?| `(list hoon)`
logical OR (loobean) `|(foo bar baz)`

?: `[hoon hoon hoon]`
branches on a boolean test

?. `[hoon hoon hoon]`
branches on a boolean test, inverted

?< `[hoon hoon]`
negative assertion

?> `[hoon hoo]`
positive assertion

?- `[wing (list (pair spec hoon))]`
switches against a union, no default

?^ `[wing hoon hoon]`
branches on whether a wing of the subject is a cell

?= `[spec wing]`
tests pattern match

?# `[skin wing]`
tests pattern match

?+ `[wing hoon (list (pair spec hoon))]`
switches against a union, with default

?& `(list hoon)`
logical AND (loobean) `&(foo bar baz)`

?@ `[wing hoon hoon]`
branches on whether a wing of the subject is an atom

?~ `[wing hoon hoon]`
branches on whether a wing of the subject is null

?! `hoon`
logical NOT (loobean) `!foo`

! zaps run wild

!:
turns on stack trace

!.
turns off stack trace

!, `[hoon hoon]`
emits AST of expression

!; `[hoon hoon]`
emits the type for an expression using the type of type

!> `hoon`
wraps a noun in its type

!= `hoon`
makes the Nock formula for a Hoon expression

!? `[$@(@ {@ @}) hoon]`
restricts Hoon version

!! `~`
crashes

!< `hoon`
lift dynamic value into static context

/ fases ford

/$ slams a gate on extra arguments

/| takes a series of horns and produces the first one (L-to-R) that succeeds; if none succeed, produces stack traces from arguments

/= runs a horn (usually produced by another Ford rune), takes the result of that horn, and wraps a face around it

/. produces a null-terminated list from a sequence of horns, terminated by ==

/, acts as switch statement, picking a branch to evaluate based on whether the current path matches the path in the switch statement

/& pass a horn through multiple marks

/_ *unfiltered*: takes a horn, producing new horn mapping supplied horn over list of files in current directory; *filtered*: runs a horn on each file matching aura

/~ produces a horn that evaluates a twig and places the product in the subject

/: takes a path and a horn, and evaluates the horn with the current path set to the supplied path

/^ takes a mold and a horn, and casts the result of the horn to the mold

/! produces a mark

/+ accepts a filename and loads that filename from the `lib` directory

/- accepts a filename and loads that filename from the `sur` directory

// parses relative path as a hoon twig, and adds the resulting twig to the subject

/; takes a twig and a horn; the twig should evaluate to a gate, which is then slammed with the result of the horn as its sample

/# takes a horn and produces a cell of the dependency hash of the result of the horn, and the result itself

/% forwards extra arguments to enclosed renderers

/? parses `%zune` version

-/= terminators terminate

-- terminates core expression

== terminates running series of Hoon expressions

+ luses change

+|
labels a chapter (produces no arm)

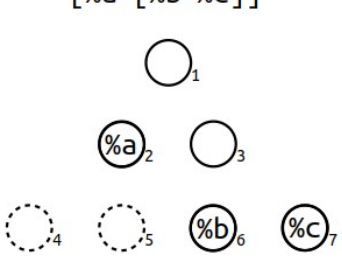
+$ `[term spec]`
produces a structure arm (type definition)

++ `[term hoon]`
produces a (normal) arm

+* `[term term spec]`
produces a type constructor arm

syntax

```
+1:[%a [%b %c]]  [%a [%b %c]]
+2:[%a [%b %c]]  %a
+3:[%a [%b %c]]  [%b %c]
+4:[%a [%b %c]]  %ride failed
+6:[%a [%b %c]]  %b
+7:[%a [%b %c]]  %c
```




```
.:[%a [%b %c]]  [%a [%b %c]]
-:[%a [%b %c]]  %a
+:[%a [%b %c]]  [%b %c]
-<:[%a [%b %c]] %ride failed
+<:[%a [%b %c]] %b
+>:[%a [%b %c]] %c
```

`.`	current subject
`+`	`+:.`
`-`	`-:.`
`+>`	`+>:.`

`^face`	face in outer core
`..arm`	core in which `++arm` is defined

	`~`	0 (nil)	`eny` entropy
`%.y`	`&`	yes/true	`now` current time
`%.n`	`|`	no/false	

```
`a [~ a]
~[a b c] [a b c ~]
[a b c]~ [[a b c] ~]
```

`<[1 2 3]>`	renders list as a tape
`>[1 2 3]<`	renders list as a tank

```
?=($hoon %hoon) %.y
?=($hoon %loon) %.n
```

`-:!>` type spear, use as `-:!>(.3.14)`

@p notation

@c	Unicode codepoints	~-~45fed.
@d	Date	
@da	Date, absolute	~2020.12.25..7.15.0..1ef5
@dr	Date, relative	~d71.h19.m26.s24..9d55
@f	Loobean (for compiler, not castable)	&
@n	Nil (for compiler, not castable)	~
@p	Phonemic base	~laszod-dozser-fosrum-fanbyr
@q	Phonemic base, unscrambled (used with Urbit HD wallet)	.~laszod-dozser-dalteb-hilsyn
@r	IEEE-754 floating-point number	
@rh	Floating-point number, half-precision, 16-bit	.~~3.14
@rs	Floating-point number, single-precision, 32-bit	.3.141592653589793
@rd	Floating-point number, double-precision, 64-bit	.~3.141592653589793
@rq	Floating-point number, quadruple-precision, 128-bit	.~~~3.141592653589793
@s	Integer, signed (sign bit low)	
@sb	Signed binary	--0b10.0000
@sd	Signed decimal	--1.000
@sv	Signed base-32	--0v201.4gvml.245kc
@sw	Signed base-64	--0w2.04AfS.G8xqc
@sx	Signed hexadecimal	--0x2004.90fd
@t	UTF-8 text (cord)	"urbit"
@ta	ASCII text (knot)	~.urbit
@tas	ASCII text symbol (term)	%urbit
@u	Integer, unsigned	
@ub	Unsigned binary	0b10.1011
@uc	Bitcoin address	0c1A1zP1eP5QGefi2DMPTfTL5SLmv7DivfNa
@ud	Unsigned decimal	8.675.309
@uv	Unsigned base-32	0v88nvd
@uw	Unsigned base-64	0wx5~J
@ux	Unsigned hexadecimal	0x84.5fed

Capital letters at the end of auras indicate the bitwidth in binary powers of two, starting from A.

@ubD signed single-byte (8-bit) decimal
@rhE half-precision (16-bit) floating-point number
@uxG unsigned 64-bit hexadecimal

Auras are non-coercive, but conversions may have to go via the empty aura: `^-(@ud ^-(@ 'foo'))`.