

Appendix A

Function, Parameter, and Constant Types

*You must never forget that programs will be read by people as well as machines.
Write them carefully.*

George E. Forsythe: Remark to Alan George (1967)

In this appendix we list all the types of objects used in our calendar functions. The major categories of objects are numbers and lists. The *real* numbers serve to indicate *moments* of time, as well as *durations* of time. Similarly, an *angle* is a subtype of *real*. Conversely, *real* is a supertype of *angle*. The *integers* are used for fixed dates, among other purposes. Dates on most calendars are *lists* of numbers; in particular, *standard-date* has three components: *standard-year*, *standard-month*, and *standard-day*. Lists are also used for intervals. One type is often a subtype of another; for example, the type *rational* is a subtype of *real*, *integer* is a subtype of *rational*, *nonnegative-integer* is a subtype of *integer*, and *positive-integer* is a subtype of *nonnegative-integer*.

After giving a list of the types themselves, we list, for each function, the types of its parameters and of its result. Then, we give a similar list for all constants. In these latter two tables we include the page on which the definition is given, using *italic* page numbers for functions needed for typesetting purposes, mostly constructors and selectors, which appear only in the Lisp code of Appendix D. (This follows the convention used for page numbers in the index.)

A.1 Types

Type name	Type or range	Supertype
<i>akan-name</i>	$\langle \textit{akan-prefix}, \textit{akan-stem} \rangle$	<i>list-of-nonnegative-integers</i>
<i>akan-prefix</i>	1 .. 6	<i>positive-integer</i>
<i>akan-stem</i>	1 .. 7	<i>positive-integer</i>
<i>amplitude</i>	$[-1 \dots 1]$	<i>real</i>
<i>angle</i>	$[0 \dots 360)$	<i>real</i>

continued

Type name	Type or range	Supertype
<i>armenian-date</i>	$\langle \text{armenian-year, armenian-month, armenian-day} \rangle$	<i>standard-date</i>
<i>armenian-day</i>	1 .. 30	<i>positive-integer</i>
<i>armenian-month</i>	1 .. 13	<i>positive-integer</i>
<i>armenian-year</i>	<i>integer</i>	
<i>auc-year</i>	<i>nonzero-integer</i>	
<i>augury</i>	0 .. 3	<i>nonnegative-integer</i>
<i>aztec-tonalpohualli-date</i>	$\langle \text{aztec-tonalpohualli-number, aztec-tonalpohualli-name} \rangle$	<i>list-of-nonnegative-integers</i>
<i>aztec-tonalpohualli-name</i>	1 .. 20	<i>nonnegative-integer</i>
<i>aztec-tonalpohualli-number</i>	1 .. 13	<i>nonnegative-integer</i>
<i>aztec-xihuitl-date</i>	$\langle \text{aztec-xihuitl-month, aztec-xihuitl-day} \rangle$	<i>list-of-nonnegative-integers</i>
<i>aztec-xihuitl-day</i>	1 .. 20	<i>nonnegative-integer</i>
<i>aztec-xihuitl-month</i>	1 .. 19	<i>positive-integer</i>
<i>aztec-xiuhmolpilli-designation</i>	$\langle \text{aztec-xiuhmolpilli-number, aztec-xiuhmolpilli-name} \rangle$	<i>list-of-nonnegative-integers</i>
<i>aztec-xiuhmolpilli-name</i>	{1, 8, 13, 18}	<i>positive-integer</i>
<i>aztec-xiuhmolpilli-number</i>	1 .. 13	<i>positive-integer</i>
<i>babylonian-date</i>	$\langle \text{babylonian-year, babylonian-month, babylonian-leap, babylonian-day} \rangle$	<i>list</i>
<i>babylonian-day</i>	1 .. 30	<i>positive-integer</i>
<i>babylonian-leap</i>	<i>boolean</i>	
<i>babylonian-month</i>	1 .. 12	<i>positive-integer</i>
<i>babylonian-year</i>	<i>integer</i>	
<i>bahai-cycle</i>	1 .. 19	<i>positive-integer</i>
<i>bahai-date</i>	$\langle \text{bahai-major, bahai-cycle, bahai-year, bahai-month, bahai-day} \rangle$	<i>list-of-integers</i>
<i>bahai-day</i>	1 .. 19	<i>positive-integer</i>
<i>bahai-major</i>	<i>integer</i>	
<i>bahai-month</i>	0 .. 19	<i>nonnegative-integer</i>
<i>bahai-year</i>	1 .. 19	<i>positive-integer</i>
<i>boolean</i>	<i>true, false</i>	
<i>century</i>	<i>real</i>	
<i>chinese-branch</i>	1 .. 12	<i>positive-integer</i>
<i>chinese-cycle</i>	<i>integer</i>	
<i>chinese-date</i>	$\langle \text{chinese-cycle, chinese-year, chinese-month, chinese-leap-month, chinese-day} \rangle$	<i>list</i>
<i>chinese-day</i>	1 .. 31	<i>positive-integer</i>
<i>chinese-leap</i>	<i>boolean</i>	
<i>chinese-month</i>	1 .. 12	<i>positive-integer</i>
<i>chinese-name</i>	$\langle \text{chinese-stem, chinese-branch} \rangle$	<i>list-of-nonnegative-integers</i>
<i>chinese-stem</i>	1 .. 10	<i>positive-integer</i>
<i>chinese-year</i>	1 .. 60	<i>positive-integer</i>

continued

Type name	Type or range	Supertype
<i>circle</i>	$[-180 \dots 180]$	<i>angle</i>
<i>clock-time</i>	$\langle \text{hour}, \text{minute}, \text{second} \rangle$	<i>list-of-reals</i>
<i>coptic-date</i>	$\langle \text{coptic-year}, \text{coptic-month}, \text{coptic-day} \rangle$	<i>standard-date</i>
<i>coptic-day</i>	$1 \dots 31$	<i>positive-integer</i>
<i>coptic-month</i>	$1 \dots 13$	<i>positive-integer</i>
<i>coptic-year</i>	<i>integer</i>	
<i>day-of-week</i>	$0 \dots 6$	<i>nonnegative-integer</i>
<i>distance</i>	<i>real</i>	
<i>duration</i>	<i>real</i>	
<i>egyptian-date</i>	$\langle \text{egyptian-year}, \text{egyptian-month}, \text{egyptian-day} \rangle$	<i>standard-date</i>
<i>egyptian-day</i>	$1 \dots 30$	<i>positive-integer</i>
<i>egyptian-month</i>	$1 \dots 13$	<i>positive-integer</i>
<i>egyptian-year</i>	<i>integer</i>	
<i>ethiopic-date</i>	$\langle \text{ethiopic-year}, \text{ethiopic-month}, \text{ethiopic-day} \rangle$	<i>standard-date</i>
<i>ethiopic-day</i>	$1 \dots 31$	<i>positive-integer</i>
<i>ethiopic-month</i>	$1 \dots 13$	<i>positive-integer</i>
<i>ethiopic-year</i>	<i>integer</i>	
<i>fixed-date</i>	<i>integer</i>	
<i>fraction-of-day</i>	$[-0.5 \dots 0.5]$	<i>real</i>
<i>french-date</i>	$\langle \text{french-year}, \text{french-month}, \text{french-day} \rangle$	<i>standard-date</i>
<i>french-day</i>	$1 \dots 30$	<i>positive-integer</i>
<i>french-month</i>	$1 \dots 13$	<i>positive-integer</i>
<i>french-year</i>	<i>integer</i>	
<i>gregorian-date</i>	$\langle \text{gregorian-year}, \text{gregorian-month}, \text{gregorian-day} \rangle$	<i>standard-date</i>
<i>gregorian-day</i>	$1 \dots 31$	<i>positive-integer</i>
<i>gregorian-month</i>	$1 \dots 12$	<i>positive-integer</i>
<i>gregorian-year</i>	<i>integer</i>	
<i>half-circle</i>	$[-90 \dots 90]$	<i>circle</i>
<i>hebrew-date</i>	$\langle \text{hebrew-year}, \text{hebrew-month}, \text{hebrew-day} \rangle$	<i>standard-date</i>
<i>hebrew-day</i>	$1 \dots 30$	<i>positive-integer</i>
<i>hebrew-month</i>	$1 \dots 13$	<i>positive-integer</i>
<i>hebrew-year</i>	<i>integer</i>	
<i>hindu-lunar-date</i>	$\langle \text{hindu-lunar-year}, \text{hindu-lunar-month}, \text{hindu-lunar-leap-month}, \text{hindu-lunar-day}, \text{hindu-lunar-leap-day} \rangle$	<i>list</i>
<i>hindu-lunar-day</i>	$1 \dots 30$	<i>positive-integer</i>
<i>hindu-lunar-leap-day</i>	<i>boolean</i>	
<i>hindu-lunar-leap-month</i>	<i>boolean</i>	
<i>hindu-lunar-month</i>	$1 \dots 12$	<i>positive-integer</i>
<i>hindu-lunar-year</i>	<i>integer</i>	
<i>hindu-solar-date</i>	$\langle \text{hindu-solar-year}, \text{hindu-solar-month}, \text{hindu-solar-day} \rangle$	<i>standard-date</i>

continued

Type name	Type or range	Supertype
<i>hindu-solar-day</i>	1 .. 32	<i>positive-integer</i>
<i>hindu-solar-month</i>	1 .. 12	<i>positive-integer</i>
<i>hindu-solar-year</i>	<i>integer</i>	
<i>hindu-year</i>	<i>integer</i>	
<i>hour</i>	0 .. 23	<i>nonnegative-integer</i>
<i>icelandic-date</i>	\langle <i>icelandic-year, icelandic-season, icelandic-week, icelandic-weekday</i> \rangle	<i>list</i>
<i>icelandic-month</i>	0 .. 6	<i>nonnegative-integer</i>
<i>icelandic-season</i>	<i>season</i>	<i>angle</i>
<i>icelandic-week</i>	1 .. 27	<i>positive-integer</i>
<i>icelandic-weekday</i>	<i>day-of-week</i>	<i>nonnegative-integer</i>
<i>icelandic-year</i>	<i>integer</i>	
<i>ides</i>	13,15	<i>roman-count</i>
<i>integer</i>		<i>rational</i>
<i>interval</i>	\langle <i>moment, moment</i> \rangle	<i>list-of-moments</i>
<i>islamic-date</i>	\langle <i>islamic-year, islamic-month, islamic-day</i> \rangle	<i>standard-date</i>
<i>islamic-day</i>	1 .. 30	<i>positive-integer</i>
<i>islamic-month</i>	1 .. 12	<i>positive-integer</i>
<i>islamic-year</i>	<i>integer</i>	
<i>iso-date</i>	\langle <i>iso-year, iso-week, iso-day</i> \rangle	<i>list-of-integers</i>
<i>iso-day</i>	1 .. 7	<i>positive-integer</i>
<i>iso-week</i>	1 .. 53	<i>positive-integer</i>
<i>iso-year</i>	<i>integer</i>	
<i>julian-date</i>	\langle <i>julian-year, julian-month, julian-day</i> \rangle	<i>standard-date</i>
<i>julian-day</i>	1 .. 31	<i>positive-integer</i>
<i>julian-day-number</i>	<i>real</i>	
<i>julian-month</i>	1 .. 12	<i>positive-integer</i>
<i>julian-year</i>	<i>nonzero-integer</i>	
<i>list</i>		
<i>list-of-angles</i>		<i>list-of-reals</i>
<i>list-of-fixed-dates</i>	<i>list-of-integers</i>	
<i>list-of-integers</i>		<i>list</i>
<i>list-of-moments</i>	<i>list-of-reals</i>	
<i>list-of-nonnegative-integers</i>		<i>list-of-integers</i>
<i>list-of-pairs</i>		<i>list</i>
<i>list-of-reals</i>		<i>list</i>
<i>list-of-weekdays</i>		<i>list-of-nonnegative-integers</i>
<i>location</i>	\langle <i>angle, angle, distance, fraction-of-day</i> \rangle	<i>list</i>
<i>mayan-baktun</i>	<i>integer</i>	
<i>mayan-haab-date</i>	\langle <i>mayan-haab-month, mayan-haab-day</i> \rangle	<i>list-of-nonnegative-integers</i>
<i>mayan-haab-day</i>	0 .. 19	<i>nonnegative-integer</i>
<i>mayan-haab-month</i>	1 .. 19	<i>positive-integer</i>
<i>mayan-katun</i>	0 .. 19	<i>nonnegative-integer</i>

continued

Type name	Type or range	Supertype
<i>mayan-kin</i>	0 .. 19	<i>nonnegative-integer</i>
<i>mayan-long-count-date</i>	$\langle \text{mayan-baktun}, \text{mayan-katun}, \text{mayan-tun}, \text{mayan-uinal}, \text{mayan-kin} \rangle$	<i>list-of-integers</i>
<i>mayan-tun</i>	0 .. 17	<i>nonnegative-integer</i>
<i>mayan-tzolkin-date</i>	$\langle \text{mayan-tzolkin-number}, \text{mayan-tzolkin-name} \rangle$	<i>list-of-nonnegative-integers</i>
<i>mayan-tzolkin-name</i>	1 .. 20	<i>nonnegative-integer</i>
<i>mayan-tzolkin-number</i>	1 .. 13	<i>nonnegative-integer</i>
<i>mayan-uinal</i>	0 .. 19	<i>nonnegative-integer</i>
<i>minute</i>	0 .. 59	<i>nonnegative-integer</i>
<i>moment</i>	<i>real</i>	
<i>nakshatra</i>	1 .. 27	<i>positive-integer</i>
<i>nones</i>	5, 7	<i>roman-count</i>
<i>nonnegative-integer</i>	0, 1, ...	<i>integer</i>
<i>nonzero-integer</i>	..., -2, -1, 1, 2, ...	<i>integer</i>
<i>nonzero-real</i>	$(-\infty .. 0) \cup (0 .. \infty)$	<i>real</i>
<i>old-hindu-lunar-date</i>	$\langle \text{old-hindu-lunar-year}, \text{old-hindu-lunar-month}, \text{old-hindu-lunar-leap}, \text{old-hindu-lunar-day} \rangle$	<i>list</i>
<i>old-hindu-lunar-day</i>	1 .. 30	<i>positive-integer</i>
<i>old-hindu-lunar-leap</i>	<i>boolean</i>	
<i>old-hindu-lunar-month</i>	1 .. 12	<i>positive-integer</i>
<i>old-hindu-lunar-year</i>	<i>integer</i>	
<i>old-hindu-month</i>	1 .. 12	<i>positive-integer</i>
<i>old-hindu-year</i>	<i>integer</i>	
<i>olympiad</i>	$\langle \text{olympiad-cycle}, \text{olympiad-year} \rangle$	<i>list-of-nonnegative-integers</i>
<i>olympiad-cycle</i>	<i>integer</i>	
<i>olympiad-year</i>	1 .. 4	<i>positive-integer</i>
<i>omer-count</i>	$\langle 0 .. 7, 0 .. 6 \rangle$	<i>list-of-nonnegative-integers</i>
<i>part</i>	0 .. 1079	<i>nonnegative-integer</i>
<i>persian-date</i>	$\langle \text{persian-year}, \text{persian-month}, \text{persian-day} \rangle$	<i>standard-date</i>
<i>persian-day</i>	1 .. 31	<i>positive-integer</i>
<i>persian-month</i>	1 .. 12	<i>positive-integer</i>
<i>persian-year</i>	<i>nonzero-integer</i>	
<i>phase</i>	[0 .. 360)	<i>angle</i>
<i>positive-integer</i>	1, 2, ...	<i>nonnegative-integer</i>
<i>radian</i>	[0 .. 2 π)	<i>real</i>
<i>range</i>	$\langle \text{fixed-date}, \text{fixed-date} \rangle$	<i>interval</i>
<i>rational</i>		<i>real</i>
<i>rational-amplitude</i>	[-1 .. 1]	<i>rational</i>
<i>rational-angle</i>	[0 .. 360)	<i>rational</i>
<i>rational-moment</i>	<i>rational</i>	<i>moment</i>

continued

Type name	Type or range	Supertype
<i>real</i>	$(-\infty \dots \infty)$	
<i>roman-count</i>	1 .. 19	<i>positive-integer</i>
<i>roman-date</i>	$\langle \textit{roman-year}, \textit{roman-month},$ $\textit{roman-event}, \textit{roman-count},$ $\textit{roman-leap} \rangle$	<i>list</i>
<i>roman-event</i>	1 .. 3	<i>positive-integer</i>
<i>roman-leap</i>	<i>boolean</i>	
<i>roman-month</i>	1 .. 12	<i>positive-integer</i>
<i>roman-year</i>	<i>nonzero-integer</i>	
<i>season</i>	[0 .. 360)	<i>angle</i>
<i>second</i>	[0 .. 60)	<i>duration</i>
<i>standard-date</i>	$\langle \textit{standard-year}, \textit{standard-month},$ $\textit{standard-day} \rangle$	<i>list-of-integers</i>
<i>standard-day</i>	1 .. 31	<i>positive-integer</i>
<i>standard-month</i>	1 .. 13	<i>positive-integer</i>
<i>standard-year</i>	<i>integer</i>	
<i>string</i>		
<i>tibetan-date</i>	$\langle \textit{tibetan-year}, \textit{tibetan-month},$ $\textit{tibetan-leap-month}, \textit{tibetan-day},$ $\textit{tibetan-leap-day} \rangle$	<i>list</i>
<i>tibetan-day</i>	1 .. 30	<i>positive-integer</i>
<i>tibetan-leap-day</i>	<i>boolean</i>	
<i>tibetan-leap-month</i>	<i>boolean</i>	
<i>tibetan-month</i>	1 .. 12	<i>positive-integer</i>
<i>tibetan-year</i>	<i>integer</i>	
<i>time</i>	[0 .. 1)	<i>duration</i>

A.2 Function Types

Function	Parameter type(s)	Result type
aberration (p. 223)	<i>moment</i>	<i>circle</i>
adda-season-in-gregorian (p. 133)	$\langle \textit{season}, \textit{gregorian-year},$ $\textit{positive-real} \rangle$	<i>list-of-moments</i>
advent (p. 70)	<i>gregorian-year</i>	<i>fixed-date</i>
akan-day-name (p. 38)	<i>integer</i>	<i>akan-name</i>
akan-day-name-on-or-before (p. 38)	$\langle \textit{akan-name}, \textit{fixed-date} \rangle$	<i>fixed-date</i>
akan-name (p. 478)	$\langle \textit{akan-prefix}, \textit{akan-stem} \rangle$	<i>akan-name</i>
akan-name-difference (p. 38)	$\langle \textit{akan-name}, \textit{akan-name} \rangle$	<i>nonnegative-integer</i>
akan-name-from-fixed (p. 38)	<i>fixed-date</i>	<i>akan-name</i>
akan-prefix (p. 478)	<i>akan-name</i>	<i>akan-prefix</i>
akan-stem (p. 478)	<i>akan-name</i>	<i>akan-stem</i>
alt-asr (p. 249)	$\langle \textit{fixed-date}, \textit{location} \rangle$	<i>moment</i>
alt-birkath-ha-hama (p. 132)	<i>gregorian-year</i>	<i>list-of-fixed-dates</i>
alt-fixed-from-egyptian (p. 31)	<i>egyptian-date</i>	<i>fixed-date</i>
alt-fixed-from-gregorian (p. 65)	<i>gregorian-date</i>	<i>fixed-date</i>

continued

Function	Parameter type(s)	Result type
alt-fixed-from-observational-hebrew (p. 299)	<i>hebrew-date</i>	<i>fixed-date</i>
alt-fixed-from-observational-islamic (p. 295)	<i>islamic-date</i>	<i>fixed-date</i>
alt-gregorian-from-fixed (p. 66)	<i>fixed-date</i>	<i>gregorian-date</i>
alt-gregorian-year-from-fixed (p. 67)	<i>fixed-date</i>	<i>gregorian-year</i>
alt-hindu-sunrise (p. 357)	<i>fixed-date</i>	<i>rational-moment</i>
alt-observational-hebrew-from-fixed (p. 299)	<i>fixed-date</i>	<i>hebrew-date</i>
alt-observational-islamic-from-fixed (p. 295)	<i>fixed-date</i>	<i>islamic-date</i>
alt-orthodox-easter (p. 147)	<i>gregorian-year</i>	<i>fixed-date</i>
amod (p. 22)	$\langle \text{integer}, \text{nonzero-integer} \rangle$	<i>integer</i>
angle (p. 514)	$\langle \text{nonnegative-integer},$ <i>nonnegative-integer, real</i> \rangle	<i>angle</i>
angle-from-degrees (p. 29)	<i>angle</i>	<i>list-of-reals</i>
apparent-from-local (p. 217)	$\langle \text{moment}, \text{location} \rangle$	<i>moment</i>
apparent-from-universal (p. 218)	$\langle \text{moment}, \text{location} \rangle$	<i>moment</i>
approx-moment-of-depression (p. 240)	$\langle \text{moment}, \text{location}, \text{half-circle},$ <i>boolean</i> \rangle	<i>moment</i> (or bogus)
arccos-degrees (p. 514)	<i>amplitude</i>	<i>angle</i>
arc-of-light (p. 250)	<i>moment</i>	<i>half-circle</i>
arc-of-vision (p. 251)	$\langle \text{moment}, \text{location} \rangle$	<i>half-circle</i>
arcsin-degrees (p. 513)	<i>amplitude</i>	<i>angle</i>
arctan (p. 205)	$\langle \text{real}, \text{real} \rangle$	<i>angle</i> (or bogus)
arctan-degrees (p. 205)	$\langle \text{real}, \text{real} \rangle$	<i>angle</i> (or bogus)
arithmetic-french-from-fixed (p. 285)	<i>fixed-date</i>	<i>french-date</i>
arithmetic-french-leap-year? (p. 285)	<i>french-year</i>	<i>boolean</i>
arithmetic-persian-from-fixed (p. 263)	<i>fixed-date</i>	<i>persian-date</i>
arithmetic-persian-leap-year? (p. 262)	<i>persian-year</i>	<i>boolean</i>
arithmetic-persian-year-from-fixed (p. 263)	<i>fixed-date</i>	<i>persian-year</i>
armenian-date (p. 477)	$\langle \text{armenian-year},$ <i>armenian-month},</i> <i>armenian-day} \rangle</i>	<i>armenian-date</i>
armenian-from-fixed (p. 31)	<i>fixed-date</i>	<i>armenian-date</i>
asr (p. 249)	$\langle \text{fixed-date}, \text{location} \rangle$	<i>moment</i>
astro-bahai-from-fixed (p. 275)	<i>fixed-date</i>	<i>bahai-date</i>
astro-bahai-new-year-on-or-before (p. 274)	<i>fixed-date</i>	<i>fixed-date</i>
astro-hindu-calendar-year (p. 360)	<i>moment</i>	<i>hindu-solar-year</i>
astro-hindu-lunar-from-fixed (p. 361)	<i>fixed-date</i>	<i>hindu-lunar-date</i>
astro-hindu-solar-from-fixed (p. 360)	<i>fixed-date</i>	<i>hindu-solar-date</i>
astro-hindu-sunset (p. 360)	<i>fixed-date</i>	<i>moment</i>
astro-lunar-day-from-moment (p. 361)	<i>moment</i>	<i>hindu-lunar-day</i>
astronomical-easter (p. 292)	<i>gregorian-year</i>	<i>fixed-date</i>

continued

Function	Parameter type(s)	Result type
auc-year-from-julian (p. 81)	<i>julian-year</i>	<i>auc-year</i>
ayanamsha (p. 359)	<i>moment</i>	<i>angle</i>
aztec-tonalpohualli-date (p. 509)	$\langle \text{aztec-tonalpohualli-number}, \text{aztec-tonalpohualli-name} \rangle$	<i>aztec-tonalpohualli-date</i>
aztec-tonalpohualli-from-fixed (p. 179)	<i>fixed-date</i>	<i>aztec-tonalpohualli-date</i>
aztec-tonalpohualli-name (p. 509)	<i>aztec-tonalpohualli-date</i>	<i>aztec-tonalpohualli-name</i>
aztec-tonalpohualli-number (p. 509)	<i>aztec-tonalpohualli-date</i>	<i>aztec-tonalpohualli-number</i>
aztec-tonalpohualli-on-or-before (p. 180)	$\langle \text{aztec-tonalpohualli-date}, \text{fixed-date} \rangle$	<i>fixed-date</i>
aztec-tonalpohualli-ordinal (p. 179)	<i>aztec-tonalpohualli-date</i>	<i>nonnegative-integer</i>
aztec-xihuitl-date (p. 508)	$\langle \text{aztec-xihuitl-month}, \text{aztec-xihuitl-day} \rangle$	<i>aztec-xihuitl-date</i>
aztec-xihuitl-day (p. 508)	<i>aztec-xihuitl-date</i>	<i>aztec-xihuitl-day</i>
aztec-xihuitl-from-fixed (p. 178)	<i>fixed-date</i>	<i>aztec-xihuitl-date</i>
aztec-xihuitl-month (p. 508)	<i>aztec-xihuitl-date</i>	<i>aztec-xihuitl-month</i>
aztec-xihuitl-on-or-before (p. 179)	$\langle \text{aztec-xihuitl-date}, \text{fixed-date} \rangle$	<i>fixed-date</i>
aztec-xihuitl-ordinal (p. 178)	<i>aztec-xihuitl-date</i>	<i>nonnegative-integer</i>
aztec-xihuitl-tonalpohualli-on-or-before 180	$\langle \text{aztec-xihuitl-date}, \text{aztec-tonalpohualli-date}, \text{fixed-date} \rangle$	<i>fixed-date</i> (or bogus)
aztec-xiuhmollpilli-designation (p. 509)	$\langle \text{aztec-tonalpohualli-number}, \text{aztec-tonalpohualli-name} \rangle$	<i>aztec-xiuhmollpilli-designation</i>
aztec-xiuhmollpilli-from-fixed (p. 180)	<i>fixed-date</i>	<i>aztec-xiuhmollpilli-designation</i> (or bogus)
aztec-xiuhmollpilli-name (p. 509)	<i>aztec-xiuhmollpilli-designation</i>	<i>aztec-xiuhmollpilli-name</i>
aztec-xiuhmollpilli-number (p. 509)	<i>aztec-xiuhmollpilli-designation</i>	<i>aztec-xiuhmollpilli-number</i>
babylonian-criterion (p. 290)	<i>fixed-date</i>	<i>boolean</i>
babylonian-date (p. 543)	$\langle \text{babylonian-year}, \text{babylonian-month}, \text{babylonian-leap}, \text{babylonian-day} \rangle$	<i>babylonian-date</i>
babylonian-day (p. 543)	<i>babylonian-date</i>	<i>babylonian-day</i>
babylonian-leap (p. 543)	<i>babylonian-date</i>	<i>babylonian-leap</i>
babylonian-month (p. 543)	<i>babylonian-date</i>	<i>babylonian-month</i>
babylonian-year (p. 543)	<i>babylonian-date</i>	<i>babylonian-year</i>
babylonian-from-fixed (p. 291)	<i>fixed-date</i>	<i>babylonian-date</i>
babylonian-leap-year? (p. 291)	<i>babylonian-year</i>	<i>boolean</i>
babylonian-new-month-on-or-before (p. 290)	<i>fixed-date</i>	<i>fixed-date</i>
bahai-cycle (p. 538)	<i>bahai-date</i>	<i>bahai-cycle</i>

continued

Function	Parameter type(s)	Result type
bahai-date (p. 538)	<i><bahai-major, bahai-cycle, bahai-year, bahai-month, bahai-day></i>	<i>bahai-date</i>
bahai-day (p. 538)	<i>bahai-date</i>	<i>bahai-day</i>
bahai-from-fixed (p. 272)	<i>fixed-date</i>	<i>bahai-date</i>
bahai-major (p. 538)	<i>bahai-date</i>	<i>bahai-major</i>
bahai-month (p. 538)	<i>bahai-date</i>	<i>bahai-month</i>
bahai-new-year (p. 277)	<i>gregorian-year</i>	<i>fixed-date</i>
bahai-sunset (p. 274)	<i>fixed-date</i>	<i>moment</i>
bahai-year (p. 538)	<i>bahai-date</i>	<i>bahai-year</i>
bali-asatawara (p. 511)	<i>balinese-date</i>	<i>1 .. 8</i>
bali-asatawara-from-fixed (p. 188)	<i>fixed-date</i>	<i>1 .. 8</i>
bali-caturwara (p. 510)	<i>balinese-date</i>	<i>1 .. 4</i>
bali-caturwara-from-fixed (p. 189)	<i>fixed-date</i>	<i>1 .. 4</i>
bali-dasawara (p. 511)	<i>balinese-date</i>	<i>0 .. 9</i>
bali-dasawara-from-fixed (p. 188)	<i>fixed-date</i>	<i>0 .. 9</i>
bali-day-from-fixed (p. 187)	<i>fixed-date</i>	<i>0 .. 209</i>
bali-dwiwara (p. 510)	<i>balinese-date</i>	<i>1 .. 2</i>
bali-dwiwara-from-fixed (p. 188)	<i>fixed-date</i>	<i>1 .. 2</i>
bali-luang (p. 510)	<i>balinese-date</i>	<i>boolean</i>
bali-luang-from-fixed (p. 188)	<i>fixed-date</i>	<i>boolean</i>
balinese-date (p. 510)	<i><boolean, 1 .. 2, 1 .. 3, 1 .. 4, 1 .. 5, 1 .. 6, 1 .. 7, 1 .. 8, 1 .. 9, 0 .. 9></i>	<i>balinese-date</i>
bali-on-or-before (p. 189)	<i><balinese-date, fixed-date></i>	<i>fixed-date</i>
bali-pancawara (p. 510)	<i>balinese-date</i>	<i>1 .. 5</i>
bali-pancawara-from-fixed (p. 187)	<i>fixed-date</i>	<i>1 .. 5</i>
bali-pawukon-from-fixed (p. 185)	<i>fixed-date</i>	<i>balinese-date</i>
bali-sadwara (p. 510)	<i>balinese-date</i>	<i>1 .. 6</i>
bali-sadwara-from-fixed (p. 187)	<i>fixed-date</i>	<i>1 .. 6</i>
bali-sangawara (p. 511)	<i>balinese-date</i>	<i>1 .. 9</i>
bali-sangawara-from-fixed (p. 188)	<i>fixed-date</i>	<i>1 .. 9</i>
bali-saptawara (p. 510)	<i>balinese-date</i>	<i>1 .. 7</i>
bali-saptawara-from-fixed (p. 187)	<i>fixed-date</i>	<i>1 .. 7</i>
bali-triwara (p. 510)	<i>balinese-date</i>	<i>1 .. 3</i>
bali-triwara-from-fixed (p. 187)	<i>fixed-date</i>	<i>1 .. 3</i>
bali-week-from-fixed (p. 187)	<i>fixed-date</i>	<i>1 .. 30</i>
bce (p. 484)	<i>standard-year</i>	<i>julian-year</i>
begin (p. 475)	<i>interval</i>	<i>moment</i>
binary-search (p. 24)	<i><—, real, —, real, —, real→boolean, <real, real>→boolean></i>	<i>real</i>
birkath-ha-hama (p. 131)	<i>gregorian-year</i>	<i>list-of-fixed-dates</i>
birth-of-the-bab (p. 278)	<i>gregorian-year</i>	<i>fixed-date</i>
bruin-best-view (p. 251)	<i><fixed-date, location></i>	<i>moment</i>
ce (p. 484)	<i>standard-year</i>	<i>julian-year</i>

continued

Function	Parameter type(s)	Result type
chinese-age (p. 325)	<i><chinese-date, fixed-date></i>	<i>nonnegative-integer</i> (or bogus)
chinese-branch (p. 554)	<i>chinese-name</i>	<i>chinese-branch</i>
chinese-cycle (p. 549)	<i>chinese-date</i>	<i>chinese-cycle</i>
chinese-date (p. 549)	<i><chinese-cycle, chinese-year, chinese-month, chinese-leap, chinese-day></i>	<i>chinese-date</i>
chinese-day (p. 550)	<i>chinese-date</i>	<i>chinese-day</i>
chinese-day-name (p. 320)	<i>fixed-date</i>	<i>chinese-name</i>
chinese-day-name-on-or-before (p. 320)	<i><chinese-name, fixed-date></i>	<i>fixed-date</i>
chinese-from-fixed (p. 317)	<i>fixed-date</i>	<i>chinese-date</i>
chinese-leap (p. 550)	<i>chinese-date</i>	<i>chinese-leap</i>
chinese-location (p. 306)	<i>moment</i>	<i>location</i>
chinese-month (p. 550)	<i>chinese-date</i>	<i>chinese-month</i>
chinese-month-name (p. 320)	<i><chinese-month, chinese-year></i>	<i>chinese-name</i>
chinese-name (p. 553)	<i><chinese-stem, chinese-branch></i>	<i>chinese-name</i> (or bogus)
chinese-name-difference (p. 319)	<i><chinese-name, chinese-name></i>	<i>nonnegative-integer</i>
chinese-new-moon-before (p. 310)	<i>fixed-date</i>	<i>fixed-date</i>
chinese-new-moon-on-or-after (p. 309)	<i>fixed-date</i>	<i>fixed-date</i>
chinese-new-year (p. 322)	<i>gregorian-year</i>	<i>fixed-date</i>
chinese-new-year-in-sui (p. 315)	<i>fixed-date</i>	<i>fixed-date</i>
chinese-new-year-on-or-before (p. 316)	<i>fixed-date</i>	<i>fixed-date</i>
chinese-no-major-solar-term? (p. 313)	<i>fixed-date</i>	<i>boolean</i>
chinese-prior-leap-month? (p. 313)	<i><fixed-date, fixed-date></i>	<i>boolean</i>
chinese-sexagesimal-name (p. 319)	<i>integer</i>	<i>chinese-name</i>
chinese-solar-longitude-on-or-after (p. 308)	<i><season, moment></i>	<i>moment</i>
chinese-stem (p. 553)	<i>chinese-name</i>	<i>chinese-stem</i>
chinese-winter-solstice-on-or-before (p. 309)	<i>fixed-date</i>	<i>fixed-date</i>
chinese-year (p. 550)	<i>chinese-date</i>	<i>chinese-year</i>
chinese-year-marriage-augury (p. 325)	<i><chinese-cycle, chinese-year></i>	<i>augury</i>
chinese-year-name (p. 320)	<i>chinese-year</i>	<i>chinese-name</i>
christmas (p. 70)	<i>gregorian-year</i>	<i>fixed-date</i>
classical-passover-eve (p. 298)	<i>gregorian-year</i>	<i>fixed-date</i>
clock-from-moment (p. 28)	<i>moment</i>	<i>clock-time</i>
coptic-christmas (p. 93)	<i>gregorian-year</i>	<i>list-of-fixed-dates</i>
coptic-date (p. 489)	<i><coptic-year, coptic-month, coptic-day></i>	<i>coptic-date</i>
coptic-from-fixed (p. 91)	<i>fixed-date</i>	<i>coptic-date</i>
coptic-in-gregorian (p. 92)	<i><coptic-month, coptic-day, gregorian-year></i>	<i>list-of-fixed-dates</i>

continued

Function	Parameter type(s)	Result type
coptic-leap-year? (p. 90)	<i>coptic-year</i>	<i>boolean</i>
cos-degrees (p. 513)	<i>angle</i>	<i>amplitude</i>
current-major-solar-term (p. 306)	<i>fixed-date</i>	<i>integer</i>
current-minor-solar-term (p. 308)	<i>fixed-date</i>	<i>integer</i>
cycle-in-gregorian (p. 83)	$\langle \text{season, gregorian-year, moment} \rangle$	<i>list-of-moments</i>
dawn (p. 241)	$\langle \text{fixed-date, location, angle} \rangle$	<i>moment (or bogus)</i>
daylight-saving-end (p. 70)	<i>gregorian-year</i>	<i>fixed-date</i>
daylight-saving-start (p. 70)	<i>gregorian-year</i>	<i>fixed-date</i>
day-number (p. 62)	<i>gregorian-date</i>	<i>positive-integer</i>
day-of-week-from-fixed (p. 33)	<i>fixed-date</i>	<i>day-of-week</i>
days-in-hebrew-year (p. 123)	<i>hebrew-year</i>	353,354,355,383,384,385
days-remaining (p. 62)	<i>gregorian-date</i>	<i>nonnegative-integer</i>
daytime-temporal-hour (p. 247)	$\langle \text{fixed-date, location} \rangle$	<i>real (or bogus)</i>
declination (p. 220)	$\langle \text{moment, angle, angle} \rangle$	<i>angle</i>
deg (p. 514)	<i>real</i>	<i>angle</i>
	<i>list-of-reals</i>	<i>list-of-angles</i>
degrees-from-radians (p. 513)	<i>radian</i>	<i>angle</i>
degrees-minutes-seconds (p. 514)	$\langle \text{degree, minute, real} \rangle$	<i>angle</i>
direction (p. 205)	$\langle \text{location, location} \rangle$	<i>angle</i>
diwali (p. 368)	<i>gregorian-year</i>	<i>list-of-fixed-dates</i>
dragon-festival (p. 324)	<i>gregorian-year</i>	<i>fixed-date</i>
dusk (p. 242)	$\langle \text{fixed-date, location, angle} \rangle$	<i>moment (or bogus)</i>
dynamical-from-universal (p. 212)	<i>moment</i>	<i>moment</i>
early-month? (p. 294)	$\langle \text{fixed-date, location} \rangle$	<i>boolean</i>
easter (p. 148)	<i>gregorian-year</i>	<i>fixed-date</i>
eastern-orthodox-christmas (p. 85)	<i>gregorian-year</i>	<i>list-of-fixed-dates</i>
egyptian-date (p. 476)	$\langle \text{egyptian-year, egyptian-month, egyptian-day} \rangle$	<i>egyptian-date</i>
egyptian-from-fixed (p. 31)	<i>fixed-date</i>	<i>egyptian-date</i>
election-day (p. 70)	<i>gregorian-year</i>	<i>fixed-date</i>
elevation (p. 515)	<i>location</i>	<i>distance</i>
end (p. 475)	<i>interval</i>	<i>moment</i>
ephemeris-correction (p. 210)	<i>moment</i>	<i>fraction-of-day</i>
epiphany (p. 71)	<i>gregorian-year</i>	<i>fixed-date</i>
equation-of-time (p. 215)	<i>moment</i>	<i>fraction-of-day</i>
estimate-prior-solar-longitude (p. 226)	$\langle \text{season, moment} \rangle$	<i>moment</i>
ethiopic-date (p. 490)	$\langle \text{ethiopic-year, ethiopic-month, ethiopic-day} \rangle$	<i>ethiopic-date</i>
ethiopic-from-fixed (p. 92)	<i>fixed-date</i>	<i>ethiopic-date</i>
feast-of-ridvan (p. 277)	<i>gregorian-year</i>	<i>fixed-date</i>
final (p. 24)	$\langle \text{—, integer, integer} \rightarrow \text{boolean} \rangle$	<i>integer</i>
first-kday (p. 69)	$\langle \text{day-of-week, gregorian-date} \rangle$	<i>fixed-date</i>
fixed-from-arithmetic-french (p. 285)	<i>french-date</i>	<i>fixed-date</i>
fixed-from-arithmetic-persian (p. 262)	<i>persian-date</i>	<i>fixed-date</i>
fixed-from-armenian (p. 31)	<i>armenian-date</i>	<i>fixed-date</i>
fixed-from-astro-bahai (p. 275)	<i>bahai-date</i>	<i>fixed-date</i>

continued

Function	Parameter type(s)	Result type
fixed-from-astro-hindu-lunar (p. 361)	<i>hindu-lunar-date</i>	<i>fixed-date</i>
fixed-from-astro-hindu-solar (p. 360)	<i>hindu-solar-date</i>	<i>fixed-date</i>
fixed-from-babylonian (p. 291)	<i>babylonian-date</i>	<i>fixed-date</i>
fixed-from-bahai (p. 271)	<i>bahai-date</i>	<i>fixed-date</i>
fixed-from-chinese (p. 318)	<i>chinese-date</i>	<i>fixed-date</i>
fixed-from-coptic (p. 90)	<i>coptic-date</i>	<i>fixed-date</i>
fixed-from-egyptian (p. 30)	<i>egyptian-date</i>	<i>fixed-date</i>
fixed-from-ethiopic (p. 92)	<i>ethiopic-date</i>	<i>fixed-date</i>
fixed-from-french (p. 284)	<i>french-date</i>	<i>fixed-date</i>
fixed-from-gregorian (p. 60)	<i>gregorian-date</i>	<i>fixed-date</i>
fixed-from-hebrew (p. 123)	<i>hebrew-date</i>	<i>fixed-date</i>
fixed-from-hindu-fullmoon (p. 356)	<i>hindu-lunar-date</i>	<i>fixed-date</i>
fixed-from-hindu-lunar (p. 350)	<i>hindu-lunar-date</i>	<i>fixed-date</i>
fixed-from-hindu-solar (p. 348)	<i>hindu-solar-date</i>	<i>fixed-date</i>
fixed-from-icelandic (p. 100)	<i>icelandic-date</i>	<i>fixed-date</i>
fixed-from-islamic (p. 107)	<i>islamic-date</i>	<i>fixed-date</i>
fixed-from-iso (p. 95)	<i>iso-date</i>	<i>fixed-date</i>
fixed-from-jd (p. 20)	<i>julian-day-number</i>	<i>fixed-date</i>
fixed-from-julian (p. 76)	<i>julian-date</i>	<i>fixed-date</i>
fixed-from-mayan-long-count (p. 171)	<i>mayan-long-count-date</i>	<i>fixed-date</i>
fixed-from-mjd (p. 19)	<i>julian-day-number</i>	<i>fixed-date</i>
fixed-from-molad (p. 126)	<i>duration</i>	<i>fixed-date</i>
fixed-from-moment (p. 20)	<i>moment</i>	<i>fixed-date</i>
fixed-from-observational-hebrew (p. 298)	<i>hebrew-date</i>	<i>fixed-date</i>
fixed-from-observational-islamic (p. 293)	<i>islamic-date</i>	<i>fixed-date</i>
fixed-from-old-hindu-lunar (p. 165)	<i>old-hindu-lunar-date</i>	<i>fixed-date</i>
fixed-from-old-hindu-solar (p. 158)	<i>hindu-solar-date</i>	<i>fixed-date</i>
fixed-from-persian (p. 260)	<i>persian-date</i>	<i>fixed-date</i>
fixed-from-roman (p. 80)	<i>roman-date</i>	<i>fixed-date</i>
fixed-from-samaritan (p. 301)	<i>hebrew-date</i>	<i>fixed-date</i>
fixed-from-saudi-islamic (p. 296)	<i>islamic-date</i>	<i>fixed-date</i>
fixed-from-tibetan (p. 378)	<i>tibetan-date</i>	<i>fixed-date</i>
french-date (p. 541)	<i>⟨french-year, french-month, french-day⟩</i>	<i>french-date</i>
french-from-fixed (p. 284)	<i>fixed-date</i>	<i>french-date</i>
french-leap-year? (p. 284)	<i>french-year</i>	<i>boolean</i>
french-new-year-on-or-before (p. 283)	<i>fixed-date</i>	<i>fixed-date</i>
from-radix (p. 27)	<i>⟨list-of-reals, list-of-rationals, list-of-rationals⟩</i>	<i>real</i>
gregorian-date (p. 479)	<i>⟨gregorian-year, gregorian-month, gregorian-day⟩</i>	<i>gregorian-date</i>
gregorian-date-difference (p. 62)	<i>⟨gregorian-date, gregorian-date⟩</i>	<i>integer</i>
gregorian-from-fixed (p. 62)	<i>fixed-date</i>	<i>gregorian-date</i>

continued

Function	Parameter type(s)	Result type
gregorian-leap-year? (p. 59)	<i>gregorian-year</i>	<i>boolean</i>
gregorian-new-year (p. 60)	<i>gregorian-year</i>	<i>fixed-date</i>
gregorian-year-end (p. 60)	<i>gregorian-year</i>	<i>fixed-date</i>
gregorian-year-from-fixed (p. 61)	<i>fixed-date</i>	<i>gregorian-year</i>
gregorian-year-range (p. 60)	<i>gregorian-year</i>	<i>range</i>
hanukkah (p. 134)	<i>gregorian-year</i>	<i>list-of-fixed-dates</i>
hebrew-birthday (p. 135)	<i><hebrew-date, hebrew-year></i>	<i>fixed-date</i>
hebrew-birthday-in-gregorian (p. 135)	<i><hebrew-date, gregorian-year></i>	<i>list-of-fixed-dates</i>
hebrew-calendar-elapsed-days (p. 121)	<i>hebrew-year</i>	<i>integer</i>
hebrew-date (p. 494)	<i><hebrew-year, hebrew-month, hebrew-day></i>	<i>hebrew-date</i>
hebrew-from-fixed (p. 123)	<i>fixed-date</i>	<i>hebrew-date</i>
hebrew-in-gregorian (p. 133)	<i><hebrew-month, hebrew-day, gregorian-year></i>	<i>list-of-fixed-dates</i>
hebrew-leap-year? (p. 115)	<i>hebrew-year</i>	<i>boolean</i>
hebrew-new-year (p. 122)	<i>hebrew-year</i>	<i>fixed-date</i>
hebrew-sabbatical-year? (p. 115)	<i>hebrew-year</i>	<i>boolean</i>
hebrew-year-length-correction (p. 122)	<i>hebrew-year</i>	<i>0 . . 2</i>
hindu-arcsin (p. 343)	<i>rational-amplitude</i>	<i>rational-angle</i>
hindu-ascensional-difference (p. 352)	<i><fixed-date, location></i>	<i>rational-angle</i>
hindu-calendar-year (p. 347)	<i>rational-moment</i>	<i>hindu-solar-year</i>
hindu-daily-motion (p. 353)	<i>fixed-date</i>	<i>rational-angle</i>
hindu-date-occur (p. 367)	<i><hindu-lunar-year, hindu-lunar-month, hindu-lunar-day></i>	<i>fixed-date</i>
hindu-day-count (p. 156)	<i>fixed-date</i>	<i>integer</i>
hindu-equation-of-time (p. 353)	<i>fixed-date</i>	<i>rational-moment</i>
hindu-expunged? (p. 356)	<i><hindu-lunar-year, hindu-lunar-month></i>	<i>boolean</i>
hindu-fullmoon-from-fixed (p. 356)	<i>fixed-date</i>	<i>hindu-lunar-date</i>
hindu-lunar-date (p. 560)	<i><hindu-lunar-year, hindu-lunar-month, hindu-lunar-leap-month, hindu-lunar-day, hindu-lunar-leap-day></i>	<i>hindu-lunar-date</i>
hindu-lunar-day (p. 560)	<i>hindu-lunar-date</i>	<i>hindu-lunar-day</i>
hindu-lunar-day-at-or-after (p. 365)	<i><rational, rational-moment></i>	<i>rational-moment</i>
hindu-lunar-day-from-moment (p. 346)	<i>rational-moment</i>	<i>hindu-lunar-day</i>
hindu-lunar-event (p. 368)	<i><hindu-lunar-month, rational, rational, gregorian-year></i>	<i>list-of-fixed-dates</i>
hindu-lunar-from-fixed (p. 349)	<i>fixed-date</i>	<i>hindu-lunar-date</i>
hindu-lunar-holiday (p. 367)	<i><hindu-lunar-month, hindu-lunar-day, gregorian-year></i>	<i>list-of-fixed-dates</i>

continued

Function	Parameter type(s)	Result type
hindu-lunar-leap-day (p. 560)	<i>hindu-lunar-date</i>	<i>hindu-lunar-leap-day</i>
hindu-lunar-leap-month (p. 560)	<i>hindu-lunar-date</i>	<i>hindu-lunar-leap-month</i>
hindu-lunar-longitude (p. 346)	<i>rational-moment</i>	<i>rational-angle</i>
hindu-lunar-month (p. 560)	<i>hindu-lunar-date</i>	<i>hindu-lunar-month</i>
hindu-lunar-new-year (p. 365)	<i>gregorian-year</i>	<i>fixed-date</i>
hindu-lunar-on-or-before? (p. 367)	\langle <i>hindu-lunar-date</i> , <i>hindu-lunar-date</i> \rangle	<i>boolean</i>
hindu-lunar-phase (p. 346)	<i>rational-moment</i>	<i>rational-angle</i>
hindu-lunar-station (p. 369)	<i>fixed-date</i>	<i>nakshatra</i>
hindu-lunar-year (p. 560)	<i>hindu-lunar-date</i>	<i>hindu-lunar-year</i>
hindu-mean-position (p. 344)	\langle <i>rational-moment</i> , <i>rational</i> \rangle	<i>rational-angle</i>
hindu-new-moon-before (p. 346)	<i>rational-moment</i>	<i>rational-moment</i>
hindu-rising-sign (p. 353)	<i>fixed-date</i>	<i>rational-amplitude</i>
hindu-sine (p. 342)	<i>angle</i>	<i>rational-amplitude</i>
hindu-sine-table (p. 342)	<i>integer</i>	<i>rational-amplitude</i>
hindu-solar-date (p. 559)	\langle <i>hindu-solar-year</i> , <i>hindu-solar-month</i> , <i>hindu-solar-day</i> \rangle	<i>hindu-solar-date</i>
hindu-solar-from-fixed (p. 347)	<i>fixed-date</i>	<i>hindu-solar-date</i>
hindu-solar-longitude (p. 345)	<i>rational-moment</i>	<i>rational-angle</i>
hindu-solar-longitude-at-or-after (p. 364)	\langle <i>season</i> , <i>moment</i> \rangle	<i>moment</i>
hindu-solar-sidereal-difference (p. 352)	<i>fixed-date</i>	<i>rational-angle</i>
hindu-standard-from-sundial (p. 355)	<i>rational-moment</i>	<i>rational-moment</i>
hindu-sunrise (p. 354)	<i>fixed-date</i>	<i>rational-moment</i>
hindu-sunset (p. 354)	<i>fixed-date</i>	<i>rational-moment</i>
hindu-tithi-occur (p. 368)	\langle <i>hindu-lunar-month</i> , <i>rational</i> , <i>rational</i> , <i>hindu-lunar-year</i> \rangle	<i>fixed-date</i>
hindu-tropical-longitude (p. 352)	<i>fixed-date</i>	<i>rational-angle</i>
hindu-true-position (p. 345)	\langle <i>rational-moment</i> , <i>rational</i> , <i>rational</i> , <i>rational</i> , <i>rational</i> \rangle	<i>rational-angle</i>
hindu-zodiac (p. 345)	<i>rational-moment</i>	<i>hindu-solar-month</i>
hour (p. 474)	<i>clock-time</i>	<i>hour</i>
hr (p. 514)	<i>real</i>	<i>duration</i>
icelandic-date (p. 491)	\langle <i>icelandic-year</i> , <i>icelandic-season</i> , <i>icelandic-week</i> , <i>icelandic-weekday</i> \rangle	<i>icelandic-date</i>
icelandic-from-fixed (p. 101)	<i>fixed-date</i>	<i>icelandic-date</i>
icelandic-leap-year? (p. 101)	<i>icelandic-year</i>	<i>boolean</i>
icelandic-month (p. 101)	<i>icelandic-date</i>	<i>icelandic-month</i>
icelandic-season (p. 491)	<i>icelandic-date</i>	<i>icelandic-season</i>
icelandic-summer (p. 100)	<i>gregorian-year</i>	<i>fixed-date</i>
icelandic-week (p. 491)	<i>icelandic-date</i>	<i>icelandic-week</i>
icelandic-weekday (p. 491)	<i>icelandic-date</i>	<i>icelandic-weekday</i>

continued

Function	Parameter type(s)	Result type
icelandic-winter (p. 100)	<i>gregorian-year</i>	<i>fixed-date</i>
icelandic-year (p. 491)	<i>icelandic-date</i>	<i>icelandic-year</i>
ides-of-month (p. 77)	<i>roman-month</i>	<i>ides</i>
independence-day (p. 69)	<i>gregorian-year</i>	<i>fixed-date</i>
in-range? (p. 26)	$\langle \text{moment}, \text{interval} \rangle$	<i>boolean</i>
interval (p. 475)	$\langle \text{moment}, \text{moment} \rangle$	<i>interval</i>
interval-closed (p. 475)	$\langle \text{moment}, \text{moment} \rangle$	<i>interval</i>
invert-angular (p. 25)	$\langle \text{real} \rightarrow \text{angle}, \text{real}, \text{interval} \rangle$	<i>real</i>
islamic-date (p. 493)	$\langle \text{islamic-year}, \text{islamic-month}, \text{islamic-day} \rangle$	<i>islamic-date</i>
islamic-from-fixed (p. 108)	<i>fixed-date</i>	<i>islamic-date</i>
islamic-in-gregorian (p. 108)	$\langle \text{islamic-month}, \text{islamic-day}, \text{gregorian-year} \rangle$	<i>list-of-fixed-dates</i>
islamic-leap-year? (p. 107)	<i>islamic-year</i>	<i>boolean</i>
iso-date (p. 490)	$\langle \text{iso-year}, \text{iso-week}, \text{iso-day} \rangle$	<i>iso-date</i>
iso-day (p. 490)	<i>iso-date</i>	<i>day-of-week</i>
iso-from-fixed (p. 96)	<i>fixed-date</i>	<i>iso-date</i>
iso-long-year? (p. 97)	<i>iso-year</i>	<i>boolean</i>
iso-week (p. 490)	<i>iso-date</i>	<i>iso-week</i>
iso-year (p. 491)	<i>iso-date</i>	<i>iso-year</i>
italian-from-local (p. 247)	<i>moment</i>	<i>moment</i>
japanese-location (p. 326)	<i>moment</i>	<i>location</i>
jd-from-fixed (p. 20)	<i>fixed-date</i>	<i>julian-day-number</i>
jd-from-moment (p. 18)	<i>moment</i>	<i>julian-day-number</i>
jewish-dusk (p. 243)	$\langle \text{fixed-date}, \text{location} \rangle$	<i>moment</i>
jewish-morning-end (p. 248)	$\langle \text{fixed-date}, \text{location} \rangle$	<i>moment</i>
jewish-sabbath-ends (p. 243)	$\langle \text{fixed-date}, \text{location} \rangle$	<i>moment</i>
jovian-year (p. 157)	<i>fixed-date</i>	1 .. 60
julian-centuries (p. 212)	<i>moment</i>	<i>century</i>
julian-date (p. 484)	$\langle \text{julian-year}, \text{julian-month}, \text{julian-day} \rangle$	<i>julian-date</i>
julian-from-fixed (p. 76)	<i>fixed-date</i>	<i>julian-date</i>
julian-in-gregorian (p. 85)	$\langle \text{julian-month}, \text{julian-day}, \text{gregorian-year} \rangle$	<i>list-of-fixed-dates</i>
julian-leap-year? (p. 75)	<i>julian-year</i>	<i>boolean</i>
julian-season-in-gregorian (p. 84)	$\langle \text{season}, \text{gregorian-year} \rangle$	<i>list-of-moments</i>
julian-year-from-auc (p. 81)	<i>auc-year</i>	<i>julian-year</i>
julian-year-from-olympiad (p. 82)	<i>olympiad</i>	<i>julian-year</i>
kajeng-keliwon (p. 190)	<i>gregorian-year</i>	<i>list-of-fixed-dates</i>
karana (p. 369)	1 .. 60	0 .. 10
kday-after (p. 34)	$\langle \text{day-of-week}, \text{fixed-date} \rangle$	<i>fixed-date</i>
kday-before (p. 34)	$\langle \text{day-of-week}, \text{fixed-date} \rangle$	<i>fixed-date</i>
kday-nearest (p. 34)	$\langle \text{day-of-week}, \text{fixed-date} \rangle$	<i>fixed-date</i>
kday-on-or-after (p. 34)	$\langle \text{day-of-week}, \text{fixed-date} \rangle$	<i>fixed-date</i>
kday-on-or-before (p. 34)	$\langle \text{day-of-week}, \text{fixed-date} \rangle$	<i>fixed-date</i>
korean-location (p. 328)	<i>moment</i>	<i>location</i>
korean-year (p. 328)	$\langle \text{chinese-cycle}, \text{chinese-year} \rangle$	<i>integer</i>

continued

Function	Parameter type(s)	Result type
labor-day (p. 69)	<i>gregorian-year</i>	<i>fixed-date</i>
last-day-of-gregorian-month (p. 63)	<i><gregorian-year, gregorian-month></i>	<i>gregorian-day</i>
last-day-of-hebrew-month (p. 122)	<i><hebrew-year, hebrew-month></i>	<i>hebrew-day</i>
last-kday (p. 69)	<i><day-of-week, gregorian-date></i>	<i>fixed-date</i>
last-month-of-hebrew-year (p. 115)	<i>hebrew-year</i>	<i>hebrew-month</i>
latitude (p. 514)	<i>location</i>	<i>half-circle</i>
list-of-fixed-from-moments (p. 26)	<i>list-of-moments</i>	<i>list-of-fixed-dates</i>
list-range (p. 26)	<i><list-of-moments, interval></i>	<i>list-of-moments</i>
local-from-apparent (p. 218)	<i><moment, location></i>	<i>moment</i>
local-from-italian (p. 247)	<i>moment</i>	<i>moment</i>
local-from-standard (p. 208)	<i><moment, location></i>	
local-from-universal (p. 208)	<i><moment, location></i>	<i>moment</i>
local-zero-hour (p. 246)	<i>moment</i>	<i>moment</i>
location (p. 514)	<i><half-circle, circle, distance, fraction-of-day></i>	<i>location</i>
longitude (p. 515)	<i>location</i>	<i>circle</i>
long-marheshvan? (p. 122)	<i>hebrew-year</i>	<i>boolean</i>
losar (p. 381)	<i>tibetan-year</i>	<i>fixed-date</i>
lunar-altitude (p. 237)	<i><moment, location></i>	<i>half-circle</i>
lunar-anomaly (p. 234)	<i>century</i>	<i>angle</i>
lunar-diameter (p. 252)	<i>moment</i>	<i>angle</i>
lunar-distance (p. 238)	<i>moment</i>	<i>distance</i>
lunar-elongation (p. 234)	<i>century</i>	<i>angle</i>
lunar-latitude (p. 236)	<i>moment</i>	<i>angle</i>
lunar-longitude (p. 232)	<i>moment</i>	<i>angle</i>
lunar-node (p. 234)	<i>fixed-date</i>	<i>angle</i>
lunar-parallax (p. 238)	<i><moment, location></i>	<i>angle</i>
lunar-phase (p. 235)	<i>moment</i>	<i>phase</i>
lunar-phase-at-or-after (p. 235)	<i><phase, moment></i>	<i>moment</i>
lunar-phase-at-or-before (p. 235)	<i><phase, moment></i>	<i>moment</i>
lunar-semi-diameter (p. 251)	<i><moment, location></i>	<i>half-circle</i>
major-solar-term-on-or-after (p. 308)	<i>fixed-date</i>	<i>moment</i>
mawlid (p. 109)	<i>gregorian-year</i>	<i>list-of-fixed-dates</i>
mayan-baktun (p. 505)	<i>mayan-long-count-date</i>	<i>mayan-baktun</i>
mayan-calendar-round-on-or-before (p. 176)	<i><mayan-haab-date, mayan-tzolkin-date, fixed-date></i>	<i>fixed-date (or bogus)</i>
mayan-haab-date (p. 506)	<i><mayan-haab-month, mayan-haab-day></i>	<i>mayan-haab-date</i>
mayan-haab-day (p. 506)	<i>mayan-haab-date</i>	<i>mayan-haab-day</i>
mayan-haab-from-fixed (p. 173)	<i>fixed-date</i>	<i>mayan-haab-date</i>
mayan-haab-month (p. 506)	<i>mayan-haab-date</i>	<i>mayan-haab-month</i>
mayan-haab-on-or-before (p. 173)	<i><mayan-haab-date, fixed-date></i>	<i>fixed-date</i>
mayan-haab-ordinal (p. 173)	<i>mayan-haab-date</i>	<i>nonnegative-integer</i>
mayan-katun (p. 506)	<i>mayan-long-count-date</i>	<i>mayan-katun</i>
mayan-kin (p. 506)	<i>mayan-long-count-date</i>	<i>mayan-kin</i>

continued

Function	Parameter type(s)	Result type
mayan-long-count-date (p. 505)	$\langle \text{mayan-baktun}, \text{mayan-katun}, \text{mayan-tun}, \text{mayan-uinal}, \text{mayan-kin} \rangle$	<i>mayan-long-count-date</i>
mayan-long-count-from-fixed (p. 171)	<i>fixed-date</i>	<i>mayan-long-count-date</i>
mayan-tun (p. 506)	<i>mayan-long-count-date</i>	<i>mayan-tun</i>
mayan-tzolkin-date (p. 507)	$\langle \text{mayan-tzolkin-number}, \text{mayan-tzolkin-name} \rangle$	<i>mayan-tzolkin-date</i>
mayan-tzolkin-from-fixed (p. 175)	<i>fixed-date</i>	<i>mayan-tzolkin-date</i>
mayan-tzolkin-name (p. 507)	<i>mayan-tzolkin-date</i>	<i>mayan-tzolkin-name</i>
mayan-tzolkin-number (p. 507)	<i>mayan-tzolkin-date</i>	<i>mayan-tzolkin-number</i>
mayan-tzolkin-on-or-before (p. 175)	$\langle \text{mayan-tzolkin-date}, \text{fixed-date} \rangle$	<i>fixed-date</i>
mayan-tzolkin-ordinal (p. 175)	<i>mayan-tzolkin-date</i>	<i>nonnegative-integer</i>
mayan-uinal (p. 506)	<i>mayan-long-count-date</i>	<i>mayan-uinal</i>
mayan-year-bearer-from-fixed (p. 176)	<i>fixed-date</i>	<i>mayan-tzolkin-name</i> (or bogus)
mean-lunar-longitude (p. 233)	<i>century</i>	<i>angle</i>
memorial-day (p. 70)	<i>gregorian-year</i>	<i>fixed-date</i>
mesha-samkranti (p. 364)	<i>gregorian-year</i>	<i>rational-moment</i>
midday (p. 218)	$\langle \text{fixed-date}, \text{location} \rangle$	<i>moment</i>
midday-in-tehran (p. 259)	<i>fixed-date</i>	<i>moment</i>
midnight (p. 218)	$\langle \text{fixed-date}, \text{location} \rangle$	<i>moment</i>
midnight-in-china (p. 309)	<i>fixed-date</i>	<i>moment</i>
midnight-in-paris (p. 283)	<i>fixed-date</i>	<i>moment</i>
minor-solar-term-on-or-after (p. 308)	<i>fixed-date</i>	<i>moment</i>
mins (p. 514)	<i>real</i>	<i>angle</i>
minute (p. 474)	<i>clock-time</i>	<i>minute</i>
mjd-from-fixed (p. 19)	<i>fixed-date</i>	<i>julian-day-number</i>
mn (p. 514)	<i>real</i>	<i>duration</i>
mod3 (p. 22)	$\langle \text{real}, \text{real}, \text{real} \rangle$	<i>real</i>
molad (p. 119)	$\langle \text{hebrew-year}, \text{hebrew-month} \rangle$	<i>rational-moment</i>
moment-from-jd (p. 18)	<i>julian-day-number</i>	<i>moment</i>
moment-from-unix (p. 19)	<i>second</i>	<i>moment</i>
moment-of-depression (p. 241)	$\langle \text{moment}, \text{location}, \text{half-circle}, \text{boolean} \rangle$	<i>moment</i> (or bogus)
month-length (p. 294)	$\langle \text{fixed-date}, \text{location} \rangle$	1 . . 31
moonlag (p. 290)	$\langle \text{fixed-date}, \text{location} \rangle$	<i>duration</i>
moon-node (p. 234)	<i>century</i>	<i>angle</i>
moonrise (p. 244)	$\langle \text{fixed-date}, \text{location} \rangle$	<i>moment</i> (or bogus)
moonset (p. 245)	$\langle \text{fixed-date}, \text{location} \rangle$	<i>moment</i> (or bogus)
mt (p. 514)	<i>real</i>	<i>distance</i>
naw-ruz (p. 277)	<i>gregorian-year</i>	<i>fixed-date</i>
new-moon-at-or-after (p. 231)	<i>moment</i>	<i>moment</i>
new-moon-before (p. 230)	<i>moment</i>	<i>moment</i>
next (p. 23)	$\langle -, \text{integer}, \text{integer} \rightarrow \text{boolean} \rangle$	<i>integer</i>
nighttime-temporal-hour (p. 248)	$\langle \text{fixed-date}, \text{location} \rangle$	<i>real</i> (or bogus)

continued

Function	Parameter type(s)	Result type
nones-of-month (p. 78)	<i>roman-month</i>	<i>nones</i>
nowruz (p. 265)	<i>gregorian-year</i>	<i>fixed-date</i>
nth-kday (p. 69)	$\langle \text{integer, day-of-week, gregorian-date} \rangle$	<i>fixed-date</i>
nth-new-moon (p. 229)	<i>integer</i>	<i>moment</i>
nutation (p. 223)	<i>moment</i>	<i>angle</i>
obliquity (p. 220)	<i>moment</i>	<i>angle</i>
observational-hebrew-first-of-nisan (p. 297)	<i>gregorian-year</i>	<i>fixed-date</i>
observational-hebrew-from-fixed (p. 298)	<i>fixed-date</i>	<i>hebrew-date</i>
observational-islamic-from-fixed (p. 294)	<i>fixed-date</i>	<i>islamic-date</i>
observed-lunar-altitude (p. 243)	$\langle \text{moment, location} \rangle$	<i>angle</i>
old-hindu-lunar-date (p. 504)	$\langle \text{old-hindu-lunar-year, old-hindu-lunar-month, old-hindu-lunar-leap, old-hindu-lunar-day} \rangle$	<i>old-hindu-lunar-date</i>
old-hindu-lunar-day (p. 504)	<i>old-hindu-lunar-date</i>	<i>old-hindu-lunar-day</i>
old-hindu-lunar-from-fixed (p. 165)	<i>fixed-date</i>	<i>old-hindu-lunar-date</i>
old-hindu-lunar-leap (p. 504)	<i>old-hindu-lunar-date</i>	<i>old-hindu-lunar-leap</i>
old-hindu-lunar-leap-year? (p. 163)	<i>old-hindu-lunar-year</i>	<i>boolean</i>
old-hindu-lunar-month (p. 504)	<i>old-hindu-lunar-date</i>	<i>old-hindu-lunar-month</i>
old-hindu-lunar-year (p. 504)	<i>old-hindu-lunar-date</i>	<i>old-hindu-lunar-year</i>
old-hindu-solar-from-fixed (p. 159)	<i>fixed-date</i>	<i>hindu-solar-date</i>
olympiad (p. 487)	$\langle \text{olympiad-cycle, olympiad-year} \rangle$	<i>olympiad</i>
olympiad-cycle (p. 487)	<i>olympiad</i>	<i>olympiad-cycle</i>
olympiad-from-julian-year (p. 82)	<i>julian-year</i>	<i>olympiad</i>
olympiad-year (p. 487)	<i>olympiad</i>	<i>olympiad-year</i>
omer (p. 129)	<i>fixed-date</i>	<i>omer-count</i> (or bogus)
orthodox-easter (p. 146)	<i>gregorian-year</i>	<i>fixed-date</i>
passover (p. 129)	<i>gregorian-year</i>	<i>fixed-date</i>
pentecost (p. 152)	<i>gregorian-year</i>	<i>fixed-date</i>
persian-date (p. 535)	$\langle \text{persian-year, persian-month, persian-day} \rangle$	<i>persian-date</i>
persian-from-fixed (p. 260)	<i>fixed-date</i>	<i>persian-date</i>
persian-new-year-on-or-before (p. 259)	<i>fixed-date</i>	<i>fixed-date</i>
phasis-on-or-after (p. 252)	$\langle \text{fixed-date, location} \rangle$	<i>fixed-date</i>
phasis-on-or-before (p. 252)	$\langle \text{fixed-date, location} \rangle$	<i>fixed-date</i>
poly (p. 473)	$\langle \text{real, list-of-reals} \rangle$	<i>real</i>
positions-in-range (p. 27)	$\langle \text{nonnegative-real, positive-real, nonnegative-real, interval} \rangle$	<i>list-of-fixed-dates</i>
possible-hebrew-days (p. 139)	$\langle \text{hebrew-month, hebrew-day} \rangle$	<i>list-of-weekdays</i>

continued

Function	Parameter type(s)	Result type
precession (p. 225)	<i>moment</i>	<i>angle</i>
prod (p. 23)	$\langle \text{integer} \rightarrow \text{real}, \text{—}, \text{integer}, \text{integer} \rightarrow \text{boolean} \rangle$	<i>real</i>
purim (p. 129)	<i>gregorian-year</i>	<i>fixed-date</i>
qing-ming (p. 324)	<i>gregorian-year</i>	<i>fixed-date</i>
quotient (p. 472)	$\langle \text{real}, \text{nonzero-real} \rangle$	<i>integer</i>
radians-from-degrees (p. 513)	<i>real</i>	<i>radian</i>
rama (p. 369)	<i>gregorian-year</i>	<i>list-of-fixed-dates</i>
rd (p. 12)	<i>moment</i>	<i>moment</i>
refraction (p. 242)	$\langle \text{moment}, \text{location} \rangle$	<i>angle</i>
right-ascension (p. 220)	$\langle \text{moment}, \text{angle}, \text{angle} \rangle$	<i>angle</i>
roman-count (p. 486)	<i>roman-date</i>	<i>roman-count</i>
roman-date (p. 486)	$\langle \text{roman-year}, \text{roman-month}, \text{roman-event}, \text{roman-count}, \text{roman-leap} \rangle$	<i>roman-date</i>
roman-event (p. 486)	<i>roman-date</i>	<i>roman-event</i>
roman-from-fixed (p. 80)	<i>fixed-date</i>	<i>roman-date</i>
roman-leap (p. 486)	<i>roman-date</i>	<i>roman-leap</i>
roman-month (p. 486)	<i>roman-date</i>	<i>roman-month</i>
roman-year (p. 486)	<i>roman-date</i>	<i>roman-year</i>
sacred-wednesdays (p. 370)	<i>gregorian-year</i>	<i>list-of-fixed-dates</i>
sacred-wednesdays-in-range (p. 371)	<i>range</i>	<i>list-of-fixed-dates</i>
samaritan-from-fixed (p. 302)	<i>fixed-date</i>	<i>hebrew-date</i>
samaritan-new-moon-after (p. 300)	<i>moment</i>	<i>fixed-date</i>
samaritan-new-moon-at-or-before (p. 300)	<i>moment</i>	<i>fixed-date</i>
samaritan-new-year-on-or-before (p. 301)	<i>fixed-date</i>	<i>fixed-date</i>
samaritan-noon (p. 300)	<i>fixed-date</i>	<i>moment</i>
samuel-season-in-gregorian (p. 132)	$\langle \text{season}, \text{gregorian-year} \rangle$	<i>list-of-moments</i>
saudi-criterion (p. 296)	<i>fixed-date</i>	<i>boolean</i>
saudi-islamic-from-fixed (p. 296)	<i>fixed-date</i>	<i>islamic-date</i>
saudi-new-month-on-or-before (p. 296)	<i>fixed-date</i> ,	<i>fixed-date</i>
season-in-gregorian (p. 224)	$\langle \text{season}, \text{gregorian-year} \rangle$	<i>moment</i>
sec (p. 514)	<i>real</i>	<i>duration</i>
seconds (p. 474)	<i>clock-time</i>	<i>second</i>
secs (p. 514)	<i>real</i>	<i>angle</i>
shaukat-criterion (p. 250)	$\langle \text{fixed-date}, \text{location} \rangle$	<i>boolean</i>
sh-ela (p. 131)	<i>gregorian-year</i>	<i>list-of-fixed-dates</i>
shift-days (p. 138)	$\langle \text{list-of-weekdays}, \text{integer} \rangle$	<i>list-of-weekdays</i>
shiva (p. 369)	<i>gregorian-year</i>	<i>list-of-fixed-dates</i>
short-kislev? (p. 122)	<i>hebrew-year</i>	<i>boolean</i>
sidereal-from-moment (p. 219)	<i>moment</i>	<i>angle</i>
sidereal-lunar-longitude (p. 234)	<i>moment</i>	<i>angle</i>
sidereal-solar-longitude (p. 225)	<i>moment</i>	<i>angle</i>
sidereal-zodiac (p. 360)	<i>moment</i>	<i>hindu-solar-month</i>

continued

Function	Parameter type(s)	Result type
sigma (p. 473)	<i><list-of-pairs, list-of-reals→real></i>	<i>real</i>
sign (p. 20)	<i>real</i>	<i>{−1, 0, +1}</i>
simple-best-view (p. 250)	<i><fixed-date, location></i>	<i>moment</i>
sin-degrees (p. 513)	<i>angle</i>	<i>amplitude</i>
sine-offset (p. 241)	<i><moment, location, circle ></i>	<i>real</i>
solar-altitude (p. 226)	<i><moment, location></i>	<i>half-circle</i>
solar-anomaly (p. 234)	<i>century</i>	<i>angle</i>
solar-longitude (p. 223)	<i>moment</i>	<i>season</i>
solar-longitude-after (p. 224)	<i><season, moment></i>	<i>moment</i>
standard-day (p. 474)	<i>standard-date</i>	<i>standard-day</i>
standard-from-local (p. 208)	<i><moment, location></i>	<i>moment</i>
standard-from-sundial (p. 248)	<i><moment, location></i>	<i>moment (or bogus)</i>
standard-from-universal (p. 208)	<i><moment, location></i>	<i>moment</i>
standard-month (p. 474)	<i>standard-date</i>	<i>standard-month</i>
standard-year (p. 474)	<i>standard-date</i>	<i>standard-year</i>
sum (p. 23)	<i><integer→real, —, integer, integer→boolean></i>	<i>real</i>
sunrise (p. 242)	<i><fixed-date, location></i>	<i>moment</i>
sunset (p. 242)	<i><fixed-date, location></i>	<i>moment</i>
ta-anit-esther (p. 130)	<i>gregorian-year</i>	<i>fixed-date</i>
tan-degrees (p. 513)	<i>angle</i>	<i>real</i>
tibetan-date (p. 570)	<i><tibetan-year, tibetan-month, tibetan-leap-month, tibetan-day, tibetan-leap-day></i>	<i>tibetan-date</i>
tibetan-day (p. 570)	<i>tibetan-date</i>	<i>tibetan-day</i>
tibetan-from-fixed (p. 378)	<i>fixed-date</i>	<i>tibetan-date</i>
tibetan-leap-day (p. 381)	<i>tibetan-date</i>	<i>tibetan-leap-day</i>
tibetan-leap-day? (p. 381)	<i><tibetan-year, tibetan-month, tibetan-day></i>	<i>boolean</i>
tibetan-leap-month (p. 380)	<i>tibetan-date</i>	<i>tibetan-leap-month</i>
tibetan-leap-month? (p. 380)	<i><tibetan-year, tibetan-month></i>	<i>boolean</i>
tibetan-month (p. 570)	<i>tibetan-date</i>	<i>tibetan-month</i>
tibetan-moon-equation (p. 377)	<i>rational-angle</i>	<i>rational</i>
tibetan-new-year (p. 381)	<i>gregorian-year</i>	<i>list-of-fixed-dates</i>
tibetan-sun-equation (p. 377)	<i>rational-angle</i>	<i>rational</i>
tibetan-year (p. 570)	<i>tibetan-date</i>	<i>tibetan-year</i>
time-from-clock (p. 28)	<i>clock-time</i>	<i>time</i>
time-from-moment (p. 21)	<i>moment</i>	<i>time</i>
time-of-day (p. 474)	<i><hour, minute, second></i>	<i>clock-time</i>
tishah-be-av (p. 130)	<i>gregorian-year</i>	<i>fixed-date</i>
topocentric-lunar-altitude (p. 239)	<i><moment, location></i>	<i>half-circle</i>
to-radix (p. 28)	<i><real, list-of-rationals, list-of-rationals></i>	<i>list-of-reals</i>
tumpek (p. 190)	<i>gregorian-year</i>	<i>list-of-fixed-dates</i>
universal-from-apparent (p. 218)	<i><moment, location></i>	<i>moment</i>
universal-from-dynamical (p. 212)	<i>moment</i>	<i>moment</i>

continued

Function	Parameter type(s)	Result type
universal-from-local (p. 208)	<i><moment, location></i>	<i>moment</i>
universal-from-standard (p. 208)	<i><moment, location></i>	<i>moment</i>
unix-from-moment (p. 19)	<i>moment</i>	<i>second</i>
unlucky-fridays (p. 71)	<i>gregorian-year</i>	<i>list-of-fixed-dates</i>
unlucky-fridays-in-range (p. 71)	<i>range</i>	<i>list-of-fixed-dates</i>
vietnamese-location (p. 329)	<i>moment</i>	<i>location</i>
visible-crescent (p. 252)	<i><fixed-date, location></i>	<i>boolean</i>
yahrzeit (p. 136)	<i><hebrew-date, hebrew-year></i>	<i>fixed-date</i>
yahrzeit-in-gregorian (p. 137)	<i><hebrew-date, gregorian-year></i>	<i>list-of-fixed-dates</i>
yallop-criterion (p. 251)	<i><fixed-date, location></i>	<i>boolean</i>
yoga (p. 369)	<i>fixed-date</i>	<i>1 . . 27</i>
yom-ha-zikkaron (p. 131)	<i>gregorian-year</i>	<i>fixed-date</i>
yom-kippur (p. 128)	<i>gregorian-year</i>	<i>fixed-date</i>
zone (p. 515)	<i>location</i>	<i>real</i>
zone-from-longitude (p. 208)	<i>angle</i>	<i>duration</i>

A.3 Constant Types and Values

Constant	Type	Value
acre (p. 204)	<i>location</i>	<i><32.94, 35.09, 22, 1/12></i>
adar (p. 115)	<i>hebrew-month</i>	<i>12</i>
adarii (p. 115)	<i>hebrew-month</i>	<i>13</i>
akan-day-name-epoch (p. 38)	<i>fixed-date</i>	<i>37</i>
april (p. 59)	<i>standard-month</i>	<i>4</i>
armenian-epoch (p. 31)	<i>fixed-date</i>	<i>201443</i>
arya-jovian-period (p. 157)	<i>rational</i>	<i>131493125/30352</i>
arya-lunar-day (p. 160)	<i>rational</i>	<i>26298625/26716668</i>
arya-lunar-month (p. 160)	<i>rational</i>	<i>131493125/4452778</i>
arya-solar-month (p. 158)	<i>rational</i>	<i>210389/6912</i>
arya-solar-year (p. 157)	<i>rational</i>	<i>210389/576</i>
august (p. 59)	<i>standard-month</i>	<i>8</i>
autumn (p. 83)	<i>season</i>	<i>180</i>
av (p. 114)	<i>hebrew-month</i>	<i>5</i>
ayyam-i-ha (p. 271)	<i>bahai-month</i>	<i>0</i>
aztec-correlation (p. 177)	<i>fixed-date</i>	<i>555403</i>
aztec-tonalpohualli-correlation (p. 179)	<i>fixed-date</i>	<i>555299</i>
aztec-xihuitl-correlation (p. 178)	<i>fixed-date</i>	<i>555202</i>
babylon (p. 290)	<i>location</i>	<i><32.4794, 44.4328, 26, 7/2></i>
babylonian-epoch (p. 291)	<i>fixed-date</i>	<i>−113502</i>
bahai-epoch (p. 271)	<i>fixed-date</i>	<i>673222</i>
bahai-location (p. 274)	<i>location</i>	<i><35.696111, 51.423055999999974, 0, 7/48></i>

continued

Constant	Type	Value
bali-epoch (p. 187)	<i>fixed-date</i>	−1721279
blind (p. 325)	<i>augury</i>	1
bogus (p. 47)	<i>string</i>	“bogus”
bright (p. 325)	<i>augury</i>	2
chinese-day-name-epoch (p. 320)	<i>integer</i>	45
chinese-epoch (p. 316)	<i>fixed-date</i>	−963099
chinese-month-name-epoch (p. 320)	<i>integer</i>	57
coptic-epoch (p. 90)	<i>fixed-date</i>	103605
december (p. 59)	<i>standard-month</i>	12
double-bright (p. 325)	<i>augury</i>	3
egyptian-epoch (p. 30)	<i>fixed-date</i>	−272787
elul (p. 115)	<i>hebrew-month</i>	6
ethiopic-epoch (p. 92)	<i>fixed-date</i>	2430
evening (p. 241)	<i>boolean</i>	false
false (p. 470)	<i>boolean</i>	false
february (p. 59)	<i>standard-month</i>	2
first-quarter (p. 236)	<i>phase</i>	90
french-epoch (p. 283)	<i>fixed-date</i>	654415
friday (p. 33)	<i>day-of-week</i>	5
full (p. 236)	<i>phase</i>	180
gregorian-epoch (p. 58)	<i>fixed-date</i>	1
hebrew-epoch (p. 119)	<i>fixed-date</i>	−1373427
hebrew-location (p. 297)	<i>location</i>	⟨32.82, 35, 0, 1/12⟩
hindu-anomalistic-month (p. 345)	<i>rational</i>	1577917828/57265137
hindu-anomalistic-year (p. 344)	<i>rational</i>	1577917828000/4319999613
hindu-creation (p. 344)	<i>fixed-date</i>	−714403429586
hindu-epoch (p. 156)	<i>fixed-date</i>	−1132959
hindu-location (p. 351)	<i>location</i>	⟨463/20, 2273/30, 0, 383/75⟩
hindu-lunar-era (p. 349)	<i>standard-year</i>	3044
hindu-sidereal-month (p. 336)	<i>rational</i>	394479457/14438334
hindu-sidereal-year (p. 336)	<i>rational</i>	394479457/1080000
hindu-solar-era (p. 347)	<i>standard-year</i>	3179
hindu-synodic-month (p. 336)	<i>rational</i>	394479457/13358334
icelandic-epoch (p. 100)	<i>fixed-date</i>	109
ides (p. 77)	<i>roman-event</i>	3
islamic-epoch (p. 106)	<i>fixed-date</i>	227015
islamic-location (p. 293)	<i>location</i>	⟨30.1, 31.3, 200, 1/12⟩
yyar (p. 114)	<i>hebrew-month</i>	2
j2000 (p. 212)	<i>moment</i>	730120.5
january (p. 59)	<i>standard-month</i>	1
jd-epoch (p. 18)	<i>moment</i>	−1721424.5
jerusalem (p. 204)	<i>location</i>	⟨31.78, 35.24, 740, 1/12⟩
julian-epoch (p. 76)	<i>fixed-date</i>	−1
july (p. 59)	<i>standard-month</i>	7
june (p. 59)	<i>standard-month</i>	6
kalends (p. 77)	<i>roman-event</i>	1

continued

Constant	Type	Value
kislev (p. 115)	<i>hebrew-month</i>	9
last-quarter (p. 236)	<i>phase</i>	270
march (p. 59)	<i>standard-month</i>	3
marheshvan (p. 115)	<i>hebrew-month</i>	8
may (p. 59)	<i>standard-month</i>	5
mayan-epoch (p. 171)	<i>fixed-date</i>	−1137142
mayan-haab-epoch (p. 173)	<i>fixed-date</i>	−1137490
mayan-tzolkin-epoch (p. 175)	<i>fixed-date</i>	−1137302
mean-sidereal-year (p. 221)	<i>duration</i>	365.25636
mean-synodic-month (p. 227)	<i>duration</i>	29.530588853
mean-tropical-year (p. 221)	<i>duration</i>	365.242189
mecca (p. 204)	<i>location</i>	⟨6427/300, 11947/300, 298, 1/8⟩
mjd-epoch (p. 19)	<i>fixed-date</i>	678576
monday (p. 33)	<i>day-of-week</i>	1
morning (p. 241)	<i>boolean</i>	true
new (p. 236)	<i>phase</i>	0
nisan (p. 114)	<i>hebrew-month</i>	1
nones (p. 77)	<i>roman-event</i>	2
november (p. 59)	<i>standard-month</i>	11
october (p. 59)	<i>standard-month</i>	10
olympiad-start (p. 82)	<i>julian-year</i>	−776
padua (p. 246)	<i>location</i>	⟨40867/900, 14263/1200, 18, 1/24⟩
paris (p. 283)	<i>location</i>	⟨175811/3600, 187/80, 27, 1/24⟩
persian-epoch (p. 258)	<i>fixed-date</i>	226896
samaritan-epoch (p. 301)	<i>fixed-date</i>	−598573
samaritan-location (p. 300)	<i>location</i>	⟨32.1994, 35.2728, 881, 1/12⟩
saturday (p. 33)	<i>day-of-week</i>	6
september (p. 59)	<i>standard-month</i>	9
shevat (p. 115)	<i>hebrew-month</i>	11
sidereal-start (p. 359)	<i>angle</i>	156.13605090692624
sivan (p. 114)	<i>hebrew-month</i>	3
spring (p. 83)	<i>season</i>	0
summer (p. 83)	<i>season</i>	90
sunday (p. 33)	<i>day-of-week</i>	0
tammuz (p. 114)	<i>hebrew-month</i>	4
tehran (p. 259)	<i>location</i>	⟨35.68, 51.42, 1100, 7/48⟩
tevet (p. 115)	<i>hebrew-month</i>	10
thursday (p. 33)	<i>day-of-week</i>	4
tibetan-epoch (p. 376)	<i>fixed-date</i>	294075
tishri (p. 115)	<i>hebrew-month</i>	7
true (p. 470)	<i>boolean</i>	true
tuesday (p. 33)	<i>day-of-week</i>	2
ujjain (p. 351)	<i>location</i>	⟨463/20, 45461/600, 0, 45461/216000⟩

continued

Constant	Type	Value
unix-epoch (p. 19)	<i>fixed-date</i>	719163
wednesday (p. 33)	<i>day-of-week</i>	3
winter (p. 83)	<i>season</i>	270
year-rome-founded (p. 81)	<i>julian-year</i>	−753



Sixteenth-century astrolabe, with zodiac and star names inscribed in Hebrew. (Courtesy of Adler Planetarium & Astronomy Museum, Chicago.)